



United States
Department of
Agriculture

Forest Service

Pacific
Northwest
Region

Gifford Pinchot
National Forest



Mount St. Helens National Volcanic Monument

Final Environmental Impact Statement Comprehensive Management Plan



"Mount St. Helens has had a long history of spasmodic explosive activity, and we believe it to be an especially dangerous volcano. In the future Mount St. Helens probably will erupt violently and intermittently just as it has in the recent geologic past, and these future eruptions will affect human life, property, agriculture, and general economic welfare over a broad area."

-- Dwight R. Grandell
-- Donal R. Mullineaux
U.S. Geological Survey, 1978



Progress made here in the search for predictability has already made life less uncertain for those living in the shadow of volcanos all over the world.

Cover: Post eruption view from the same location as the above photograph.

RECORD OF DECISION

USDA Forest Service

MOUNT ST. HELENS NATIONAL VOLCANIC MONUMENT COMPREHENSIVE MANAGEMENT PLAN

Gifford Pinchot National Forest
Clark, Cowlitz, Lewis, and Skamania Counties, Washington

Final Environmental Impact Statement

DECISION ON THE SELECTED ALTERNATIVE

It is my decision to select Alternative D (Modified) as the Comprehensive Management Plan for the Mount St. Helens National Volcanic Monument. This decision is made in full consideration of comments received on the Draft Environmental Impact Statement from the public, the Scientific Advisory Board, and from other agencies. The recently completed Spirit Lake tunnel outlet project was considered in making this decision.

This plan has been prepared in compliance to Public Law 97-243.

SELECTED ALTERNATIVE WITH REASONS FOR THE DECISION

Review comments on the draft plan are presented in Appendix N of the attached final plan, along with Forest Service responses to each comment. Based on these comments, the Preferred Alternative D (East and Westside Moderate Development) presented in the Draft Environmental Impact Statement has been changed, to form the selected alternative, Alternative D (Modified). No new significant environmental consequences other than those already identified in the Draft Environmental Impact Statement result from these changes.

Some of the major aspects of the selected alternative, Alternative D (Modified), along with reasons for changes, are:

- Aerial tram access to Johnston Ridge, as originally shown in the draft Preferred Alternative D, is changed to single lane shuttle bus access, as in Alternative C. The principal reason for proposing the aerial tram was to protect the sensitive debris avalanche between Coldwater Lake and Johnston Ridge. This area has already been substantially modified during the past several years as part of efforts to stabilize Coldwater Lake. A road has recently been constructed along South Coldwater Creek, from Coldwater Lake to the tunnel outlet. The tunnel is now constructed to maintain a safe water level on Spirit Lake. Major portions of this existing road are usable for accessing Johnston Ridge. Approximately three miles of road will be constructed from this existing access road from near the tunnel outlet to the top of Johnston Ridge.

Single lane shuttle bus access, along this roadway, will allow the visitor to enjoy the excellent view and interpretive opportunities available at Johnston Ridge. This change addresses the concerns expressed in the review comments; it specifically, (a) reduces the potential for high winds or earthquakes to disrupt service; (b) improves access for evacuation; (c) reduces the visual impact on the view from Coldwater Lake; (d) improves access and reduces cost for U.S. Geological Survey monitoring and other research; and (e) reduces the cost to the visitor (\$5 to \$6 for the aerial tram compared to \$3 to \$4 for the bus), and it provides a more appropriate recreation experience.

- Alternative D is modified to continue the present closure of the existing access road about two miles west of Castle Lake. Public access within the Monument would be limited to hiking to this lake. The road would be gated, with vehicle access permitted for research and administration. Public access rights are not acquired on the private roads leading to this area.

Castle Lake is a fragile area of high scientific values with many current research projects underway. Unrestricted public access would present high potentials for disturbance of these sensitive values. The relative remoteness of this area would make Forest Service administration of unrestricted use difficult. The high cost of acquiring public access rights is not justified.

- The existing low standard road from Windy Ridge to Spirit Lake is not needed to maintain the lake-level control structure, so shuttle bus access is eliminated from the selected alternative. The existing road will not be maintained, allowing natural processes to reclaim the roadway. As natural reclamation takes place, limited access will be allowed by permit to complete existing research and monitoring. Upgrading and continued maintenance of this road would be difficult and expensive, would damage sensitive features and processes, in an area with high scientific values. A trail will be constructed from Windy Ridge to Coldwater Lake, but is not scheduled until after Johnston Ridge access is completed.
- An objective of the selected alternative is to allow mountain climbing on or before 1987, beginning with a maximum of 100 climbers per day. The Monument Manager will monitor climbing and adjust the number of daily permits to provide an appropriate level of use for a quality recreation experience and protect ecological processes. Educational material will be used to enlist climbers help in protecting unique natural features, scientific research sites, and personnel working in the crater below. The crater will be closed to visitor access due to geologic hazards and to protect volcano monitoring activities.

- Under the selected alternative, the Forest Service will explore Congressional authority to charge a Monument entrance fee, with funds dedicated to the continued operation and maintenance of the Monument.
- State Route 504 (the Spirit Lake Memorial Highway) ends at Coldwater Lake under the selected alternative. The depth and unstable nature of the debris avalanche deposits between Coldwater Lake and Spirit Lake make road building in the area extremely difficult and expensive, if not impossible, at this time. The continual erosive nature of this material, which results in deep gullies occurring in one storm, makes keeping a passable road prohibitively expensive. The North Fork of the Toutle River is constantly changing location, and would require major modification of the landscape and great expense to provide a suitable crossing. In the event of volcanic activity, any investment in a road on the debris avalanche would have a high probability of being covered or washed away. This decision does not preclude reevaluating the extension of State Route 504 during future planning.

OTHER ALTERNATIVES CONSIDERED

Seven alternatives were analyzed in the draft plan, including Alternative D, presented as the Forest Service's preferred alternative.

Alternative A (No Change):

This alternative continues "present management." Only those improvements that are presently authorized in existing approved plans will be completed.

Alternative B (Limited Development):

Emphasis is placed on providing the facilities necessary to support the recreation visitors primarily outside the Monument while maximizing opportunities for primitive and semi-primitive experience within. Significant aspects include providing a Forest Service road to Coldwater Lake from the west, and improving the existing road to Windy Ridge to the east.

Natural features and processes are protected by limited access.

Alternative C (Westside Moderate Development):

Emphasis is placed on providing convenient access to key viewing areas accompanied by a moderate level of supporting facilities. Significant aspects include reconstructing State Route 504 to a double lane paved standard from near Camp Baker to a large day use complex at Coldwater Lake, providing a bus shuttle on a single lane paved road to Johnston Ridge, and maintaining Road 99 at its present standard to the Windy Ridge viewpoint.

Natural features and processes are protected by locations of access routes, modes of travel, and limiting visitor use to developments on one of the key features.

Alternative D (East and Westside Moderate Development):

This alternative is similar to Alternative C but eastside access is also improved. Significant aspects include reconstructing State Route 504 to a double lane paved standard from near Camp Baker to a large day use complex at Coldwater Lake, providing an aerial tram and a low standard single lane service road to Johnston Ridge, upgrading Road 99 to Windy Ridge, and providing a bus shuttle to Spirit Lake.

Natural features and processes are protected by increased supervision of the visitor, modes of travel, and limiting visitor use to developments on a significant portion of the Monument.

Alternative E (Eastside Moderate Development):

Emphasis is placed on improving access from the south and east and not reestablishing State Route 504 from the west. Significant aspects include upgrading and extending Road 99 to Spirit Lake, providing a day use facility and concessionaire in the vicinity of Ole's Cave, and providing a small campground near McBride Lake.

Natural features and processes are protected by the lack of westside access, and limiting visitor use to developments on a large portion of the Monument.

Alternative F (East and Westside High Level Development):

Emphasis is placed on providing convenient automobile access accompanied by highly developed recreation facilities. Significant aspects include extending State Route 504 at a double lane paved standard to provide automobile access from near Camp Baker to Johnston Ridge, providing a north south loop route between State Route 504 and Cougar, extending Road 99 to a day use facility at Spirit Lake, expanding Ape Cave parking, and providing a horse camp and trails in the Cave Basalt area.

Natural features and processes are protected by increased control of visitor use through rules and regulations.

Alternative G (Maximum Development):

This alternative is similar to Alternative F, but with added emphasis placed on improving access by providing a cross-Monument highway. Significant aspects include extending a double lane paved Forest Service road from State Route 504 at Coldwater Lake across the Spirit Lake Basin to connect with Road 99, providing a day use facility at Spirit Lake, providing a camping and day use complex near Ole's Cave, and providing a horse camp and trails in the Cave Basalt area.

Natural features and processes are protected by increased supervision of the visitors.

ENVIRONMENTALLY PREFERRED ALTERNATIVE

Alternative D, as modified by public comment (the selected alternative) is environmentally preferable because the best long-term balance is achieved between access and support facilities, and protection of biophysical features and processes. A larger portion of the Monument receives special attention to protect scientific research in D than in C. Monitoring is at a high level under the selected alternative, with an annual review of protection measures. Alternative D (Modified) best addresses the direction provided by the Monument Act: protecting the fragile ecosystem, permitting safe and convenient encounters with important features, while providing access and facilities at reasonable construction and operation costs.

Protection of biophysical features and processes in Alternatives A (No Change) and B (Limited Development) occurs primarily through limited access, which less effectively meets the mandate of the Monument Act. While short-term construction disturbances are lower in Alternatives A and B, protecting natural features and processes from user impacts under these alternatives will continue only as long as access is restricted by volcanic hazard closures. User access is projected to increase dramatically after volcanic hazards decrease and the closure zone is reduced. Then facilities and administrative measures will be essential to guide users to less sensitive areas within the Monument. The lower levels of facilities and administration identified in Alternatives A and B would then be inadequate to protect natural features and processes from unregulated use. Such overuse would cause cumulative, long-term adverse effects that would irreversibly harm sensitive natural features and processes within the Monument.

IMPLEMENTATION, MONITORING, AND MITIGATION

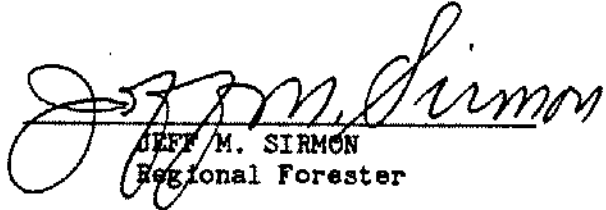
Implementation of the selected alternative, Alternative D (Modified), shall include all of the mitigation measures identified in Chapter II of the attached final plan. All practical means to avoid or minimize environmental harm have been adopted. These mitigation measures include direction for the development of more detailed monitoring plans, such as the Cave Basalt and Mt. Margaret Backcountry Management Plans. The overriding purpose of these measures is to allow "geologic forces and ecological succession to continue substantially unimpeded." (From Section 4b1 of the Monument Act.) The philosophy in the development of this plan places overriding importance on protecting natural features and processes, through the application of "biophysical carrying capacities, sensitivities, and maximum development categories" (Appendix B in the plan). Detailed facility planning for the selected alternative will consider the following priorities for the protection of natural features and processes: entirely avoiding sensitive features, limiting development to the margins, and limiting the size of development. All construction activities will be done in strict compliance with site-specific project specifications. These specifications will be developed utilizing the mitigation measures identified in the attached plan. Construction will involve the smallest areas possible to minimize disturbances. Monitoring of mitigation measures will be a planned part of each project development plan. The monitoring of the effectiveness of the mitigation measures will be a standard part of management reviews conducted to measure the effectiveness of activities carried out within the Monument.

RIGHT TO ADMINISTRATIVE APPEAL

This Decision is subject to administrative Appeal in accordance with the provisions of 36 CFR 211.18. Notice of the appeal must be in writing and submitted to:

October 18, 1985

DATE


JEFF M. SIMON
Regional Forester

Mount St. Helens National Volcanic Monument

Final Environmental Impact Statement

Comprehensive Management Plan

Gifford Pinchot National Forest



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Date of Transmission to
EPA and the Public: Draft; October 5, 1984

ABSTRACT

This Final Environmental Impact Statement covers a comprehensive management plan as required in the August 1982 Act creating the Mount St. Helens National Volcanic Monument. A range of eight management and development alternatives are presented and analyzed which provide various levels of recreation, interpretation, access, and research including a "no change" alternative which continues the current levels of management and development. Based on public review comments, the Preferred Alternative D (East and Westside Moderate Development) presented in the Draft Environmental Impact Statement has been changed to form the selected alternative, Alternative D (Modified). No new significant environmental consequences other than those already identified in the Draft Environmental Impact Statement result from these changes. It includes: reconstruction of State Route 504 (Spirit Lake Memorial Highway) to Coldwater Lake and a bus shuttle to Johnston Ridge viewpoint/observation post, and reconstruction of Roads 25 and 99. Trails to be constructed include: a loop around the mountain, along Smith Creek, in the Mt. Margaret and Vanson areas, and interpretive trails at Coldwater Lake and Lava Canyon. Recreation sites include: winter recreation near Road 83/8312 junction, a fire lookout/interpretive site at Strawberry Mountain, expanded facilities at Ape Cave and day use sites at Lava Canyon and Sheep Canyon. Camping facilities would be constructed at Lewis River Falls. The information stations at Yale and Iron Creek would be relocated along major access routes and the Pine Creek visitor information station would be upgraded. Fire management would be the quickest reasonable control of all fires in blowdown and fringe zones, using modified suppression techniques whenever possible and allowing prescribed natural fires in all other undeveloped areas, under specified conditions. The highest level of protection of scientific values in areas of highest sensitivity is achieved by standards for regulating access and use.

Table of Contents

	Page		Page
		IV	ENVIRONMENTAL CONSEQUENCES 131
I	RECORD OF DECISION		Introduction 131
	SUMMARY 1		Natural Features and Processes 131
	PURPOSE OF AND NEED FOR ACTION 1		Geology 131
	Planning Context 1		Watershed Resources 136
	Contents 1		Terrestrial Wildlife 144
	Issues, Concerns, and Opportunities 3		Vegetation 150
	Relationship to Other Plans and Agencies 3		Summary of the Nature of Impacts on
II	ALTERNATIVES INCLUDING PROPOSED ACTION 7		Natural Features and Processes 152
	Process Used to Form Alternatives 7		Human Activities 153
	Alternatives Eliminated From Detailed Study 11		Science and Research 153
	Management Concept Areas 11		Recreation, Interpretation, and Visual 159
	Description of Alternatives 13		Transportation 168
	Alternative D (Modified) 13		Cultural Resources 179
	Alternative A 25		Public Safety 179
	Alternative B 25		Fire Management 180
	Alternative C 26		Cost Effectiveness 183
	Alternative D 28		Socioeconomic Conditions 185
	Alternative E 29		Summary of the Nature of Impacts of
	Alternative F 31	V	Human Activities 191
	Alternative G 32	VI	LIST OF PREPARERS 193
	State Route 504 34		LIST OF AGENCIES, ORGANIZATIONS, AND
	Management Practices Common to		PERSONS TO WHOM COPIES OF THE
	All Alternatives 36		STATEMENT ARE BEING SENT 199
	Comparison of Alternatives 40	VIII	APPENDICES 209
	Natural Features and Processes 41	A	The Monument Act 211
	Recreation 44	B	Biophysical Carrying Capacity 221
	Science and Research 54	C	Research Alternatives 239
	Public Safety 54	D	Alternatives by Management
	Insect, Diseases, and Fire Management 55		Concept Areas 243
	Wildlife and Fish Habitat 56	E	Interpretive Themes 289
	Cost Effectiveness 57	F	Alternative Access Proposals,
	Cultural Resources 59		Coldwater Lake and Johnston
	Cave Management 59		Ridge 293
	Socioeconomic Conditions 60	G	Recreation Opportunity Spectrum 295
	Mitigation Measures 62	H	Air Traffic Restriction 309
III	AFFECTED ENVIRONMENT 67	I	Description of Models Used 311
	Introduction 67	J	Estimated Development Schedule
	Natural Features and Processes 67		and Costs for Alternative D
	Geology 67		(Modified) 313
	Watershed Resources 80	K	Fire Management Strategy 325
	Terrestrial Wildlife 89	L	Expected Visitor Use Study 327
	Vegetation 92	M	Expected Visitation by Road 335
	Climate 93		Corridors 335
	Air Quality 94	N	Public Involvement and Comments 337
	Forest Insects and Diseases 94	O	References 435
	Human Activities 95	P	Glossary 441
	Science and Research 95	Q	Index 447
	Recreation and Interpretation 100		
	Visual Resources 106		
	Transportation 109		
	Mining Activity 110		
	Cultural Resources 110		
	Public Safety 116		
	Law Enforcement 122		
	Fire Management 122		
	Socioeconomic Conditions 125		

List of Figures

Figure Number	Figure Name	Page
1	Response to Decision Criteria	xiv
2	Location Map (State Level)	2
3	Vicinity Map (4-County)	4
4	Crater and Dome Viewing Area	8
5	Subcharacter Land Types	10
6	Management Concept Areas	12
7	Coldwater/Johnston Ridge Development Concept, Alternative D (Modified) . .	16
8	State Route 504 Corridors	35
9	Geologic Resources, Conditions, and Features Impacted	42
10	Watershed Processes Impacted	44
11	Mount St. Helens Recreation, Supply Demand Comparison	45
12	Traditional Recreation, Supply Demand Comparison	46
13	Recreation Opportunity Spectrum, Supply Demand Comparison	47
14	Volcanic and Hydrologic Risk to Facilities	54
15	Trail Access Provided	55
16	Recreation Visitor Days by Fuel Type	56
17	Miles of Trails in Standing Dead Tree Areas	56
18	Number of Lakes Accessed	57
19	Cost Effectiveness, Capital Investment, and Operation and Maintenance	57
20	Cost Effectiveness, Returns to the Treasury	59
21	Cultural Resources Potentially Impacted	59
22	Number of Jobs Created	60
23	Estimated Gasoline Consumption Per Visitor by Alternatives	61
24	Post May 18, 1980, Geologic Resources	69
25	Pre May 18, 1980, Geologic Resources	76
26	Geologic Conditions and Processes . .	79
27	Water Resources	84
28	Stream Corridors, Watersheds, and Lakes	88
29	Wildlife Habitat	90
30	Ecological Features with High Scientific Value	96
31	Current Research Study Sites	98
32	Origin of Visitors, Pre 1980	100
33	Origin of Visitors to Mount St. Helens Compared to Grand Canyon Visitor Origin	102
34	Visual Quality Objectives	108
35	Mining Claims	110
36	Cultural Resource Sites	114
37	March 19, 1982, Snow Avalanche and Flood	118
38	Levels of Volcanic Risk	120

39	Fire Management Zones and Fuel Types	124
40	Fire Size and Frequency Predictions .	
C-1	Research Alternatives	240
D-1	Coldwater/Johnston Ridge--Development Concept--Alternative C	254
D-2	Coldwater/Johnston Ridge--Development Concept--Alternative D	260
D-3	Coldwater/Johnston Ridge--Development Concept--Alternative F	274
E-1	Rapid Change Punctuating Normal Events	291
G-1	ROS Classes--Alternative A	300
G-2	ROS Classes--Alternative B	301
G-3	ROS Classes--Alternative C	302
G-4	ROS Classes--Alternative D	303
G-5	ROS Classes--Alternative D (Modified)	304
G-6	ROS Classes--Alternative E	305
G-7	ROS Classes--Alternative F	306
G-8	ROS Classes--Alternative G	307
H-1	Helicopter Access	310
K-1	Fire Management Strategy	326
L-1	Population Growth in the Local Area .	329
L-2	Traditional Recreation Projections .	329
L-3	Visitation to the Grand Canyon N.P. .	331
L-4	Visitation to Mount Rainier N.P. . .	331
L-5	Mount St. Helens Recreation Projections	331

List of Tables

Table Number	Table Names	Page
1	Key Differences Between Alternatives.	iv
2	Summary of Outputs and Effects Compared by Alternative	vi
3	Issues, Concerns, and Opportunities .	3
4	Comparison of Effects on the Quality of the Visitor Experience	49
5	Comparison of Costs	58
6	Employment Created in or Near Monument	60
7	Estimate of Visitor Days to the Former St. Helens District, 1979 . .	100
8	Current Mount St. Helens Visitation .	101
9	Existing Opportunity Spectrum Classes	102
10	Supportive State and Private Developments	105
11	Cultural Resource Sites	113
12	Volcanic Risk Compared with Familiar Risks	119
13	Natural Fire Rotation	123
14	Economic Growth in Mount St. Helens Region, 1970-1980	126
15	Economic Profile of Mount St. Helens Region, 1980	127
16	Employment and Income in Mount St. Helens Region, 1980	127
17	Employment by County in Mount St. Helens Region, 1980	129
18	Proposed Bridges Common to All Alternatives	137
19	Lake Sensitivities and Access	141

List of Tables (Continued)

20	Fishing Visitor Days	143
21	Miles of Roads and Trails by Vegetative Condition	145
22	Wildlife Appreciation Visitor Use	145
23	Effects on Summer Range Habitat	147
24	Acres of Habitat Lost from Road Construction	147
25	Number of Caves Accessed by Roads and Trails	149
26	Summary of Recreation Visitor Days Supplied by Alternative (By Activity)	159
27	Summary of Acres of ROS Classes by Alternative	166
28	Summary of Recreation Visitor Days Supplied by Alternative (By ROS Classes)	167
29	Changes in Roading by Alternative	169
30	Bridge Construction Summary by Alternative	170
31	Trail Construction by Alternative	171
32	Summary of Public Access Rights	173
33	Summary of Alternatives for Isolated Non-federal land	174
34	Summary of Effects of Alternatives for Isolated Land Parcels	175
35	Summary of Effects of State Route 504 Corridors	176
36	Potential Impacts on Cultural Resources	179
37	Proposed F.A.A. Regulations over Monument by Alternative	180
38	Effects of Visitor Use and Development on Fire Risk	182
39	Summary of Capital Investment and Other One-Time Costs	183
40	Summary of Operation and Maintenance and Other Annual Costs	184
41	Summary of Concession Opportunities and Estimated Annual Return to the Government	184
42	Economic Impact by Alternative, 1990-2000	185
43	Economic Impact by Alternative	186
44	Economic Impact of Construction by Alternative, 1985-1990	187
45	Total Jobs by County by Alternative, 1985-2000	188
46	Direct Visitor Industry Related Jobs in or Near Monument, 2000	189
47	Total Visitor Industry Related Jobs in or near Monument	189

Tables in the Appendices

B-1	Biophysical Areas	223
B-2	Biophysical Sensitivity Rating Scale	223
B-3	Sensitivity Rating of Features and Processes	224
B-4	Development Categories	233
B-5	Maximum Development Categories	234
F-1	Comparison of Tram Systems	293
F-2	Estimated Annual Cost of a Gondola	294
F-3	Estimated Gross Annual Receipts	294
I-1	Estimated Delivered Sediment by Alternatives	312
J-1	Scheduling of Capital Investments, Recreation Facilities	313
J-2	Scheduling of Capital Investments, Roads and Bridges	317
J-3	Scheduling of Capital Investments, SR 504	319
J-4	Scheduling of Capital Investments, Trails	320
J-5	Scheduling of Capital Investments, One-Time Costs	323
J-6	Scheduling of Capital Investments, Administrative Headquarters and Seasonal Work Centers	324
L-1	Expected Traditional Recreation Use	330
L-2	Total Demonstrated Use	330
L-3	Expected Mount St. Helens Use	332
L-4	Expected Traditional Use by ROS	332
L-5	Expected Mount St. Helens Use by ROS	333
L-6	Summary of RVD's by ROS Class	333
L-7	Summary of Expected Visits	333
M-1	Projected Visits by Access Corridors	336
N-1	Residence of Respondents	338
N-2	Comment Subjects	339

Summary

INTRODUCTION

The Mount St. Helens National Volcanic Monument is administered by the United States Department of Agriculture (USDA), Forest Service, Gifford Pinchot National Forest. The events of May 18, 1980, made this portion of southwestern Washington internationally known. Centuries have passed between the eruptions of this volcano, yet it completely altered a vast landscape in seconds. An unparalleled opportunity to study the dynamics of geological force and biological response was created. Successive generations will witness the restoration of natural succession.

PURPOSE AND NEED

In October, 1981, The Mount St. Helens Land Management Plan allocated 84,700 acres of land to an "Interpretive Area" to protect distinctive features and processes for public education, interpretation and recreation, and for research. In August, 1982, the United States Congress passed an Act establishing the "Mount St. Helens National Volcanic Monument," an area of approximately 110,000 acres (Public Law 97-243).

The Monument Act requires the development of a "detailed and Comprehensive Management Plan (CMP) for the Monument," including but not limited to:

- "1. Measures for the preservation of the natural geologic and ecologic processes and integrity of the resources;
2. Indications of types, locations, and general intensities of development and access routes associated with the public understanding, use, and enjoyment of the area, including anticipated timetables and costs;
3. Identification of, and implementation plans for, visitor carrying capacities of the area; and
4. Indications of any potential modifications of the external boundaries of the area, and the reasons therefore."

The Final Environmental Impact Statement (FEIS) which follows was prepared by the Forest Service in response to this and other direction in the Act. Eight alternatives are evaluated in detail. The "decision to be made" is the selection of a plan for managing the Volcanic Monument. It will be based on the Monument Act;

identified issues, concerns, and opportunities; and public review and comment on this DEIS.

The Mount St. Helens National Volcanic Monument is located in southwestern Washington. Major population centers in its vicinity, including Portland-Vancouver, Longview-Kelso, Chehalis-Centralia, Olympia, and Seattle-Tacoma, are situated along the Interstate Highway 5 corridor. This highway runs along the western edge of the area. Population centers in eastern Washington and Oregon are separated from the Monument by the Cascade Mountains.

MAJOR ISSUES

Listed below are the issues, concerns, and opportunities (ICOs) that emerged from the Monument Act, public comment, and management concerns. They were addressed by the eight alternatives. The "best," most balanced, approach to meeting them was judged to be Alternative D (Modified), which is the Forest Service's selected alternative.

1. The effects of the Monument management on the natural ecologic and geologic processes.
2. Kinds and levels of recreation and interpretation opportunities and their administration.
3. Coordination and administration of research.
4. Public safety within and around the Monument.
5. Types and locations of access routes into and within the Monument.
6. Management of insects, disease, and fire within and immediately adjacent to the Monument.
7. Hunting and fishing regulations and the possible reintroduction of animals.
8. The cost effectiveness of Monument development.
9. Management and protection of cultural resources within the Monument.
10. Management of the cave basalt flow area.
11. The socioeconomic effects associated with management of the Monument.

ALTERNATIVES

Seven alternatives were analyzed including a no change alternative in the Draft Environmental Impact Statement (DEIS). Based on public comment, the Preferred Alternative D (East and Westside Moderate Development) presented in the DEIS has been changed, to form an eighth alternative, Alternative D (Modified), which is the selected alternative. No new significant environmental consequences other than those already identified in the DEIS result from these changes. All of these alternatives stress the overriding importance of protecting the natural processes and features.

Brief descriptions of the alternatives are outlined below. Amounts of development and access generally increase by letter from a continuation of the current situation, except for the selected Alternative D (Modified) with levels falling between Alternatives C and D. Table 1 highlights the key differences between alternatives.

Alternative D (Modified)

SELECTED. Emphasis is placed on providing convenient east and westside access to key viewing areas. Access to Johnston Ridge is provided by a bus shuttle on a single lane asphalt paved road, and upgrading Road 99 to a double lane asphalt paved standard to Windy Ridge. The Washington State Department of Transportation is requested to reconstruct State Route 504 (the Spirit Lake Memorial Highway) along the upper corridor, to a double lane paved standard, from near the Green River to Coldwater Lake.

Natural features and processes are protected by increased supervision of the visitor, modes of travel, and limiting visitor use to developments on a significant portion of the Monument.

Alternative A (No Change)

This alternative continues "present management." Only those improvements that are presently covered by approved plans will be completed.

Alternative B (Limited Development)

Emphasis is placed on providing the facilities necessary to support the recreation visitors primarily outside the Monument while maximizing opportunities for primitive and semi-primitive experience within. Significant aspects include providing a Forest Service road to Coldwater Lake from the west, and improving the existing road to Windy Ridge on the east.

Natural features and processes are protected by the limited access.

Alternative C (Westside Moderate Development)

Emphasis is placed on providing convenient access to key viewing areas accompanied by a moderate level of supporting facilities.

Significant aspects include reconstructing SR 504 to a double lane paved standard from near Camp Baker to a large day use complex at Coldwater Lake, providing a bus shuttle on a single lane paved road to Johnston Ridge, and maintaining Road 99 at its present standard to the Windy Ridge viewpoint.

Natural features and processes are protected by locations of access routes, modes of travel, and limiting visitor use to developments on one of the key features.

Alternative D (East/Westside Moderate Development)

PREFERRED, in DEIS. This alternative is similar to Alternative C but eastside access is also improved. Significant aspects include reconstructing State Route 504 to a double lane paved standard from near Camp Baker to a large day use complex at Coldwater Lake, providing an aerial tram and a low standard single lane service road to Johnston Ridge, upgrading Road 99 to Windy Ridge, and providing a bus shuttle to Spirit Lake.

Natural features and processes are protected by increased supervision of the visitor, modes of travel, and limiting visitor use to developments on a significant portion of the Monument.

Alternative E (Eastside Moderate Development)

Emphasis is placed on improving access from the south and east and not reestablishing State Route 504 from the west. Significant aspects include upgrading and extending Road 99 to Spirit Lake, providing a day use facility and concessionaire in the vicinity of Ole's Cave, and providing a small campground near McBride Lake.

Natural features and processes are protected by the lack of westside access, and limiting visitor use to developments on a large portion of the Monument.

Alternative F (East/West High Level Development)

Emphasis is placed on providing convenient automobile access accompanied by highly developed recreation facilities. Significant aspects include extending State Route 504 at a double lane paved standard to provide automobile access from near Camp Baker to Johnston Ridge, providing a north south loop route between SR 504 and Cougar, extending Road 99 to a day use facility at Spirit Lake, expanding Ape Cave parking, and providing a horse camp and trails in the Cave Basalt area.

Natural features and processes are protected by increased control of visitor use through rules and regulations.

Alternative G (Maximum Development)

This alternative is similar to Alternative F but with added emphasis placed on improving access

by providing a cross-Monument highway. Significant aspects include extending a double lane paved Forest Service road from SR 504 at Coldwater Lake across the Spirit Lake Basin to connect with Road 99, providing a day use facility at Spirit Lake, providing a camping and day use complex near Ole's Cave, and providing a horse camp and trails in the Cave Basalt Area.

Natural features and processes are protected by increased supervision of the visitors.

MANAGEMENT PRACTICES COMMON TO ALL ALTERNATIVES

Some management practices are observed in all alternatives. They are required by direction in the Monument Act or have been established by existing plans or administrative decisions.

A detailed description of management direction common to all alternatives appears in Chapter II of this document. Included are practices having to do with the management of vegetation, interpretation, off-road vehicles, facility design, law enforcement, visual resource management, science and research, public safety, insect and disease management, hunting and fishing, fire, cultural resources, and cave basalt area management, air quality control, entrance fees, landownership, and the activities of the U.S. Geological Survey.

AFFECTED ENVIRONMENT

This local area, affected by volcanic activity throughout the ages, is well known worldwide. The mountain remains active, drainage patterns are being reestablished, water bodies, vegetation and wildlife are slowly recovering. Future volcanic activity at Mount St. Helens is difficult to predict and was a major consideration in developing management approaches in the area.

Numerous features and processes within the Monument have high scientific value and extensive research activities are ongoing; more than 500 scientists and 300 separate investigations are involved. Studies range from soils, vegetation, geology, streams, lakes, and fauna, to research in sociology, economics, and health. The investment in research within the Monument and the scientific significance of the area are internationally recognized.

Only a few recreation and interpretive sites and viewpoints are available now. They include Ape Cave, Kalama Springs Campground, Lava Cast Picnic Area, and viewpoints with interpretive signs. Forest Service facilities outside of the Monument constructed since the eruptions that support visitors to the Monument include a visitor center, information stations (Yale, Iron Creek, and Pine Creek), Iron Creek Campground, and minor interpretive sites and viewpoints.

There are additional developments provided by the private sector and other governmental agencies adjacent to the Forest.

More than 85 cultural resource sites within the Monument were inventoried but few have been investigated in the field.

There are approximately 23,000 acres of blowdown trees and 5,000 acres of standing dead trees in a fan-shaped fringe within the Monument; both create significant wildfire hazard. Ash has eroded or settled, lessening its utility as a fire retardant. Branchwood and snags have begun to drop in the fringe, creating significant fire potential, especially on slopes. Revegetation has begun to accumulate litter and restore a continuous fuelbed in both blowdown and fringe areas.

There are currently 173 miles of roads and seven temporary bridges providing access to or within the Monument. Road construction and reconstruction since the eruption have taken place primarily to provide access for timber salvage in areas adjacent to the Monument.

COMPARISON OF ALTERNATIVES

The key environmental consequences, outputs, and social and economic effects are compared by alternative in Table 2. The interdisciplinary team measured how each alternative responded to the issues, concerns, and opportunities. Figure 1 shows a relative comparison of this response in graph form.

MAJOR CONCLUSIONS

Compared to the No Change Alternative A, the selected Alternative D (Modified) places increased emphasis on providing a mix of access routes and visitor support facilities capable of accommodating the expected visitor use while also increasing the emphasis on protecting research values by placing key features into protection classes.

Under the selected alternative, 242 acres affected in the past by development and use will continue to be used with similar types and intensities of impact. A total of 92 acres of land presently disturbed will be restored to a more natural condition, and 213 acres of land not now in use or disturbed will receive significant impact. The total land to be occupied by future development and use is 455 acres.

The net result will be a National Monument of 110,330 acres of which 99.6 percent will remain undeveloped, and 0.4 percent will be developed and used by visitors for enjoyment of the Monument.

Table No. 1: KEY DIFFERENCES BETWEEN ALTERNATIVES

	A	B	C	D	Preferred in DEIS	Modified/Selected	E	F	G
Natural Processes: Area occupied by trails, roads, and facilities. 1/ (Areas not occupied)	334 acres (109,996 acres)	319 acres (110,311 acres)	387 acres (109,943 acres)	491 acres (109,839 acres)	455 acres (109,875 acres)	462 acres (109,868 acres)	605 acres (109,725 acres)	659 acres (109,672 acres)	
Research: Protection Class I Area (acres) Key features (Number)	None None	None None	16,960 One	27,200 Four	28,520 Five	27,200 Four	27,200 Four	27,200 Four	
Air traffic restrictions:	None	2,000 ft. above the terrain over the entire Monument	2,000 ft. above the terrain over a portion of the Monument	1,000 ft. above the terrain over the entire Monument	1,000 ft. above the terrain over the entire Monument	1,000 ft. above the terrain over a portion of the Monument	None	None	
Fire:	Modified suppression techniques	Modified suppression techniques Prescribed natural fires	Modified suppression techniques Prescribed natural fires Scheduled prescribed fires	Modified suppression techniques Prescribed natural fires Scheduled prescribed fires	Modified suppression techniques Prescribed natural fires Scheduled prescribed fires	Modified suppression techniques Prescribed natural fires Scheduled prescribed fires	Modified suppression techniques Prescribed natural fires Scheduled prescribed fires	Modified suppression techniques Prescribed natural fires Scheduled prescribed fires	
Visuals: Private land between major access corridors and the Monument	No action	No action	Acquire scenic easement	Acquire land	Acquire land	Acquire scenic easement	No action	Acquire land	
Access Coldwater/Johnston	None	Reconstruct private roads to Coldwater Lake	State Route 504 to Coldwater Lake Bus shuttle to Johnston Ridge	State Route 504 to Coldwater Lake Aerial tram to Johnston Ridge	State Route 504 to Coldwater Lake Bus shuttle to Johnston Ridge	None	State Route 504 to Johnston Ridge (7.1 miles)	State Route to Coldwater Lake with FS road through Spirit Lake Basin to Road 99 (8.6 miles)	
Road 99	Single lane to Windy Ridge	Double lane to Windy Ridge	Single lane to Windy Ridge	Double lane paved to Windy Ridge Bus shuttle over native surface road to Spirit Lake	Double lane asphalt paved to Windy Ridge	Double lane gravel to Spirit Lake	Double lane paved to Spirit Lake	Double lane paved to Spirit Lake.	

Table No. 1: KEY DIFFERENCES BETWEEN ALTERNATIVES

	A	B	C	Preferred in DEIS D	Modified/Selected D	E	F	G
Facilities	20 cars and 1 bus parking	20 cars and 1 bus parking	30 cars and 1 bus parking	40 cars and 1 bus, add conces- sion building	40 cars and 1 bus, add conces- sion building	20 cars and 1 bus parking	50 cars and 1 bus, add concession building	20 cars and 1 bus parking
Ole's	None	None	None	None	None	Construct 12 unit campground Parking for 40 cars, day use concession bldg.	Construct 25 unit campground Parking for 40 cars, day use concession bldg.	Construct 25 unit campground Parking for 40 cars, day use concession bldg.
Lewis River C.G.			50 units	60 units	60 units	60 units	100 units	100 units
McBride Lake C.G.	None	None	None	None	None	12 units	12 units	25 units
Kalama Horse C.G.	None	None	None	None	None	None	12 units	12 units
Portals: Iron Cr.	Temporary	Kiosk	Reconstruct at present location	Relocate on Hwy.	Relocate on Hwy.	Relocate on Hwy.	Relocate on Hwy.	Relocate on Hwy.
Yale			Reconstruct a present location as Coop Visitor Center w/PP&L	Relocate on Hwy.			Reconstruct at present location as Coop Visitor Center w/PP&L	Reconstruct at present location as Coop Visitor Center w/PP&L
Pine Cr.	Temporary	Kiosk	Relocate on Hwy.	Relocate on Hwy.	Relocate on Hwy.	Relocate on Hwy.	Relocate on Hwy.	Relocate on Hwy.
	Retain	Retain	Retain	Retain	Retain	Retain	Retain	Retain
Horse Use Permitted	No restrictions	North of Green River	North of Green River	N. of Green River plus 3 trail miles in Cave Basalt Area 40 Miles	Green timbered area	N. of Green River plus 3 trail miles in Cave Basalt Area 40 Miles	N. of Green River plus 30 trail miles in Cave Basalt Area 86 Miles	N. of Green River plus 30 trail miles in Cave Basalt Area 90 Miles
Total Miles Open	39 Miles	15 Miles	34 Miles	40 Miles	52 Miles	40 Miles	86 Miles	90 Miles
Sno-park: Swift Cr.	None	None	50 cars	60 cars	60 cars	60 cars	80 cars	80 cars
Road 25/99	None	None	None	20 cars	20 cars	20 cars	20 cars	40 cars
Coldwater Lake	None	None	None	200 cars	200 cars	None	200 cars	100 cars (Spirit Lake)
Kalama River	None	None	None	None	None	None	30 cars	15 cars

1/ Other effects are reported in Chapter IV.

Table No. 2 : Comparison of Outputs and Effects

ELEMENTS OF THE ISSUES	A	B	C	D (Preferred in DEIS)	D (Modified, Selected)	E	F	G
Natural Processes and Features:								
1. Biological Features and Processes--Overall Level of Disturbance Compared to Present (Acres)	334	319	387	491	455	462	605	658
2. Geologic Resources, Conditions, and Processes (1)								
a. Resources--# of Impacts	9	16	24	27	21	28	32	33
b. Conditions and Processes--# of Impacts	3	7	7	9	9	9	10	9
3. Watersheds (1)								
a. Processes--# of Impacts	2	2	6	5	3	5	8	8
Recreation:								
1. Supplied Outputs Mount St. Helens Activities (MRVD's)	263	405	548	590	584	412	513	506
Traditional Activities (MRVD's)	241	260	322	386	389	374	454	454
Total (MRVD's)	504	665	870	976	973	787	967	960
2. Quality of the Visitor's Experience								
Achieving the View	Skewed	Partially blocked	Improved	Relieved	Full view of crater and dome	Increased	Relieved	Relieved
Traffic Congestion	Increased	Slightly improved	Balanced	Balanced	Balanced	Balanced	Limited	Balanced
Interpretation	Limited	Limited	\$6	\$6	\$6	\$10	\$7	\$7
Cost to Visitor	\$10	\$8	Moderate	Moderate	Moderate	Low	High	High
Convenience	Low	Low	Moderate	Full range	Full Range	Limited	Moderate	Moderate
Diversity	Limited	Limited	Moderate	Retention	Retention	Retention	Maximum	Retention
Visual (Corridors)	Maximum	Maximum	Retention	Retention	Retention	Retention	Modification	Retention
3. Recreation Opportunity Spectrum								
Primitive (Acres)	19,506	17,050	10,018	10,018	10,018	0	0	0
(MRVD's)	3.5	5.3	8.1	12.9	12.8	.8	1.0	.9
Semi-primitive, Non-motorized (Acres)	56,932	64,925	66,838	66,154	79,212	76,215	68,507	67,246
(MRVD's)	60.1	74.9	112.6	122.2	124.1	129.6	153.5	147.1
Semi-primitive Motorized (Acres)	(30,000)	(30,000)	(30,000)	(30,000)	(30,000)	(30,000)	(30,000)	(30,000)
(MRVD's)	20.7	25.7	36.2	37.8	37.4	40.0	48.9	48.4
Roaded Natural (Acres)	33,892	28,355	33,394	34,078	21,020	34,115	41,743	43,004
(MRVD's)	337.3	461.9	575.5	657.3	654.2	520.9	645.1	653.1

Table No. 2 : Comparison of Outputs and Effects (Continued)

ELEMENTS OF THE ISSUES		A	B	C	D (Preferred in DEIS)	D (Modified, Selected)	E	F	G
<u>Science/Research:</u>									
1. Communication With Scientific Community		Through Scientific Advisory Board (SAB), system for permits to restricted zone, and one-on-one contacts.	SAB, limited assistance by local scientists, permit system for restricted zone.	Panel representing research programs assist science coordination and SAB in assuring protection of natural features.	Same as C	Panel of researchers with active interests in Mount St. Helens, as well as science coordinator and SAB, serve as vehicles for communication between the Monument and scientific community.	Same as C	Same as C	Same as C
2. Documentation of Research Activities		Participation by scientists based on existing system of communication with scientific community (informal one-on-one contacts and permit system for restricted zone).	System for gaining scientist participation same as A.	Active system for gaining scientist participation in documentation.	Same as C	Active system for gaining scientist participation in documentation.	Same as C	Same as C	Same as C
3. Coordination of Research		Opportunities for coordination limited by levels of documentation and communication.	Improved somewhat over A because of improved recordkeeping	Coordination facilitated by active program of communication with scientific community.	Same as C	Coordination facilitated by active program of communication with scientific community.	Same as C	Same as C	Same as C
4. Facilities		No working or living facilities designed or designated for research use.	Some camping sites designated for research use.	Designates campsites at Curley Creek. Laboratory/camping at Pine Creek.	Same as C Same as C Claus Overnight Use Goat Cr. Trail	Laboratory/camping at Pine Creek. Claus Overnight Use Observation Post at Johnston Ridge	Same as C Same as C Same as D	Same as C Same as C Same as D	Same as C Same as C Same as D Goat Cr. Trail St. Helens Lk. Trail Same as C

Table No. 2 : Comparison of Outputs and Effects (Continued)

ELEMENTS OF THE ISSUES		A	B	C	D (Preferred in DEIS)	D (Modified, Selected)	E	F	G
<u>Science/Research (Continued):</u>									
5. Collection and Maintenance of Long-term Environmental Records		Maintain present uncoordinated system managed by many individuals.	Monument sets up system managing records generated by USDA FS.	Same as B plus Monument catalogs data sets collected by others.	Same as C plus Monument picks up appropriate monitoring efforts abandoned by others.	Monument sets up system managing records generated by USDA FS; plus catalogs data sets collected by others appropriate monitoring efforts abandoned by others.	Same as C		Same as D (Preferred)
6. Access for Research		No specific provisions for providing administrative access to remote research sites.	Same as A	Same as A	Administrative access provided to selected remote research sites.	Same as D	Same as D		Same as D
7. Protection of Research Plots and Features and Processes of Scientific Value		Limited program for protection of natural features and processes, no annual review of and report on protection of natural processes and features.	Low intensity monitoring program except for most sensitive features which have moderate level of monitoring and effort to control use in sensitive areas and internal review of annual report.	Same as B except in most sensitive areas where there is regulation of use and introduction and removal of organisms, moderate intensity of monitoring, annual report reviewed by SAB and panel representing research programs.	Same as C except that area of high level of protection covers larger area.				

Table No. 2 : Comparison of Outputs and Effects (Continued)

ELEMENTS OF THE ISSUES	A	B	C	D (Preferred in DEIS)	D Modified, Selected	E	F	G
<u>Public Safety:</u>								
1. Volcanic Risk Range (2) (Number of facilities or structures within current closure zone)	1	8	15	18	15	17	21	21
2. Hydrologic (number of structures in areas of active channel develop- ment and migration)	3	6	13	15	14	16	18	19
3. Air Traffic Restrictions	No restric- tions on air traffic	All flights restricted to 2,000 feet above terrain	Portions of Monument restricted to 2,000 feet above terrain	Entire Monument restricted to 1,000 feet above terrain	Entire Monument restricted to 1,000 feet above terrain except by permit	Portions of Monument restricted to 1,000 feet above terrain	No restric- tions on air traffic	No restric- tions on air traffic
<u>Access:</u>								
1. Ease of Road Access (2)								
a. Westside	No public access to Monument from west	Reconstructed private road from west to Coldwater Lake	State highway to Coldwater Lake; bus shuttle to Johnston Ridge; single lane to Castle Lake	State highway to Coldwater Lake; aerial tram and bus shuttle to Johnston Ridge; single lane road to Castle Lake	State highway to Coldwater Lake; bus shuttle to Johnston Ridge	Single lane road to Castle Lake (with restrictions)	State highway to Johnston Ridge; single lane paved road to Castle Lake, continuing paved road to across S. Fork Toutle to Sheep Canyon	State highway to Coldwater Lake; double lane road to Spirit Lake; single lane paved road to Castle Lake
b. Eastside	Public access via single and double lane Roads 25, 26, 99	Double lane paved road to Windy Ridge. Abandon Road 92 (Smith Creek)	Double lane Road 25; single lane Road 99 to Windy Ridge. Relocate Road 92 (Smith Creek)	Double lane paved roads to Windy Ridge; bus shuttle to Spirit Lake	Double lane asphalt paved road to Windy Ridge	Double lane paved roads to Windy Ridge; double lane gravel to Spirit Lake; recon- struct Road 92 (Smith Creek)	Double lane paved roads to Spirit Lake; reconstruct/ construct roads in Smith Creek area	Double lane paved roads to Spirit Lake; ties to road from west; reconstruct/ construct roads in Smith Creek area

Table No. 2 : Comparison of Outputs and Effects (Continued)

ELEMENTS OF THE ISSUES	A	B	C	D (Preferred in DEIS)	D Modified, Selected	E	F	G
<u>Access (Cont.)</u>								
2. Trail Access								
a. Miles of Trail	49	96	116	170	180	176	211	204
b. RVDs	6,295	12,448	15,016	21,982	23,275	22,691	27,232	26,342
3-a. Rights of Way (ml.)	0	18	14	0	0	19	44	24
b. Agreements (ml.)	0	34	39	36	5	21	21	42
<u>Fire Management:</u>								
1. Total RVDs by Fuel Type								
a. General Forest	4,541	5,123	8,217	21,139	21,139	27,108	48,291	45,324
b. Blowdown	3,941	11,248	16,891	31,426	31,426	11,010	34,669	7,077
c. Fringe	460	1,207	1,605	5,862	5,862	10,608	17,248	18,043
2. Number of Developed Sites by Fuel Type								
a. General Forest	2	4	5	5	5	6	5	6
b. Blowdown	7	10	13	13	13	12	13	12
c. Fringe	3	3	3	4	4	4	4	4
3. Miles of Trail by Fuel Type								
a. General Forest	27	19	34	42	42	42	61	63
b. Blowdown	3	11	18	31	31	20	23	29
c. Fringe	1	17	17	31	31	30	28	25
4. Number of Dispersed Campgrounds by Fuel Type								
a. General Forest	1	1	3	4	4	5	6	6
b. Blowdown	--	2	2	3	3	3	3	3
c. Fringe	1	2	2	4	4	5	5	5

Table No. 2 : Comparison of Outputs and Effects (Continued)

ELEMENTS OF THE ISSUES	A	B	C	D (Preferred in DEIS)	D Modified, Selected	E	F	G
Wildlife and Fisheries:								
1. Lakes and lakeshores								
a. Lakes with road or trail access	8	17	20	23	20	21	23	23
b. Backcountry use restrictions	None	None	Length of stay limited	Number of camping permits limited	Number of camping permits limited	Same as D	Camping, hiking, and fires restricted	Camping, hiking, and fires restricted
2. Deer and Elk Winter Range								
Sno-parks located in Winter Range	1	0	0	0	0	0	2	1
3. Deer and Elk Summer Range								
Key habitat areas impacted								
+ = positive								
- = negative								
0 = both or no change								
a. Goat Marsh	0	+	+	0	0	0	-	-
b. Marble Mountain	0	-	-	-	0	-	-	-
4. Miles of Trail in Standing Dead Tree Areas	4	29	28	35	34	31	35	32
5. Streams and Stream-side Potential Cumulative Damage	Low distur- bances to streams and riparian vegetation	Same as A	Moderate disturbances to streams and riparian vegetation	Same as C	Moderate disturbances to streams and riparian vegetation	Same as C	High distur- bances to streams and riparian vegetation	Same as F
Cost Effectiveness:								
1. a. Total (less SR 504) (Thousands \$)	12,400	34,976	33,314	41,244	39,667	37,933	52,850	53,154
b. Cost/RVD (\$)	1.23	2.63	1.91	2.11	2.06	2.41	2.73	2.77

Table No. 2 : Comparison of Outputs and Effects (Continued)

ELEMENTS OF THE ISSUES	A	B	C	D (Preferred in DEIS)	D Modified, Selected	E	F	G
<u>Cost Effectiveness (Cont.)</u>								
2. Operation & Maintenance								
a. Annual (Thous. \$)	1,417	1,104	1,444	1,570	1,538	1,347	1,662	1,718
b. Cost/RVD (\$)	2.27	1.66	1.66	1.60	1.58	1.71	1.74	1.79
3. State Route 504 Construction Costs (Thous. \$)	0	0	64,000	64,000	64,000	0	89,400	64,000
4. Concessionaire Returns to Treasury (Thous. \$)	0.25	0.25	53.20	134.40	91.7	13.00	65.00	62.75
<u>Cultural Resources:</u>								
Number of Cultural Resource Sites Potentially Impacted (4)	7	10	11	15	15	14	16	18
<u>Cave Basalt Area Management:</u>								
1. Biological Resources								
a. Townsend's big-eared bat hibernation site: Newly developed with access	0 4	0 2	0 2	0 2	0 2	1 3	1 4	1 4
b. Number of caves developed for recreation	2	2	2	2	2	3	3	3
c. Number of "sensitiv-ity level 2-5" caves with access (5)	16	6	6	6	6	6-16 (6)	16	16
2. Geological Resources								
a. Number of geologically sensitive caves developed	1	1	1	1	2	2	2	2
b. Number of geologically sensitive caves accessed	7	6	6	10	9	11	16	16

Table No. 2 : Comparison of Outputs and Effects (Continued)

ELEMENTS OF THE ISSUES	A	B	C	D (Preferred in DEIS)	D Modified, Selected	E	F	G
<u>Socioeconomic Conditions:</u> (in year 2000 unless otherwise noted)								
1. Operations								
a. Total Jobs (No.)	2,377	3,529	4,744	5,135	5,135	3,700	4,585	4,525
b. Income (mil. \$)	168.8	250.6	337.8	364.6	364.6	262.7	325.5	321.3
2. Construction (1995-1990)								
a. Total Jobs (No.)	Neg11.	460	3,330	3,820	3,820	1,680	4,880	3,960
b. Income (mil. \$)	Neg11.	40.9	135.7	155.8	155.8	46.3	208.9	161.8
3. Total NPM - Related Per Capita Income (Thou \$)	44.1	44.1	44.1	44.1	44.1	44.1	44.0	43.9
4. NPM - Related Jobs	2,378	3,529	4,745	5,135	5,135	3,700	4,585	4,526
5. NPM - Related Jobs in or Near Monument	881	1,342	1,813	1,954	1,954	1,377	1,713	1,668
6. Social Impacts (7)	Concentrated along US 12 and SR 504 road corridors	Same as A	Concentrated along SR 504 road corridor (Spiral Lake Memorial Highway)	Same as C	Concentrated along SR 504 road corridor (Spiral Lake Memorial Highway)	Same as A & B	Same as C & D	Concentrated along US 12, SR 504, and SR 503 road corridors

NOTES: (1) Magnitude and duration of impacts by alternatives are discussed in Effects (Chapter IV) and Comparison of Alternatives (Chapter II).

(2) Does not consider magnitude of risk within closure area by specific location and eruptive state of the volcano (discussed in Chapters II and IV).

(3) Based on road standards (single versus double lane, gravel versus paved) and number of sites accessible by roads proposed in alternatives.

(4) Numbers reflect only potential impacts to cultural resource sites because the actual number of sites that will be located on the ground is unknown at this time.

(5) For explanation of "sensitivity levels," refer to "cave habitat" in Chapter IV.

(6) When Road 8300080 is no longer passable, the number of caves assessed is reduced from 16 to 6.

(7) "Social Impacts" includes effects along main road corridors on visitor services; local lifestyles and values; and land uses, plans, and zoning.

Response of Alternatives to Issues, Concerns and Opportunities

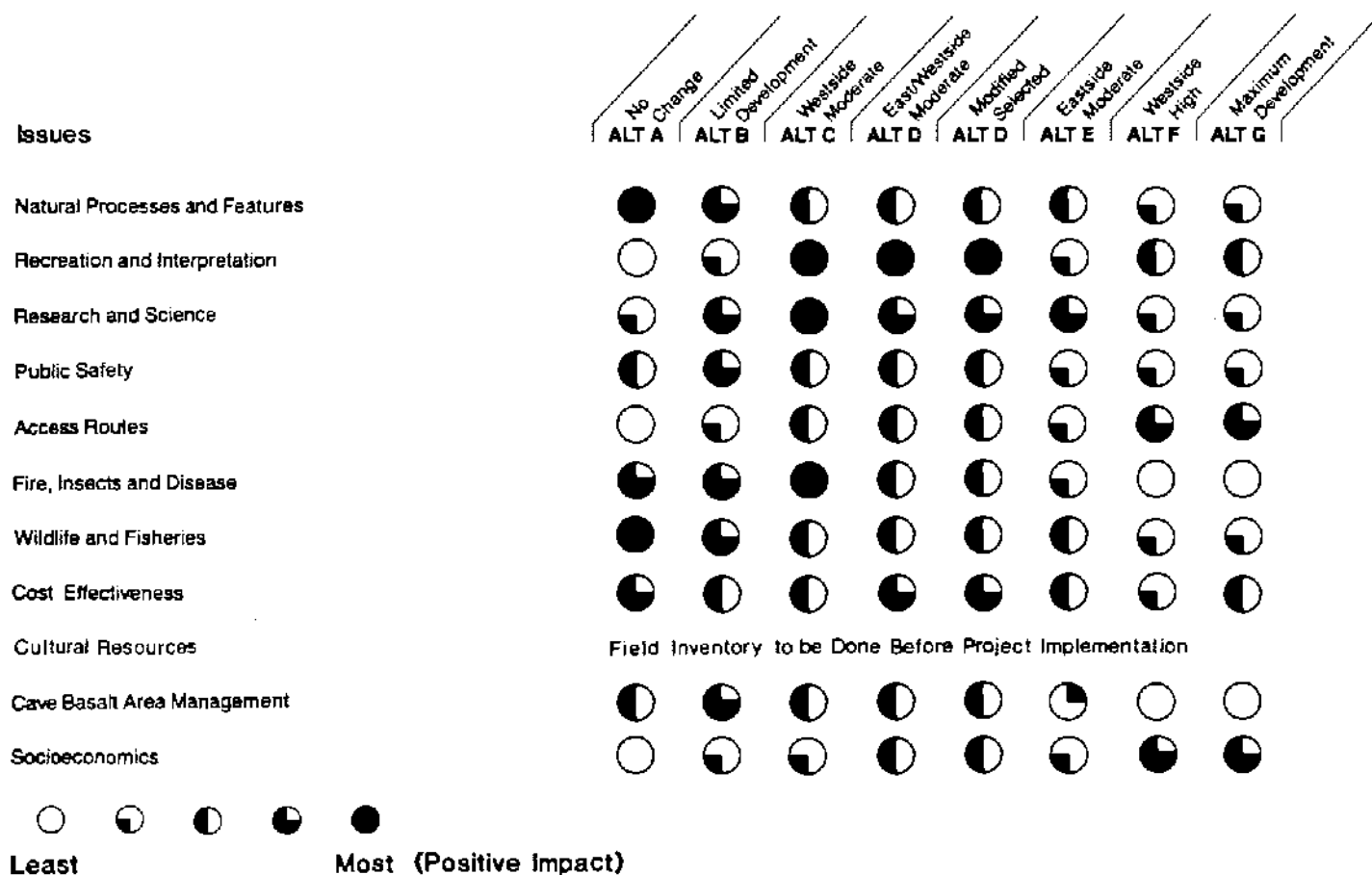


Figure 1

Final Environmental Impact Statement Mount St. Helens National Volcanic Monument Comprehensive Management Plan

I. Purpose of and Need for Action

PLANNING CONTEXT

Recent volcanic eruptions at Mount St. Helens, particularly the event of May 18, 1980, have created one of the best-known landmarks in the United States. To protect these distinctive features for interpretation, recreation, and research, The Mount St. Helens Land Management Plan (a Final Environmental Impact Statement) allocated land to an "Interpretive Area" in October, 1981. Subsequently, in August, 1982, the United States Congress passed an Act creating an 110,330 acre "Mount St. Helens National Volcanic Monument" (Figure 2 and Appendix A). This Act (Public Law 97-243) requires the development of a "detailed and comprehensive management plan for the Monument," including but not limited to:

1. Measures for the preservation of the natural geologic and ecologic processes and integrity of the resources;
2. indications of types, locations, and general intensities of development and access routes associated with the public understanding, use, and enjoyment of the area, including anticipated timetables and costs;
3. identification of, and implementation plans for, visitor carrying capacities of the area; and
4. indications of any potential modifications of the external boundaries of the area, and the reasons therefore."

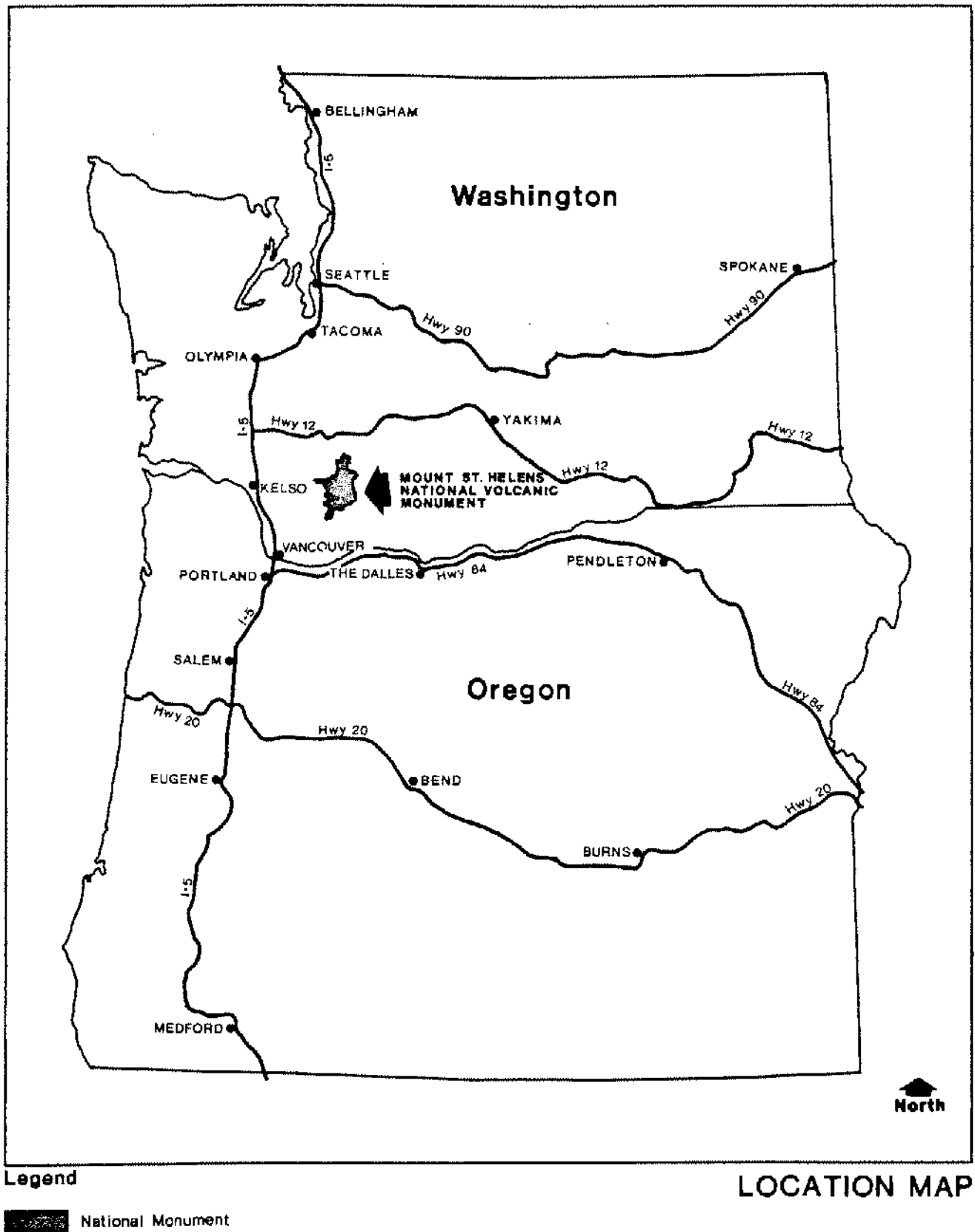
This comprehensive management plan provides the link between the broad direction found in the Act and the earlier Land Management Plan and the implementation of actual project plans. This guidance for later specific project plans will include: 1) timing and general locations, 2) general resolution of conflicts between

resources and users, 3) general project standards and targets to be attained, 4) the environmental, social and economic effects. To the extent possible, specific site development proposals are included.

CONTENTS OF THIS FINAL ENVIRONMENTAL IMPACT STATEMENT (FEIS)

Seven alternative management plans for the Monument were compared in the draft Comprehensive Management Plan (Draft Environmental Impact Statement, October 7, 1984). Based on public review comments, the Preferred Alternative D (East and Westside Moderate Development) presented in the draft plan has been changed to form the selected alternative, Alternative D (Modified). This decision is guided by the Act; the issues, concerns, and opportunities; and public review and comment on the draft of the Comprehensive Management Plan. The public review comments are presented in Appendix N, along with Forest Service responses to each comment.

The FEIS describes conditions which currently prevail in the Monument, (Affected Environment, Chapter III), and examines the environmental effects of implementing each of the eight management approaches (Environmental Consequences, Chapter IV). The alternatives are compared in Chapter II, the decision making portion of the document. No new substantial environmental effects are identified or compared for the Selected Alternative D (Modified), since this alternative is a modified version of the Preferred Alternative presented in the DEIS. This Comprehensive Management Plan is the product of an interdisciplinary (ID) process (see "List of Preparers," Chapter V).



PUBLIC ISSUES, MANAGEMENT CONCERNS, AND OPPORTUNITIES

The issues, concerns, and opportunities (ICOs) expressed by public input and Forest Service management are central in this planning process (Table 3). The ICOs were developed after an analysis of public comment. The degree to which they are or are not accommodated provides a basis for forming and comparing alternatives. Elements of the issues were derived from ICOs to provide standards for comparing impacts associated with each alternative. This process led to the identification of a preferred alternative in the DEIS. The first issue, "measures for the preservation of natural geologic and ecologic processes and the integrity of the resources" (quoting from the Monument Act), acts as a limit on all management and development activities called for by the other issues. The last ten ICOs are alternative management or development actions.

The ordering of these issues in this way reflects the overriding issue to be resolved in this plan: the selection of management and development practices that most equitably protect and preserve natural processes within the Monument.

Table No. 3: Issues, Concerns, and Opportunities (ICOs)

1. The effects of the Monument management on the natural ecologic and geologic processes.
2. Kinds and levels of recreation and interpretation opportunities and their administration.
3. Coordination and administration of research.
4. Public safety within and around the Monument.
5. Types and locations of access routes into and within the Monument.
6. Management of insects, disease, and fire within and immediately adjacent to the Monument.
7. Hunting and fishing regulations and the possible reintroduction of animals.
8. The cost effectiveness of Monument development.
9. Management and protection of cultural resources within the Monument.
10. Management of the cave basalt flow area.
11. The socioeconomic effects associated with management of the Monument.

RELATIONSHIP OF THIS PLAN TO OTHER PLANS AND AGENCIES

Forest Service Plans

In addition to the earlier Mount St. Helens Land Management Plan (Final EIS, October, 1981) (discussed on previous page), two other Forest Service plans are involved in management of the Monument.

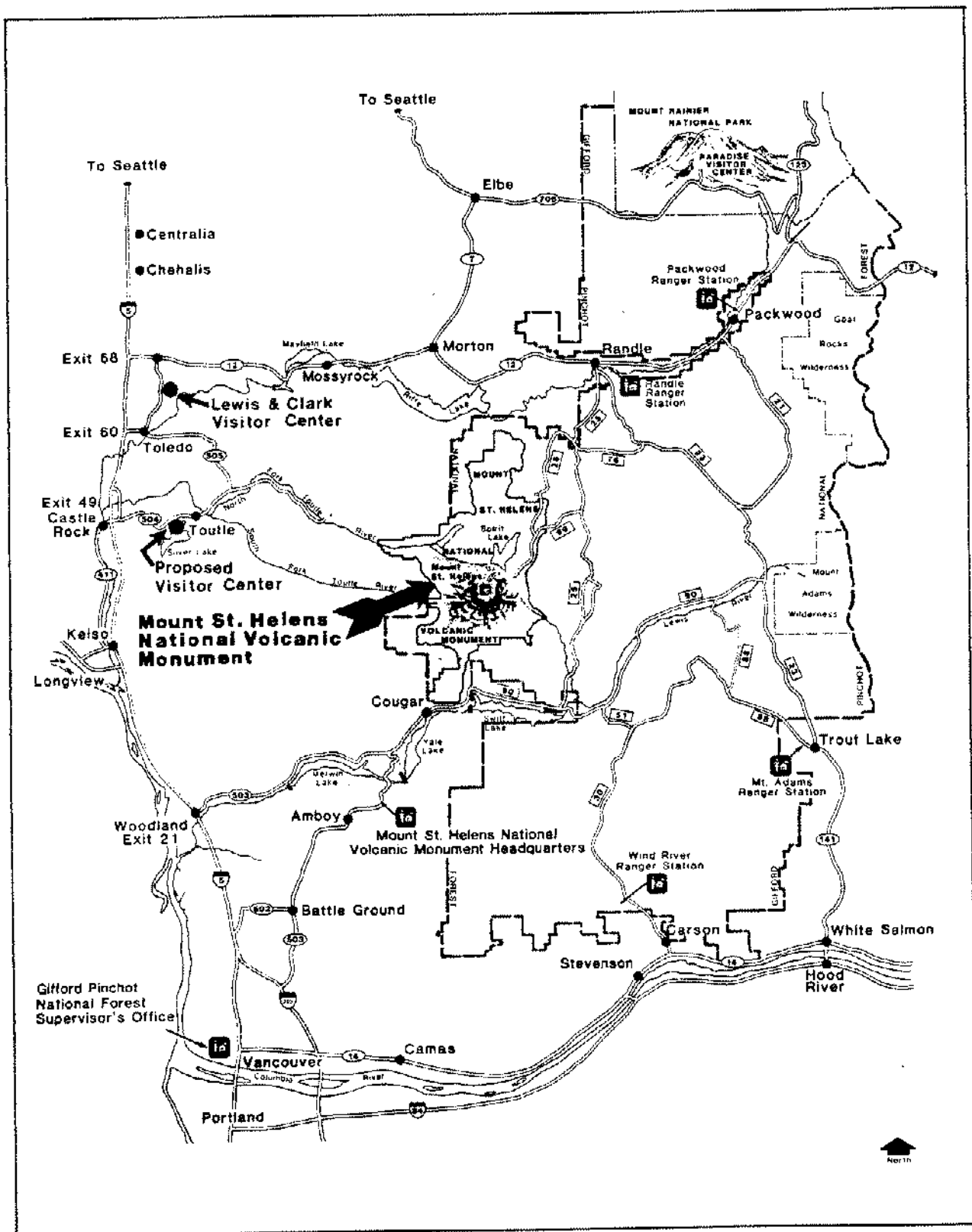
The Interpretation and Development Program for Mount St. Helens National Volcanic Monument (October 1983) presented an inventory of key interpretive opportunities. It also developed interpretive themes and a unifying concept for developing the interpretive program. The inventory was used in formulating alternatives for access and recreation development. It also identified site specific recreation and interpretation facilities completed since the eruptions for use in describing the "no change" alternative.

The Gifford Pinchot National Forest Plan, required by the National Forest Management Act (NFMA), is currently being prepared and will allocate land to a variety of uses. A 1981 federal regulation reads, in part: "...the area included in the Mount St. Helens land management plan will not be subject to planning activities for the first generation Gifford Pinchot National Forest Plan unless the Regional Forester for the Pacific Northwest Region determines that additional planning activities are desirable" (CFR 219.29). This Comprehensive Management Plan implements the allocation made by the earlier Land Management Plan and by the Monument Act.

Related Plans of Other Agencies

U.S. Army Corps of Engineers: The Corps of Engineers has issued report entitled A Comprehensive Plan for Responding to the Long-Term Threat Created by the Eruption of Mount St. Helens, Washington (Nov. 1983). Another plan, Alternative Strategies for a Permanent Outlet for Spirit Lake near Mount St. Helens, Washington (April 1984) was published as a Final E.I.S. The Forest Service was a cooperating agency in the preparation of this plan. The document identifies a selected alternative consisting of a tunnel alignment draining the lake westward into the South Coldwater Creek Valley. The tunnel is about 8,500 feet in length and 11 feet in diameter; it will maintain Spirit Lake at an elevation of approximately 3,440 feet, the identified safe level.

The construction of the tunnel was completed prior to the implementation of this Forest Service Comprehensive Management Plan and will impact lands within the Monument. The need to accommodate an outlet to Spirit Lake was taken into account throughout the alternative development and evaluation process of this plan.



Legend

- National Monument Boundary
- - - - National Forest Boundary

Vicinity Map

Figure 3

Toutle-Cowlitz Watershed Management Plan: This plan was prepared by the Cowlitz County Department of Community Development (Youngquist et al, March 1983). It is a response to continuing downstream volcano-related hazards which require a basin-wide management plan for watershed recovery. The study area includes the entire Toutle River Watershed (North and South Forks and the Green River) from the the headwaters to the Cowlitz River and thence to its confluence with the Columbia River. Four watershed management and rehabilitation alternatives were evaluated.

The Board of Commissioners of Cowlitz County adopted and recommended to the Federal government a long term strategy which emphasizes upstream control and removal of sediment in the Toutle Basin, such as conceptually presented in Strategy C, Multiple Upstream Removal Sites, the large retaining structure of Strategy D, or a combination of the two. Cowlitz County's support for an upstream sediment control strategy was qualified until detailed engineering and economic evaluations are performed by the Corps of Engineers. None of the strategies presented in this plan significantly impact the Monument alternatives.

Mount St. Helens Visitor Industry Development Program: This plan was published by the Washington State Department of Commerce and Economic Development (Harrison Price and Malcolm McPhee, July, 1983) to assess and recommend specific visitor facilities to enhance the Mount St. Helens recreation experience and improve growth in the regional visitor industry. A four county study area was established including Clark, Cowlitz, Lewis, and Skamania Counties (Figure 3), the same area of influence used in this plan. The pivotal attraction around which visitor industry strategies were constructed was the National Volcanic Monument.

If the recommendations of this Visitor Industry Development Program are implemented, increased visitation to the Monument will generate substantial economic benefits, including increased employment, retail sales, and increased tax revenues to State and local agencies. In order to estimate the potential magnitude of these benefits, the Mount St. Helens Regional Forecasting Model was utilized.

That model was also used to make economic projections in this plan.

Mount St. Helens Public Access Report: This report (Boyle et al, January 1982) was prepared by a Public Access Task Group composed of representatives from the Forest Service; Washington State Departments of Transportation, Natural Resource, and the Parks and the Recreation Commission; Cowlitz and Skamania Counties; and the Weyerhaeuser Company. It recommended future needs and locations for public access, including but not limited to recreation sites, vistas, scientific study areas, industrial operations, and landowner access. The principle recommendation related to this comprehensive management plan was the reconstruction of State Route 504 (Spirit Lake Memorial Highway) up the Toutle River Valley to Johnston Ridge. Quality vistas along this route were also recommended. Determination of the final route was delegated to the Washington State Department of Transportation. The alternatives in this plan which include an extension of State Route 504 took these recommendations into account. The two (upper and lower) State Route 504 corridors compared later in this document were developed in consultation with the Washington Department of Transportation and the Federal Highway Administration (refer to "Comparison of Alternatives"). This consultation led to the inclusion of the upper corridor as part of the Selected Alternative D, East/Westside Moderate Development, (Modified).

COOPERATING AGENCIES

The Gifford Pinchot National Forest is the lead agency for development of this FEIS. The Washington State Department of Transportation and the Federal Highway Administration are cooperators, providing specialist assistance in developing and analyzing alternative road corridors for reconstruction of State Route 504 (the Spirit Lake Memorial Highway) needed in Alternatives C, D, F, and G (compared in Chapter II).

The Washington Department of Game assisted in making revisions to the Final EIS. The Department of Game and the Department of Fisheries will be cooperators in the Monument Fish and Wildlife plan called for in this plan.

II. Alternatives Including Proposed Action



INTRODUCTION

This chapter, the decision making portion of the Environmental Impact Statement, consists of: 1) a description of the management approaches which were considered but not pursued, 2) the process used to form alternatives, 3) a description of each alternative in detail, 4) a comparison of the alternatives based on the issues, and 5) mitigation measures included in the alternatives.

PROCESS USED TO FORM ALTERNATIVES

Resource specialists working on the draft plan (DEIS) created a broad range of possible approaches to managing the Monument. They were guided by the Monument Act, and the issues, concerns, and opportunities. Compatible strategies were combined into preliminary alternative narratives.

The alternatives presented in the DEIS were created to provide a wide range of interpretive and recreational opportunities appropriate to the area. These were developed along a continuum that ranged from emphasizing Primitive and Semi-primitive experiences and corresponding low level of development to roaded natural and rural experiences with higher levels of development. Public comment on the alternatives presented in the DEIS led to the formation of the selected Alternative D (Modified).

All alternatives, including the selected Alternative D (Modified), were required to meet minimum existing standards established by Forest Service direction. This pre-established framework included: 1) provisions of the National Volcanic Monument Act; 2) controls for human safety which have been imposed in high hazard areas; 3) statutes pertaining to historic, pre-historic, and archaeological resources of cultural importance; 4) attention required for threatened, endangered, or sensitive plants and animals; 5) Executive Orders on wetlands and flood plains; 6) requirements of Civil Rights legislation; 7) direction for the management of existing Research Natural Areas; and 8) the Council of Environmental Quality's regulations for implementing the National Environmental Policy Act.

Critical View Areas: Public visitation to the Monument area in 1984 confirmed the obvious; people want to see the crater and dome of Mount St. Helens. Accommodating this desire was used to develop portions of the alternatives. Figure 4 shows locations from which the crater and dome can be viewed. It also displays portions of the area which are suitable for developments, based on topography and volcanic hazard.

Suitability for development is based on having sufficient level area to accommodate facilities capable of safely handling approximately 1,000 visitors at one time.

These areas are ranked on the quality of the view provided. Johnston Ridge is ranked number 1 (best) on the basis that it provides a view directly into the crater with no ridges screening the view of the lower slopes. It also provides unobstructed views of the debris avalanche, the overtopping of Johnston Ridge, Spirit Lake, and exciting evidence of the blast.

The two areas on Coldwater Ridge are ranked 2 and 3 because they also provide a direct view into the crater and of the overtopping of the ridge. Johnston Ridge blocks the view of the debris avalanche, Spirit Lake, and the lower slopes of the mountain.

The areas on the ridge northwest of Coldwater Lake are ranked 4 and 5 because of a less direct view of the crater and dome, and the screening effect of both Coldwater and Johnston Ridges.

The area along the south shore of Spirit Lake provides views equal to those from Johnston Ridge, but volcanic hazards make development risky; therefore, this area was not ranked.

Determine Carrying Capacity: A key phrase in the Monument Act requires that the Monument be managed "to protect the geologic, ecologic, and cultural resources . . . allowing geologic forces and ecological succession to continue substantially unimpeded." To ensure compliance, it was necessary to establish thresholds within which activities could occur to meet the spirit and intent of the legislation. To delineate the thresholds a team of resource specialists first defined the concept of biophysical carrying capacity as follows:

"Biophysical carrying capacity equals the maximum level of human impact possible while remaining within the intent of the Act for "preservation of the natural geologic and ecologic processes and integrity of the resources."

With the above definition in mind the team then used the following process to define threshold levels of development for the Monument:

1. The Monument was divided into major areas called subcharacter land types (Figure 5). These areas are generally homogenous in terms of significant biological and physical



- ## Crater and Dome Viewing Areas

Figure 4

features and processes. These subcharacter land types were further divided into biophysical areas to further refine the features and processes contained in them.

2. In each biophysical area, significant physical and biological features and processes were identified and placed in a hierarchy based on sensitivity to human disturbance; a 1 rating indicates a very low sensitivity, a 5 very high (Tables 2 and 3, Appendix B). This sensitivity rating indicates the relative care required in the design and construction of developments in all portions of the Monument.
3. Nine levels of management intensities were then established for potential development activities in the Monument (Table 4, Appendix B). Called Management Development Categories, they range from closed to most uses (Category 1) to open to all uses (Category 9).
4. Each biophysical area was then assigned a Maximum Development Category (MDC) that was complimentary to the intent of the Act and the sensitivity ratings for the features and processes in that area (Table 5, Appendix B). An area's Maximum Development Category, with adjustments described below, define the threshold of activity, and is its biophysical carrying capacity.

The biophysical carrying capacity seldom matches any Development Category exactly because of the large size and diversity of biophysical areas. For this reason, some MDCs were fine-tuned by specifying exceptions and conditions. For example, the Lower Green River Biophysical Area (No. XIII) was assigned a MDC of 4, which excludes horses. But the Biophysical Team determined that horses would be acceptable on slopes of less than 20 percent where erosion is not expected to be a problem. No. XII was modified to permit recreation stock with the condition that these areas are regularly monitored to make certain that impacts on compactible ash soils and understory vegetation do not become unacceptable.

Modifications can also occur if effects on sensitive features and processes have already occurred or can be avoided or mitigated. The Debris Avalanche Biophysical Area (No. VII) was assigned a MDC of 2, which does not permit the construction of new roads. This prohibition of road construction was based on the judgment that disruption of channel process and the unique stratigraphy would be too severe. These impacts, however, have already been produced by the channelized outflow constructed at Coldwater Lake to prevent flooding. Because of this, a road in that area was considered acceptable.

Construction of a highway across the Monument to provide access from both the west and east sides was proposed during the public involvement portion of this planning process. This route would cross a major portion of the debris

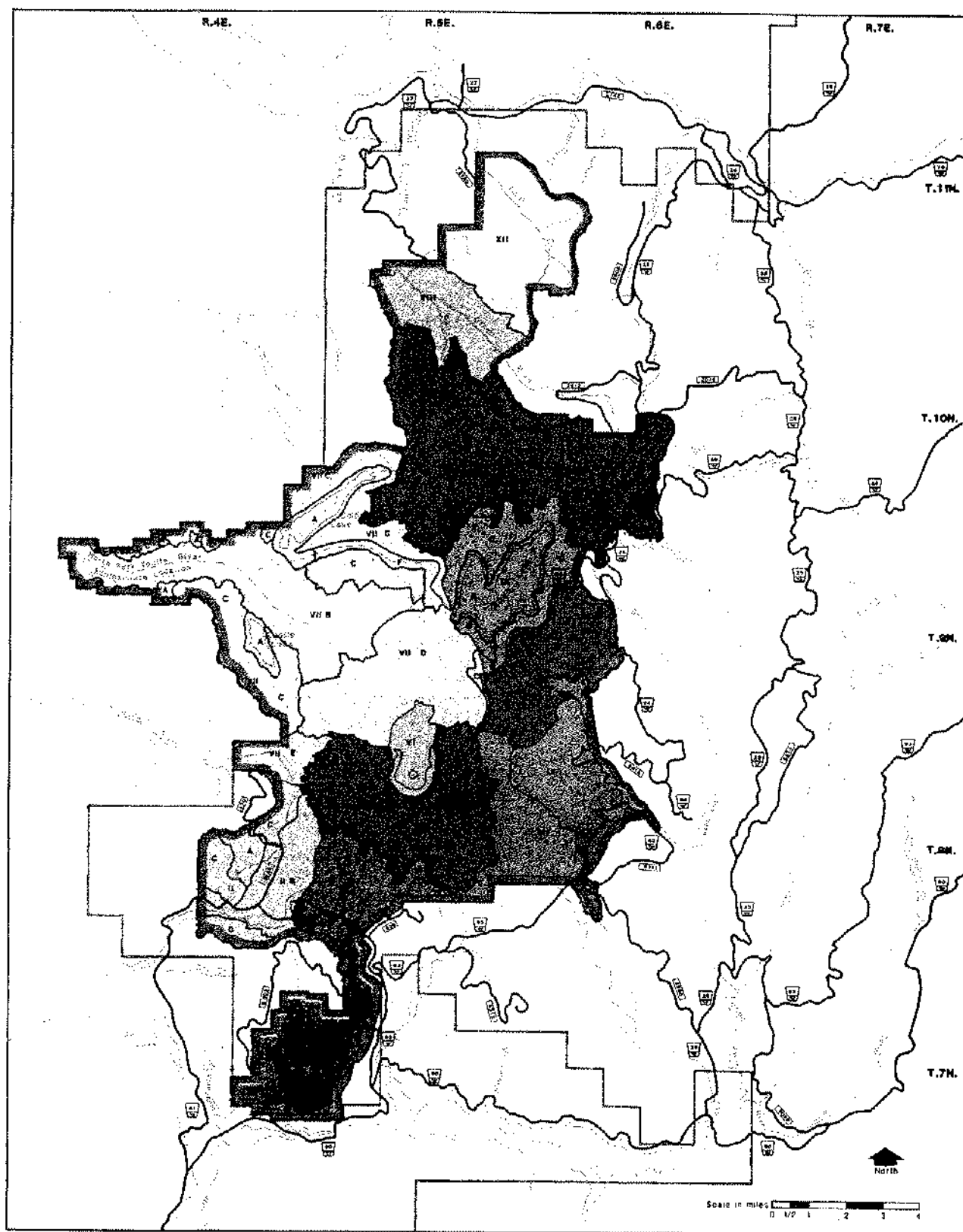
avalanche. Evaluation by the Biophysical Team produced a judgment that new roads there would cause severe disruption of channel processes and the unique stratigraphy. The area was placed in Maximum Development Category II, which precludes new road building. To make certain that a broad range of alternatives was examined, however, the cross-Monument highway was included in Alternative G. This permitted a careful study of all the implications of constructing such a route. Alternative G did not emerge from the comparison and evaluation of alternatives as the selected management plan.

Biophysical areas, features, and processes were defined at a general level of resolution. Portions of each area probably have higher or lower carrying capacities than that of the whole. Some are explicitly discussed in Table 5, Appendix B. Because of this, thorough ground checking by specialists will be required at early stages of project planning. This will not only assure that the biophysical carrying capacity of small areas is not exceeded, it will improve the location of developments by disclosing portions of an area where impacts will create the least disturbance.

Geological and ecological features and processes on the Monument are changing rapidly. As the first organisms begin to get a foothold on new substrates, for example, the sensitivity of that area may increase. Conversely, as easily-eroded deposits are removed from hillsides and vegetation blankets an area, sensitivity to disturbance will diminish. Because of this, the Biophysical Team recommended that the process described above be repeated within five years after the approval of this plan.

Off-Road Vehicle (ORV) biophysical carrying capacities are essentially the same throughout most of the Monument. Over-snow ORVs are acceptable outside deer and elk winter range when the Monument Manager determines that snow conditions will accommodate them. Non-snow ORVs are not acceptable in the devastated area (including blow-down and scorched forest areas) because of the sensitive soils and tephra, steep slopes, sensitive plant and animal succession, and potential for animal harassment. For hillsides to recover, unopened roads should not be used. It would be difficult and expensive to regulate non-snow ORVs closely enough to be certain that they remained on designated trails or roads.

Scientific and Research Values: Alternatives for scientific research were concurrently developed while development levels were limited by biophysical carrying capacity (Appendix C). Both the administration of research and the protection of scientific values are considered in the alternatives. Research administration was considered by first developing broad goals based on an appraisal of current and future potentials for research activities. These goals include: 1) achieving effective communication between Monument staff managers and the scientific community, 2) documenting research



Legend

- National Monument Boundary
- National Forest Boundary
- Existing Roads
- Streams
- I. Caves
- II. Goat Marsh
- III. Lahar
- IV. Ape Canyon

- V. Mt. St. Helens
- VI. Crater
- VII. Debris Avalanche
- VIII. Tephra
- IX. Spirit Lake
- X. Upper Green River
- XI. Mt. Margaret
- XII. Vanson

- XIII. Lower Green River

For explanation of biophysical areas see appendix B

Subcharacter Land Types

Figure 5

sites and activities in the Monument to provide for coordination, planning, and protection of scientific values, 3) coordinating research activities among scientists, 4) collecting and maintaining long term records of landscape, ecological, and other conditions at the Monument, and 5) providing access to remote research sites. A number of strategies for meeting each goal were then developed and meshed with the seven alternatives. The assignment of a particular research administration strategy was influenced primarily by the level of access and facility construction in each alternative. Protection of scientific values was considered by first dividing the Monument into ecological landscape features. Each area was given a rating based on the uniqueness and sensitivity.

Based on these ratings, one of three protection classes was assigned to each area (Figure C-1, Appendix C), with goals ranging from those areas needing greatest protection (Class 1--the debris avalanche and pyroclastic flow areas) to those areas needing the least protection (Class 3--generally forests on steep slopes not greatly affected by eruptive activity). Specific protection strategies for meeting each goal were then assigned for each area. These protection goals and strategies were then used to help refine developments in each alternative.

MANAGEMENT APPROACHES CONSIDERED BUT NOT ANALYZED IN DETAIL

Ten alternatives were initially considered but three were eliminated. A mid-level access alternative was combined with Alternatives C and D because no appreciable changes in access occurred among alternatives. Two alternatives below Alternative A (No Change) maximized Primitive and Semi-primitive Nonmotorized recreation, with very limited access and development. There would have been no improvement of existing roads. Such low levels of development were rejected because demand would create uncontrolled use of the Monument and administration would be difficult; irreversible environmental damage and dangerous traffic congestion would have resulted.

Additional Roads

Several additional road corridors were initially considered. They were not included in any of the alternatives either because they would have exceeded the Monument's biophysical carrying capacity or would have traversed areas which were unroaded prior to the eruption (guidelines of the Act):

1. Green River: A route through the Green River Valley was analyzed in the Mount St. Helens Land Management Plan as Alternative No. 6 and was not selected during that planning process. The Monument Act states

that roads should generally be located in pre-1980 locations, except for those accessing recreational and interpretive facilities (Section 4e2). No road was located here prior to the 1980 eruption. This route would enter into elk winter range, riparian habitat, and a spotted owl management unit; all are important and sensitive wildlife areas. It would also reduce opportunities for Semi-primitive recreation. It would have required the removal of standing green timber, a serious impact on an important resource. The route would require purchase of right-of-way and reconstruction of about 20 miles of existing private road. The route provides no views of the volcano and little opportunity to view the volcano impacts.

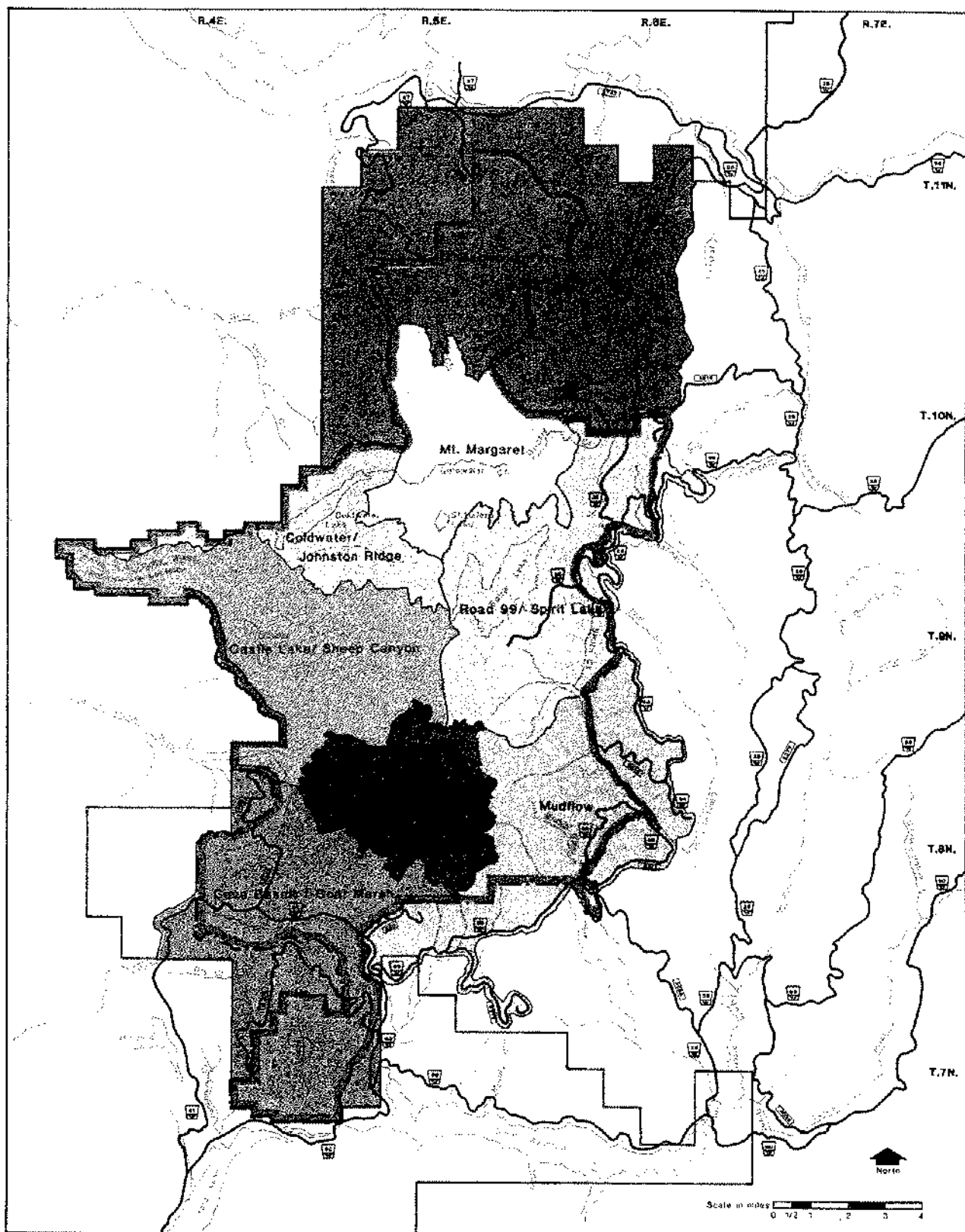
2. Plains of Abraham: This route would cross sensitive biophysical areas, including a mudflow. Accessing the plains from each end (north and south) would be difficult; it would traverse a very sensitive area in the north. Due to the high elevation, it would be open for only a few months each year and maintenance would be high. Semi-primitive recreation opportunities would be lost.
3. Landers Creek: Located primarily on private land, this road was judged to be of little value to the Monument.

MANAGEMENT CONCEPT AREAS

The Monument was subdivided into geographical areas called Management Concept Areas (Figure 6). Each has a particular biophysical subcharacter and provides opportunities for similar or compatible recreation, interpretation, and research activities. In some cases, the boundaries of Concept Areas were adjusted to accommodate different approaches to access and development. A set of objectives was developed for each Concept Area. These objectives and more detailed information about facilities proposed in each Concept Area by alternative are presented in Appendix D.

The alternative descriptions which follow begin with Coldwater/Johnston Ridge Concept Area and proceeds in a counter-clockwise direction around Mount St. Helens. Table No. 1 in the summary highlights some key differences among the alternatives. Maps of each alternative are in a pocket on the back cover of this document.

Supporting facilities were identified along road corridors outside the Monument boundary. Facilities in the selected alternative that are located outside the area included in the Mount St. Helens Land Management Plan will be evaluated further in the ongoing Forest planning process.



Legend

- | | |
|----------------------------|---------------------|
| National Monument Boundary | Road 99/Spirit Lake |
| National Forest Boundary | Mt. Margaret |
| Existing Roads | Backcountry |
| Streams | Mount St. Helens |
| Coldwater/Johnston Ridge | |
| Castle Lake/Sheep Canyon | |
| Cave Basalt/Goat Marsh | |
| Mudflow | |

Management Concept Areas

Figure 6

DESCRIPTION OF THE ALTERNATIVES

Seven alternatives were analyzed in the DEIS, with Alternative D (East/Westside Moderate Development) recommended by the Forest Service as preferred. Based upon public review comments on the draft, Alternative D is modified to form the selected alternative (Alternative D, Modified). The selected alternative is described first in detail, including those management practices that are common to all the alternatives. The mitigating measures described later in this chapter are also included as part of the selected alternative.

SELECTED ALTERNATIVE

Alternative D Modified

Research and Science Management Administration

The Total Resource Information (TRI) System will continue to be used within the Monument and adjacent areas for documenting research sites.

An in-house science coordinator documents and coordinates research activities, which include: preparing an "Annual Report on Protection of Natural Processes and Features," sharing scientific information for use in interpretation, identifying research needs, analyzing and monitoring impacts on natural processes and features. The annual report is submitted to the Scientific Advisory Board for review.

A panel of scientists assists the science coordinator in evaluating protection procedures and in communicating with the scientific community. Recommendations for change in protection procedures, combined with input from the panel of scientists, are given to the Scientific Advisory Board for review and possible recommendation to the Regional Forester.

Protection of Scientific Values

The Monument is subdivided into ecological/landscape features as shown in Figure 30, Chapter III. Each of these features is assigned one of three levels of protection and monitoring as shown in Appendix C.

- Protection Class 1. The Monument Manager uses regulations, closures, and permits to protect sensitive features and processes, and to control the introduction and removal

of organisms, with the exception of consumptive wildlife which will be regulated in cooperation with the Washington State Department of Game.

- Protection Class 2. The Monument Manager relies on education of users and plans location of access routes to protect features and processes, and to regulate the introduction and removal of organisms.

- Protection Class 3. The Monument Manager relies on the location of access routes to protect features and processes.

U.S. Geological Survey

Mount St. Helens and adjacent areas will continue to be monitored by the U.S. Geological Survey at least as long as potentially dangerous eruptive activity continues. The U.S. Geological Survey will acquire permits for its research and monitoring and keep it compatible with other legitimate uses of the Monument.

Public Safety

Closures to public access necessitated by volcanic activity will continue to be jointly established by the Forest Service, the State of Washington, and other concerned agencies as appropriate. The public closure boundary will expand or contract based on activity levels of the volcano and the ongoing assessment of probability of volcanic hazard and risk. The Forest Service will coordinate with medical service agencies to help determine support needed to administer the Monument.

Forest Insects and Disease Management

Measures to control effects of insects and disease will be limited to the removal of individual trees which present hazards to visitors. If catastrophic infestation jeopardizes resources within and outside the Monument, an interdisciplinary process will be used to determine if control actions and the proposed control methods are within the intent of the Monument Act.

Fish and Wildlife Management

The Washington Departments of Game and Fisheries will continue to regulate fishing, hunting, and trapping. There is a five-year moratorium (May 18, 1983, through May 17, 1988) on the stocking of fish in lakes within the Monument and construction of the Green River fish passage, as recommended by the Scientific Advisory Board and adopted by the Regional Forester and the Washington Department of Game. This decision will be reevaluated at the conclusion of the moratorium.

The Forest Service will cooperate with the Washington Department of Game and with adjacent landowners in the management of the Marble Game Management Unit as a quality hunting area, with closures of some of the area's roads during the hunting season.

The Forest Service and Washington State Departments of Game and Fisheries will cooperatively develop a Fish and Wildlife Management Plan for the Monument.

Fire

The fire management strategy will be as follows (Appendix K provides more detail on the fire management strategy):

- In areas of blowdown and standing dead timber, the objective will be the quickest reasonable control of all fires using modified suppression techniques whenever possible (i.e., minimal use of heavy equipment, firelines only where necessary, clear retardant, etc.).
- In all other areas, naturally occurring fires or unplanned ignitions may be allowed to burn under specific environmental conditions and intensity levels to allow fire to play a natural role in the ecological succession of the area.
- Under favorable conditions fires may be ignited by managers to reduce fire hazards on certain areas or on a limited basis to create the same effect as the naturally occurring fire.

Open campfires will be excluded in all areas of blowdown and standing dead timber (Zones 1 and 2, Figure 39) and on the new mudflows to reduce the threat of man-caused fires, and to preserve the natural state of these areas. The remaining area of the Monument is open to campfire, and will be monitored to determine the impacts.

A "Fire Management Implementation Plan" will be completed within 12 months after this plan is approved.

Air Traffic

The Federal Aviation Administration will be requested to chart the entire Monument and implement the following restrictions:

- All aircraft except for those on approved business of the federal, state, and county governments are requested to maintain a minimum altitude of 1,000 feet above the terrain, and monitor an assigned frequency.
- All landing of aircraft is prohibited on lands and waters administered by the Forest Service without authorization. Exceptions include: (1) When forced to land due to an emergency beyond the control of the operator,

(2) at officially designated landing sites, or (3) on approved official business of the federal, state, and county governments.

- All airdropping of persons, cargo, or objects by parachute or other means from aircraft is prohibited without authorization from the Forest Service. Exceptions include: (1) emergencies involving the safety of human life, or (2) threat of serious property loss.

The guidelines, policies, and procedures contained in the "Gifford Pinchot National Forest's Aviation Plan" (Dec. 1981) will be used to manage air traffic.

Vegetative Management

Combinations of chemical, mechanical, and manual vegetation control will be needed periodically along roads and at recreation sites within the Monument to ensure public safety. Near areas of significant value for scientific research, vegetative control will be strictly regulated. The amount and type (or combinations of types) of control methods will be determined on a case-by-case basis.

Normal Forest Service erosion control methods will be employed in areas south of Mount St. Helens where the basic vegetative ecosystem is intact. North of Mount St. Helens within the blast and devastation zones and within the margins of all mudflow-affected channels, the need for erosion control planting will be assessed on a case-by-case basis. If planting is deemed necessary, only native (indigenous) species will be used.

Off-Road Vehicles

The entire Monument will be closed to off-road vehicle use with the following exceptions: (1) Over-the-snow vehicles will be permitted except in the Goat Marsh Research Natural Area, Mt. Margaret area, big-game winter range, Johnston Ridge areas, and designated cross-country ski trails. The Monument Manager will monitor and regulate this use to prevent impacts to the natural features and processes, and reduce user conflict. (2) Specifically authorized permits. (3) Organized and official rescue and firefighting efforts.

Boating

All lakes will be closed to motorized boating and float planes with the following exceptions: (1) boats on official business of the federal, state, and county governments, including search and rescue missions; (2) electric motors will be permitted on Coldwater Lake.

Mountain Climbing

A permit system will be developed by 1987 to administer mountain climbing within the carrying capacity of the resource, and to provide the users with information on specific hazards. The Monument Manager will monitor and adjust the

number of permits to provide an appropriate level of use for a quality recreation experience and protect ecological processes.

Horse Use

Horse use will be allowed in the portion of the Monument not effected by the blast, and not designated as Research Protection Class 1. The Monument Manager will monitor and control use to prevent damage to the resources, protect research values, and reduce conflict between users.

Mt. Margaret Backcountry

The Monument Manager will prepare a "Backcountry Management Plan" for the Mt. Margaret area by 1990 that includes procedures for a permit system for managing overnight use to prevent damage to the resources.

Cave Basalt Area Management

Within two years of the approval of this plan, the Monument Manager will provide a detailed "Cave Basalt Area Management Plan." Its primary goal will be to establish measures to protect cave resources from human impacts while allowing compatible recreation use.

Law Enforcement Management

Law enforcement will be governed by the Law Enforcement Plan (Gifford Pinchot National Forest, Oct. 1983), which is revised annually and includes special law enforcement direction for the Monument.

Facility Design

Facilities within or adjacent to the Monument shall conform to approved design standards presented in the Mount St. Helens National Monument Facility Design Guide (April 1983). The architectural theme is a modified "Cascadian" style characterized by large round or hand-hewn timbers and rock masonry.

Visual Resource Management

Visual Quality Objectives established for the Interpretive Area and Research Natural Areas in the Mount St. Helens Land Management Plan FEIS (October 1981) are common to all alternatives. The Retention Visual Quality Objective (VQO) applies to most of the Monument. Research Natural Areas have a Preservation VQO.

Interpretation

An interpretive plan will be completed within one year following approval of this Comprehensive Management Plan.

Cultural Resource Management

Upon implementation of this plan, there will be an inventory of prehistoric and historic cultural resource sites and facilities which

testify to the force of the volcano, e.g., vehicles, logging equipment, structures. Sites located during the inventory will be evaluated according to National Register of Historic Places criteria to determine whether sites have national, regional, or local significance. Significant sites will be protected; direct and indirect impacts must be mitigated. Consultation will be conducted with both the Washington State Historic Preservation Officer and the (Federal) Advisory Council on Historic Preservation.

Air Quality Management

All actions in this proposal will comply with the Washington State Implementation Plan for air quality.

An air quality management and monitoring plan will be developed and implemented upon finalization of this Comprehensive Management Plan. Until then, the management objective will be to avoid causing impacts to atmospheric clarity from June to September.

SPECIFIC ACTIONS

The specific capacities and size of facilities shown in this section are approximate.

Coldwater/Johnston Ridge Management Concept Area

Coldwater Lake Complex

- Washington State Department of Transportation to construct State Route 504 (the Spirit Lake Memorial Highway) along the upper corridor from near the Green River to Coldwater Lake, and a 340 car parking facility at Coldwater Lake.
- U.S.D.A. Forest Service to construct an additional 260 parking spaces with designed-in possible expansion for an additional 400 car parking facility.
- Issue a special use permit to operate a shuttle bus concession from Coldwater Lake to Johnston Ridge. Permittee to provide a total package that includes buses and support services capable of handling public demand for the experience.
- Construct a visitor information station/information building with space for law enforcement cooperators.
- Construct an outdoor amphitheater and a 30 unit picnic area with covered tables.
- Construct a boat launch ramp, access road, and paved parking for 25 cars.
- Construct Trail No. 221A as an interpretive trail with paved parking for 20 cars.

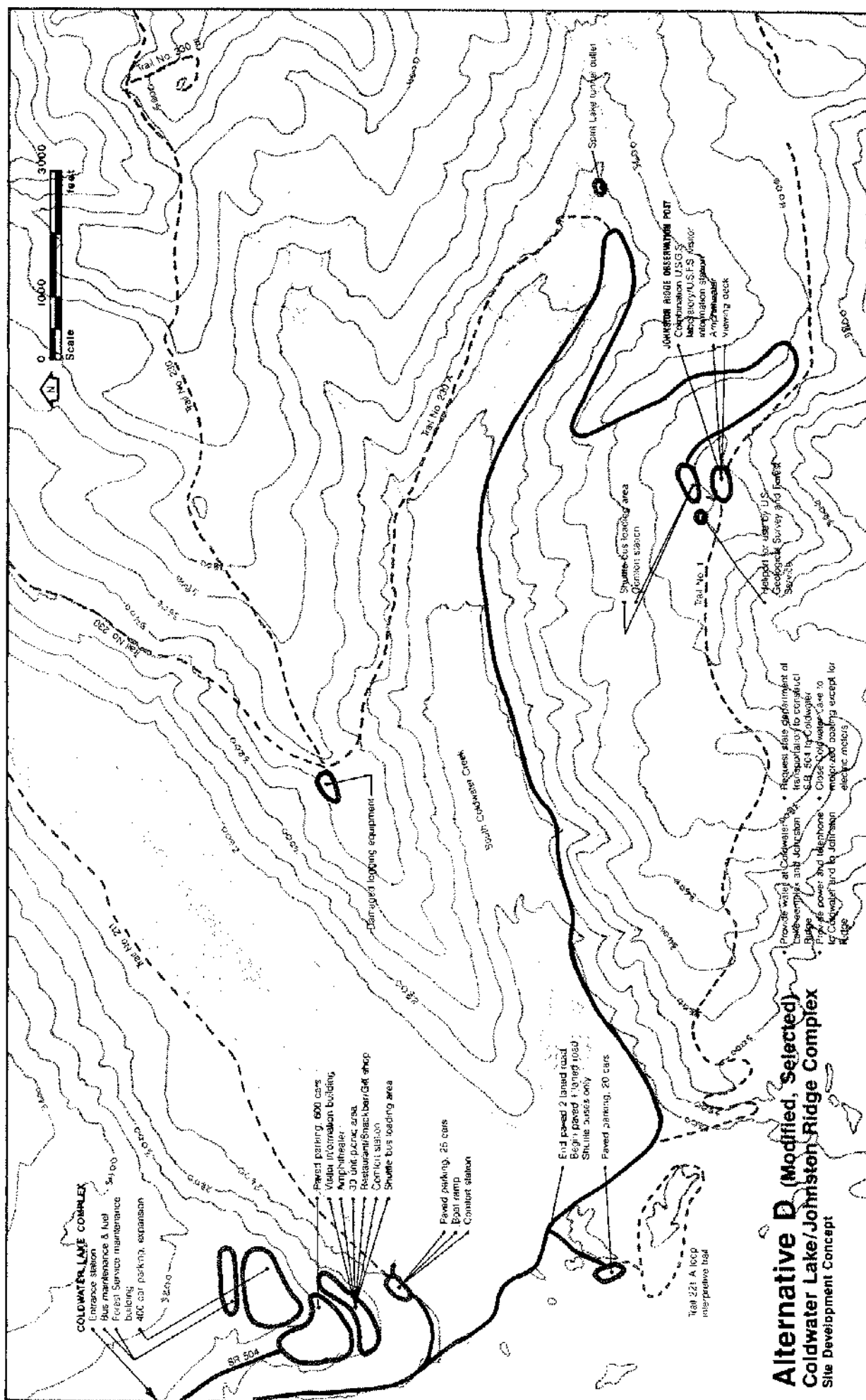


Figure 7

-- Provide power, telephone, water, and sanitation.

-- Provide interpretive signing.

Johnston Ridge

-- Construct 7.2 miles of single lane asphalt paved forest development road from Coldwater Lake to Johnston Ridge, utilizing 4.5 miles of existing road constructed by the U. S. Army Corps of Engineers.

-- Special use permittee to maintain road for shuttle bus operation.

-- Construct a cooperative U.S. Geological Survey observation post and Forest Service visitor center building, and provide an outdoor amphitheater nearby.

-- Construct asphalt paved parking for five administrative vehicles.

-- Construct a heliport for U.S. Geological Survey and Forest Service administrative use.

-- Provide power, telephone, water, and sanitation.

-- Provide interpretive signing.

Harrys Ridge

-- Reconstruct the U.S. Geological Survey's building and antenna to the new architectural standards.

-- Construct a three-sided rock shelter for day use only.

-- Provide sanitation.

-- Provide interpretation.

-- Provide information board with pack-it-out and low impact backcountry use information.

Dispersed Area

-- Acquire the private land between State Route 504 and the Monument boundary, and the S 1/2 of the S 1/2 of Section 35, T. 10 N., R. 4 E.

-- Request the Washington State Department of Transportation to construct three viewpoints along State Route 504.

-- Provide interpretive signing.

-- Construct the following trails:

- Trail No. 1.6 Coldwater Lake to Johnston Ridge.

- Trail No. 1.5 Johnston Ridge to Harrys Ridge.

- Trail No. 211 Coldwater Lake to Norway Pass.

- Trail No. 230 from Trail No. 211 to the damaged logging equipment on Coldwater Ridge, and along the ridge to Trail No. 1.

- Trail No. 230A from the shuttle bus road near the tunnel to Trail No. 230.

- Trail No. 230B from Trail No. 230 to Coldwater Peak.

-- Prepare cultural resource management plan to protect Coldwater Ridge logging equipment.

Castle Lake/Sheep Canyon Management Concept Area

Castle Lake Complex

-- Close the temporary road constructed by the U.S. Army Corps of Engineers at the point where the road crosses the ridge about two miles west of the lake.

-- Allow vehicle access for research or administration by permit.

-- No acquisition of public access rights in the private road.

Sheep Canyon Complex

-- Maintain Road 8123 as single lane gravel access to Sheep Canyon.

-- Construct a new single lane gravel road from the end of Road 8123 to the proposed viewpoint.

-- Construct viewpoint/trailhead parking for 20 autos, three picnic units, two interpretive signs, and a short trail to a viewpoint.

-- Provide water and sanitation.

-- Obliterate old logging roads in the vicinity of the viewpoint.

Dispersed Area

-- Construct Trail No. 221 from Castle Lake to Trail No. 216G.

-- Construct Trail 216.1 across the South Fork of the Toutle River and Trail No. 216.8 on the debris avalanche north of the crater.

-- Construct a ten car parking area where the road to Castle Lake is closed.

Cave Basalt/Goat Marsh Management Concept Area

Ape Cave

- Relocate the parking area further away from the cave entrance and expand to asphalt paved parking for 40 cars and one bus.
- Construct a 20 ft. x 20 ft. building for interpretive displays, lamp and equipment rental, and a gathering area for interpretive walks.
- Issue a special use permit to provide these services by concession.
- Construct a new vault toilet.
- Rewrite the Ape Cave brochure as a self-guided trail.
- Retain Trail No. 239 to the upper end of the Ape Cave.
- Construct a cedar fence around the skylight near the upper end of Ape Cave.
- Relocate Road 8303 to eliminate traffic past the cave entrance.
- Retain an information bulletin board at the cave entrance with cave conservation messages.
- Reconstruct Road 8303 to double lane forest development asphalt paved standard to the Ape Cave parking area.

Lava Cast

- Retain the picnic area at ten units.
- Construct a site sign on a rock base.
- Construct a 0.3 mile barrier free loop interpretive trail through the Lava Cast area.
- Provide interpretive signing.
- Retain parking for 20 cars and add parking for two oversized vehicles along Road 8303.
- Provide water.
- Provide vault toilets.

Kalama Springs

- Construct parking for five cars in a location that avoids disturbing the reworked volcanic deposits.
- Provide an access trail to Kalama Springs and to McBride Lake.
- Install interpretive signing.
- Provide vault toilets.

South Information Station

- Construct a new building on Pacific Power and Light (PP&L) lands along the county highway to Cougar, near the junction with Road 81.
- Install power and telephone.
- Provide asphalt paved parking for five cars.
- Provide double lane access to drive-up windows on both sides of the building.
- Provide water and sanitation.
- Enter into a cooperative agreement with PP&L for use of land.
- Provide the latest information on volcano and road conditions on a 24-hour broadcast over low frequency radio.

Dispersed Area

-- Roads

- Reconstruct the portion of Road 81 that was damaged by alluvial flows to the same standard as Road 81.
- Reconstruct Road 8100830 from Road 81 to Trail No. 216A to the pre-eruption standard.
- Close the damaged portion of Road 8123 from Blue Lake to end.
- Reconstruct Road 8123 (formerly Road 8123170) to Sheep Canyon viewpoint as a single lane gravel surfaced road.
- Close Road 8300030 at the junction with Road 83, and allow Pacific Power and Light Company access by permit for powerline maintenance.
- The Monument Manager will monitor the mix of industrial and recreation traffic along Road 8303, and if appropriate, analyze acquiring industrial use rights for the private road from Road 8303 to Road 81 to allow industrial traffic to flow west.
- Close Roads 8123070, 8123171, and 8123173 to protect the Goat Marsh Research Natural Area.

-- Trails

- Reconstruct Trail No. 238 from Red Rock Pass to Sheep Canyon viewpoint (horse/hiker).
- Reconstruct Trail No. 238A to Butte Camp (horse/hiker).

- Reconstruct the Old Kalama Trail No. 238.2 from the site of the former Kalama Guard Station to Red Rock Pass (horse/hiker).
- Construct Trail 216 at timberline (hiker).
- Construct Trail 238D from Road No. 8123 to the Blue Lake Noble Fir Grove and tie to Trail No. 238 to form a loop interpretive trail (hiker).
- Retain Trail No. 237.

-- Trailheads

- Trail No. 238 at Road 8123 near Blue Lake, construct ten car parking.
- Retain parking for six cars at Red Rock Pass on Road 81 for Trail No. 238.

-- Camping

- Provide space for 20 camp sites and provide toilets near Sheep Canyon.
- Camping opportunities will be created on spur roads off Road 83 and Road 81 within nonsensitive areas. Camping will not be allowed within the lahar area on Road 83 nor on Road 8303 from Road 83 junction to Ape Cave. The Monument Manager will monitor dispersed camping along Road 8123 and restrict camping if unacceptable resource impacts are discovered.
- Provide a toilet at Butte Camp.

-- Caves

- Until the Cave Management Plan is completed, close the following caves to protect sensitive wildlife habitat: November 1 to April 1, Ole's, Bat, Spider, Flow, Beaver, and Dollar and Dime Caves; August 15 to October 31, Utterstroms Cave. During these closures access will be by permits and only for limited monitoring of wildlife.
- Prohibit pets, food, beverages, smoking, smoke emitting devices, fires, and depositing of human or solid waste material in any cave.

Goat Marsh Research Natural Area

- Sign the Research Natural Area (RNA) boundary.
- Provide an interpretive sign on Road 8123.
- Close the RNA to horse use, all motorized use, and to camping except immediately adjacent (100 feet) along Road 8123.

- Sign Trail No. 237 with information encouraging low impact use.

Winter Season

- Request state cooperative funds to groom roads for snow trails as shown on the map.

Mudflow Management Concept Area

Lava Canyon Complex

- Construct parking for 35 autos near Lahar Viewpoint.
- Maintain Trail No. 234 to the "Round-the-Mountain" Trail No. 216.
- Construct Trail No. 184 along the Muddy River to Road 83.
- Construct Trail No. 184A across the Muddy River to form a loop opportunity.
- Provide water and sanitation (vault toilets).
- Install six tables for picnicking.
- Construct and install interpretive signs.
- Improve the Lahar viewpoint parking, ten autos.

Dispersed Area

-- Roads

- Reconstruct Road 83 from Road 81 to Road 8312 to a dust free standard.
- Reconstruct the portions of Road 83 and Road 2588 through the new mudflow to the preeruption standard (single lane, graveled).
- Reconstruct portions of Road 83, formerly portions of Roads 2588 and 9211, and operate as a single lane gravel surfaced road with turnouts from the Muddy River mudflow to Smith Creek (pre-eruptive condition).
- Remove the temporary road along Smith Creek north of Road 83.
- Abandon the portion of Road 83 on the north side of the Muddy River from Lahar Viewpoint to Smith Creek.

-- Trails

Construct the following trails:

- Trail No. 216B from Road 83 to June Lake.
- Trail No. 216 at timberline.

- Trail No. 225 from Road 83 along Smith Creek to Road 99.
- Trail No. 216A from Road 8100830 to Trail No. 216.
- Retain Trail No. 216C from Road 83 to Jack Pine Shelter.

Trailheads

- Road 8100830, construct 20 car parking for Trail No. 216A.
- Road 83, construct four car parking for Trail No. 216B.
- Road 83, construct 20 car parking for Trails No. 225 and 184 (provide toilet).

Camping

- Designate 20 camp sites and provide toilet near the Trail No. 216A trailhead on Road 8100830 (monitor ridge).
- No overnight use in Lava Canyon.
- Retain and maintain Jack Pine Shelter.

Environmental Study Area

- Designate ten acres on the mudflow for school groups to conduct studies.

Winter Season

- Construct Sno-park facility near the junction of Roads 83 and 8312 with the following: Paved parking area for 60 autos with trailers. Vault toilets and a shelter with picnic tables.
- Request state Sno-park funds for snow removal.
- Request state cooperative funds to snowgroom 13.5 miles of roads as shown on the map.
- Construct cross country ski trails as shown on the map.
- Close ski trail to snowmobiling.

Road 99/Spirit Lake Management Concept Area

Bear Meadow

- Develop asphalt paved parking for five vehicles with trailers on the north side of Road 99 to accommodate hiking/horse use on Trail No. 1.
- Install site sign on a rock base.
- Install rock wall with interpretive signs.

- Construct vault toilet at the trailhead.
- Install horse tie rack.
- Install curbing and sidewalk on the existing 15 auto parking area.
- Provide water.
- Retain the existing five picnic units.

East Entrance

- Construct entrance sign with rockbase.
- Construct rock wall complete with curbing and sidewalk and 1 interpretive sign.
- Retain the existing paved parking for seven autos.

Miner's Car

- Separate parking from traffic by realigning the road, and expand to accommodate ten autos and one bus.
- Construct a hiker trail from the car to the Meta Lake trailhead to eliminate walking on the road.
- Remove cyclone fence and replace with a rock wall. Weld removable parts to the car.

Meta Lake

- Maintain the barrier free trail to the lake.
- Construct rock wall at the trail's end to serve as a physical barrier and deter hiking, other than for fishing, on the lake shore.
- Mount new interpretive sign on the wall.
- Install site sign on a rock base.
- Improve parking on Road 99 for ten autos and one bus.
- Provide water.

Cascade Peaks Viewpoint (Road 94/99 junction)

- Retain parking for 15 autos and one bus.
- Install rock wall with interpretive sign.

Independence Pass

- Improve parking to accommodate eight to ten autos.
- Extend Trail No. 227 north to Trail No. 1.
- Replace interpretive sign and base.

Harmony Creek

- Construct parking for 11 vehicles.

-- Construct Trail No. 224 to Spirit Lake.

-- Install site sign on a rock base and an interpretive sign on a rock wall.

Cedar Creek

-- Improve parking for ten autos.

-- Install interpretive sign on rock base.

Donnybrook

-- Widen road to provide parallel parking for 15 autos for viewing Spirit Lake.

Upper Smith Creek Trailhead

-- Construct parking for five cars.

-- Install trailhead sign on rock base.

Smith Creek View

-- Construct parking for 15 cars.

-- Install vault toilets.

-- Construct rock wall complete with curbing and walkways with interpretive sign on wall.

-- Install site sign on rock base.

-- Install five picnic tables.

Windy Ridge Viewpoint

-- Retain 110-car paved parking and improve with curbing, rock wall, and sidewalk.

-- Construct a wind shelter amphitheater open toward Spirit Lake with 100 to 200 seat amphitheater.

-- Provide toilets.

-- Construct Trail No. 207 from Windy Ridge to Spirit Lake and eventually form a tie to Harrys Ridge. Construct the portion of the trail to a viewpoint on the ridge, and delay the portion to Spirit Lake until adequate parking, visitor control, and Johnston Ridge access are available.

Norway Pass Trailhead

-- Retain the 30 car parking area at Trail No. 1 on Road 26.

-- Provide water and sanitation.

Strawberry Mtn. Lookout

-- Construct a lookout building to serve both fire detection and visitor interpretation.

-- After the lookout is constructed, close Road 2516 near where it enters the Monument, develop parking for ten cars, install a vault toilet, and eliminate the closed portion of the road.

-- Construct a trail to the lookout.

Concession

-- A food service concession compatible with the Monument architectural theme will be permitted on a temporary basis somewhere along Road 99. The need for this service will be reevaluated after State Route 504 (the Spirit Lake Memorial Highway) provides access from the west.

Dispersed Area

-- Roads

- Reconstruct Road 99 to a minimum forest development double lane asphalt paved standard from Road 25 to Windy Ridge viewpoint.
- Phase out of the temporary road from Windy Ridge to Spirit Lake over about a two year period or until nature obliterates the road. During this period, allow access for approved research by permit.
- Reconstruct Road 2516 from Road 25 to the Monument boundary near Strawberry Mountain.
- Close Road 2516 beyond the Monument boundary and return the area to a near natural condition.

-- Trails

- Reconstruct Trail No. 220.1 from Road 26 to Road 2516. (hiker/horse/motorbike)
- Reconstruct Trail No. 220.2 from Road 2516 to Trail No. 1. (hiker/horse)
- Manage Trail No. 1 from Trail No. 220 to the trailhead one mile east of Bear Meadow on Road 99 for hiker/horse only.
- Reconstruct Trail No. 1D from Trail No. 1 to Ghost Lake after fire hazard decreases.
- Construct trail from Road 99 to St. Charles Lake Environmental Study Area.

Environmental Study Area

-- Designate ten acres near St. Charles Lake for school groups to conduct studies; provide parking for five cars and one bus, and construct hiker trail to the area.

Winter Season

- Request state cooperative funds to snowgroom Road 99 as a snow trail to Cascades Peaks viewpoint (contingent on availability of funding and snow conditions).
- Request state Sno-park funds to remove snow on Road 25 to the Sno-park area near the junction with Road 99.

Mt. Margaret Management Concept Area

Dispersed Area

- Construct the following trails:
 - Trail No. 1 across Mt. Margaret Ridge to Harrys Ridge.
 - Trail No. 211 from Trail No. 1 to the Coldwater Lake Complex.
 - Trail No. 212 across Mt. Venus to Deep Lake and down Falls Creek to Trail No. 213.
 - Primitive trail (most difficult) to the south end of Boot Lake.
 - Primitive trail (more difficult) to Coldwater Peak.
 - Trail No. 214 across Whittier Ridge from Trail No. 1 to Trail No. 211.
 - Primitive Trail (most difficult) to Snow Lake.
- Provide toilets at the following designated camping areas: Panhandle Lake, Boot, Snow, Shovel, and Obscurity Lakes.
- Close the entire area to open campfires.
- Require a permit for overnight camping and limit to designated areas.
- Provide backcountry ranger to make available low impact/fire prevention messages to users.
- Close the area to all entry during periods of high fire danger.
- Limit trail use to hiker only.
- Delay trail construction to fire hazard areas until 1990.

Backcountry Management Concept Area

Ryan Lake

- Construct parking for ten autos.

- Install interpretive sign and site sign on rock base.
- Construct vault toilet.
- Construct four picnic units.

Quartz Big Tree

- Construct parking for five autos and one bus.
- Construct vault toilet.
- Construct site sign and interpretive sign.
- Reconstruct nature Trail No. 219.
- Prepare a visitor's guide to the area with emphasis on school groups.

North Fringe

- Construct interpretive sign on rock base.
- Construct parking for three autos.

Dispersed Area

--Roads

- Reconstruct Road 2612 and construct needed new road to the trailhead for Trail No. 213.
- Close the temporary road used to salvage the timber along the Green River and return the area to a near natural condition.
- Manage Road 2612 from the Green River bridge south to maintain the semi-primitive experience objective in the Mt. Margaret Backcountry by closing the road when it is not being used for resource management.
- Manage Road 2608016 by blocking to maintain the semi-primitive experience objective in the Tumwater Mountain portion of the backcountry.

--Trails

- Retain a trail corridor for Trail No. 213 through Sec. 31 and 32, T. 11 N., R. 5 E.
- Reconstruct Trail No. 213 from private road 2500 to Road 2612 (horse/hiker).
- Reconstruct Trail Nos. 217 and 218 (horse/hiker).
- Construct Trail No. 218.1 from Tumwater Mountain to Road 2750 (horse/hiker).

- Construct Trail No. 205 from Road 2750 to Trail No. 217 near Vanson Peak (horse/hiker).
- Construct Trail No. 213A from Trail No. 213 to Trail No. 217 (horse/hiker) to replace the portion of Trail No. 217 on private land.

-- Trailhead

- Construct the following trailheads (to accommodate horse use):

Road	Trail No.	Toilet	No. of Cars
2612	213	Vault	10
2612	217		6
2600	220		3
2750	218	Vault	10
2750	217C		5

-- Camping

- Provide toilets and designate camp sites at Vanson Lake and Deadmans Lake.
- Provide low impact camping and pack-it-out information at all trailheads.
- Provide a backcountry ranger to monitor impacts, provide fire prevention messages, and enforce ORV use regulations.

Land Adjustments

- Acquire ownership of private lands in Section 13, T. 10 N., R. 5 E., and Section 18, T. 10 N., R. 6 E.
- Recommend that the National Forest land outside the Monument on the west side in T. 11 N., R. 5 E., and T. 10 N., R. 5 E. be considered for disposal in further land exchanges.

Mount St. Helens Management Concept Area

Mountain Climbing

- Allow climbing to begin on or before 1987 (dependent upon volcanic risk at the time).
- Use a permit system to allow up to 100 climbers per day.
- Monitor climbing impact and adjust number of permits up or down as necessary.
- Provide a mountain climbing brochure with emphasis on educating the user of specific hazards.
- Sign trails leading to the mountain slopes with information on the permit system.
- Participate in the regional mountain weather and avalanche forecasting program.

- Close the crater to all entry except by permit for scientific study.

Other Facilities Outside the Monument Along Major Access Corridors

North Information Station

- Relocate along Road 25 between US 12 and Road 26.
- Provide parking for five cars.
- Construct as a drive-up building with service windows on both sides.
- Provide a kiosk (information dispensing unit) during unstaffed periods.
- Provide water and sanitation.

Iron Creek Campground

- Retain the existing 92 camp units.

Iron Creek Picnic Area

- Convert the existing information station site to a picnic area with five picnic sites and a picnic shelter containing eight tables.
- Maintain the existing vault toilet.
- Provide water.

Boundary Trailhead

- Construct parking at Elk Pass for five cars.
- Provide horse ties.
- Provide vault toilet.

Clearwater Overlook

- Retain existing parking for six cars.
- Construct a rock wall or sign base with sidewalk and curb.
- Install interpretive sign(s) on the wall.

Muddy River Overlook

- Construct asphalt paved parking for five cars.
- Construct trail to viewpoint.
- Construct a rock wall or sign base with interpretive sign(s) at the viewpoint.

Muddy River Mudflow

- Maintain existing ten car parking and interpretive sign(s) on a rock base.

Cedar Flats Research Natural Area

- Maintain existing five car parking and one mile loop interpretive trail.

Pine Creek Viewpoint

- Improve parking for five cars.
- Provide interpretive signs on a rock wall.

Pine Creek Work Center

-- Pine Creek Information Station

- Retain and improve the former ranger station office as an information station.
- Provide comfort station.
- Provide a kiosk (information dispensing unit).
- Improve landscaping and displays/exhibits.
- Retain 911 emergency telephone.
- Complete the Pine Creek Work Center development plan which should consider:
 - Space at Pine Creek for a research laboratory.
 - Space for eight trailer camping units for use by visiting scientists.
 - Joint office space for the Skamania County law enforcement cooperator and emergency medical service coordinator.
 - Housing for the Skamania County Sheriff's deputy.
 - Housing for rescue personnel with a covered garage for an ambulance.
 - Reliable power and public telephone service.

Cispus Environmental Learning Center

- Retain the buildings, and continue to operate under a special use permit as an Environmental Learning Center.
- Upgrade the Mount St. Helens displays and library.
- Prepare a special brochure to inform the research community of special facilities available to them at the center, and include the environmental study areas in the Monument. (Cooperative effort between the agency and the permittee.)

Lewis River Support Facilities

- Recommend that the Forest Plan consider a 50 unit campground near the Lewis River, and that the Lower Falls Campground be converted to a day use viewpoint and picnic area.

Outlaw Ridge

- Retain as a viewpoint picnic area with paved parking for 16 cars and two buses, vault toilet, eight picnic tables, and interpretive signs.
- Construct a kiosk (information dispensing unit) to display visitor orientation information.

Dispersed Area

-- Roads

- Upgrade the remaining portions of Road 25 to a forest development double lane asphalt paved surface standard.
- Replace the Pine Creek and Muddy River bridges on Road 25, and the Eagle Cliff Bridge on Road 90 with permanent double lane structures.
- Provide improved Monument signing between from US 12 and SR 14.
- Begin feasibility study to determine opportunities for bringing Road 51 up to road standards consistent with Roads 25 and 99. This road connection would provide a Randle to Carson road corridor that would improve access to the east side of the Monument.

Winter Season

- Construct paved parking for 20 cars with trailers near the junction of Road 25/99. (Also to be used as a trailer drop area during the summer.)
- Provide vault toilet.
- Request state cooperative funds to snowgroom Road 99 as snow trail to Cascade Peaks viewpoint (contingent on availability of funding and snow conditions).

Other Alternatives Considered But Not Selected

Summaries of seven alternatives considered but not selected are presented here. Detailed descriptions of these alternatives are presented in Appendix D.

ALTERNATIVE A

No Change

This alternative continues "present management." Only those improvements that are presently covered by approved plans will be completed.

Coldwater/Johnston Ridge--No visitor access provided.

Castle Lake Sheep Canyon Management Concept Area--Continues to use existing private roads to access the Castle Lake control structure for maintenance. Rights for public use of these roads would not be acquired.

Cave Basalt/Goat Marsh Area Management Concept Area--Maintains existing day use facilities at Ape Cave, Lava Casts, and Kalama Springs, and trails to Butte Camp, Sheep Canyon, the upper end of Ape Cave and Goat Marsh. Continues to operate the visitor information station at Yale recreation site until 1987. Maintains the damaged portion of Road 81 as a road surfaced with native material.

Mudflow Management Concept Area--Maintains Roads 83 and 2588 as native material surfaced roads across the Muddy River and Smith Creek mudflows. Operates Road 83 from the mudflow as a one-way loop system. Maintains a trail to an interpretive overlook at the Muddy River mudflow. Maintains Jackpine Shelter and access trail. Limits access to Smith Butte via Smith Creek Road (92) to industrial and administrative traffic. Replaces temporary bridge on Road 83 crossing Pine Creek with a permanent structure. Continues to snowgroom Road 83 as state funding is available.

Road 99/Spirit Lake Management Concept Area--Retains Road 99 at the present standard to Windy Ridge. Retains existing viewpoint/interpretive sites at Bear Meadow, Parker Car, Meta Lake, Cascade Peaks, Independence Pass, and Windy Ridge. Retains the trailhead on Road 26 for Trail No. 1, and the trail west to Norway Pass and east to Bear Meadow. Retains Road 2516 to the viewpoint on Strawberry Mountain.

Mt. Margaret Management Concept Area--Provides trail access from Road 26 to Norway Pass; all other use is cross country.

Backcountry Management Concept Area--Maintains all existing trails in present locations. Reconstructs damaged portions of the Green River Trail No. 213 to connect to Road 2612 and a private road on the west side of the Monument. Retains the pullout parking and interpretive sign at Ryan Lake, Quartz Creek Big Tree Area, and at the blast edge along Road 26.

Mount St. Helens Management Concept Area--Continues to restrict access as coordinated with the Washington State Department of Emergency Services and U.S. Geological Survey.

Facilities Outside the Monument Along Major Access Routes--Retains the visitor information station at Iron Creek Campground through 1987. No major change in the Iron Creek Campground. Continues to operate the former Pine Creek Ranger Station as a visitor information station. No major change in parking for viewpoints at Clearwater Overlook, Muddy River Mudflow, and Cedar Flats. Continues to manage a portion of Road 25 as a one-way system. Maintains the campground at Lower Falls, dispersed camping area at Curly Creek, and viewpoints at Big Creek Falls, Curly Creek Falls, and Outlaw Ridge.

Other Management Direction:

Fire: Calls for the quickest reasonable control of all fires, confining them to the smallest size possible while using modified suppression techniques whenever possible.

Research: Protects scientific values mainly by not providing access to sensitive features and by present restrictions related to hazards. This protection, however, is contingent on the current restricted zone, which will decrease in size as the volcanic hazard abates. Communication with scientific community, documentation and coordination of research activities, contribution to interpretive program, and monitoring and evaluation of effects of past and proposed developments on scientific values are all performed by in-house staff with limited research background.

ALTERNATIVE B

Limited Development

Emphasis is placed on providing the facilities necessary to support the recreation visitors primarily outside the Monument while maximizing opportunities for Primitive and Semi-primitive experience within. Significant aspects include providing a Forest Service road to Coldwater Lake from the west, and improving the existing road to Windy Ridge on the east.

Coldwater/Johnston Ridge Management Concept Area--Reconstructs and acquires public rights on existing private roads to Coldwater Lake. Develops parking and sanitation for a moderate number of visitors. Constructs trails to Johnston Ridge, Harrys Ridge, and damaged logging equipment. Provides shelter and toilet facilities.

Castle Lake/Sheep Canyon Management Concept Area--Acquires public access agreement on a private road to Castle Lake, regulates public access using a bus concessionaire from State Route 504 during peak use periods. Provides parking for a small amount of day use at Castle Lake and Sheep Canyon. Confines visitor use to trails in the debris avalanche area.

Cave Basalt/Goat Marsh Management Concept Area--Maintains existing day-use facilities and improves sanitation at Ape Cave and the Lava Cast Area. Constructs interpretive trail at Lava Cast. Converts Kalama Springs from a picnic area to an interpretive site. Removes trail to Goat Marsh. Closes damaged portion of Roads 81 and 8123. Restricts camping along Road 8303 near Ape Cave. Replaces the Yale Information Station with an information kiosk. Relocates Road 8303 to avoid the entrance to Ape Cave. Restricts access to caves during bat hibernation.

Mudflow Management Concept Area--Continues to maintain Roads 83 and 2588 as native surface roads through the Muddy River mudflow. Removes Road 92 from the Smith Creek mudflow. Operates Roads 83 as a one way loop system. Expands viewpoint parking and interpretation at Lava Canyon. Constructs trailheads on Road 83 for trails to Windy Pass and June Lake. Constructs a viewpoint at Marble Mountain. Replaces Pine Creek Bridge.

Road 99/Spirit Lake Management Concept Area--Reconstructs Road 99 to a double lane dust free standard to Windy Ridge Viewpoint. Expands the existing viewpoint parking at Bear Meadow to accommodate trailhead use. Improves parking and facilities at seven viewpoints and constructs parking and facilities at four new viewpoints. Reconstructs Trails No. 1 and 220 to accommodate horse use. Retains Road 2516 to Strawberry Mountain Viewpoint and improves parking.

Mt. Margaret Management Concept Area--Reconstructs Trail No. 1 across Mt. Margaret Ridge with Trail No. 214 providing connection to the lakes basin. Constructs Trail No. 211 from Minnie Peak to Boot Lake providing primitive spurs to Panhandle, Snow, Obscurity Lakes, and to the south end of Boot Lake. Compost toilets are provided at each of these lakes. Constructs Trail No. 212 along Miners Creek to the Green River Trail No. 213. Trails are limited to hikers. Provides a backcountry ranger.

Backcountry Management Concept Area--Reconstructs damaged portion of the Green River Trail No. 213 to connect to Road 2612 and a private road on the west side of the Monument. Constructs

trailhead parking and toilet facilities at both ends of the trail. Reconstructs all existing trails and constructs new trails in the area to a standard that will accommodate hiker/horse use. Construct six new trailheads. Expands the parking and provides sanitation at Ryan Lake and the Quartz Creek Big Tree Area. Provides compost toilets at Vanson and Deadman Lakes. Acquires public access agreement on principle roads to trailheads.

Mount St. Helens Management Concept Area--Provides a registration system for mountain climbing, and a brochure emphasizing the volcanic hazards and fragility of the area.

Facilities Outside the Monument Along Major Access Corridor--Replaces the Iron Creek Information Station with an information kiosk. Retains the Iron Creek Campground at its present size. Improves facilities at the Clearwater Overlook, and Cedar Flats. Constructs two new viewpoints and a trailhead. Upgrades the former Pine Creek Ranger Station for use as a visitor information station and provides sanitation. Provides camping spaces for research. Improves single lane portion of Road 25 to a double lane, dust free standard. Converts the Lower Falls Campground into a viewpoint/picnic area. Maintains viewpoints at Big Creek Falls, Curly Creek Falls, and Outlaw Ridge. Designates campsites at Curly Creek dispersed camping area for research. Improves signing from and to State Route 14.

Other Management Direction:

Air Traffic: Requests Federal Aviation Administration (F.A.A.) restriction on aircraft elevation to 2,000 feet above the terrain over the entire Monument.

Fire: Controls all fires in blowdown and fringe areas using modified suppression techniques and allowing prescribed natural fires in all other undeveloped areas, under specified conditions.

Research: Protects scientific values in most sensitive features by establishing rules for meeting standards of access and use by scientists and nonscientists. Administers research activities with the aid of a qualified science coordinator.

ALTERNATIVE C

Westside Moderate Development

Emphasis is placed on providing convenient access to key viewing areas accompanied by a moderate level of supporting facilities. Significant aspects include reconstructing SR 504 to a double lane paved standard from near Camp Baker to a large day use complex at

Coldwater Lake. A bus shuttle is provided to Johnston Ridge via a single lane paved road, and Road 99 is maintained at its present standard to the Windy Ridge viewpoint.

Coldwater/Johnston Ridge Management Concept Area--Reconstructs State Route 504 from near Camp Baker to Coldwater Lake and operates a bus over a single lane paved road to an observation post/visitor center on Johnston Ridge. Develops a complex at the end of State Route 504 to adequately accommodate large numbers of day use visitors.

Constructs a trail from the observation post to Harrys Ridge where shelter and toilet facilities are provided and to these points of interest: the debris avalanche, the damaged logging equipment, and along the shoreline of the lake.

Castle Lake/Sheep Canyon Management Concept Area--Acquires public rights on a private road to Castle Lake, and provides a small day use facility to support car top boating, picnicking, and interpretation. Maintains access to a small trailhead/viewpoint development at Sheep Canyon. Confines visitor use to trails on the debris avalanche.

Cave Basalt/Goat Marsh Management Concept Area--Relocates and expands the Ape Cave day use facility. Improves sanitation at Lava Cast and adds an interpretive trail. Provides an alternate access route to reduce industrial traffic in the vicinity of Ape Cave. Restricts access to caves during bat hibernation. Restricts camping along Road 83 near Ape Cave and Lava Cast. Converts Kalama Springs from a picnic area to an interpretive site. Constructs a visitor information station in cooperation with Pacific Power & Light Co. (PP&L) at the present location at Yale Recreation Site.

Mudflow Management Concept Area--Improves portions of Roads 83 and 2588 through the Muddy River Mudflow to preeruption standard. Relocates Road 92 along the edge of Smith Creek Mudflow and reconstructs Road 9418 to eliminate steep portions. Manages Roads 94 and 9418 for one-way traffic south. Upgrades the parking and viewpoint at Lava Canyon. Constructs trailhead parking with water and sanitation to serve trails to Windy Ridge and Lava Canyon. Constructs a trail at timberline on the south side of the mountain. Constructs a viewpoint at Marble Mountain. Construct a Sno-park facility. Provides snowgrooming on roads. Constructs cross-country ski trails.

Road 99/Spirit Lake Management Concept Area--Retains Road 99 as a single lane paved road from Road 25 to Road 94 and as a single lane gravel surface road to Windy Ridge. Expands the existing viewpoint parking at Bear Meadow to accommodate trailhead use. Improves parking and facilities at seven existing viewpoints and constructs seven new viewpoints. Reconstructs Trail No. 1 east of Bear Meadow and Trail No. 220 for horse use. Constructs a combination fire prevention lookout/visitor information station at Strawberry Mountain.

Mt. Margaret Management Concept Area--Reconstructs Trail No. 1 across Mt. Margaret Ridge to Harrys Ridge with a Trail No. 214 connection to the lake basin near Boot Lake. Provides primitive spurs to Shovel, Snow, Panhandle, Obscurity Lakes, and to the south end of Boot Lake. Provides compost toilets at each of these lakes. Constructs trail No. 212 across Mt. Venus and along Falls Creek to the Green River Trail No. 213. Trails are limited to hikers. Provides a backcountry ranger. Requires campers to register, and camp at designated locations. Constructs Trail No. 211F from Road 2612 to Trail No. 211 near Panhandle Lake. Constructs Trail No. 209 to St. Helens Lake.

Backcountry Management Concept Area--Reconstructs damaged portion of the Green River Trail No. 213 to connect to Road 2612 and a private road to the west. Constructs trailhead parking at both ends of the trail and a toilet at the west end. Reconstructs all trails to accommodate hiker and horse use. Relocates Trail No. 217 to avoid private land. Constructs five new trailheads. Provides two toilets. Expands parking and provides toilets at Ryan Lake and Quartz Creek Big Tree Areas. Constructs a picnic area/interpretive site near the Polar Star Mine. Acquires scenic easement along Road 2612. Acquires public access agreement on principal roads to trailheads, including Weyerhaeuser Road 2500 along lower Green River. Constructs trail for research along Goat Creek.

Mount St. Helens Management Concept Area--Provides a registration system for mountain climbing.

Facilities Outside the Monument Along Major Access Corridors--Reconstructs the Iron Creek Information Station. Improves facilities at Clearwater Overlook and Cedar Flats. Constructs two new viewpoints and one trailhead. Improves the former Pine Creek Ranger Station, and continues its use as a visitor information station. Provides a laboratory and trailer camping for researchers. Improves single lane portion of Road 25 to a double lane, dust free standard. Converts the Lower Falls Campground into a viewpoint/picnic area. Maintains viewpoints at Big Creek Falls, Curly Creek Falls, and Outlaw Ridge. Converts Curly Creek dispersed camp into a developed campground and designates specific units for the use of researcher. Improves signing to and from State Route 14.

Other Management Direction:

Air Traffic: Requests F.A.A. restriction on aircraft elevation to 2,000 feet except over Cave Basalt/Goat Marsh, Mudflow, and the Backcountry Concept Areas.

Fire: Places high priority on the suppression of fires in blowdown and fringe zones, using modified suppression techniques whenever possible. Prescribed natural fires will be allowed in all other undeveloped areas, under

specified conditions. Scheduled prescribed fires are recommended for some high hazard areas. Specific fire mitigation measures include: fire lookout at Strawberry Mountain, no open campfires outside designated areas in blowdown and fringe zones, and some remote helispots brushed to a 50 foot diameter.

Research: Protects scientific values in more sensitive features by establishing rules for meeting standards of access and uses by scientists and non-scientists. Engages a science coordinator and a panel of researchers with active interests in Mount St. Helens to coordinate the scientific program.

Visuals: Protects visual quality by acquiring scenic easements on State and private lands along major access routes in the vicinity of the Monument, i.e., State Route 504, private Road 3500, and Forest Roads 2612 and 83.

ALTERNATIVE D

East/Westside Moderate Development (Preferred)

This alternative was presented as the "preferred alternative" in the DEIS, and is repeated here as it was presented in the DEIS. This alternative was "modified" based on public comment to form the selected alternative.

This alternative is similar to Alternative C but eastside access is also improved. Significant aspects include reconstructing State Route 504 to a double lane paved standard from near Camp Baker to a large day use complex at Coldwater Lake. An aerial tram and a single lane low standard service road is provided to Johnston Ridge. Road 99 is upgraded to Windy Ridge and a bus shuttle is provided to Spirit Lake.

Coldwater/Johnston Ridge Management Concept Area--Reconstructs State Route 504 from near Camp Baker to Coldwater Lake and operates an aerial tramway to an observation post on Johnston Ridge. Develops a complex at the end of State Route 504 to adequately accommodate large numbers of visitors seeking a day use experience.

Based on the best information available at the time of this plan, the access from Coldwater Lake to Johnston Ridge is displayed as a combination aerial tram/bus shuttle system. As more intensive field surveys and market analysis are completed, it may be technically and economically feasible to have the aerial tram extend all the way to the observation post.

Constructs a trail from the observation post to Harrys Ridge where shelter and toilet facilities would be provided. Constructs other trails to

these points of interest: the debris avalanche, the damaged logging equipment on Coldwater Ridge, and the shoreline of Coldwater Lake.

Castle Lake/Sheep Canyon Management Concept Area--Acquires agreement from the landowner to use private road for public access to Castle Lake and provides a medium sized day use facility. Constructs a trail across the debris avalanche in front of the crater and across the South Fork of the Toutle River to Sheep Canyon. Maintains road access to a medium sized day use facility at the trailhead/viewpoint there. Confines visitor use to trails on the debris avalanche.

Cave Basalt/Goat Marsh Management Concept Area--Relocates and expands the Ape Cave day use facility, providing a concession building and guided tours of the Cave. Provides an alternate access route to reduce industrial traffic in the vicinity of Ape Cave. Expands parking, improves sanitation, and adds an interpretive trail at Lava Cast. Restricts access to caves during bat hibernation. Restricts camping along Roads 83, 8303, and 81. Provides designated campsites for mountain climbing near Sheep Canyon and Butte Camp. Permits horse use on several trails. Expands picnic area at Kalama Springs. Provides a trail and interpretive signs to the Blue Lake Noble Fir Grove. Requires dispersed campers and mountain climbers to register. Constructs a new visitor information station along the highway west of Cougar.

Mudflow Management Concept Area--Improves portions of Roads 83 and 2588 through the Muddy River Mudflow to preeruption standard. Upgrades Road 83 to Road 8312. Removes Road 92 from the Smith Creek Mudflow. Operates Roads 83 beyond the mudflow as a one-way loop system. Constructs a trailhead/interpretive/picnicking complex at Lava Canyon.

Constructs trail east side of Mount St. Helens at timberline connecting with trailheads on Road 83. Provides a loop trail opportunity in Lava Canyon. Provides an environmental education area for school groups to become involved with the ecological succession. Constructs a viewpoint on Marble Mountain. Constructs a Sno-park facility, including a picnic shelter. Provides snowgrooming on designated roads. Constructs cross country ski trails. Constructs trail for hikers only in Smith Creek drainage between Road 83 and Road 99.

Road 99/Spirit Lake Management Concept Area--Reconstructs Road 99 to a double lane, dust free standard to Windy Ridge Viewpoint, and provides a single lane gravel road to Spirit Lake. Provides a bus shuttle concession to Spirit Lake from Windy Ridge area after State Route 504 is completed to Coldwater Lake. Expands parking at Smith Creek viewpoint to accommodate a portion of the bus shuttle parking. Provides a picnic shelter at Spirit Lake and a trail to Harrys Ridge which connects with Trail No. 1.

Constructs a combination fire prevention lookout/visitor information station at Strawberry Mountain. Designates an environmental education area at St. Charles Lake. Improves parking and facilities at seven viewpoints and constructs new parking and facilities at eight new viewpoints. Snowgrooms Road 99 to Windy Ridge. Reconstructs Trail No. 1 east of Bear Meadow and Trail No. 220 to accommodate combination hiker/horse/bike use.

Mt. Margaret Management Concept Area--
Reconstructs Trail No. 1 across Mt. Margaret Ridge to Harrys Ridge with Trail No. 214 connecting to the lakes basin. Constructs Trail No. 211 from Trail No. 1 to the Coldwater Lake complex passing by or providing primitive spur trails to Grizzly, Panhandle, Holmstedt, Obscurity, Boot, Snow, Shovel, and Venus Lakes. Provides compost toilets at all of these lakes except Holmstedt. Constructs Trail No. 212 across Mt. Venus and along Falls Creek to the Green River and Trail No. 213. Constructs a primitive trail to Coldwater Peak. Requires a permit for overnight use. Trails are limited to hikers. Provides backcountry ranger.

Backcountry Management Concept Area--Acquires right-of-way and reconstructs damaged portions of the Green River Trail No. 213 to connect with Road 2612 and Weyerhaeuser Road 2500 to the west. Provides trailhead at Road 2612 with toilets. Reconstructs all trails to accommodate hiker/horse use. Relocates Trail No. 217 to avoid private land. Extends Trail No. 218 into Goat Creek to Road 2750 to eliminate a deadend situation. Constructs five new trailheads. Expands parking and provides interpretation and a toilet at Ryan Lake and the Quartz Creek Big Tree Area. Provides two compost toilets in the backcountry. Acquires public access agreements on roads to key trailheads. Constructs an administrative trail for research scientists along Goat Creek.

Mount St. Helens Management Concept Area--
Requires a permit for mountain climbing or camping. Limits hikers to trails in the high value research areas around Butte Camp and the Upper Muddy Fan.

Facilities Outside the Monument Along Major Access Corridors--Relocates the Iron Creek Information Station along Road 25, north of Road 26 junction. Adds picnicking area adjacent to the Iron Creek Campground. Constructs two new viewpoints and one trailhead. Improves facilities at Clearwater Overlook and Cedar Flats. Adds a comfort station and office spaces at the former Pine Creek Ranger Station for use by the Skamania County deputy and as visitor information station. Provides a research laboratory and camping facilities. Provides overnight lodging for researchers at the Cispus Environmental Learning Center. Improves single lane portion of Road 25 to a double lane, dust free standard. Constructs toilet and paved parking for 20 cars near the junction of Roads 25 and 99 for Sno-park. Converts the Lower Falls Campground into a viewpoint/picnic

area. Maintains viewpoints at Big Creek Falls, Curly Creek Falls, and Outlaw Ridge. Improves the dispersed camping area at Curly Creek to a developed campground and designate specific units for the use of research scientists. Improves signing to and from State Route 14. Constructs a 60 unit campground near the Lewis River.

Other Management Direction:

Air Traffic: Requests F.A.A. restriction on the elevation of airflights to 1,000 feet above the terrain over the entire Monument. (See Appendix H for full details.)

Fire: Places high priority on the quickest reasonable control of all fires in blowdown and fringe zones, using modified suppression techniques whenever possible. Allows prescribed natural fires in all other undeveloped areas, under specified conditions. Scheduled prescribed fires recommended for some high hazard areas. Specific fire mitigation measures include: fire lookout at Strawberry Mountain, no open campfires outside designated areas in blowdown and fringe zones, and some remote hellspots brushed to a 50 foot diameter.

Research: Protects scientific values in more sensitive features by establishing rules for meeting standards of access and uses by scientists and nonscientists. Places the debris avalanche, the Spirit Lake Basin, the Upper Muddy Fan, and Butte Camp--areas of the greatest scientific significance--in Protection Class I. This provides the greatest assurance that natural processes and features in the most sensitive areas will be unimpeded (see Appendix E. Engages a science coordinator and a panel of researchers with active interests in Mount St. Helens to coordinate the scientific program.

Visuals: Protects visual quality by acquiring state and private lands between major access routes and the Monument boundary, i.e., acquires 950 acres adjacent to State Route 504, which includes 80 acres north of the Coldwater Lake complex, T. 10 N., R. 4 E., Section 35, S 1/2 of SE 1/4.

ALTERNATIVE E

Eastside Moderate Development

Emphasis is placed on improving access from the south and east and not reestablishing State Route 504 from the west. Significant aspects include upgrading and extending Road 99 to Spirit Lake, providing a day use facility and concessionaire in the vicinity of Ole's Cave, and providing a small campground near McBride Lake.

Coldwater/Johnston Ridge Management Concept

Area--Continues use of private roads to access the Coldwater Lake control structure for maintenance. Provides no road access for visitors. Constructs trails from Castle Lake to Coldwater Lake and Harrys Ridge. Provides shelter and toilet facilities at Harrys Ridge. Constructs helicopter landing area at Johnston Ridge for use by concessionaires.

Castle Lake/Sheep Canyon Management Concept

Area--Acquires rights for public use of the private road to Castle Lake. Confines access during peak use periods to bus travel provided by a concessionaire. Constructs a day use facility for viewing scenery, picnicking, and interpretation at Castle Lake.

Constructs trails across the debris avalanche in front of the crater and across the South Fork of the Toutle River from Sheep Canyon to Castle Lake. Maintains road access to a trailhead/viewpoint at Sheep Canyon. Restricts visitor use to trails on the debris avalanche.

Cave Basalt/Goat Marsh Management Concept

Area--Relocates the Ape Cave day use facility. Provides an alternate access route to reduce industrial traffic in the vicinity of Ape Cave. Expands parking, improves sanitation, and adds an interpretive trail at Lava Cast. Constructs a 12 unit campground and day use complex near the junction of Roads 90 and 83; it would include a concession building and guided tours of the cave. Constructs a 12 unit campground near McBride Lake. Expands picnic area at Kalama Springs. Restricts access to caves during bat hibernation. Requires permits for camping. Provides designated campsites for mountain climbing near Sheep Canyon and Butte Camp. Permits horse use on several trails. Constructs a new visitor information station along the highway west of Cougar.

Mudflow Management Concept Area--Improves portions of Roads 83 and 2588 through the Muddy River Mudflow to preeruption standard, and upgrades Road 83 to Road 8312 to a dust free standard. Reconstructs Road 92 along the Smith Creek Mudflow. Operates Road 83 beyond the mudflow as a one-way loop system. Provides an alternate haul route from Smith Butte to Road 83 via Clearwater Creek. Constructs a trailhead/interpretive/picnicking complex at Lava Canyon.

Constructs a trail at timberline with several connecting trails to trailheads on Road 83. Provides a loop trail opportunity in Lava Canyon. Constructs a viewpoint on Marble Mountain. Constructs a Sno-park facility, including a shelter and parking for 60 cars. Provides snowgrooming on designated roads. Constructs cross country ski trails. Constructs hiker trail in Smith Creek drainage from Road 92 and Road 99.

Road 99/Spirit Lake Management Concept

Area--Reconstructs Road 99 to a double lane dust free standard to Windy Ridge Viewpoint and improves the road to Spirit Lake to a double

lane standard. Provides parking, sanitation, interpretive trail, and shelter at Spirit Lake. Constructs trail to Harrys Ridge to connect to Trail No. 1. Constructs a combination fire prevention lookout/visitor information station at Strawberry Mountain. Improves parking and facilities at seven viewpoints and constructs provides parking and facilities at seven new viewpoints. Reconstructs Trail No. 1 east of Bear Meadow and Trail No. 220 to accommodate a combination hiker/horse/bike use. Snowgrooms Road 99 to Spirit Lake.

Mt. Margaret Management Concept Area--

Reconstructs Trail No. 1 across Mt. Margaret Ridge to Harrys Ridge with a Trail No. 214 connection to the lakes basin. Constructs Trail No. 211 from Trail No. 1 to Castle Lake passing by or providing primitive spur trails to Grizzly, Panhandle, Holmstedt, Obscurity, Boot, Snow, Shovel, and Venus Lakes. Provides compost toilets at all of these lakes except Holmstedt and Grizzly. Constructs Trail No. 212 across Mt. Venus and along Falls Creek to Green River Trail No. 213. Constructs a primitive trail to Coldwater Peak. Requires permits for overnight use. Limits trail use to hikers.

Backcountry Management Concept Area--Reconstructs

damaged portions of the Green River Trail No. 213 to connect with Road 2612 and a private road to the west. Provides trailhead at Road 2612 with toilets. Reconstructs all trails to accommodate hiker/horse use. Relocates Trail No. 217 to avoid private land. Eliminates a dead end by extending Trail No. 218 north to a road. Constructs five new trailheads. Expands parking and provides interpretation and sanitation at Ryan Lake and the Quartz Creek Big Tree Area. Provides two compost toilets. Acquires public access agreement on roads to key trailheads. Manages Road 26 as one way northbound.

Mount St. Helens Management Concept Area--

Requires a permit for mountain climbing or camping. Restricts access to trails in the high value research areas around Butte Camp and the Upper Muddy Fan.

Facilities Outside the Monument Along Major

Access Corridors--Relocates the Iron Creek Information Station along Road 25, north of Road 26 junction. Adds picnic sites at the Iron Creek Campground. Constructs two new viewpoints and one trailhead. Improves facilities at Clearwater Overlook and Cedar Flats. Provides office space at the former Pine Creek Ranger Station for the Skamania County deputy. Continues to use it as a visitor information station. Upgrades toilet facilities. Provides a research laboratory and camping facilities. Provides overnight lodging for research scientists at the Cispus Environmental Learning Center. Improves single lane portion of Road 25 to double lane, dust free standard. Provides a Sno-park with toilets and paved parking for 20 cars near the junction of Roads 25 and 99. Converts the Lower Falls Campground into a viewpoint/picnic area. Maintains viewpoints at

Big Creek Falls, Curly Creek Falls, and Outlaw Ridge. Converts dispersed recreation area at Curly Creek into a developed campground and designate specific units for research. Improves signing to and from State Route 14. Constructs a 60 unit campground near the Lewis River.

Other Management Direction:

Air Traffic: Requests F.A.A. restriction on airlift traffic to 1,000 feet above the terrain in the Monument except over the Cave Basalt/Goat Marsh, Mudflow, and Backcountry areas.

Fire: Places high priority on the quickest reasonable control of all fires in blowdown and fringe zones, using modified suppression techniques whenever possible. Allows prescribed natural fires in all other undeveloped areas under specified conditions. Scheduled prescribed fire recommended for some high hazard areas. Specific fire mitigation measures include: fire lookout at Strawberry Mountain, no open campfires outside designated areas in blowdown and fringe zones, and some remote helispots brushed to a 50 foot diameter.

Research: Protects scientific values in more sensitive features by establishing rules for meeting standards of access and uses by scientists and nonscientists. Engages a science coordinator and a panel of researchers with active interests in Mount St. Helens to administer the scientific program.

Visual: Protects visual quality by acquiring scenic easements on state and private lands along major access routes in the vicinity of the Monument, i.e., along Roads 2612 and 83.

ALTERNATIVE F

Westside High Development

Emphasis is placed on providing convenient automobile access accompanied by highly developed recreation facilities. Significant aspects include extending State Route 504 to a double lane paved standard to provide automobile access from near Camp Baker to Johnston Ridge. A north-south loop route is provided between SR 504 and Cougar. Road 99 is upgraded and extended to a day use facility at Spirit Lake. Ape Cave parking is expanded, and a horse camp and trails are provided in the Cave Basalt Area.

Coldwater/Johnston Ridge Management Concept Area--Reconstructs State Route 504 from near Camp Baker to the observation post on Johnston Ridge. Develops a complex at Coldwater Lake to adequately accommodate large numbers of visitors seeking a day use experience.

Constructs a trail from the observation post to Harrys Ridge where shelter and toilet facilities would be provided. Constructs other trails to these points of interest: the debris avalanche, damaged logging equipment, and the shore of Coldwater Lake.

Castle Lake/Sheep Canyon Management Concept Area--Acquires rights for public use of private road to Castle Lake and reconstructs to a single lane, dust free road. Constructs a day use facility, including a large picnic shelter to support cartop boating, interpretation, hiking, and viewing scenery.

Constructs trails across the debris avalanche in front of the crater and across the South Fork of the Toutle River from Castle Lake to Sheep Canyon. Improves road to viewpoint/trailhead at Sheep Canyon to single lane, dust free standard. Confines visitor use to trails only on the debris avalanche. Constructs a through road from State Route 504 to Cougar.

Cave Basalt/Goat Marsh Management Concept Area--Relocates and expands the Ape Caves day use facility providing a concession building and guided tours. Provides an alternate access route to reduce industrial traffic in the vicinity of Ape Cave. Expands parking and picnicking facilities at Lava Cast and adds an interpretive trail. Constructs a 12 unit campground and day use parking facility near Ole's Cave. Restricts access to caves during bat hibernation. Constructs a 12 unit campground near McBride Lake. Expands the picnic area at Kalama Springs. Requires a permits for camping. Constructs a 12 unit horse camp near the Kalama River. Expands the trail system along the Kalama River and southern portion of the Monument to accommodate more horse use. Reconstructs Road 8123 to preeruption standard and provides interpretation at the Blue Lake Noble Fir Grove. Provides designated camping areas for mountain climbing. Constructs a new visitor information station along the highway west of Cougar.

Mudflow Management Concept Area--Improves Road 83 to the Lava Canyon complex to dust free standard. Relocates Road 92 as a mid-slope road and removes all traces of the present temporary road from the Smith Creek Mudflow. Reconstructs Road 2588 to accommodate two-way traffic. Provides an alternate haul route for industrial traffic from Smith Butte via Clearwater Creek and the Muddy River. Constructs paved parking for trailhead/interpretive facility at Lava Canyon. Constructs trail at timberline connecting with trailheads on Road 83. Constructs a hiker trail in Smith Creek. Constructs a viewpoint on Marble Mountain. Constructs a Sno-park with shelter. Provides snowgrooming on designated roads. Constructs cross country ski trails.

Road 99/Spirit Lake Management Concept Area--Reconstructs Road 99 from Road 25 to Spirit Lake as a double lane paved road. Constructs parking, shelter, sanitation, and interpretive trail at Spirit Lake. Constructs trail to Harrys Ridge with a connection to Trail No. 1. Improves

parking and facilities at seven viewpoints and constructs facilities at seven new viewpoints. Reconstructs Trail No. 1 east of Bear Meadow and Trail No. 220 to accommodate a combination horse/hiker/bike use. Flows open Road 99 to Bear Meadow for Sno-park and snowgrooms Road 99 to Spirit Lake.

Mt. Margaret Management Concept Area---

Reconstructs Trail No. 1 across Mt. Margaret Ridge to Harrys Ridge with a primitive loop Trail No. 209 on the east side of St. Helens Lake. Constructs Trail No. 211 from Trail No. 1 to Minnie Peak passing by or providing primitive spur trails to Grizzly, Panhandle, Holmstedt, Obscurity, Boot, and Snow Lakes. Constructs Trail No. 212 across Mt. Venus and along Falls Creek to the Green River and Trail No. 213. Constructs Trail No. 211F by Venus, Island, and O'Conner Lakes, with a connection to Trail No. 212. Provides compost toilets at Panhandle, Boot, Snow, Shovel, and Obscurity Lakes. Requires a permit for camping. Trails are limited to hikers only.

Backcountry Management Concept Area--Reconstructs

damaged portions of Trail No. 213 to connect with Road 2612 and a private road to the west. Provides trailheads with toilets at both ends of the trail. Reconstructs all trails to accommodate hiker/horse use. Relocates Trail No. 217 to avoid private land. Constructs trail access from Red Springs Creek to Deadmans Lake. Eliminates a dead end by extending Trail No. 218 north to a road. Constructs eight other trailheads. Expands parking and provides a toilet at Ryan Lake and the Quartz Creek Big Tree Area. Constructs picnic area and interpretive site near Polar Star Mine. Provides two compost toilets in the backcountry. Constructs Trail No. 205 from Goat Creek to Vanson Peak. Acquires public access agreement on several private roads to trailheads. Manages Road 26 as a one-way northbound road.

Mount St. Helens Management Concept Area--

Requires a permit for mountain climbing or camping. Restricts access to trails in the high value research areas around Butte Camp and the Upper Muddy Fan.

Facilities Outside the Monument Along Major

Access Corridors--Relocates the Iron Creek Information Station along Road 25, north of Road 26 junction. Adds picnicking area adjacent to the Iron Creek Campground. Constructs two new viewpoints and a trailhead. Improves facilities at Clearwater Overlook and Cedar Flats. Provides office space at the former Pine Creek Ranger Station for the Skamania County deputy. Continues to use as a visitor information station. Upgrades toilet facilities. Provides a research laboratory and camping facilities. Provides overnight lodging for research scientists at the Cispus Environmental Learning Center. Improves single lane portion of Road 25 to a double lane, dust free standard. Converts the Lower Falls Campground into a viewpoint/picnic area. Maintains viewpoints at Big Creek

Falls, Curly Creek Falls, and Outlaw Ridge. Converts the dispersed recreation area near Curly Creek into an industrial campground. Improves signing to and from State Route 14. Constructs a 100 unit campground near the Lewis River.

Other Management Direction:

Fire: Places high priority on the quickest reasonable control of all fires in blowdown and fringe zones, using modified suppression techniques whenever possible. Modified suppression techniques used in all other areas. Specific fire mitigation measures include: no open campfires outside designated areas in blowdown and fringe zones, and some remote helispots brushed to a 50 foot diameter.

Research: Protects the scientific value of sensitive features by establishing rules for meeting standards of access and uses by scientists and nonscientists. Engages a science coordinator and a panel of scientists active in Monument research to administer the scientific program.

Visual: No land acquisition or scenic easement is planned to protect visual quality along major access routes across private land.

ALTERNATIVE G

Maximum Development

This alternative is similar to Alternative F but with added emphasis placed on improving access by providing a cross-Monument highway. Significant aspects are extending SR 504 at a double lane paved standard from near Camp Baker to Coldwater Lake, and a Forest Service double lane road across the Spirit Lake Basin to connect with Road 99, providing a day use facility at Spirit Lake. A camping and day use complex are provided near Ole's Cave, and a horse camp and trails are provided in the cave basalt area.

Coldwater/Johnston Ridge Management Concept

Area--Reconstructs State Route 504 from near Camp Baker to Coldwater Lake and a Forest Service double lane standard road to Spirit Lake. This road connects with Road 99 providing a cross-Monument highway. Develops a complex at Coldwater Lake that can support the large numbers of visitors traveling to Spirit Lake. Constructs Trail No. 230 along the north shoreline of Coldwater Lake, and to viewpoints on Johnston and Harrys Ridges. Provides shelter and toilet facilities at Harrys Ridge. Constructs a trail from Coldwater Lake to Castle Lake.

Castle Lake/Sheep Canyon Management Concept Area--Acquires rights for public use of private road to Castle Lake and reconstructs single lane, dust free road. Constructs a day use facility, including a large picnic shelter, to support cartop boating, interpretation, hiking, and viewing scenery.

Constructs trails across the debris avalanche in front of the crater and across the South Fork of the Toutle River from Castle Lake to Sheep Canyon. Improves road to viewpoint/trailhead at Sheep Canyon to paved standard. Confines visitor use to trails on the debris avalanche.

Cave Basalt/Goat Marsh Management Concept Area--Maintains the day use facility at Ape Cave with improved sanitation. Provides an alternate access route to reduce industrial traffic in the vicinity of Ape Cave. Retains the picnic area at Lava Cast and expands parking, improves water and sanitation, and adds an interpretive trail. Constructs a 25 unit campground, concession building, and large day use parking facility near Ole's Cave. Restricts access to caves during bat hibernation.

Constructs a 25 unit campground near McBride Lake and a 12 unit campground near the Kalama River. Expands the trail system along the Kalama River and southern boundary of the Monument to accommodate heavy use by horse recreationists. Expands the picnic area at Kalama Springs.

Upgrades most roads to a dust free standard. Provides camping areas for mountain climbing. Requires permits for camping. Constructs a new visitor information station along the county highway about a mile west of Cougar.

Mudflow Management Concept Area--Paves Road 83 to the Lava Canyon complex. Relocates Road 92 as a mid-slope road and removes all traces of the present temporary road from the Smith Creek Mudflow. Reconstructs Road 9418 to accommodate public traffic. Provides an alternate haul route for industrial traffic from Smith Butte via Clearwater Creek and the Muddy River. Constructs paved parking for trailhead/interpretive facility at Lava Canyon. Constructs trails at timberline with connecting trails to trailheads on Road 83. Constructs a hiker trail in Smith Creek. Constructs a viewpoint on Marble Mountain. Constructs a Sno-park facility, including a warming hut. Provides snowgrooming on designated roads. Constructs cross country ski trails.

Road 99/Spirit Lake Management Concept Area--Reconstructs Road 99 from Road 25 to Spirit Lake as a double lane dust free road to connect with State Route 504. Constructs a large parking area with sanitation facilities, picnicking shelter, and interpretive trails at Spirit Lake. Constructs trail to Harrys Ridge connecting with Trail No. 1. Improves parking and facilities at seven viewpoints and constructs facilities at seven new viewpoints.

Reconstructs Trail No. 1 east of Bear Meadow and Trail No. 220 to accommodate a combination of horse/hiker/bike use. Reduces size of Windy Ridge parking area upon completion of State Route 504 to Spirit Lake. Snowgrooms Road 99 to Spirit Lake.

Mt. Margaret Management Concept Area--Provides trail across Mt. Margaret Ridge to Harrys Ridge with a connecting trail into the lakes basin. Constructs a trail from Minnie Peak through the lakes basin to Trail No. 1 passing by or providing primitive spurs to Grizzly, Panhandle, Boot, Snow, Shovel, Venus, Obscurity, and Holmstedt Lakes. Provides compost toilets at six of these lakes. Provides trail access from Road 2612 along Grizzly Creek to the lakes basin. Constructs a trail on the east side of St. Helens Lake. Requires a permit to camp. Limits all trails to hikers only.

Backcountry Management Concept Area--Reconstructs damaged portions of trail No. 213 to connect with Road 2612 and a private road to the west. Provides trailheads with toilets at both ends of the trail. Reconstructs all trails to accommodate hiker/horse use. Relocates Trail No. 217 to avoid private land. Constructs trail access from Red Springs Creek to Deadman's Lake. Eliminates dead end by extending Trail No. 218 north to a road. Constructs seven other trailheads. Expands parking and provides toilets at Ryan Lake and the Quartz Creek Big Tree Area. Constructs picnic area and interpretive site near Polar Star Mine. Provides two compost toilets. Constructs Trail No. 205A from Goat Creek to Vanson Peak. Acquires public access agreement on several private roads to trailheads. Manages Road 26 as a one-way road northbound. Constructs an administrative trail along Goat Creek to provide access for research. Acquires ownership of private land along Road 2612.

Mount St. Helens Management Concept Area--Requires a permit for mountain climbing or camping. Restricts access to trails in the high value research areas around Butte Camp and the Upper Muddy Fan.

Facilities Outside the Monument Along Major Access Corridors--Relocates the Iron Creek Information Station along Road 25, north of Road 26 junction. Add picnic area adjacent to the Iron Creek Campground. Constructs two new viewpoints and a trailhead. Improves facilities at Clearwater Overlook and Cedar Flats. Improves and adds a comfort station to the former Pine Creek Ranger Station. Provides an office/ residence for the Skamania County sheriffs deputy. Provides a research laboratory and camping facilities. Provides overnight lodging for research scientists at the Cispus Environmental Learning Center. Improves single lane portion of Road 25 to a double lane, dust free standard. Constructs paved parking and toilets near the junction of Roads 25 and 99 and a Sno-park at Elk Pass. Converts the Lower Falls Campground into a viewpoint/picnic area.

Maintains viewpoints at Big Creek Falls, Curly Creek Falls, and Outlaw Ridge. Converts the dispersed recreation area at Curly Creek into an industrial campground. Improves signing to and from State Route 14. Constructs a 100 unit campground near the Lewis River.

Other Management Direction:

Fire: Places high priority on the quickest reasonable control of all fires in blowdown and fringe zones, using modified suppression techniques whenever possible. Modified suppression techniques used in all other areas. Specific fire mitigation measures include some remote helispots kept brushed to a 50 foot diameter.

Research: Protects scientific values of the more sensitive features by establishing rules for meeting standards of access and uses by scientists and non-scientists. Engages a science administrator and a panel of scientists active in Monument research to administer the scientific program.

Visual: Protects visual quality by acquiring the state and private lands between major access routes and the Monument boundary; i.e., acquires approximately 950 acres south of State Route 504 and private Road 3500, and along Roads 2612 and 83. Also, acquires property in the Ole's Cave Campground area includes S 1/2 of SE 1/4 Section 35, T. 10 N., R. 4 E., north of the Coldwater Lake complex.

State Route 504 Alternatives (Spirit Lake Memorial Highway)

Alternatives A, B, and E do not include reconstruction of State Route (SR) 504. Alternatives C, D, D (Modified), F, and G call for the reconstruction of SR 504 (the Spirit Lake Memorial Highway) eastward from near Camp Baker, by either an upper or a lower corridor (Figure 8). This state route terminates at Coldwater Lake in Alternatives C, D, D (Modified), and G, and at Johnston Ridge in Alternative F. In Alternatives C, D, D (Modified), and G either an aerial tram or Forest Service road extend further eastward into the Monument and are described above as part of the core alternatives. The section of SR 504 between Coldwater Lake and Johnston Ridge is described as part of Alternative F.

The roadway will consist of two 12 foot lanes with 4 foot shoulders and the entire 32 foot width will be asphalt concrete pavement. A 50 mph design speed and a maximum grade of 5 percent will be used except in a few places where the terrain is very rough.

Valley Floor Corridor

Reconstruction of SR 504 would be on the mudflow and debris flow in the North Fork of the Toutle

River Valley. This was the location of the pre-eruption highway. The valley floor is not a cost effective alternative due to the extremely high maintenance costs. The initial construction costs for this route are less than the other corridors. The mud and debris materials are highly erodible and because of the depths (up to 200 feet) it is not feasible to protect the highway embankment from the Toutle River. The route would also be vulnerable to any subsequent mudflows from the volcano and therefore is not a viable alternative.

Lower Corridor

The Lower Corridor starts near the community of St. Helens and runs east on a natural bench approximately 200 feet above the valley floor then crosses Cow Creek and Hoffstadt Creek. From Hoffstadt Creek crossing the corridor swings back out to the Toutle Valley crossing the West Fork of Bear Creek and then around the base of Elk Rock. From Elk Rock, it crosses Elk Creek and Maratta Creek to Coldwater Creek. All of the above creeks and three unnamed creeks will be bridged. The bridges vary from 100 feet to 500 feet in length. The entire route is from 50 to 400 feet above the valley floor. The location of this corridor should be above any subsequent mudflows and will not be subject to erosion from the North Fork of the Toutle River. This corridor enters the Monument approximately 6.5 miles west of Coldwater Lake.

Upper Corridor

The Upper Corridor will reconstruct SR 504 on the same route as the Lower Corridor between the community of St. Helens and Hoffstadt Creek. Between Hoffstadt Creek to Coldwater Creek the route will climb from 1,000 feet to 1,500 feet above the valley floor. This will provide an opportunity for the construction of some excellent turnouts or viewpoints to view Mount St. Helens, the debris avalanche, and observe an overall panoramic view of the impacted area. The last one-half mile is within the Monument.

The same creeks will be bridged on this corridor, but some of the bridges will be shorter in length because of the less severe terrain.

A maximum 5 percent grade will also be used on this corridor. Truck climbing lanes or slow vehicle turnouts will be provided on the longer grades.

No-Build Alternatives A, B, and E

The No-Build alternative would not reconstruct SR 504. This would deny state highway access to the National Monument and the other public and private lands in the area. Public access is desirable for timber management, recreation, and access to private homes and property.

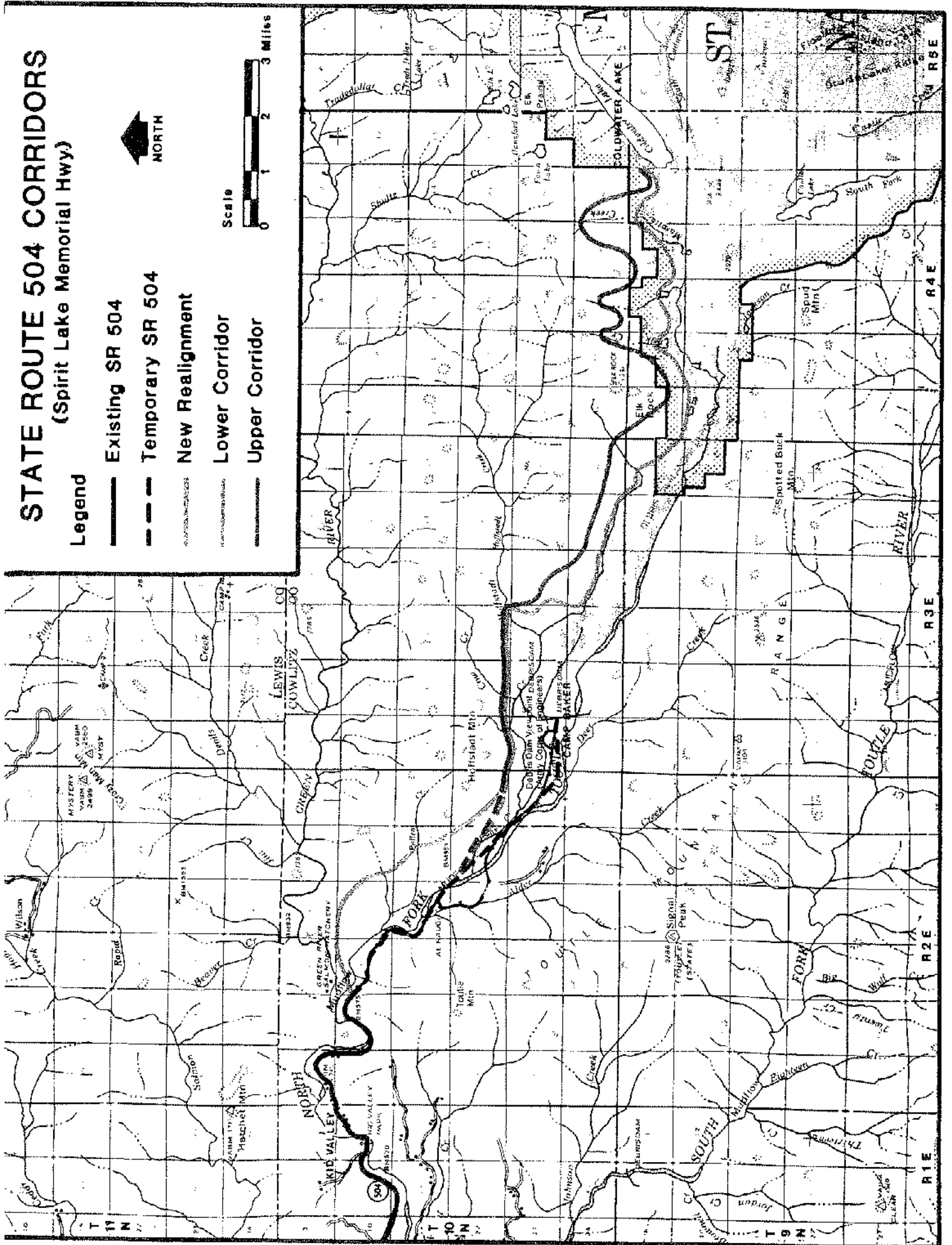


Figure 8

MANAGEMENT PRACTICES COMMON TO ALL ALTERNATIVES

Introduction

This section describes management practices that have been determined by direction found in the Monument Act or other federal legislation, by existing plans, or by administrative decisions. Circumstances requiring more detailed planning or monitoring are also identified. These common management practices will be followed regardless of which alternative is implemented and were not evaluated as part of the selection process. Documentation for this required direction can be found at the Gifford Pinchot National Forest Supervisor's Office.

Vegetative Management

Combinations of chemical, mechanical, and manual vegetation control will be needed periodically along roads and at recreation sites within the monument to ensure public safety. In scientific research areas, vegetative control will be strictly regulated. The amount and type (or combinations of types) of control methods will be determined on a case by case basis.

Planting of road cut and fill slopes for the purpose of erosion control shall be limited to areas south of Mount St. Helens where the basic vegetative ecosystem is intact. Normal Forest Service erosion control methods will be employed in these areas. North of Mount St. Helens within the blast and devastation zones and within the margins of all mudflow-affected channels, the need for erosion control planting will be assessed on a case-by-case basis. If planting is deemed necessary, only native (indigenous) species will be used. Sedimentation models (Appendix I) indicate only minor increases in sedimentation from road construction compared with the very high ambient rates. This suggests that revegetation will not always be required. This direction permits the necessary flexibility to provide for erosion control planting if the need arises.

Interpretation

To excite the visitors into a deeper appreciation of the Monument resources and provide the key that opens the door to deeper understanding of the Monument, natural phenomena must be interpreted. This planning document will not attempt to describe in detail how this interpretation will be accomplished, but will only identify specific facilities in each of the seven alternatives that will be used to support the interpretation program. An interpretive

plan, that provides detailed information on the topics listed below, will be completed within one year following approval of this Comprehensive Management Plan.

Interpretive Plan Topics:

- Specific objectives of the interpretation.
- Analysis of the anticipated audiences (background, education, and special requirements such as foreign language).
- Development and expansion of themes.
- Staffing, scheduling, and budgeting.
- Techniques and media.
- Concession provided interpretation.
- Off-site interpretation including conservation education, publications, slide programs, and pre-visit packages.
- Utilization of research materials presently available, and identification of additional research necessary for implementation of a quality interpretive program.
- Description of how interpretation will be used to protect the natural features and process.

In 1983 a special task force identified a primary theme and several secondary themes which will be used as guidelines in preparing the interpretive plan. They are described in the Interim Interpretation and Development Program for Mount St. Helens National Volcanic Monument (Forest Service, Feb. 1983). The primary theme will be "how and why Mount St. Helens after a repose of a century and a quarter suddenly erupted with astonishing power." Secondary themes include: rapid volcanic change and gradual ecologic change; the similarities and differences between Mount St. Helens and other volcanoes; the response of ecosystems and society to sudden change; and the search for predictability. More information on themes is presented in Appendix E.

Many visitors miss the temporary Visitor Center operated by the Forest Service at Lewis and Clark State Park because of its location 17 miles north of the Interstate 5 and State Route 504 junction. Space for expansion of the building and parking area is limited. Construction of a permanent Visitor Center on Silver Lake in Seaquest State Park about five miles east of Castle Rock is common to all alternatives. An interdisciplinary planning team evaluated this proposal and a Decision Notice for the permanent Visitor Center was filed May 12, 1982.

MANAGEMENT PRACTICES COMMON TO ALL ALTERNATIVES (Continued)

Off-Road Vehicle Management

Off-road vehicle use in the Monument will be prohibited except for: 1) organized and official rescue and firefighting efforts; 2) snow vehicles in alternatives which propose them; and 3) specifically authorized permits.

Law Enforcement Management

Law enforcement will be governed by the Law Enforcement Plan (Gifford Pinchot National Forest, Oct. 1983), which is revised annually and includes special law enforcement direction for the Monument.

Facility Design

Facilities within or adjacent to the Monument shall conform to approved design standards presented in the Mount St. Helens National Monument Facility Design Guide (April 1983). The modified "Cascadian" architectural style is characterized by large round or hand-hewn timbers and rock masonry.

Visual Resource Management

Visual Quality Objectives established for the Interpretive Area and Research Natural Areas in the Mount St. Helens Land Management Plan FEIS (October 1981) are common to all alternatives. The Retention Visual Quality Objective (VQO) applies to most of the Monument. Research Natural Areas have a Preservation VQO.

Research and Science Management

The Gifford Pinchot National Forest recognized the tremendous importance of research in the Mount St. Helens area since the first eruptive stages in 1980. The Forest Service will continue to exercise leadership in coordination and communication with the scientific community through existing formal and informal channels.

The Total Resource Inventory (TRI) system will continue to be used within the Monument and adjacent areas for documenting research sites. This documentation will enable managers to identify potential conflicts between research and other activities and to mitigate those conflicts.

Regulate foot and other travel and introduction and removal of organisms for scientific purposes in accordance with standards described in the protection class system (Appendix C). Introduction and removal of fish and wildlife for recreational purposes will be regulated through procedures set forth in a fish and wildlife management plan prepared in cooperation with Washington Department of Game. A program to monitor effects of man's impacts on natural processes and features and research plots will be instituted in accordance with procedures described in Appendix C. Monitoring may also

include recovery of the environment as it affects the timing of development. For example, recovery of lake shore vegetation and lake water quality may set limits on when access should be provided to Mt. Margaret lakes.

An in-house science coordinator 1) documents and coordinates research activities, 2) helps prepare an Annual Report on Protection of Natural Processes and Features, 3) aids information transfer from scientists to the interpretation program, 4) manages the program for monitoring human impacts on natural processes and features, 5) helps identify research needs, and 6) contributes to analysis of effects of proposed developments and activities on research and natural processes and features. A panel of scientists active in research on the Monument is established to assist the Monument science coordinator in evaluating protection procedures and in communication with the scientific community.

An "Annual Report on Protection of Natural Processes and Features" will be prepared by the Monument. The Report will contain: 1) results of the monitoring program; 2) summary of visitor use patterns; 3) an assessment of the success of research plot protection measures; 4) assessment of proposed developments and activities in terms of their effects on natural processes and features; 5) reviews of research documentation, coordination, and collection and maintenance of long-term records of key environmental conditions; 6) identification of needed research activities; and 7) recommendations for change in the procedures for protection of natural processes and features and research plots. The report is submitted to the Scientific Advisory Board for its review. Recommendations for change in the protection procedures, combined with input from the panel of scientists active on the Monument, are given to the Scientific Advisory Board for its review and possible recommendation to the Regional Forester. This flexibility in protection procedures is desirable in the Mount St. Helens landscape where the landscape, ecosystem, and patterns of visitor use are changing rapidly.

U.S. Geological Survey

Mount St. Helens and adjacent areas will continue to be monitored by the U.S. Geological Survey at least as long as potentially dangerous eruptive activity continues. These investigations include but are not limited to regular monitoring of seismicity, deformation, gas emissions, solid eruptive products, discharge and quality of surface water, and changes in surface channels. Public statements on anticipated eruptive activity and associated potential hazards will continue to be released. Numerous investigations of deposits of 1980-84 and older rocks will continue intermittently. USGS monitoring and research involves the frequent use of helicopters and fixed-wing aircraft, ground access to restricted areas far from established roads and trails, collection of samples, and other activities. The continued

MANAGEMENT PRACTICES COMMON TO ALL ALTERNATIVES (Continued)

use of instruments, many now operating within the Monument, is essential. These include seismometers, small transmitting antennae, radio repeaters, and gauging stations. The USGS will acquire permits for its research and monitoring and keep it compatible with other legitimate uses of the Monument.

Public Safety

Closures to public access necessitated by volcanic activity will continue to be jointly established by the Forest Service, the State of Washington, and other concerned agencies as appropriate. The public closure boundary will expand or contract based on activity levels of the volcano and the ongoing assessment of probability of volcanic hazard and risk. The Forest Service will coordinate with medical service agencies to determine support required to administer the Monument.

Forest Insects and Disease Management

Measures to control effects of pest insects and disease will be limited to the removal of individual trees which present hazard to visitors. If catastrophic infestation jeopardizes resources within and outside the Monument, an interdisciplinary process will be used to determine if control actions and the proposed control methods are within the intent of the Monument Act. Part of monitoring for pest insects and disease will include the Forest Service maintaining contact with adjacent landowners.

Fire Management

Open campfires will be excluded in all areas of blowdown and standing dead timber, the blast zone, and on mudflows to reduce the threat of man caused fires and to preserve the natural state of these areas. The remaining area of the Monument is open to campfires, and will be monitored to determine the impacts.

To implement fire management direction contained in this document and provide specific guidelines, a Fire Management Implementation Plan for the Monument will be completed within 12 months after the approval of this plan.

Fishing, Hunting, and Trapping Regulation

The Washington Department of Game will continue to regulate animal populations under their Statewide Strategic Plan, and Game Commission approved hunting, fishing, and trapping regulations. The five-year moratorium on the stocking of fish in Monument lakes, recommended by the Scientific Advisory Board and accepted by the Regional Forester and Washington Department of Game, will continue to be in effect until May 18, 1988. This moratorium also applies to the construction of a Green River Falls fish passage. The fish planting and fish passage

issues will both be reexamined through an environmental analysis process prior to the end of the moratorium.

The Forest, the Washington Department of Game, and the Washington Department of Fisheries will cooperatively produce a Monument Fish and Wildlife Management Plan. It will address hunting, fishing, and trapping regulations in Protection Class I and biophysically sensitive areas of the Monument, the monitoring of animal populations and habitats, how animal damage and "problem animals" will be handled, and other wildlife and fisheries problems and opportunities, and will coordinate wildlife and fisheries management with the selected alternative from the Comprehensive Management Plan.

This Comprehensive Management Plan does not close any areas within the Monument to hunting. Any areas within the volcanic safety closure zone are closed to all entry without special permit. Hunting and fishing regulations in Protection Class I areas will be determined in the Cooperative Fish and Wildlife Management Plan, considering game populations, resource sensitivity, and research site sensitivity.

The Forest will continue to cooperate with the Washington Department of Game and with adjacent landowners in the management of the Marble Game Management Unit as a quality hunting area, with closure of some of the area's roads during hunting season.

In addition to the Fish and Wildlife Management Plan, the Cave Basalt Area Management Plan and the Backcountry Management Plan will address the monitoring of lake, stream, and terrestrial habitat recovery, and the monitoring and mitigating of the effects of recreational use on wildlife and fisheries populations and their habitats.

Cultural Resource Management

Upon implementation of this plan, a detailed field inventory will be conducted for each proposed project area prior to any ground disturbing activity. There will also be an inventory for prehistoric and historic cultural resource sites and facilities which testify to the force of the volcano, e.g., vehicles, logging equipment, structures. Sites located during the inventory will be evaluated according to National Register of Historic Places criteria to determine whether sites have national, regional, or local significance. Significant sites will be protected; direct and indirect impacts must be mitigated. Consultation with both the Washington State Historic Preservation Officer and the (Federal) Advisory Council On Historic Preservation will be conducted.

Cave Basalt Area Management

Within two years after the approval of this plan, the Monument Manager will complete a detailed Cave Basalt Area Management Plan. Its primary goal will be to establish protection measures for

MANAGEMENT PRACTICES COMMON TO ALL ALTERNATIVES (Continued)

plant and animal habitats and geologic and cultural resources which might otherwise be damaged by people's use of the caves. The management plan will also address the issues of protection of caves from mudflows and flooding, the monitoring of plant and animal populations, monitoring and mitigating the effects of recreational use where permitted, and monitoring of the effectiveness of protection measures.

Until this plan is completed, the following caves will be closed to all use to provide protection for sensitive wildlife habitats: Ole's, Bat, Spider, Flow, Beaver, and Dollar and Dime will be closed from November 1 to April 1, and Utterstrom's cave system, or parts of it, will be closed August 15 through October 31. During the above specified time, access to these caves will be by permit only. The Washington State Department of Game is encouraged to pursue a management agreement with the landowner to close Powerline Cave August 15 through October 31, and to protect cave entrances and passages from damage.

Air Quality Management

Air quality, particularly atmospheric clarity, is an especially important management consideration at Mount St. Helens. Air clarity has been severely impacted by the volcano; winds on the slopes of the mountain regularly cause ash deposits to become airborne and impart a dirty gray haze to the Spirit Lake Basin. Since enjoyment of the Monument is closely related to opportunities for clear viewing, other man related impairments to air quality are of major

concern. In order to assess the additional impact of human activities and to determine the appropriate level of air quality management, a monitoring plan for the Monument will be developed and implemented upon finalization of the Comprehensive Management Plan. In the interim, between monitoring plan development and analysis of the data collected through the monitoring plan, management in and around the Monument will be committed to the avoidance of impacts on atmospheric clarity during the high visitor use season (June-September), on visibility important days, and on other clear weather days when visitation is expected to be high. This will involve efforts to secure the cooperation of adjacent landowners. All activities comply with the Washington State Implementation Plan for air quality.

Entrance Fees

The Forest Service presently does not have legal authority to charge a fee for the use of areas on National Forests. Charges can be made only for the use of specific recreational facilities. The Forest Service will seek authority from Congress to charge an entrance fee for this area, where the cost of collecting fees is cost effective, and stipulate that these collections be made available for funding the Monument.

Landownership

The Act directs the Forest Service to acquire ownership of all lands and interests in lands within the Monument. The process for acquiring the remaining 5,000 plus acres of non-Federal lands is underway, as directed by the Monument Act.

COMPARISON OF ALTERNATIVES

During preparation of the Draft Environmental Impact Statement (DEIS), issues were identified by the public and the concerns and opportunities considered by land managers (ICOs described in Chapter I) were used to establish "elements of the issues." Then measures determined how well the ICOs were accommodated, and provided the basis for the comparison of alternatives. The relative importance of each element was determined, based on these factors: 1) direction provided by the Monument Act; 2) public comments; 3) historical conditions within or near the Monument; and 4) management concerns.

The interdisciplinary planning team and other resource specialists began the comparison, among the alternatives presented in the DEIS, by establishing which effects were desirable and which were undesirable (when is the effect better and when is it worse?). Rating numbers which reflected the relative magnitude of effects by alternative were then assigned and the rationale documented. The implementation of mitigation measures was assumed. Where mitigation would be impossible effects by alternative were quantified and compared. Qualitative effects were described by the narrative descriptions. Each resource category was further analyzed to estimate the relative magnitude of overall effects that each alternative would create by the year 2000.

The final step was to determine which alternative struck the most equitable balance between protection and the accommodation of

visitors: in the language of the Act, between "... preservation of the natural geologic and ecologic processes and the integrity of the resources ..." and "... indications of development and access routes ..." This was accomplished by averaging the scores for each set of effects and multiplying this outcome by rating numbers establishing the importance of each element.

Alternative D (East and Westside Moderate Development) was then presented as the preferred alternative in the DEIS. Based on public comments on the DEIS, this alternative has been modified to form the selected alternative, Alternative D (Modified). No new significant environmental consequences, other than those already identified as part of the alternatives presented in the DEIS, result from these changes to form Alternative D (Modified, Selected).

Table No. 2 in the summary and the Comparison of Alternatives, summarize the key effects of each alternative. "Natural processes and features" is judged to be most important. The principle measure of impacts on natural processes was acres affected. It was assumed that certain actions will be taken to mitigate disturbance to natural processes. The comparison of how well each alternative meets the other elements are then presented in descending order of relative importance. More information on this process is available at the Gifford Pinchot National Forest Supervisor's Office, Vancouver, Washington.

COMPARISON OF ALTERNATIVES (Continued)

Elements of the Issues: Natural Features & Processes

Initially, activities in each alternative were compared to establish that they remained within the threshold levels of the biophysical carrying capacity, described above under Alternative Formation.

Natural processes and features were compared under three headings: 1) geologic resources, conditions, and processes, 2) biological resources and processes (including vegetative communities and habitats, and ecological succession), and 3) watershed and soils.

Geology: The Monument Act (Sec. 4 b 1) states that the area shall be managed "to protect the geologic, ecologic, and cultural resources in accordance with the provisions of this Act allowing geologic forces and ecological succession to continue substantially unimpeded." Two aspects of geology are discussed separately: 1) geologic resources, and 2) geologic conditions and processes.

--Geologic Resources include geologic and volcanic features, caves, earth construction materials, and groundwater. Effects of Monument management on geologic features vary by alternative and are summarized below. Effects on caves are compared separately. Effects on earth construction materials and groundwater do not vary significantly by alternative and are summarized in Chapter IV, Effects of Implementation.

Current development activities (Alternative A) are resulting in few disturbances to geologic features in the Monument. Primary areas effected are in the vicinity of emergency lake level stabilization efforts at Spirit Lake. Protection, however, is the result of limited access which will change as the volcanic hazard diminishes and the restricted zone decreases in size.

Alternatives from B through G progressively increase road and facility construction; impacts to geologic features increase accordingly. Alternative B will cause local impacts to the debris avalanche deposit, near Castle and Coldwater Lakes, and the reworked volcanic deposits south of the mountain. Impacts to the blast effects will occur in the Mt. Margaret and Backcountry areas.

Alternatives C, D, D (Modified), and E will cause local long-term impacts to the debris avalanche, though Alternative C proposes a single lane paved road, Alternative D (Preferred) a single lane

aerial tram service road, Alternative D (Modified, Selected) a single lane road mostly following the route used in construction of the Spirit Lake tunnel, and Alternative E only a trail to Johnston Ridge. Alternative C, D, D (Modified), and E due to increased trail construction will locally result in minor impacts to the debris avalanche, mudflow and pyroclastic flow features. Upgrading of Roads 81 and 92 on mudflow features will cause impacts in Alternatives C and E, as will permanent bridge construction across the Muddy River in these alternatives. Reconstruction of Road 99 will locally accelerate the removal of the tephra feature. Construction of visitor parking (in Alternatives C, D, and E) and interpretive facilities at Spirit Lake will erase geologic features in that area, though the area impacted is small in relation to the size of the features. Alternative D (Modified), has no facilities at Spirit Lake.

Many of the impacts identified for Alternatives C, D (Preferred), D (Modified, Selected), and E are local in nature, affecting the area immediately adjacent to the facility.

The magnitude and number of developments in Alternatives F and G will impact geologic features at Coldwater Lake over a larger portion of the area. Reconstruction of State Route 504 to Johnston Ridge in Alternative F will cause substantial impacts to the debris avalanche and blast features. Construction of a tie road between Coldwater and Spirit Lakes in Alternative G will cause significant impacts to the debris avalanche and pyroclastic flow features. More and larger facilities at Spirit Lake will impact a slightly larger portion of geologic features than Alternatives C through E.

Although many of the impacts identified for Alternatives F and G are local in nature, a significant number of areas are impacted.

--Geologic Conditions and Processes are features or processes which affect the safety, cost or feasibility of management activities and development. The primary process of concern in the Monument is mass movement. The effects of management on this process are summarized below. Those which are hydrologic in nature are considered in the Watershed portion of this evaluation.

The primary impacts occurring in Alternative A are on the pyroclastic flow and debris avalanche deposits near Spirit Lake, the reworked volcanic deposits south of the mountain, and along Road 99. In the Spirit Lake Basin, the impacts are due to road access and the recently discontinued

COMPARISON OF ALTERNATIVES (Continued)

—Geologic Conditions and Processes (Continued)

pumping of Spirit Lake, which has locally increased erosion and failure of oversteepened slopes adjacent to the pipeline outlet. Continued use of Roads 81 and 8303 is locally affecting the unimpeded movement of the reworked volcanic deposits. Along Road 99, reestablishment and continued maintenance in some areas has accelerated ravel of oversteepened materials upslope and increased the frequency of debris flows adjacent to the road.

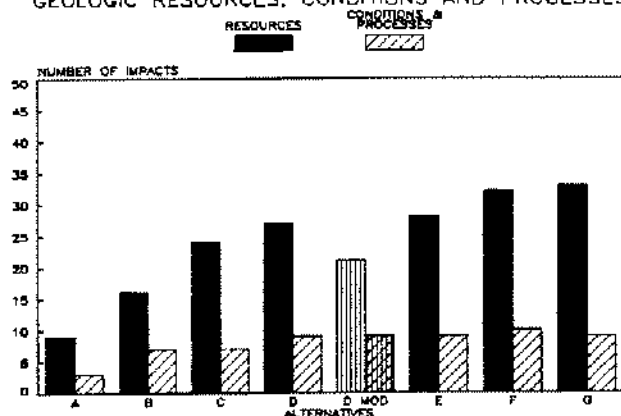
Alternative B will cause considerable local impacts along Road 99, which will be reconstructed to double lane standard.

An increase in the level of road and trail construction in Alternative C will impact the debris avalanche and pyroclastic flow deposits. The impacts for the most part will be confined to that area adjacent to the road except on steeper slopes where impacts may extend farther up and down slope.

Alternatives D through G will result in higher levels of road and trail construction, particularly in the debris avalanche, mudflow, pyroclastic flow, and blast deposits. This construction will locally accelerate erosion and failure of oversteepened slopes, and initiate debris flows on steep slopes adjacent to the road or trail corridor. Alternative D (Modified) will result in slightly lower impacts to geologic processes on these deposits than Alternative D, because of no road or facilities at Spirit Lake.

Figure 9

NATURAL PROCESSES AND FEATURES
GEOLOGIC RESOURCES, CONDITIONS AND PROCESSES



Biological Processes & Features: Current development (Alternative A) levels would produce minimum disturbances to biological processes and features. The net effects of Alternative B produce minimum impacts due to improved management compensating for development in some areas. Impacts on natural biological processes and features increase progressively in Alternatives C, D (Modified), E, D, G, and F. Alternatives F and G would significantly impact natural processes.

--Old Growth Coniferous Forests: Old growth forests are a limited ecosystem within and outside the Monument. No alternatives propose new roads or facilities in old growth within the Monument.

--Standing dead tree areas: About 4 percent of the Monument is occupied by standing trees (snags) killed by the volcano's blast. These areas have important habitat value for wildlife. No impacts are proposed in standing dead tree areas under any alternatives. Existing roads in these areas will be used in all alternatives and will necessitate the removal of some snags for visitor safety. The major difference among the alternatives is in trail and accompanying campsite construction in the Mt. Margaret area.

--Lodgepole-bearberry Community: Effects on this plant community in the Cave Basalt area will result from increased visitor use. This would be low under Alternatives A and B which do not develop new sites or increase development at existing sites. Alternatives E, F, and G, where new trails and a new campground are constructed and use of existing facilities is promoted, result high impacts.

--Nonforest Plant Communities: Alternatives B and C improve the present situation on talus and vegetated nonforest communities, such as the slopes on the south side of Mount St. Helens. They would channel hiker and climber traffic onto trails, limiting off-trail trampling, and eliminate horse use in this area.

--Lakes, Wetlands, and Meadows: Impacts to lakeshores and lakes occur in Alternatives B, C, D (Preferred), and E, primarily due to trail access in the Mt. Margaret high lakes country. Because of concentration of use, these fragile lakeshore ecosystems could easily be overused. These alternatives also introduce facilities at Coldwater and Castle Lakes, and D through G propose a road from the Windy Ridge Viewpoint to Spirit Lake. Although the number of lakes accessed generally increases with the alternative letter, Alternatives D, D (Modified), E, F, and G have limits on the numbers of campers per night at the Mt. Margaret lakes; reducing the vegetation trampling and soil compaction at lakes accessed. Alternatives F and G provide trail access directly to the shorelines of more lakes in the high country and propose larger scale developments at the big lakes.

--Hydrothermal Ecosystems: Hydrothermal ecosystems are found in association with fumaroles in the crater, pyroclastic flow, and South Coldwater blast deposit areas and contain unusual heat tolerant bacteria. The area associated with these ecosystems is small. As deposits cool over the years, many fumaroles will disappear.

Little access to the fumaroles currently exists. Alternatives B and C provide trail access to the fumaroles in the pyroclastic flows and Alternatives D (Preferred) through G introduce a road from the Windy Ridge viewpoint and the

COMPARISON OF ALTERNATIVES (Continued)

--Hydrothermal Ecosystems (Continued):

Round-the-Mountain Trail on the north side of the mountain. No road is constructed from Windy Ridge in Alternative D (Modified, Selected). Alternative D (Preferred) also provides aerial tram access to Johnston Ridge. Alternative D (Modified, Selected) provides shuttle bus access to Johnston Ridge, primarily along a road already constructed to the Spirit Lake tunnel outlet. Alternatives D, D (Modified), E, F, and G also have trail access from Johnston Ridge to the pyroclastic flow, but hiker use is restricted to on-trail use unless by permit. Alternatives F and G have high potential impacts, with the addition of a road across the debris avalanche in G and the extension of State Route 504 along South Coldwater Creek in F.

General Coniferous Forest: Impacts on coniferous forest areas are minor in all alternatives; these areas are more abundant and resilient than most others. Effects increase as general development level increases in the Cave Basalt/Goat Marsh, Backcountry, and Mudflow Management Concept Areas. Impacts are lowest in Alternatives A and B; slightly higher in C, D (Preferred), D (Modified, Selected), and E; and higher in Alternatives F and G.

--Primary Succession: Debris avalanche, pyroclastic flows, and mudflow devastated areas are affected by management at minor levels in Alternatives A and B, which provide little access. Moderate levels of impacts can be expected under Alternatives C, D (Modified, Selected), D (Preferred), and E, as road and/or trail access are provided at Coldwater, Castle, and Spirit Lakes. Impacts in F and G would be high because of major road construction.

--Secondary Succession: Effects on secondary succession in blowdown and standing dead areas are relatively short term, and are low in Alternative A, due to little access. Under Alternative B the Minnie Peak Trail, providing easy access into the Mt. Margaret Area, will increase trampling, fire risk, and disturbance from camping there. Alternatives C, D (Preferred), D (Modified, Selected), E, F, and G have moderate levels of impact on the relatively widespread area where secondary succession dominates vegetative recovery.

--Stream Ecosystems: Alternatives A and B provide low impacts because they have the low levels of roading in the Monument and propose no road construction across mudflow-affected stream channels. They also have the most limited trail and road access so impacts of visitor use on altered and damaged streamside vegetation would be low. (This is qualified by the near certainty of a decrease in the size of the restricted zone, mentioned above under "Geologic Features.") Alternative C has moderate impacts due to a proposed bridge crossing of Smith Creek. Alternative D (Preferred) is similar in total

road mileage and overall impact to Alternative C, but removes the Smith Creek crossing. It adds a road from Windy Ridge to Spirit Lake across a portion of the debris avalanche, however, where active channel building is taking place. The road from Windy Ridge to Spirit Lake is eliminated in Alternative D (Modified, Selected). Roading in Alternative E is similar to B, and it calls for two bridge crossings in the Muddy River drainage. Alternatives F and G pose high negative impacts, due to highest total road mileages, the road across the debris avalanche in G, and the extension in F of State Route 504 up the South Coldwater Creek drainage on extremely unstable slopes.

--Watershed/Soils: The primary source for increased sedimentation from management activities in the Monument will come from the construction or reconstruction of roads and the associated ground disturbing activities. Sediment delivery to channels was calculated for each alternative by watershed areas within the Monument. Generally, sedimentation increased incrementally with increased development. These sedimentation levels, however, must be placed in context of the extreme ambient sedimentation rates within the Monument. From this perspective, the difference in sedimentation rates between alternatives is not large.

Roads and associated structures, i.e., culverts and bridges, play the major role in altering the ongoing natural channel building processes, especially on mudflow affected channels and those on the debris avalanche. Once again affects varied incrementally by the degree, intensity and location of proposed developments, with fewer impacts in Alternatives A and B and higher levels in Alternatives F and G. Alternatives A and B propose no road construction across any of the mudflow affected channels or across the debris avalanche.

Alternatives C and E propose a road on or immediately adjacent to the floodplain and a bridge crossing of the mudflow affected channel, Smith Creek, while Alternative D (Preferred) does not. Alternatives D (Preferred), D (Modified, Selected), and E propose a road from the Windy Ridge viewpoint to the Spirit Lake Basin, across the debris avalanche, while Alternatives C and D (Modified) do not. These four alternatives have an increased amount of road mileage over Alternatives A and B but less than Alternatives F and G.

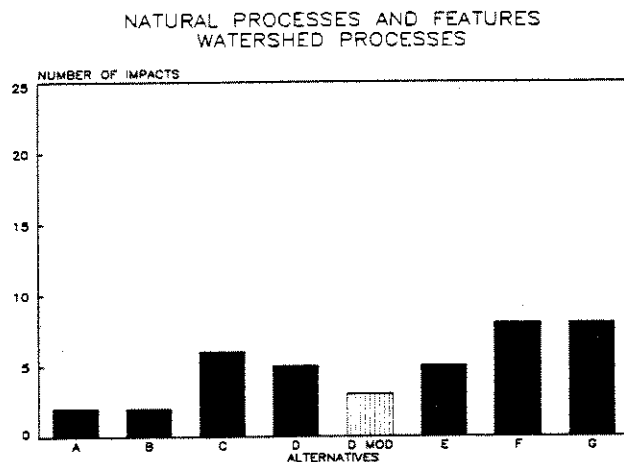
Alternative D (Modified, Selected) proposes the construction of 7.2 miles of single lane asphalt paved road up the South Coldwater Creek drainage. The first 4.5 miles would be on the approximate location of the existing road constructed by the U.S. Army Corps of Engineers to access the Spirit Lake control tunnel. This road, in places, is located adjacent to South Coldwater Creek and would require protection, most probably rip-rap. The remaining 2.7 miles would cross the upper slopes of the drainage, an area of active rill and gully erosion.

COMPARISON OF ALTERNATIVES (Continued)

Watershed/Soils (Continued):

Alternative F is the only alternative which proposes the extension of State Route 504 across the outlet of Coldwater Lake and the alluvial deposits at the mouth of that stream. This road would proceed up the South Coldwater Creek drainage on extremely unstable, steep sideslopes. Alternative G, in addition to crossing mudflow affected channels, as in other alternatives, proposes a west to east road, across the debris avalanche, from Coldwater Ridge through the Spirit Lake Basin to connect with a road from the Windy Ridge Viewpoint. The debris avalanche is an area of extremely active channel movement; this road and its associated structures would, at least locally, severely disrupt those processes.

Figure 10



Elements of the Issues: Recreation

Three elements were compared by alternatives: ability to accommodate the expected recreation use, the quality of the experience, and the ability to meet Recreation Opportunity Spectrum objectives.

Supply/Expected Use (Demand) Comparison: Past use of the Monument indicates that there are two distinctly different kinds of users; those that are seeking the Mount St. Helens recreation activities and those that want to participate in traditional recreation activities such as camping, snowmobiling, hiking, etc. Analysis of data collected at the Visitor Center and at key recreation sites in and around the Monument also show that the two kinds of users come from different places. Those seeking the Mount St. Helens recreation activities come from all over the nation while those seeking traditional recreation are primarily from Southwest Washington.

Since population growth is the main determinant in the growth of traditional recreation, the population growth of the four county area surrounding the Monument was used to predict expected use in the year 2000. The expected use for the Mount St. Helens recreation was determined by using the predicted tourism growth rate for the State of Washington, which is slower. The method used to calculate the expected visitor use is explained in Appendix L.

The amount of recreation that can be supplied was estimated in recreation visitor days (RVDs) for each alternative and is compared to the expected visitor use for each recreation activity in Figures 11 and 12 on the following pages.

The demand for the Mount St. Helens recreation is met by Alternatives C, D (Preferred), D (Modified, Selected), F, and G. Viewing and interpreting features created by the volcano and its impact on lands surrounding the mountain are considered the most important aspects of this type of recreation because they cannot be achieved as satisfactorily outside the Monument. Alternative C, D (Preferred), D (Modified, Selected), F, and G are all close to supplying the estimated demand for interpretation. Alternatives C, D, and D (Modified) exceed the estimated demand for viewing scenery, by 10 percent and 18 percent respectively.

The demand for the traditional recreation is most closely met by Alternatives C, D (Preferred), D (Modified, Selected), and E. Alternative C supplies 7 percent less than the demand, while Alternatives D (Preferred), D (Modified), and E supply about 20 percent more.

Quality of the Experience:

The quality of a recreation experience depends on how successful a visitor is in achieving a satisfying experience. Several key contributing factors follow:

Achieving the Desired View--Obtaining a view of the crater and dome is the primary objective of most visitors; achieving it would greatly enhance any trip.

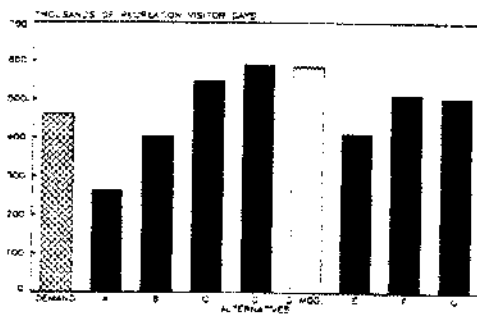
Traffic Congestion--Visitors expect to get away from traffic jams when visiting a park or monument. Encountering heavy traffic would significantly detract from the experience.

Interpretation--Visitors to parks and monuments have learned to expect interpretation. In the case of Mount St. Helens, the public has demonstrated great interest in learning about what they see around them; interpretation will greatly enhance their visit.

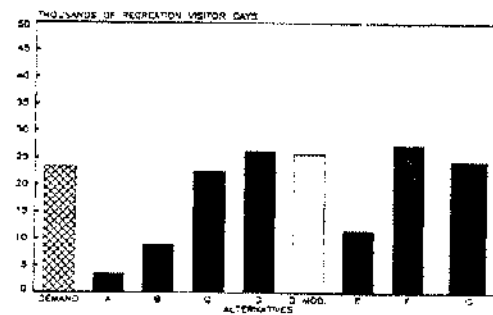
Cost of the Visit--Visitors also have learned that visits to parks and monuments usually entail some cost. Some potential visitors, however, will be eliminated if the cost per visit is too high. Cost factors involved in visits to Mount St. Helens are concession fees, driving conditions, and the time required to reach various portions of the area.

COMPARISON OF SUPPLY TO DEMAND IN YEAR 2000 MOUNT ST. HELENS RECREATIONAL ACTIVITIES

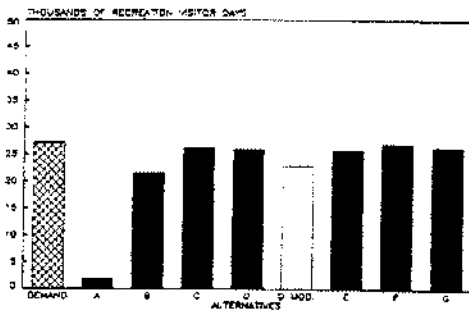
SUMMARY



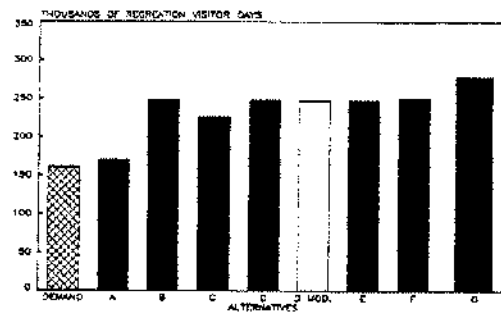
INTERPRETATION



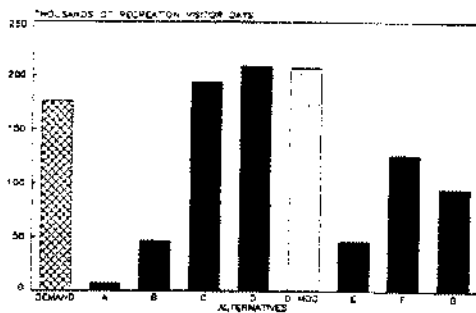
NATURE STUDY



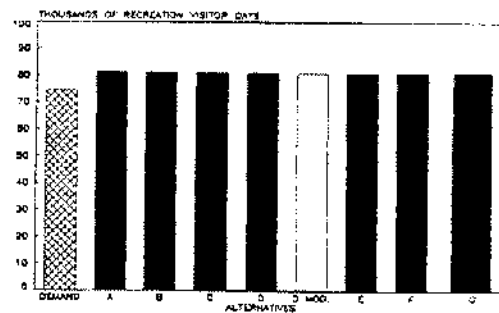
PLEASURE DRIVING



VIEWING SCENERY

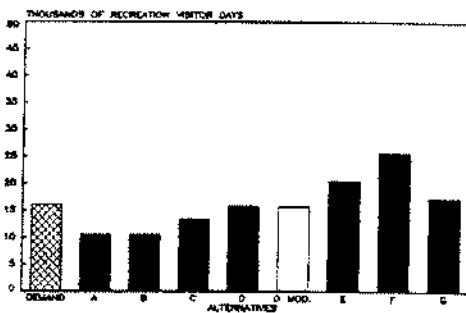


VISITOR CENTER USE



TRADITIONAL RECREATION ACTIVITIES

CAVING



CROSS-COUNTRY SKIING

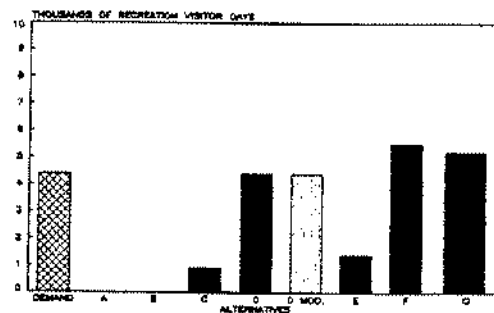
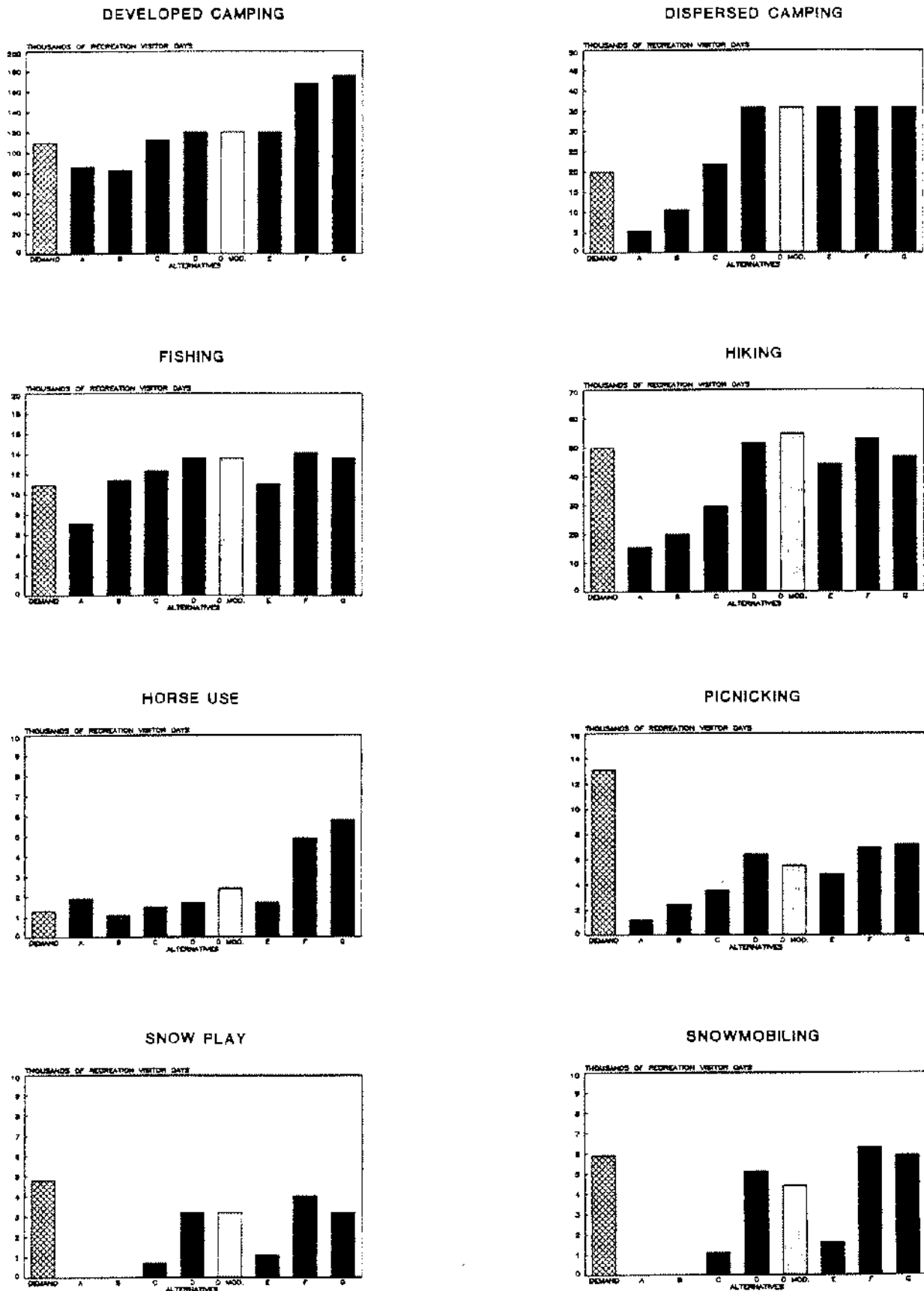


FIGURE 11

COMPARISON OF SUPPLY TO DEMAND IN YEAR 2000

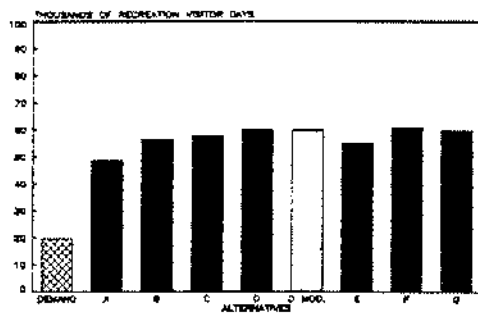
TRADITIONAL RECREATION ACTIVITIES



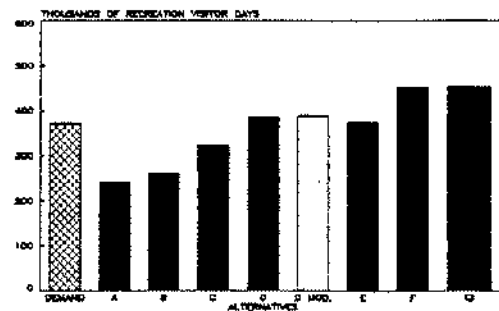
COMPARISON OF SUPPLY TO DEMAND IN YEAR 2000

TRADITIONAL RECREATION ACTIVITIES

WILDLIFE VIEWING

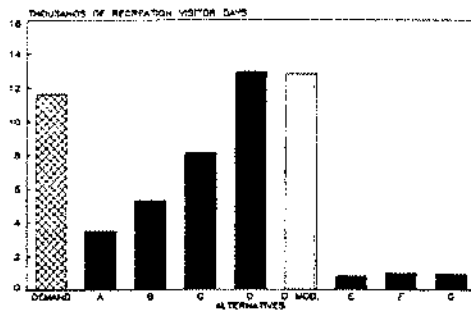


SUMMARY

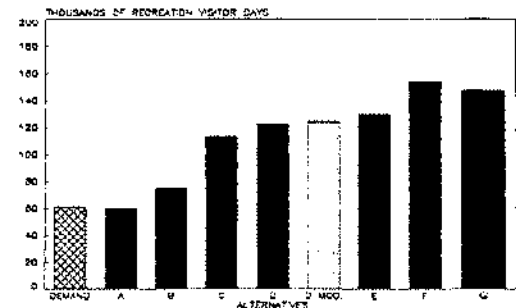


RECREATION OPPORTUNITY SPECTRUM

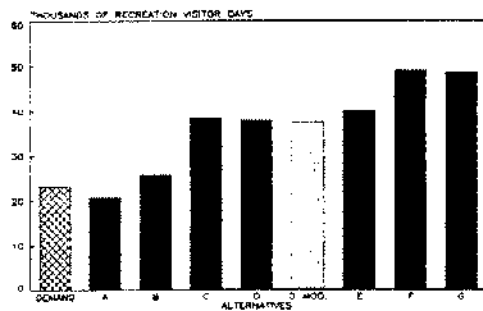
PRIMITIVE



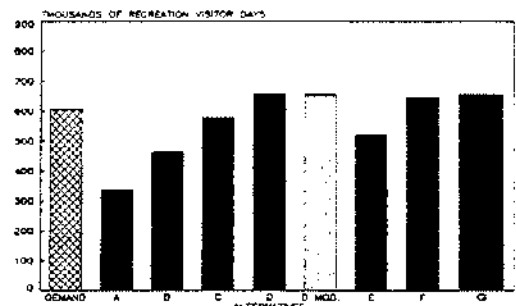
SEMI-PRIMITIVE NON-MOTORIZED



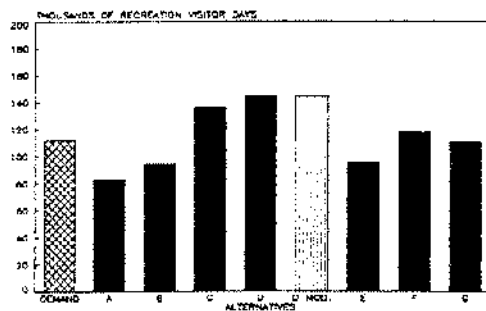
SEMI-PRIMITIVE MOTORIZED



ROADED NATURAL



RURAL



TOTAL

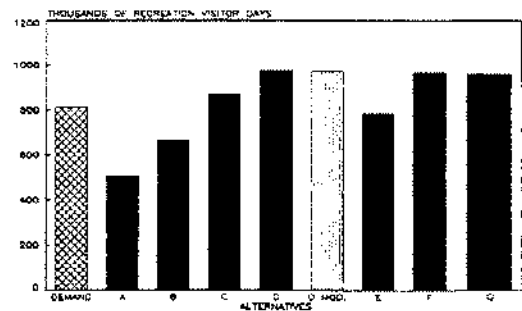


FIGURE 13

COMPARISON OF ALTERNATIVES (Continued)

Quality of the Experience (Continued)

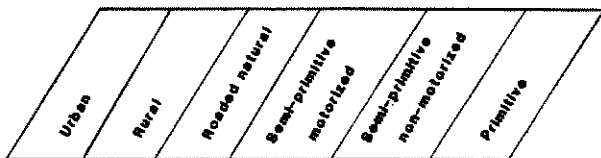
Convenience--Availability of good support services, current information, and loop roads add to the enjoyment of visits.

Diversity--Visitors come to the Monument with many preferences on how to achieve their vacation experience. The availability of choices usually improve a vacation experience.

Visuals--The less landscape modification between major travel routes and the key viewing features the greater likelihood of meeting the visitor's expectation. The narrow strips of isolated private land between major road corridors and the Monument are of primary concern.

Table 4 compares the effects of the alternatives on the above described factors that contribute to the quality of the recreation experience.

Recreation Opportunity Spectrum: The Recreation Opportunity Spectrum (ROS) is a system that combines the three major components of recreation; recreation activity, recreation settings, and recreation experiences to describe the recreation opportunities that the resource can provide. The ROS system recognizes the importance of describing the setting in which the recreation activity occurs along with the activity itself and the subsequent experience that is derived. The ROS system defines six broad classes of opportunity as follows:



Each class is made up of a different mix of activity, setting, and experience opportunities. They describe a continuum of recreation experience from urban with its social interactions and modified environment to primitive with very little contact between humans and an undisturbed natural environment. More information about the ROS system is presented in Chapter IV and Appendix G.

The recreation opportunities provided by each alternative are compared by the following described methods. Figure 13 depicts the amounts of recreation opportunities in recreation visitor days (RVDs), each alternative supplies by ROS class and the estimated demand for each ROS class. The areas within the Monument most likely to provide recreational opportunities by each ROS class are mapped by alternative and are presented in Appendix G.

The first method compares the recreation

opportunity (Primitive to Rural) provided by each alternative with the expected future use to determine which alternative provides the closest match between demand and supply.

The second method compares the extent to which each alternative provides a full spectrum of recreation opportunities. This comparison provides a measure of the recreation options in terms of ROS opportunities that will be available by the year 2000.

Alternative D (Preferred) and D (Modified, Selected) provide the greatest amount of Primitive and Semi-primitive opportunities while still providing the needed Roaded Natural opportunities and supplying a full range of recreation opportunities.

Rural recreation opportunities are adequately provided by Alternatives D, D (Modified), C, F and G. The demand for these opportunities are difficult to measure and are not as critical in this area.

Semi-primitive Motorized opportunities are supplied in the greatest amount by Alternative F followed closely by Alternatives G, D, and D (Modified). All alternatives beyond A meet the future demand for this recreation opportunity. All of these opportunities are supplied during the winter months.

The third method compares the extent to which each alternative provides the needed Roaded Natural recreation opportunities. The key demand has been described as a Roaded Natural recreation opportunity.

Alternative D, D (Modified), F, and G meet the needed expected future demand for Roaded Natural recreation opportunities. The other alternatives fail to provide the needed recreation opportunities due to lack of adequate access or lack of facilities.

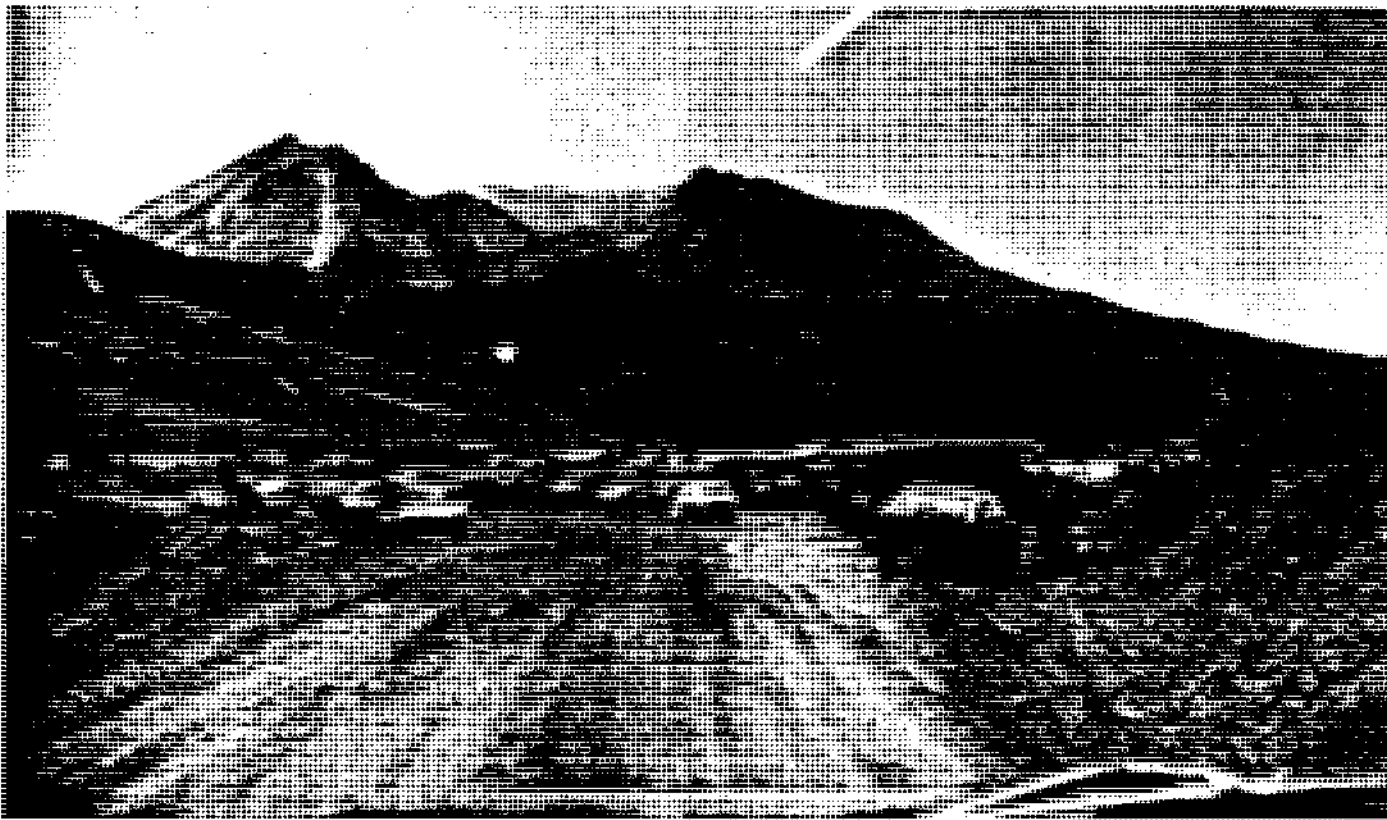
The final method compares the extent to which each alternative provides Semi-primitive and Primitive recreation opportunities. This is of concern because by the year 2000 the demand for these opportunities will exceed the supply on a Forest-wide basis.

Primitive recreation opportunities are provided in the greatest amount by Alternative D (Preferred) and D (Modified) followed by C, B, and A with E, F, and G not providing any primitive opportunities except during the winter months. The highest quality or depth of primitive recreation experiences are provided by Alternative A followed by B, D (Modified), C, and D. None of the alternatives meet the expected future demand for this resource.

Semi-primitive Non-Motorized opportunities are supplied in the greatest amount by Alternative F followed by D (Modified) and D. All alternatives beyond A meet the expected future demand. However, the unmet demand for Primitive recreation opportunities will spill over.

Table 4: Comparison of Effects on the Quality of the Visitor Experience

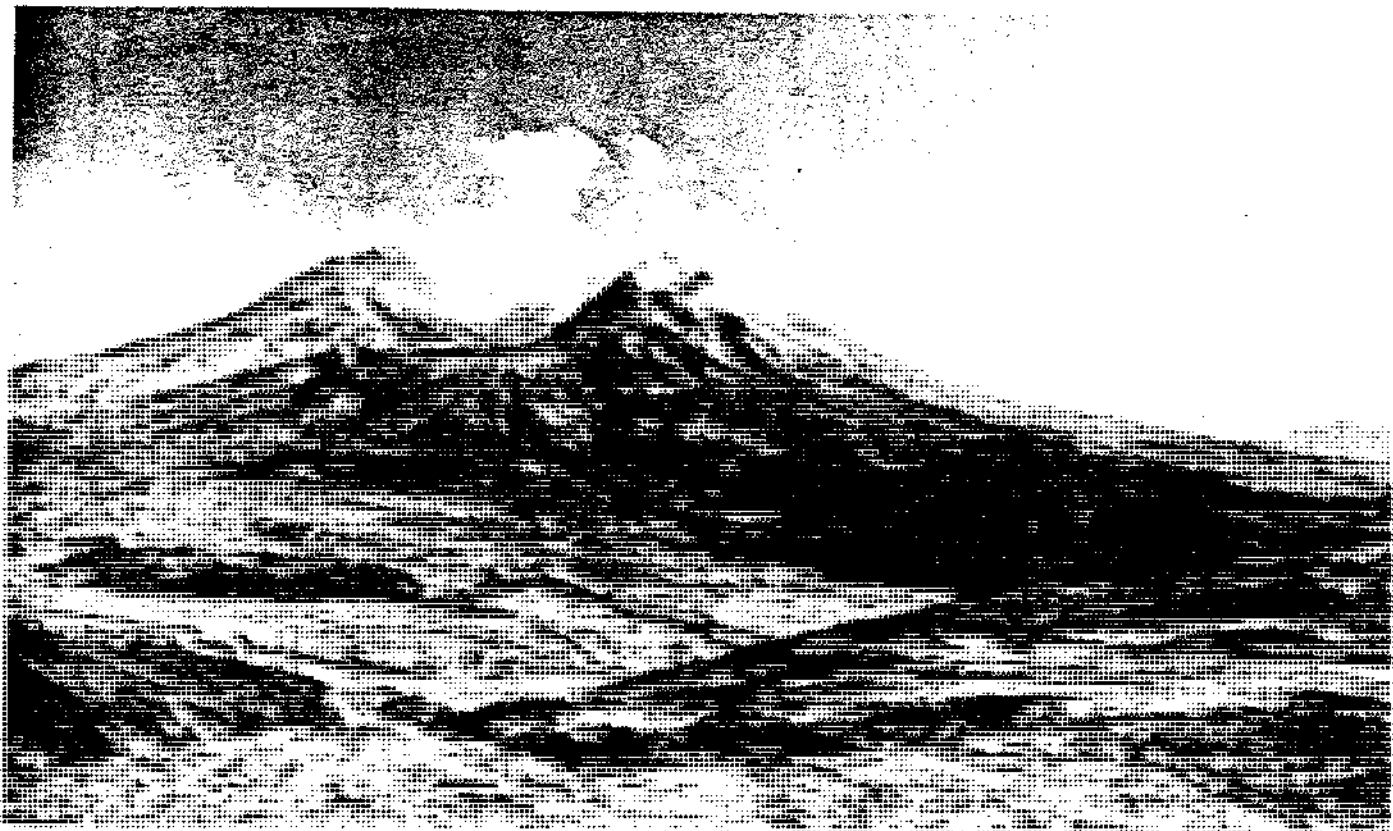
Visitor Expectation	A	B	C	D	D (Modified)	E	F	G
Critical View *(See photos on the next pages)		Achieved marginally	Achieved	Achieved	Achieved	Achieved	Achieved	Achieved
Traffic Congestion Alleviated	Overcrowding on Rd 99. Continued mixing of recreation/industrial traffic. Winter use parking congestion on Rd 83 would continue.	Overcrowding on Rd 99 continues but reduced. Congestion would be at least as bad as presently on Rd 99 on the improved private roads to Coldwater Lake. Winter use parking congestion on Rd 83 would continue.	Overcrowding on Rd 99, since it will remain a single lane road. Good westside access will reduce some of impact on Rd 99. Winter season congestion on Rd 83 is reduced.	Some overcrowding at Windy Ridge & Smith Cr Viewpoint as parking for bus shuttle to Spirit Lake is limited. Rd 99 improved to a double lane standard. Winter season congestion on Rd 83 is eliminated.	Overcrowding on Rd 99 eliminated. Winter season congestion along Road 83 is eliminated. Winter season congestion on Road 83 is eliminated.	Overcrowding on Rd 99 due to lack of West side access. Castle Lake Road would be congested due to the public's desire for west side access. Winter season congestion on Road 83 is eliminated.	Limited parking area development at Johnston Ridge will cause overcrowding. Winter season congestion on Road 83 is eliminated.	Overcrowding on Rd 99 would continue until Hwy. 504 is completed to Spirit Lake. Hwy. 504 between Coldwater and Spirit Lakes would be congested due to design standard, anticipated wash outs & traffic. Winter season congestion on Road 83 is eliminated.
Favorable Cost	No West side access requires an extra 6 to 8 hours (150 miles) to reach critical view. Approx \$30/car.	Travel over reconstructed private roads would take at least 2 hours more than on State Hwy. (Approx \$10)	SR 504 provides easy access to the Monument approximately 1 hour (41 miles) from I-5. Bus shuttle to Johnston Ridge would cost \$6/person and take more time than F or G. Bus shuttle to Spirit Lake would cost the visitor \$2 to \$4.	SR 504 provides easy access to the Monument approximately 1 hour (41 miles) from I-5. Aerial tram would cost \$6/person and take more time than F or G. Bus shuttle to Spirit Lake would cost the visitor \$2 to \$4.	SR 504 provides easy access to the Monument approximately 1 hour (41 miles) from I-5. Bus shuttle to Johnston Ridge would cost \$3 to \$4/person.	No west side access requires an extra 6 to 8 hours or 150 miles. Cost approx \$30/car. Bus shuttle to Castle Lake would cost about \$10/person.	SR 504 provides easy access to the Monument approximately 1 hour (41 miles) from I-5.	SR 504 provides easy access to the Monument approximately 1 hour (41 miles) from I-5.
Convenience	Visitors on Rd 83 are deadended at Smith Cr.	Visitors on Rd 83 are deadended at Smith Cr. and also at the washout on Rd. 81.	Visitors must leave the privacy of their autos and ride mass transit to Johnston Ridge and Spirit Lake. Visitors on Rd 83 deadended at Smith Cr.	Visitors must leave the privacy of their autos and ride mass transit to Johnston Ridge. Visitors on Rd 83 deadended at Smith Creek. No road access to Castle Lake.	Visitors must leave the privacy of their autos and ride mass transit to Johnston Ridge. Visitors on Rd 83 deadended at Smith Creek. No road access to Castle Lake.	Visitors must leave the privacy of their autos and ride mass transit to Johnston Ridge and Spirit Lake only.	Road across S. Fork of the Toutle provides loop route.	Cross Monument Road at Spirit Lake provides loop route.
	Portals at Iron Creek and Yale phased out.	Portal reduced to a kiosk at Yale and Iron Creek.	Food concession provided. Cave concession prov. Portals moved to location but improved.	Food concession provided. Cave concession prov. Portals moved to more convenient locations.	Food concession and cave tours and equipment rental. Portals moved to more convenient location.	Cave concession provided. Portals moved to more convenient locations.	Food concession provided. Cave concession prov. Portals moved to more convenient locations.	Food concession provided. Cave concession prov. Portals at same locations, but improved.



View from Windy Ridge achieved in all alternatives.



View from Coldwater Lake achieved in alternatives B, C, D, D (Modified), F, and G.



View from Johnston Ridge Observation Post achieved in alternatives C, D, D (Modified), and F.



View from Spirit Lake achieved in alternatives D, E, F, and G.

Table 4: Comparison of Effects on the Visitor Experience (Quality)
(Continued)

Visitor Expectation	A	B	C	D	D (Modified)	E	F	G
User Freedom	<p>Restricted zone based on volcanic hazard.</p> <p>Hydrologic hazards administrative closures for protection of features and research sites.</p>	<p>Camping would be restricted within sight of Roads 83 & 8303 to Ape Cave.</p>	<p>Camping would be restricted within sight of Roads 83 & 8303 to Ape Cave.</p>	<p>Camping would be restricted within sight of Roads 83 & 8303 to Ape Cave, and also Road 81.</p>	<p>Camping restricted along portions of Road 83 and 8303, and in Goat Marsh RNA.</p>	<p>Permits required to camp.</p>	<p>Permits required to camp.</p>	<p>Permits required to camp.</p>
	<p>No use permitted off roads, trails, or developed sites on the debris avalanche.</p> <p>Registration required for camping in the backcountry and Mtn. climbing.</p>	<p>No use permitted off roads, trails, or developed sites on the debris avalanche.</p> <p>Registration required for camping in the backcountry and Mtn. climbing.</p>	<p>No use permitted off roads, trails, or developed sites on the debris avalanche.</p> <p>Registration required for camping in the backcountry and Mtn. climbing.</p>	<p>No use permitted off roads, trails, or developed sites on the debris avalanche.</p> <p>Registration required for camping in the backcountry and Mtn. climbing.</p>	<p>Permits required for mountain climbing and camping in Mt. Margaret Backcountry.</p> <p>Johnston Ridge and Goat Marsh are closed to snowmobiling.</p>	<p>No use permitted off roads, trails, or developed sites on the debris avalanche and Upper Muddy Fan and Butte Camp areas.</p> <p>Registration required for camping in the backcountry and Mtn. climbing.</p>	<p>No use permitted off roads, trails, or developed sites on the debris avalanche and Upper Muddy Fan and Butte Camp areas.</p> <p>Registration required for camping in the backcountry and Mtn. climbing.</p>	<p>No use permitted off roads, trails, or developed sites on the debris avalanche and Upper Muddy Fan and Butte Camp areas.</p> <p>Registration required for camping in the backcountry and Mtn. climbing.</p>
Interpretation	<p>Most important interpretive opportunities are missed because of limited West side access, or access to Spirit Lake.</p> <p>Interpretive sites provided: inside 8 outside 2</p> <p>Signing, brochures and volunteers doing interpretation at Ape Cave.</p>	<p>Most important interpretive opportunities are missed because of no West side access, or access to Spirit Lake.</p> <p>Interpretive sites provided: inside 10 outside 7</p> <p>Signing, brochures and volunteers doing interpretation at Ape Cave.</p>	<p>Observatory at Johnston Ridge brings USGS & FS together to interpret to public, presenting a very unique interpretive opportunity.</p> <p>Concessionaires will have opportunity to provide interpretation to visitors while being transported to Johnston Ridge.</p> <p>Interpretive sites provided: inside 14 outside 10</p> <p>Signing, brochures and volunteers doing interpretation at Ape Cave.</p>	<p>Observatory at Johnston Ridge brings USGS & FS together to interpret to public, presenting a very unique interpretive opportunity.</p> <p>Concessionaires will have opportunity to provide interpretation to visitors while being transported to Johnston Ridge and Spirit Lake.</p> <p>Interpretive sites provided: inside 14 outside 8</p> <p>Concessionaires provided interpretation at Ape Cave.</p>	<p>Observation post brings USGS & FS together to interpret to public presenting a very unique interpretive opportunity.</p> <p>Concessionaires provide interpretation on shuttle bus at Johnston Ridge.</p> <p>Interpretive sites provided: inside 12 outside 9</p> <p>Concessionaires provided interpretation at Ape Cave.</p>	<p>Many of the most important interpretive opportunities are missed because of no West side access (debris avalanche, and Johnston Ridge).</p> <p>Interpretive sites provided: inside 14 outside 9</p> <p>Concessionaires provided interpretation at Ole's Cave.</p>	<p>Observatory at Johnston Ridge</p> <p>Interpretive sites provided: inside 15 outside 12</p> <p>Concessionaires provided interpretation at Ape Cave.</p>	<p>Observatory at Johnston Ridge</p> <p>Interpretive sites provided: inside 14 outside 11</p> <p>Concessionaires provided interpretation at Ole's Cave.</p>

Table 4: Comparison of Effects on the Visitor Experience (Quality)
(Continued)

Visitor Expectation	A	B	C	D	D (Modified)	E	F	G
Diversity	Limited opportunity for Winter Recreation	Limited opportunity for Winter Recreation	Bus shuttle	Aerial tram offers diversity and makes the experience at Johnston Ridge different from that at Coldwater Lake.	Bus shuttle	No boating	Restaurant/Gift shop Cave tours	Road across Spirit Lake basin homogenizes the Monument. It makes the recreation experience about the same because of easy access to the east.
	No boating	No boating	Snack bar	Restaurant/Gift shop Cave tours/Bus shuttle Ski rental	Restaurant/Gift shop Cave tours Fire lookout	No boating	Boating except for gasoline powered	More difficult to find untraveled and unroaded area.
			Boats with no motors Fire lookout	Boating except for gasoline powered Fire lookout	Boating except for gasoline powered Fire lookout	Fire lookout	Boating except for gasoline powered	Restaurant/Gift shop Horse rental/ Cave tours
						No primitive recreation	No primitive recreation	Variety of boating opportunities.
Visual quality objective on isolated private land between major road corridors and the Monument.	Maximum modification	Maximum modification	Retention	Retention	Retention	Retention	Maximum modification	No primitive recreation Retention

COMPARISON OF ALTERNATIVES (Continued)

Elements of the Issue: Science and Research

Scientific values are protected by limited access under Alternatives A, B, and C, but under A measures for the protection of natural features and processes of high scientific value and research plots are significantly limited. (Protection in A is also contingent on the restricted zone, which is temporary.) Under Alternatives A and B, research is constrained by limited access, and there are limited local channels of communication between managers and scientists. Developments in Alternatives C, D (Preferred), and D (Modified, Selected) moderately impact scientific values, especially in the pyroclastic flow area, but there are adequate procedures in D (Preferred) and D (Modified, Selected) for the protection of natural features, processes, and research plots. While administrative procedures under Alternatives E, F, and G are similar to those in Alternatives D (Preferred) and Alternative D (Modified, Selected), negative impacts on features and processes of high scientific value increase progressively from E to G. This is due to effects of (direct and indirect--including off-site) increased roading, trails, and development, including higher levels of uncontrolled public access.

Elements of the Issue: Public Safety

Three elements are compared by alternative:

Air Traffic Hazards: Alternatives A, F, and G propose no restrictions on flight location or minimum elevation above the terrain. Alternative E proposes recommended minimum altitude above the terrain of 1,000 feet for that portion of the Monument immediately surrounding the volcano north to the Monument boundary. Alternative D (Preferred) and Alternative D (Modified, Selected) propose a recommended minimum flight elevation of 1,000 feet above the terrain for the entire Monument. Alternatives B and C pose the lowest level of risk because of a minimum altitude above the terrain of 2,000 feet (Alternative B for the entire Monument, Alternative C for the volcano north to the Monument boundary). More information on proposed Federal Aviation Administration regulations is presented in Appendix H.

Hydrologic Risk: In order to compare hydrologic risk, the number of facilities to be constructed in areas of active channel building or migration subject to hydrologic events (pyroclastic flow, blast pyroclastic flow, debris avalanche, and mudflow deposits) were considered. Alternative A has three facilities in these areas; Alternative B proposes 6; Alternative C proposes 13; Alternative D (Modified) proposes 14; Alternative D proposes 15; Alternative E proposes 16; Alternative F proposes 18; and Alternative G proposes 19 facilities in these potentially high risk areas (see bar graph on this page).

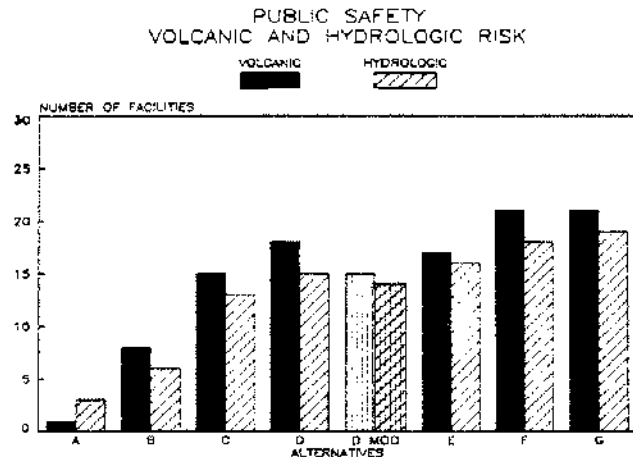
Volcanic Risk: The risk assessment was based on the density of development within the current closure zone. For facilities in this area, the specific location was compared to the relative level of short-term risk (orders of magnitude) for the following eruptive states of the volcano: quiet, slight unrest, severe unrest, dome growth, and explosive eruption. The risk levels vary according to the assumed relative length of time an individual in various categories would spend in the specific location. The categories considered include:

- Case 1 = resident (100 percent of a given year in that location)
- Case 2 = worker (20 percent of a year)
- Case 3 = visitor (17 percent of a year)
- Case 4 = long term risk to facility

Future closures to public access in response to volcanic activity is a management practice common to all alternatives and construction of contemplated facilities will be staged accordingly. Public closures will continue to be jointly established between the Forest Service and the State of Washington.

Alternative A contains one facility within the current closure zone; Alternative B proposes 8; Alternatives C and D (Modified) propose 15; Alternative D proposes 18; Alternative E proposes 17; Alternative F and G propose 21 facilities in this area (see bar graph on this page).

Figure 14



COMPARISON OF ALTERNATIVES (Continued)

Elements of the Issue: Access Routes:

Alternative A does not change the number of miles of roads and trails from the current situation. No right-of-way acquisition will occur. Traffic congestion will increase, particularly along Roads 25, 26 and 99.

Alternative B adds access to the Monument from the west side and improves eastside access. It has minor construction in problem areas and includes acquisition of sensitive rights-of-way.

Alternative C adds more trail access within the Monument and allows westside access via state highway. It has construction in problem areas and includes right-of-way acquisition in sensitive areas.

Alternative D (Preferred) provides trails encircling the mountain and road access into Monument from east and west. It has construction in problem areas, uses road use agreements to maintain public access.

Alternative D (Modified, Selected) will continue to provide trails around the mountain and road access into the Monument from east and west. Some construction will be in problem areas and road use agreements to maintain public access will be somewhat less than Alternative D (Preferred).

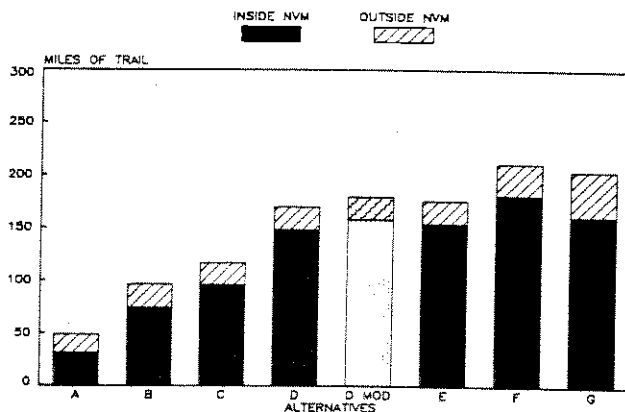
Alternative E also provides trails encircling the mountain. Road access is primarily from the east side. It includes construction in problem areas and a few sensitive rights-of-way.

Alternative F includes trail access throughout the Monument and road access from all sides. It has construction in problem areas and includes acquisition of sensitive rights-of-way.

Alternative G also includes trail access throughout the Monument, but provides road access into and through the interior of the Monument. It includes construction in several problem areas and a number of sensitive rights-of-way acquisitions.

Figure 15

TRANSPORTATION TRAIL ACCESS



State Route 504 (Spirit Lake Memorial Highway):

Alternatives C, D (Preferred), D (Modified, Selected), F, and G call for the reconstruction of State Route 504 from near Camp Baker eastward by either an upper or lower corridor (Figure 8). This state route terminates at Coldwater Lake in Alternatives C, D, D (Modified), and G, and at Johnston Ridge in Alternative F. In Alternatives C, D, D (Modified), and G either an aerial tram or Forest Service road extend further eastward into the Monument. The upper corridor is selected for reconstruction, and therefore is part of Alternative D (Modified, Selected), since impacts are lessened in comparison with the lower corridor.

Wildlife will be affected by either corridor but the "barrier" of the highway to deer and elk crossing from the valley to the hillside will be less of an impact on the upper route due to the less severe slope of the terrain. Neither route will affect fish habitat as all streams will be bridged with structures. The visual impact of the highway will be similar for each corridor. The visual quality of the view from the highway will be better from the upper corridor. The upper corridor will offer a much better overall view of the effects of the volcanic eruption including the debris avalanche, blown down timber, dammed streams and overall destruction.

Research will be impacted less by the upper corridor because the public will be kept farther from the research plots and valley floor and will have less chance for disturbance and interference with the research.

Public safety will be better on the upper corridor because the traveling public will have less access to the debris avalanche area and less chance of being caught by a mudflow from volcanic activity. There are no known cultural resources that would be impacted by either corridor. The lower corridor may impact some caves or rock shelters that have not been investigated. There are no known caves or rock shelters on the upper corridor. A field survey for cultural resources will be made prior to construction.

The initial reconstruction costs are less for the upper corridor. The winter maintenance (snow plowing and sanding) will be greater for the upper corridor but the lower corridor has a greater potential for rock slides.

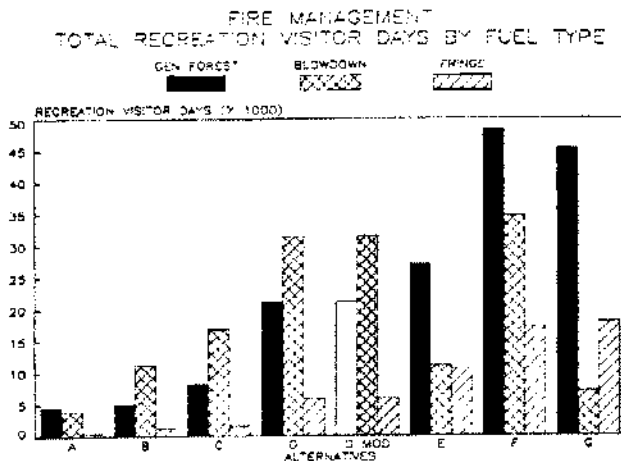
Elements of the Issue: Insect, Disease, and Fire Management

Man-caused fires are the primary variable that change by alternative. Risk increases as visitors, recreational activity, and fuel types and loading increase. The risk posed by developed sites in general forest is lowest, while the risk posed by dispersed camping in the fringe is highest. Effects of implementation are measured by projections of potential number of fires and acres burned over time.

COMPARISON OF ALTERNATIVES (Continued)

Elements of the Issues: Insect, Disease, and Fire Management (Continued)

Figure 16



In the model used, Alternative A shows the least acres burned, but the model does not take into account the mitigation measures in other alternatives. Alternative C would result in least acres burned while allowing for management activities, followed closely by Alternative B. Alternatives D (Preferred), D (Modified, Selected), and E would result in an increase in acres burned and in greater intensity levels (i.e., more fires in blowdown and fringe fuels). Alternatives F and G would result in the most acres burned at highest intensity levels over time, due to increased fire frequency in blowdown and fringe fuels. Note that prescribed natural fires (Alternatives B-E) would increase acres burned over time only slightly, since lightning is less frequent in the general forest areas where such fires would be allowed. Limits on fire size and intensity level for natural fires would also minimize acres burned. More information about constraints on the use of prescribed natural fire and scheduled prescribed fire is presented in Appendix K.

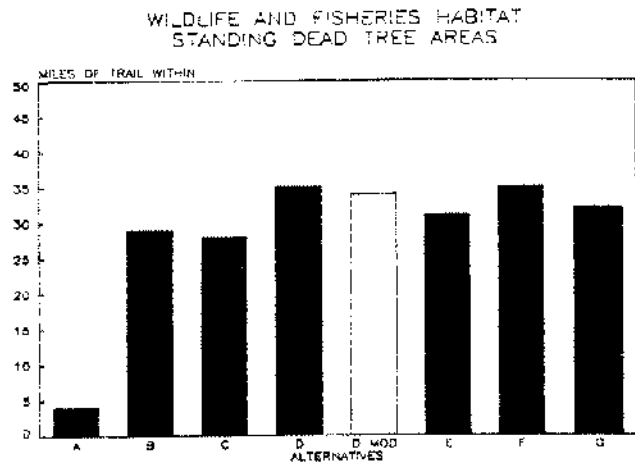
In the absence of catastrophic infestations, control of insects and disease will be minimal and this does not vary significantly between alternatives. The removal of hazard trees would be required more frequently in alternatives with the greatest density of developed sites, roads and trails.

Elements of the Issues: Wildlife and Fish Habitat

Effects of the alternatives on availability of successional stages of terrestrial habitat, old growth, green timber stands younger than old growth, standing dead tree areas, blowdown areas, and devastated areas are compared. Other habitats compared were lake and lakeshore

habitat, stream and streamside habitat, and deer and elk habitat. No new roads or facilities other than trailheads and interpretive signs are proposed in any alternative in old growth or standing dead areas. Collectively, trail, road, and developed site impacts in green timbered areas other than old growth are low except for some disturbance of wildlife sensitive to human use.

Figure 17



Effects on lakes and lakeshore habitats were measured by how much access the alternative provided, usually by trail. They were weighted by the sensitivity rating of the lake, and the presence of special habitats in association with the lakes. These included snags, wetlands, talus and cliffs. Also taken into account was the amount of control over human use through permits, backcountry rangers, and limits on numbers of campers each alternative provides. Most of the lakes are in the Mt. Margaret backcountry, a critical area for management because a number of lakeshores were badly damaged by the volcano and use there is expected to be high.

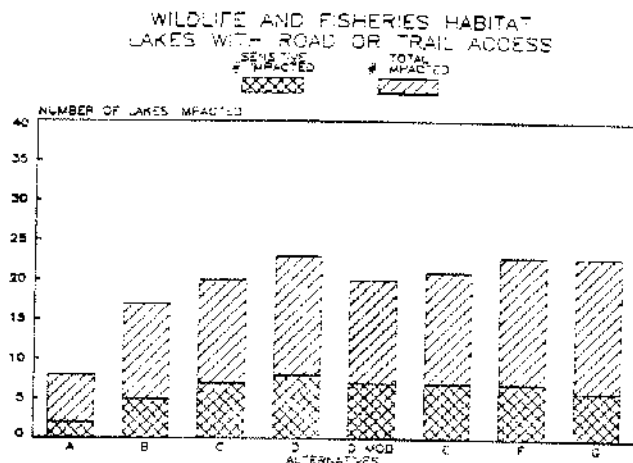
Lakes are affected least under Alternative A, with no trails in the Mt. Margaret lakes area. An extensive trail system is proposed in this area by the other alternatives, posing higher risks to habitats near Mt. Margaret lakes, Coldwater, Castle, and Spirit Lakes (See Figure 18).

Although the number of lakes accessed generally increases with the alternative letter, Alternative D, D (Modified), E, F, and G have limits on the numbers of campers per night at the Mt. Margaret lakes, reducing the trampling of vegetation and soil compaction at the lakes accessed.

COMPARISON OF ALTERNATIVES (Continued)

Elements of the Issues: Wildlife and Fish Habitat (Continued)

Figure 18



Deer and elk habitat in the Monument includes both summer and winter range. Winter range in the Monument is limited in availability and important to herds in the area. Road mileage, winter ORV use, and construction of recreation developments were the key measures of effects.

Little roads would be plowed during the winter in deer and elk winter range and the amount does not vary significantly through the range of alternatives. What does vary is the presence of Sno-parks and plowed access roads to them. Normally, ORV users will access higher elevations from these Sno-parks inside winter range. Winter range is excluded from skiing and oversnow vehicle use, except for roads plowed to access winter sports areas outside of winter range but vehicular traffic and human activity stress wildlife and decrease their use of an area. Alternative A would continue to provide winter sports parking inside winter range on Road 83, and disturbance to wintering big game would continue. Alternatives C, D (Preferred), D (Modified, Selected), and E locate Sno-parks outside winter range, with Road 83 in winter range plowed to access the Marble Mountain Winter Sports Area. Alternative F locates two Sno-parks inside winter range and G calls for one. Winter range roads are plowed to access Sno-parks outside of winter range in A, C, and D (Preferred), harassing wintering big game. Alternative B has the most positive effect, by minimizing winter recreation and placing no winter sports areas in winter range. Alternatives C, D, D (Modified), and E would have minimal effects and Alternatives F and G would increase disturbance in winter range during the winter, when game are sensitive to human encroachment.

Developments and roads in summer range increase with alternative letter, except for Alternative E which has a level of roading similar to B.

Less than 1 percent, of deer and elk habitat are directly lost to developed recreational sites under any alternative. Alternatives A and B would produce the least disturbance to summer habitat, with B reducing access to Goat Marsh, a key elk calving, rutting, and feeding area. Alternatives B, D, E, F, and G, however, all establish a viewpoint on Road 8312 at Marble Mountain, increasing disturbances to key calving, summer, and fall habitat for elk. Alternative D (Modified) does not include this viewpoint. A mitigation and habitat improvement program--closure of roads leading off the 8312--would be initiated under all alternatives. Alternatives C, D (Preferred), D (Modified, Selected), and E retain the trail to Goat Marsh Lake, but reduce access from the north. Alternatives F and G extend the trail along the west side of the lake and up to Goat Mountain, increasing disturbance to elk calving, rutting, and foraging areas.

Potential stream and streamside habitat effects were measured by road mileage, general levels of development, and specific effects on stream channels and slope stability. Direct and indirect effects on stream and streamside areas increase with alternative letter; Alternatives A and B could produce low levels of detrimental effects from management activities; Alternatives C, D, and D (Modified) moderate effects; and Alternatives F and G high.

Elements of the Issues: Cost Effectiveness

The costs associated with implementing each alternative are displayed in Table 5. Capital investment plus one time costs range from about \$12 million in Alternative A to \$53 million in Alternative G. Operation and maintenance costs per visitor day vary from Alternative D (Modified) (\$1.58) to Alternative A (\$2.27). Construction costs for State Route 504 are shown in Alternatives C, D, D (Modified), G (\$64 million) and F (\$89 million). Returns to the treasury range from \$250/year in Alternative A and B to \$134,400 in Alternative D (Preferred).

Figure 19

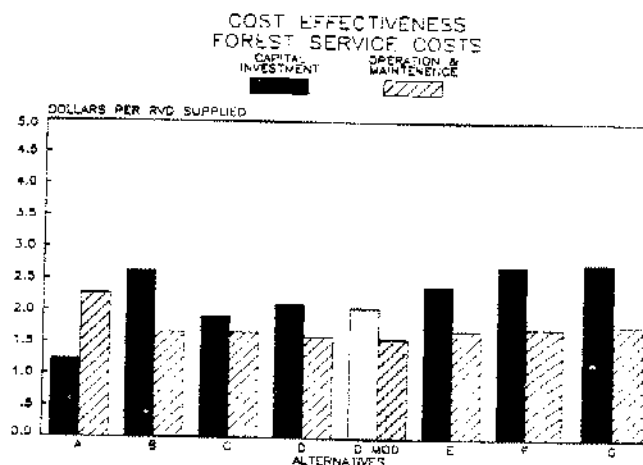


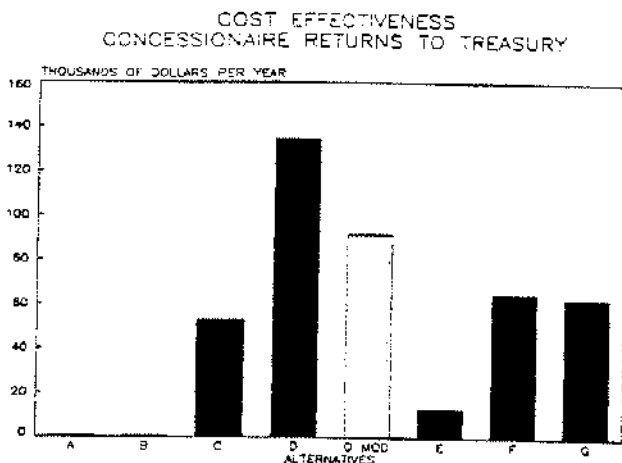
Table 5: COSTS BY ALTERNATIVE

	A	B	C	D	D (Modified)	E	F	G
Capital Investment (except Highway 504)	12,408	34,976	33,314	41,244	40,017	37,933	52,850	53,154
Recreation Use (Year 2000)	504.5	665.4	870.4	975.9	973.5	786.6	966.5	960.0
Construction Cost/Visitor Day, based on 20 year life of facilities	1.23	2.63	1.91	2.11	2.06	2.41	2.73	2.77
Operation & Mtnce Cost (annual)	1,147	1,104	1,444	1,570	1,538	1,347	1,682	1,718
O&M Cost/Visitor Day	2.27	1.66	1.66	1.60	1.58	1.71	1.74	1.79
Cost of Highway 504 (Spirit Lake Memorial Highway)	0	0	64,000	64,000	64,000	0	89,400	64,000
Opportunities for private Returns to treasury	(temp. only) 250	250	2	6	5	2	7	6
			53,200	13,4400	91,700	13,000	65,000	62,750

1. Visitors days shown in this table are the expected visitor use (supplied) in the year 2000. A visitor day is the recreational use of an area for a total of 12 hours by one person.

COMPARISON OF ALTERNATIVES (Continued)

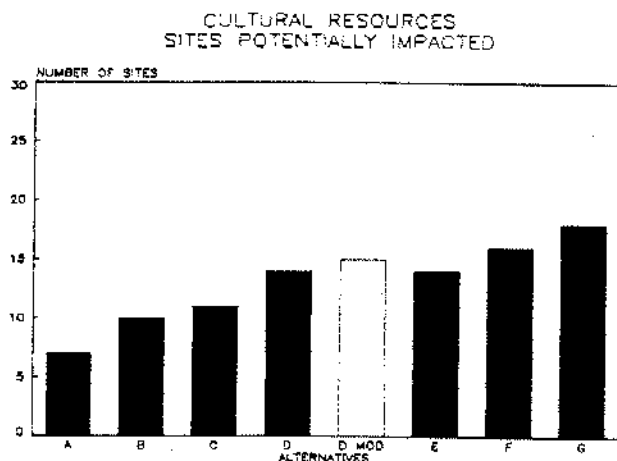
Figure 20



Elements of the Issues: Cultural Resources

Few of the over 85 cultural resource sites inventoried in the Monument have had field investigation to date. They are potential site locations based on historic records and information from people familiar with the area. Development which may impact these sites is shown by alternative in Figure 21. Once an alternative is selected, a detailed field inventory will determine whether sites in the inventory exist, the condition of sites which are discovered, and whether other sites exist for which there are no historic records and informant data.

Figure 21



Sites located will be evaluated for national, regional, and local significance according to criteria established for the National Register of Historic Places. Significant sites will be protected or the effects of projects mitigated.

Consultation will be conducted with the Washington State Historic Preservation Officer and the (Federal) Advisory Council on Historic Preservation.

The impacts of a given alternative cannot be accurately measured at this time because it is not known whether sites listed in the current inventory will be located during the field investigation. In addition, sites unknown at present may be found by field examination. Current development (Alternative A) will produce the lowest levels of potential impacts to inventoried cultural resource sites. Ranked in order of increasing levels of potential impacts are Alternatives B, C, E, D (Preferred), and D (Modified, Selected) are the same, F, and G. Potential impacts to inventoried cultural resource sites are estimated to be predominantly associated with trail construction and reconstruction.

Elements of the Issues: Cave Management

Geological Effects: In Alternative A impacts are primarily confined to Ape Cave, where natural geological conditions have been disturbed and unique rock specimens removed. Minor impacts are also occurring to several sensitive caves north of Ape Cave in the vicinity of Road 81. Closure of Road 8300030 in Alternative C will reduce visitation in the vicinity of Ole's Cave.

Alternative B closes Road 81, which will reduce access and visitation to the area near several sensitive caves.

Alternatives D and D (Modified) will build Trail No. 239 past several geologically sensitive caves.

In Alternative E a trail will be built directly to Ole's Cave and will bring visitors near other sensitive caves.

In Alternatives F and G construction of Trail 232 will increase public access to eight geologically sensitive caves.

Biological Effects: Under all alternatives, a Cave Basalt Area Management Plan will identify further management and protection measures to ensure that sensitive cave habitats are protected. In the interim between the Comprehensive Management Plan and the Cave Plan, all key Townsends big-eared bat habitats will be closed during the season of habitat use, with entry only by very limited permit. All alternatives continue to manage Ape Cave and the Lava Cast area near Lake Cave as high public use sites; developments which encourage use are scheduled. The fauna of Ape Cave, including Townsend's big-eared bat, has already largely been lost and probably will disappear with continued and increasingly higher levels of visitation. Lake Cave's present and proposed level of human use greatly reduces its habitat value; bat and other wildlife use can be expected to decline. Since Ape and Lake Caves

II. COMPARISON OF ALTERNATIVES (Continued)

Biological Effects (Continued)

are already widely known and heavily used, they are probably the best site to which to direct public visitation. Alternative A is an improvement over the existing situation since it calls for the development of a Cave Management Plan.

Alternatives E, F, and G develop campgrounds (60-250 persons at one time capacity) about one mile from Ole's Cave, with trails leading to the south entrance of the cave. Ole's Cave is a key habitat for Townsend's big-eared bats and other bat species. Human use is thought to have eliminated a nursery colony. Increased use of caves may also adversely affect several rare vertebrate or invertebrates, including the Mount St. Helens Grylloblattid.

In terms of overall effects on the Cave Basalt Area habitat, Alternative B has the least adverse impact because it introduces no new trails or increased developments. It greatly improves the present situation by closing Road 8300030, which crosses the southern part of the Cave Basalt Area, and closing the washed out portion of Road 81 at the north end of the area. Alternatives C, D (Preferred), and D (Modified, Selected) pose low impacts because they also close Road 8300030 and propose no additional developed caves. They do increase visitation at presently developed sites (Ape Cave and Lake Cave), and reconstruct the washed out portion of Road 81, providing a loop drive which would increase traffic through the northern part of the Cave Basalt. Alternative E is intermediate because it develops Ole's Cave and provides public access to the vicinity of one other hibernation site and three other sensitive caves. Alternatives F and G could cause high impacts because they propose road and/or trail access to the largest development near Ole's Cave and access to the vicinity of several other caves. Five of these caves are occupied by the Larch Mountain Salamander, proposed for State listing, and rare invertebrate species.

Cultural Effects: At least eight caves, rock shelters, and lava tubes on the Forest contain evidence of early human use, some date from as early as 4,000 years ago. It is currently not known whether such evidence exists in caves located in the Monument. It is doubtful that evidence of prehistoric use survives in caves which have been heavily used by recreationists for many years--Ape and Ole's Caves. From the standpoint of cultural resource protection, these are the appropriate places to direct the public and this is done in all alternatives.

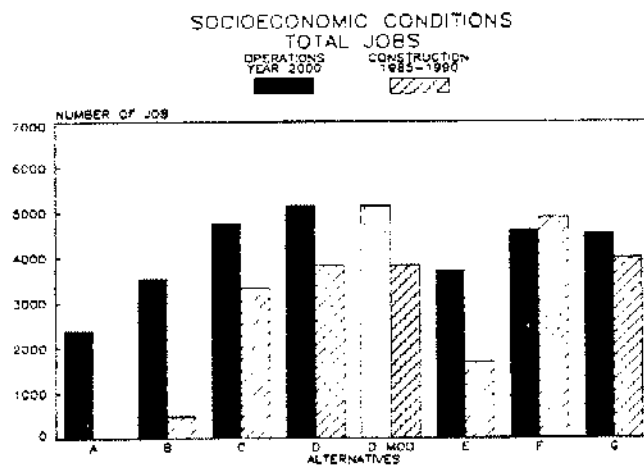
Ole's Cave was discovered by Ole Peterson in 1895 and operated as Washington State's first commercial cave. Alternatives E, F, and G propose a campground near this cave and would require the development of historical information for interpretation.

Alternative B provides protection for potential cultural resource sites because it proposes no new trails or other development. In order of increasing potential impact are A, C, D, D (Modified), E, and F-G. Alternatives E, F, and G open nearly all caves in the area to increased human use and would result in the possible loss of prehistoric artifacts and information.

Socioeconomics

The level of demand under Alternative A by year 2000 would support 1,236 direct and 2,377 total visitor related jobs in Lewis, Cowlitz, Clark, and Skamania Counties from the operation of the Monument. For the same year, Alternative G would support 2,353 direct and 4,525 total visitor industry related jobs. These jobs, by the year 2000, would result in a \$196 million increase in personal income under Alternative A and a \$322 million increase under Alternative G. Total jobs stimulated by Monument construction in the four-county region between 1985-1990 (major period of construction) ranges from negligible levels under Alternative A to 4,880 jobs under Alternative F. Alternative E stimulates fewer operation and construction jobs (and personal income) than Alternatives D (Preferred), D (Modified, Selected), F and G because it does not call for the construction of State Route 504 (Spirit Lake Memorial Highway).

Figure 22



Of the total county employment impacts, the following could be expected to occur in or near the Monument among the smaller interior communities along the principal access routes (Table 6).

Table 6 : Total Jobs In or Near Monument, 2000

	<u>Alternative</u>							
<u>County</u>	A	B	C	D	D*	E	F	G
Lewis	431	415	271	292	292	648	275	438
Cowlitz	362	819	1,433	1,544	1,544	592	1,319	1,113
Clark	52	67	37	38	38	83	52	67
Skamania	35	40	73	79	79	56	69	67
Total	881	1,342	1,813	1,954	1,954	1,377	1,713	1,688

*Modified

COMPARISON OF ALTERNATIVES (Continued)

Elements of the Issues: Socioeconomic Conditions (Continued)

These figures are approximate because they represent both total direct and indirect employment impacts. Some of the indirect impacts would not occur in or near the Monument because some workers would commute and spend their money elsewhere.

While some of these impact estimates appear small there are several factors to consider. These Monument related employment estimates represent one-fourth of the region's visitor industry employment and two-thirds of its growth by 1990. In addition, while employment gains of a few hundred seem small, they are often quite large given the size of the communities in which they would occur.

Social impacts by alternative relate primarily to projected growth in Monument visitation to the year 2000, and the projected distribution in visitation among the four major Monument access routes: the northern route (primarily US 12), the western route (primarily SR 504), the southwestern route (primarily SR 503), and the southern route (the "Wind River Road"). Three categories of social effects are identifiable by alternative by access route: the availability of visitor services (including restaurants, overnight facilities, gas stations, emergency services); contrasts in local lifestyles and values; and changes in land uses, plans, and zoning.

Visitor center use is expected to increase in all alternatives by almost 200 percent by the year 2000. This use will shift to the new Visitor Center at Silver Lake and will put significant demands upon visitor services along Interstate Highway 5, the lower end of SR 504 (the western corridor). Significant private sector development will be needed to meet these demands, which increases contrasts in local lifestyles and values. Limited land use regulation will probably be needed to guide development and reduce potentials for conflicts among varying lifestyles and values. Monument visitation along the southern corridor (the Wind River Road) is also projected to increase by about 80 percent in Alternative A, to over 300 percent in Alternatives C, D (Preferred), D (Modified, Selected), F, and G. However, actual projected use levels account for less than 5 percent of total visitation in the year 2000, so demands for visitor services are expected to be accommodated without significant private sector development.

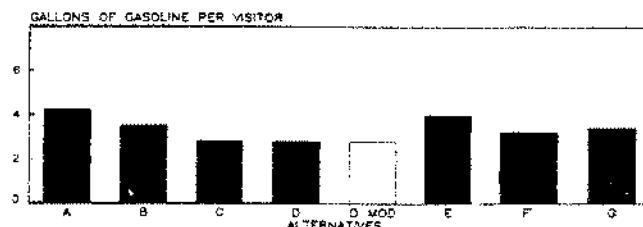
Alternatives A, B, and E have similar projected distributions in Monument visitation in the year 2000 among the remaining three road corridors. The heaviest user will be concentrated along the northern (US 12) route (between about 35 and 60 percent of total use in the year 2000), followed by the southwestern (SR 503) route (between 25 and 40 percent of total use). Consequently, social impacts will be concentrated

primarily along these two routes. Visitor services are currently marginal along these corridors and shortages are expected by the year 2000, especially on summer weekends. Demands for visitor services along the western (SR 504) corridor will be partially offset by expected development near the Visitor Center at Silver Lake. Contrasts in lifestyles and values between "old timers, newcomers, and entrepreneurs" could increase potentials for social polarization along the northern and southwestern routes, particularly over economic growth on limited available land. Relatively unregulated commercial and residential development could occur along these corridors without limited land use regulation (such as limited zoning).

Alternatives C, D, (Preferred), D (Modified, Selected), and F tend to concentrate projected use along the western (SR 504) road corridor (growth in visitation range from about 115 percent to over 200 percent increases by the year 2000). Consequently, visitor services will be overextended for most of each summer without substantial development of both public and private support services. This development will increase contrasts in local lifestyles and values, increasing contrasts for polarization. Competition between tourist oriented development and more traditional resource-based uses (primarily commercial timber management) may lead to demands for increased land use regulation. Visitor use along the northern (US 12) road corridor grows from about 3 to 30 percent in these alternatives by the year 2000, probably not enough to stimulate significant social effects. Alternatives F (about 115 percent), possibly stimulating social effects similar to those described above for Alternatives A, B, and E.

Alternative G levels of visitation will probably stimulate social effects similar to those described for Alternatives C, D (Preferred), D (Modified, Selected), and F, except that the extension of SR 504 will tend to distribute high levels of use relatively more evenly among the northern (US 12), western (SR 504), and southwestern road corridors. Thus this alternative will require even greater increases in visitor services along all these three corridors, increasing the possibilities for polarization over lifestyles and values, and increasing demands for more extensive land use regulation.

Gasoline Consumption by alternative is related to both energy requirements for Monument visitors and the demand for gas stations along the access corridors. Gasoline consumption by visitors is based on projected visitor use (Figure 23, Year 2000). **COMPARISON OF FUEL CONSUMPTION PER VISITOR BY ALTERNATIVE**



MITIGATING MEASURES INCLUDED IN THE ALTERNATIVES

The overriding purpose of the following mitigation measures is to allow "geologic forces and ecological succession to continue substantially unimpeded." (From Section 4b1 of the Monument Act.) These measures apply to all alternatives unless noted otherwise. No mitigation measures are identified for cost effectiveness (Issue 8) and socioeconomic conditions (Issue 11).

Mitigation Measures for Natural Features and Processes (Issue No. 1)

All planned facilities will be located with the following priority for protection of unique natural features; entirely avoid the feature; limit disturbance to the margin; and limit the size of the development. All activities that effect natural features and processes will be done in strict compliance with site specific project (including contract) specifications. These specifications will require that such activities be conducted in as small an area as is necessary to perform the action to minimize the amount of environmental damage to soils and ecosystems within the Monument. Project supervision will be done by onsite service personnel to ensure that all impacts on the natural environment are kept as small as possible.

All construction and obliteration activities will be conducted to minimize the degradation of the environmental quality from noise, air pollution, and litter. All contract equipment used within the Monument will meet or exceed federal and state standards for emission and noise control. All unnatural materials remaining as waste following proposed actions will be removed from the site and, if they cannot be salvaged, from the Monument.

All sites where vegetation and soil disturbance has occurred as a result of proposed actions will be returned to a natural contour and revegetated or landscaped immediately following the completion of the land-disturbing project. Only plants native to the Monument and occurring naturally within the ecosystem of the disturbed area will be used for revegetation or landscaping.

Geologic/Volcanic Features: The following is a list, in order of preference, of measures required to minimize impacts on Monument resources:

- Avoid significant geologic features where possible.
- Impact only the margin of feature if the feature cannot be avoided.

- Impact a small percentage of the feature or minimize the size of the development.
- Attempt to control public access to avoid or minimize impacts to sensitive geologic features.

Geologic Conditions and Processes: The following is a listing of general guidelines to mitigate impacts from development on geologic processes:

- Avoid active slope failures.
- Avoid construction on steep slopes prone to debris slides.
- Minimize earthwork on steep slopes.
- Avoid concentration of runoff on steep slopes.
- Minimize disruption of natural drainage patterns.
- Decrease spacing of culverts on roads and trails, and consider outsloping and drain dips whenever practical.
- Design erosion protection measures for culverts.
- Avoid berming of construction/maintenance waste on road/trail shoulders--best accomplished by end haul.
- Avoid construction on oversteepened slopes and areas of active erosion and channel migration on mudflow, pyroclastic flow and debris avalanche deposits.
- Avoid road and trail construction in the heavy tephra area.

These mitigating measures can best be accomplished by involvement by geology/geotechnical specialists for site specific evaluation at the project design level.

Biological Features and Processes: Construction zones will be confined to the smallest areas possible in order to minimize volumes of vegetation removed.

- Revegetation of denuded construction zones bordering new developments will be limited to native species in the blast area.

MITIGATING MEASURES (Continued)

Watershed and Soils:

- Construction zones will be held to minimum size to avoid temporarily accelerated erosion and increased sediment load in streams. Management of vegetative recovery in areas disturbed by construction will hold temporary erosion to a minimum. Use of drainage collection and dispersion devices at sites of impermeable structures also will prevent most erosion by channelization.
- Soil erosion will be partly averted at all development sites by installation of drainage structures (normally designed as parts of roadways, parking areas, and buildings) that will contain runoff and channel it with minimal sediment load to natural drainages. Construction zones will be confined to the smallest area possible to avoid disturbance of soil. At sites for new trails and facilities where foot traffic could compact soils or create dusty conditions, walks and trails and directional signing will discourage random walking.
- All planned facilities will be located to avoid active slope failures, heavy tephra deposition areas, and steep slopes prone to debris slides, and to minimize disruption of natural drainage patterns.
- Road design will include downspouting and energy dissipators on relief culverts, avoid concentrating runoff on steep slopes, and to minimize earthwork on steep slopes.
- Project plans will identify potential sources of pollution from runoff and employ whatever means available to reduce or eliminate their effects.

Mitigation Measures for Recreation and Interpretation (Issue No. 2)

- The interpretive program will be utilized to minimize human impacts on the resources by developing an awareness, appreciation, and understanding of the value and fragileness of the geologic features and vegetation.
- At all sites selected for public use where foot traffic could result in trampling of vegetation and retarding its recovery, walks and trails and directional signing will discourage random walking.
- All new facilities will be located to reduce visibility from higher viewing areas.

Mitigation Measures for Science and Research (Issue No. 3)

- Mitigation is considered under each alternative in that the protection classes assigned and the research administration programs partially mitigate effects of development and use in the Monument.

Mitigation Measures for Science and Research (Issue No. 3) (Continued)

- Additional mitigation occurred during alternative formation by locating trails to avoid high-value research sites.
- Various intensities of future monitoring are identified by alternative to provide for protection regardless of the alternative selected. This monitoring by the Scientific Advisory Board, and in Alternatives A and B by a panel of scientists representing active research in the Monument, will direct site-specific monitoring to anticipate future conflicts with other uses.

Mitigation Measures for Public Safety (Issue No. 4)

The new developments for the most part will be in areas of low risk to human life from volcanic activity. However, some of the new developments will be in the demonstrated paths of pyroclastic flows, mudflows, and falls of tephra. The Forest Service accepts the long-term hazard to the development investment from these events and will mitigate the potential hazard to human life by providing an evacuation plan and a volcanic activity monitoring system to provide warning and response to renewed volcanic activity.

- When public safety officials judge an area to be unsafe because of volcanic activity, it will be closed to the public rather than relying entirely on evacuation.
- When drainage systems cross high risk areas, appropriate specialists (hydrology, geotechnical) will participate in the selection of location and design to minimize risk of sudden failure during anticipated storm/runoff events.
- The Forest Service will coordinate with medical service agencies to determine support required to administer the Monument.

Mitigation Measures for Access Route (Issue No. 5)

Mitigation pertaining to road and trails include all those measures listed for the other issues.

Mitigation Measures for Insects, Disease and Fire (Issue No. 6)

The following measures will be implemented to reduce fire starts, especially in high hazard areas, while minimizing potentially adverse impacts from suppression actions taken on fires that do occur:

- The quickest reasonable control methods will be used on all fires in the blowdown and fringe areas.
- The techniques used for the suppression of fires will be modified to minimize disturbance to the resources.

MITIGATING MEASURES (Continued)

Mitigation Measures for Insects, Disease and Fire (Issue No. 6) (Continued)

- Fire prevention patrols will be provided during the fire season (Alternatives B-G).
- Open campfires will be prohibited in the blowdown and fringe areas, and this area will be closed to all hiking during periods of high fire danger (Alternatives B-G).
- The construction of trails in areas of high fire danger caused by heavy accumulation of fuels will be delayed until after 1990 (Alternatives B-C).
- A fire management implementation plan that details staffing and equipment needs will be completed within twelve months after the approval of this plan (Alternatives B-G).
- Remote automatic weather stations will be located in the blowdown and fringe areas to monitor fire danger (Alternatives B-G).
- Helispots will be maintained in remote areas (Alternatives B-G).
- A fire lookout will be provided at Strawberry Mountain (Alternatives C-E).

Scheduled prescribed fires (planned ignitions) are recommended, where feasible, in potential high fire hazard areas.

Mitigation Measures for Wildlife and Fisheries Habitat (Issue No. 7)

- The need to remove dead standing trees for safety reasons will be evaluated on a case-by-case basis to retain as much of this type of wildlife habitat as possible.
- The need to retain the standing dead trees will be given consideration in designating locations for dispersed camping and in locating trails.
- If prescribed fire is used to reduce fire hazard around campsites or other specific locations, the prescription will include provisions for protecting snags.
- An interdisciplinary Backcountry Management Plan will be completed within four years; it will include measures of managing use of and protecting fragile lakeshore habitats and for protecting sensitive habitat areas such as meadows and wetlands.
- Impacts to lakeshores will be monitored and adjustments in management made as necessary to reduce or prevent damage. Campsites, trails, viewpoints, etc., will be located at the least sensitive sites possible based on a site-specific interdisciplinary analysis. Trails will not encircle lakes, will avoid lakeshores, and will access hardened (e.g.,

rocky) areas wherever possible. Trails and campsites will be located at least 300 feet from deltas and wet meadows wherever possible.

- On larger lakes where boating is allowed, a minimum number of access points will be provided.
- Deer and elk winter range will be closed to winter ORV use, except for minor amounts of road plowed to access higher elevation winter sports areas. Use in these cases will be confined to trails or roads. Roads in winter range, except for those scheduled for plowing in this plan, will remain closed during the winter months.
- Specific trail, campsite, interpretive, and other site locations will be coordinated with the wildlife biologists to avoid calving, rutting, wallowing and other high value big-game habitats. Site-specific plans will also consider the effects on ptarmigan, raptor, waterfowl, and sensitive vegetative communities such as marshes, meadows, streamside riparian zones, and will avoid these areas or minimize adverse effects to the fullest extent possible.
- Any need for the removal of dead trees or other debris from lakes and streams will be evaluated on a case-by-case basis to retain as much of this type of fish habitat as possible. Ordinarily, such material will not be removed. A fisheries biologist and hydrologist will evaluate any proposed removal.
- All stream crossings, work in streams, and debris removal will comply with the Master Memorandum of Understanding for the hydraulic approval process between Region 6 of the Forest Service and the Washington Departments of Game and Fisheries, whenever the streams involved bear fish.
- Camping on streambanks in the devastated area will be allowed only at designated sites. Within the devastated areas, construction will be located at least 100 feet from streambanks, except for boat launches and necessary road and trail crossings.
- Buffers will be used whenever possible between roads, campgrounds, trails, and construction sites and streams to reduce adverse effects on stream and streamside habitat. Project plans will identify potential sources of pollution from runoff and prevent or minimize it.
- Existing roads not displayed as part of the selected alternative will be closed.
- In deer and elk winter range, where snow or lack of maintenance does not prevent winter travel on roads not identified as open and plowed in winter, install road management methods in addition to closure orders, in order to reduce harassment by humans.

MITIGATING MEASURES (Continued)

- In deer and elk winter range and in calving, rutting, and other key summer range habitat areas, close roads with barriers, by obliteration, or by other active means rather than by simple abandonment.
- Close all roads on National Forest land leading from Road 8312, the road to the top of Marble Mountain, and pursue cooperative road management agreements with other landowners there to the same end.
- Recommend that Washington Department of Transportation coordinate with Washington Department of Game and Washington Department of Fisheries to develop wildlife and fisheries mitigation measures for State Highway 504.

Mitigation Measures for Cultural Resources (Issue No. 9)

- Prior to any ground disturbing activity associated with any alternative, a field inventory will be conducted to determine the presence or absence of cultural resource sites.
- If an increase in visitor use is proposed for any cave, known cultural resource site, or volcano site, a cultural resource specialist will determine whether the action will affect that site, and whether the site is significant.
- Significant cultural resources sites will be protected, or effects of projects or recreation use will be mitigated. Criteria for the National Register of Historic Places will be used to determine significance.
- Mitigation plans will be developed for sites where over-use by recreationists threatens cultural or interpretive values.
- Mitigating measures described above will be conducted in consultation with the Washington State Historic Preservation Office and (Federal) Advisory Council on Historic Preservation.
- An interdisciplinary Cave Basalt Area Management Plan will be developed within two years after the completion of this plan to determine additional mitigating actions needed to protect cultural values.
- The contracting officer and/or archaeologist will have the responsibility and authority to halt any construction activities if historic, archeological, or paleontological resources are exposed. Construction activities will remain halted pending evaluation of the remains and completion of the steps required by the regulations of the Advisory Council on Historic Preservation.

- The contractor will be made responsible to halt construction activities immediately and to notify the contracting officer or archaeologist in the event that historic, archaeological, or paleontological resources are discovered during construction. The contractor will be briefed specifically on these provisions, and the types of cultural material he may observe, by the contracting officer prior to the start of construction. All contracts will reflect these provisions.
- The Forest Service will work with the State Historic Preservation Office (SHPO) on a Programmatic Memorandum of Agreement to address compliance issues in implementation. Until completion of that Agreement, cultural resource inventories and SHPO consultation will continue on a project-by-project basis.

Mitigation Measures for Cave Management (Issue No. 10)

- Under all alternatives, a Cave Basalt Area Management Plan for protecting habitats and geological and cultural features will be completed within two years.
- In the interim, all caves known to be used for hibernation, nursery sites, or fall concentration roost sites by the Townsend's big-eared bat will be closed during the season of habitat use. Access will be by limited special permit, given only for essential research, monitoring, or administrative use. The Forest will seek the support and cooperation of local cave users in maintaining the closures. Existing trails to sensitive caves will be removed, obscured, or otherwise managed so as to discourage use.
- Pursue management agreements with adjacent landowners to provide protection for cave entrances and passages, to close roads near caves where possible, and to make and enforce seasonal closures to protect key Townsend's big eared bat habitats.
- New trails must be located at least one quarter mile from cave entrances. Trailheads, trails, and signs will be designed to avoid drawing attention to cave entrances.
- Any caves found to contain archaeological resources subject to being damaged by cave users, sensitive and geologic features, will be closed.
- Caves which are not developed or designated for recreational use will not be shown on recreation or other maps for general distribution. The effects of recreational use on caves will be monitored.
- Develop user awareness of the fragile cave environment through the interpretive program at Ape Cave and Lava Cast area, and through

educational information in the Monument newspaper, brochures, and displays at the Visitor Center.

- Road 8300030 will be closed to public travel at or near the junction with Road 83 to reduce disturbance to cave wildlife sensitive to human intrusion (Alternatives B, C, and D).

-- Road 8303 to Ape Cave will not be snow plowed in the winter.

- The special use permit for the Ape Cave concession will specify that lamps will be rented only for use at Ape Cave, and that no food will be sold at the concession.

III. Affected Environment



INTRODUCTION

The 1980 eruptions of Mount St. Helens were one of the most publicized natural events of this era. A large literature on the subject exists and a summary account of the volcanic events was published by the Gifford Pinchot National Forest in its Mount St. Helens Land Management Plan, 1981. Detailed technical papers on the eruptions of the 1980s appear in many scientific publications, including U.S. Geological Survey Professional Papers 1249 and 1250; more recent data was published in Science Magazine, Vol. 221, No. 4618 (September 30, 1983). These and other technical documents were used along with oral communication to develop this Comprehensive Management Plan.

This description of the Monument provides information necessary for a thorough review of Chapter II, the Comparison of Alternatives, and Chapter IV, the Environmental Consequences. To judge the appropriateness and the likely consequences of different approaches to management, an understanding of the nature of this singular terrain is required.

Management decisions that might effect the biophysical environment occur within the Monument and on National Forest lands surrounding it. They are described below under "Natural Features and Processes." The social, economic, or scientific implications of different approaches to managing the Monument are described in the "Human Activities" section. Economic considerations are particularly significant to residents of Clark, Cowlitz, Lewis, and Skamania Counties.

NATURAL FEATURES AND PROCESSES

Historically, the landscape around Mount St. Helens has been strongly influenced by frequent volcanic activity and subsequent geologic and hydrologic processes. Nine major eruptive episodes during the last 40,000 years have left their mark, affecting not only the type and distribution of vegetation surrounding the volcano, depositing new soil substrate, and modifying stream courses, but actually creating new landforms. Vegetative patterns and physical forces of erosion and sedimentation have influenced the wildlife and fish habitat quality, which in turn affects populations and distribution.

Effects of past eruptions of Mount St. Helens include pre-1980 Spirit Lake, mudflow and pyroclastic flow deposits in several valleys, lava flows on the lower flanks of the volcano, and great lava domes, including the former mountain

summit and others scattered on the sides of the mountain. Trees and other vegetation were still in the process of reestablishing on the cone after previous volcanic events when the eruption of May 18, 1980, again interrupted ecologic succession. The May 18 eruption followed a pattern similar to many previous events, with two notable exceptions: the landslide and ensuing debris avalanche, the largest slope failure known in the earth's recorded history; and the hot lateral blast or density flow which leveled trees in a 215 square mile area.

GEOLOGY

The Monument Act (Sec. 4 b 1) states that the area shall be managed "...to protect the geologic...resources...allowing geologic forces...to continue substantially unimpeded." Two aspects of geology, 1) resources and 2) conditions and processes, are discussed separately.

Geologic resources include geologic and volcanic features, caves, earth construction materials, and groundwater. Geologic conditions are features or processes which affect the safety, cost, or feasibility of resource management activities and development. The primary geologic process of concern in the Monument is slope stability. Other "geologic forces" as described in the Act are judged to be hydrologic in nature and are evaluated in the watershed portion of this plan.

Geologic and Volcanic Features

Pre-1980 Eruptive History: The pre-1980 eruptive history of Mount St. Helens, though overshadowed by the recent violent eruptions and land modifications of the 1980s, is of interest because it provides perspective on those 1980 events.

Spirit Lake was created about 3,500 years ago by ash flows from the summit damming the headwaters of the North Fork Toutle River. Most of the visually striking lava flows on the lower south-southeast flanks of the volcano were emplaced about 400 years ago, as was the great dome at the former summit of the mountain. The Cave Basalt Flow, combed with lava tubes of diverse geologic and biologic value, emerged from the south flank of the volcano about 1,900 years ago. As spectacular as the 1980 mudflows down the South Fork Toutle Valley are, they only veneer a much thicker mudflow deposit emplaced during the 19th Century and earlier eruptive episodes. In comparison with ancient mudflows which dammed Silver Lake, the May, 1980, mudflows and floods, despite the havoc wreaked, were relatively small. During this same period, similar deposits also formed a continuous fill across the floor of the

Cowlitz River Valley near Castle Rock; it probably extended to the mouth of the Cowlitz River. Lahars and fluvial deposits formed a similar fill in the Lewis River Valley, extending at least as far downstream as Woodland. Large pyroclastic flows have moved away from the volcano in nearly all directions.

Although the evidence of historic eruptions are preserved in some areas around the mountain--airfall deposits, pyroclastic flows, mudflows, lava flows, and domes--many deposits are obscured by vegetation or subsequent eruptive products, or are inaccessible. Excellent exposures of pre-historic Mount St. Helens include views into the entrenched Pine Creek Valley, the sight of the interior of a lava flow from within Ape Cave, and the arresting texture of lava flows on the southeast flank of the volcano as seen from Marble Mountain.

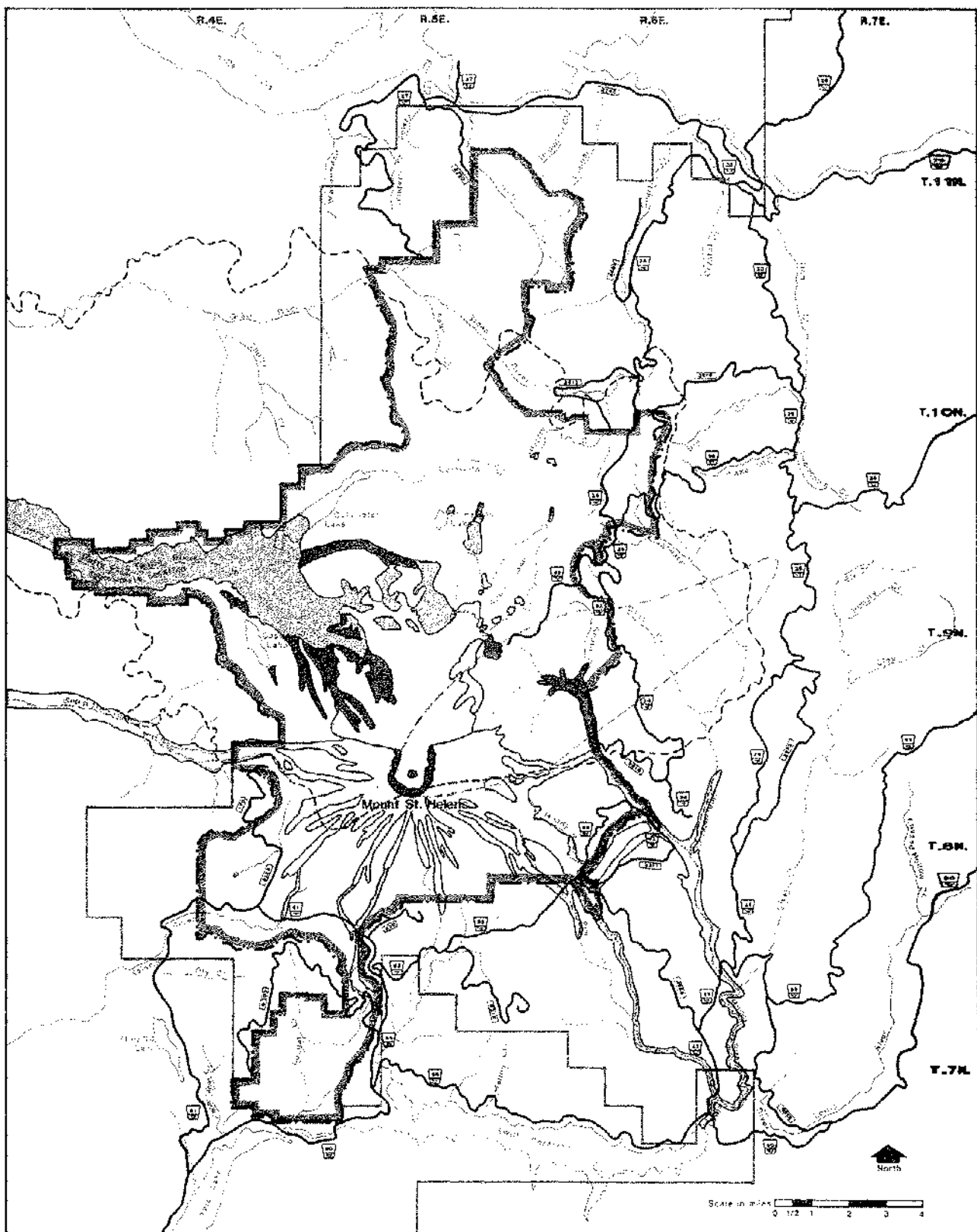
The eruptive history of Mount St. Helens prior to 1980 is summarized by Mullineaux and Crandall (1981) and subdivided into nine eruptive periods, each with a name, which are clusters of eruptions distinguished by close association in time, by similarity of rock types, or both. Many of these periods are referred to in subsequent discussion.

Eruptions of the 1980s: On March 20, 1980, small earthquakes marked the renewal of volcanic activity at Mount St. Helens after 123 years of dormancy. On March 27, 1980, the mountain began a seven week period of minor steam and ash eruptions, accompanied by an ominous bulging on

the north face of the cone. On May 18, a magnitude 5+ earthquake triggered landslides that decapitated the mountain and flowed as a great debris avalanche down the north side of the volcano and 13 1/2 miles down the North Fork Toutle Valley. As much as 600 feet of material was deposited near the outlet of Spirit Lake and the deposit averaged 150 feet in thickness over the whole area. The sudden depressurization of magmatic gas and hydrothermal water engendered a series of colossal explosions; they, in turn, created a ground-hugging flow of hot gas and rock, which traveled at an estimated speed of 220-250 miles per hour across 215 square miles north, east, and west of the mountain. Standing timber was leveled and human beings, wildlife, logging equipment, and everything else in the path of the eruption were destroyed. Within minutes of the landslide and ensuing lateral blast or density flow, a vertical column of steam, gas and ash rose as high as 75,000 feet above sea level. Ash from this eruption cloud was rapidly blown east northeastward. Up to several feet of airfall tephra were deposited adjacent to the cone, thinning east northeastward. This eruptive column continued vigorously for nine hours and produced numerous ashflows. A distinctive "blast deposit" was left in the devastated area by the density flow; it consists primarily of sand and gravel sized rock fragments. The hot flow melted mountain snow and ice, generating floods of water and mud (lahars) that flowed rapidly down the mountain flanks and into surrounding valleys. The outer limits of the blast were clearly demarcated by lines of seared standing timber.



Typical blown down timber effects and accompanying blast deposits.



Legend

- | | |
|----------------------------|---------------------------------|
| National Monument Boundary | Blast Pyroclastic Flow Deposits |
| National Forest Boundary | Mudflow Deposits and Effects |
| Existing Roads | Blast Effects of May 18, 1980 |
| Streams | Area of Heavy Tephra Deposition |
| New Lava Dome | Reworked Volcanic Deposits |
| Breached Crater | |
| Pyroclastic Flow Deposits | |
| Debris Avalanche Deposits | |

Geologic Resources

Post May 18, 1980

Figure 24

As a result of this eruption, the mountain itself and surrounding terrain were altered dramatically; it was the primary reason why the National Volcanic Monument was created. Subsequent eruptions from May 25, 1980, to the present have produced other airfalls, pyroclastic flows, and (compared with May 18) minor mudflows, and a dacite lava dome within the breached crater. The 1980-83 effects at Mount St. Helens are important to the scientist and visitor because of their visibility and relatively undisturbed state and because they permit clarification of the eruptive behavior of the volcano, past, present, and future. Drainage systems in the area are still re-establishing, the mountain remains active, and the vegetation, wildlife and water-resources are in a gradual process of recovery.

The visible effects of the eruptions of the 1980s, particularly that of May 18, are stunning. The symmetrical summit of the cone has been replaced by a yawning breached crater, an amphitheater open to the north with steep side walls. The new lava dome with a rugged "bread crust" texture rises over 800 feet above the crater floor. The North Fork Toutle Valley is buried by a hummocky debris avalanche deposit. The downed and seared timber affected by the lateral blast is widespread and can be seen in a sector northwest through northeast of the mountain. Mudflows left scour and deposits in several valleys around the mountain. There are excellent opportunities for both scientific research and visitor interpretation of features and processes such as the directed blast and density flow, pyroclastic flows and airfall tephra, the catastrophic landslide and debris avalanche, the displacement of Spirit Lake water and damming of the lake, mudflows, and nonvolcanic modification of these deposits by vegetative succession, erosion and deposition. The number and types of features are staggering, and the quality of opportunity for interpretation varies widely. In April, 1982, the Regional Forester Jeff M. Sirmon appointed the Mount St. Helens National Volcanic Monument Task Force, and its report, issued in February 1983, contains a map showing 70 potential interpretive sites. The process used to formulate alternatives and the management direction common to all alternatives section of chapter II discusses the use of this information in greater detail.

The following is not intended to provide a comprehensive inventory of specific geologic and volcanic research or interpretive opportunities within and near the Monument, but rather a description of the major geologic resources. Other existing and potential opportunities are described in other portions of this document. This inventory is intended to serve as a guide to potential research and interpretive sites by outlining the approximate boundary of conspicuous eruptive products and effects at Mount St. Helens.

Immediate Effects of May 18, 1980: The collapse of the north face of the volcano resulted in the sudden removal of a nearly 3,000 foot thickness of overlying material; it caused entrapped gas

and fluids to escape explosively over and through the landslides descending the mountain as a catastrophic directed blast. The explosions generated a hot, ground-hugging flow of gas and rock that devastated a broad area of approximately 215 square miles. Propelled by expanding gases and gravity, the mixture of gas, rock and ice moved off the volcano as a directed blast which affected nearly a 180° sector north, east, and west of the mountain. It moved at speeds as high as 220-250 miles per hour, leveling all in its path. Eventually the hot cloud rose: at the fringes of the blast, trees were left standing but were killed by the heat, estimated to have approached 680°F.



Blasted tree stump on Coldwater Ridge.

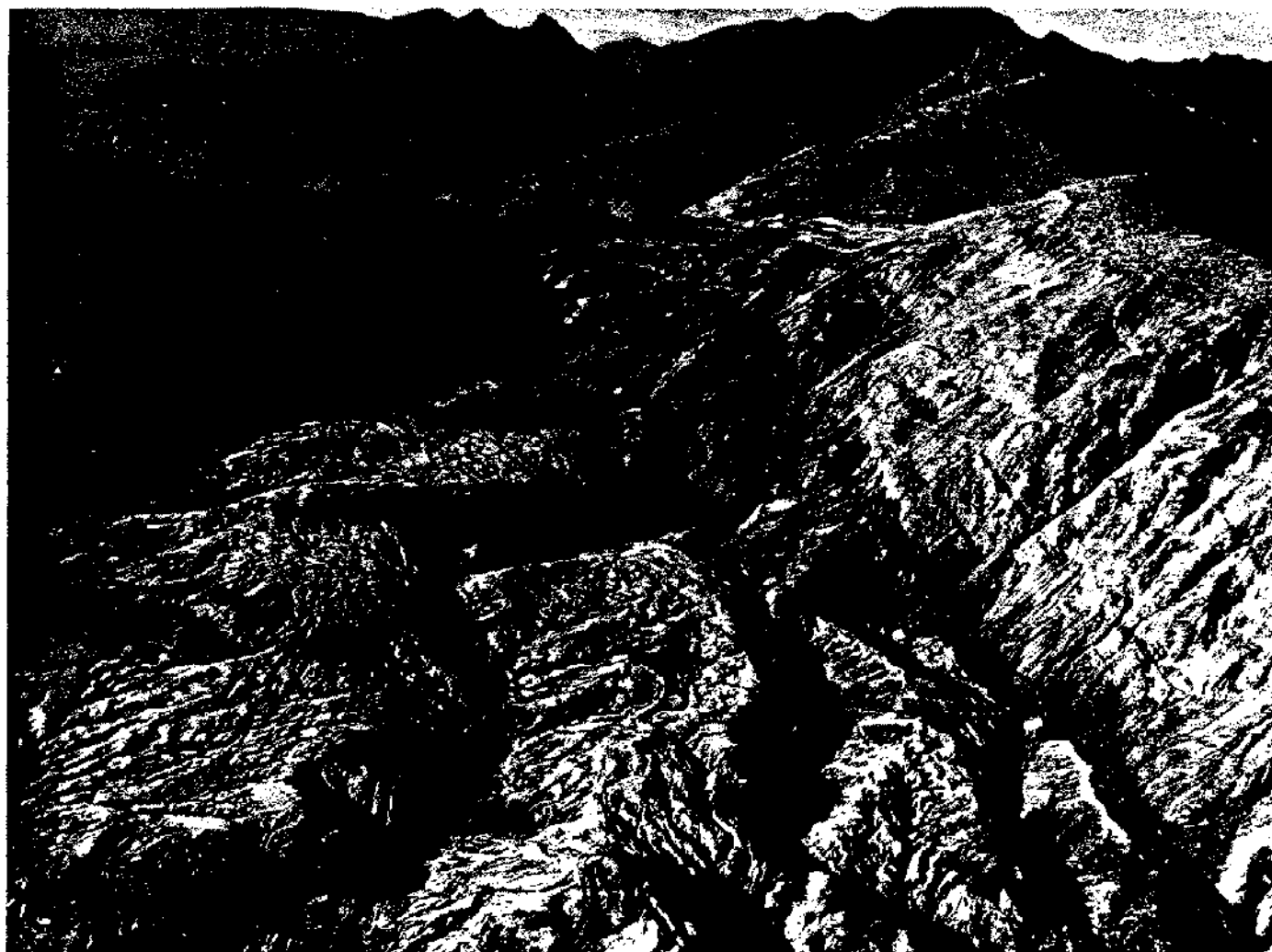
The hot gas and rock flow left a distinctive sequence of deposits in its wake. The thickness, distribution, and particle size of the blast deposit within the devastated area varies according to the distance and direction from the point of origin. About half of the deposit consists of fresh, originally hot dacite rock material from within the volcano; the remainder is chiefly mixed rock fragments from the former north flank of the volcano and entrained soil and organic material. One portion of the blast deposit, the blast pyroclastic flow unit, was derived from the pyroclastic density flow forming fill deposits in topographically low areas. The blast pyroclastic flow deposits are believed to represent especially dense concentrations of fine material within the May 18 blast cloud, as well

as material that flowed down steep slopes after initial deposition. These particular deposits contain more ash than the massive lower part of the primary blast deposit, and form valley-bottom deposits as thick as 65 feet having relatively flat upper surfaces. The location of the area affected by the blast and accompanying pyroclastic density flow is shown on Figure 24 (Geo. Resources Post May 18) as are locations of mapped blast pyroclastic flow deposits such as South Coldwater Creek and upper Smith Creek.

Debris Avalanche: Within seconds following a magnitude 5+ earthquake on the morning of May 18, 1980, the north slope of the volcano collapsed, creating one of the most dramatic mass movement events of historic time. The cumulative effect of multiple slope failures was development of an enormous avalanche of fragmental debris that flowed downslope in pulses or waves. The path of flow was strongly influenced by topography, and divided into several lobes. One lobe traveled northward for a distance of about 4 miles from the toe of the rupture surface; portions slammed into and overtopped a 985-1,250 foot high ridge and reached South Coldwater Creek (this feature

is now known as the Spillover). Another lobe traveled through Spirit Lake, causing a wave runup to 850 feet above the original lake level and raising the lake level by about 200 feet.

For about 10 minutes, the main lobe traveled down the North Fork Toutle River Valley to a distance of about 13 1/2 miles and formed a hummocky, chaotic deposit. It consists of unconsolidated, poorly sorted debris that buried about 23 square miles of terrain to an average depth of 150 feet. Its maximum thickness of 640 feet occurs north of the cone. The avalanche debris consisted of blocks of varied and uniform rock types which vary in size and shape and range from 3 to 500 feet across. Identified clasts include those from the summit dome and the Goat Rocks dome (formerly on the north flank) as well as both St. Helens and older non-related volcanic rocks. Also included were soil deposits, tree trunks, splintered wood, and glacier ice blocks as large as 40 feet across. Lahars that were mobilized from avalanche debris by excess water mantled avalanche materials and generated debris-laden floods which extended down to the Cowlitz and Columbia Rivers.



Debris avalanche overtopping Johnston Ridge: The Spillover.

Pyroclastic Flow Deposits: Pyroclastic flows are hot gas and fragmental material moving along the earth's surface at speeds of between 30 and in excess of 100 miles per hour. They occurred at Mount St. Helens as a result of the collapse of an explosive eruptive column or when bulbous masses of gas-inflated tephra erupted 500 feet or less above the crater floor and then collapsed and spilled down the rampart through the breach in the north wall. Pumiceous pyroclastic flows occurred during six major 1980 eruptions at Mount St. Helens.

The resulting deposits extend as much as 5 miles from the vent, cover an area of about 6 square miles, and have a bulk volume of about .05 cubic miles. The deposits form a fan-like pattern of sheets, tongues, and lobes of mostly poorly sorted ash and clasts of pumice and dense dacite rock material. The form of deposition and surface features which result depend on the relative proportion of block-sized pumice, volume of the flow, and the shape of the underlying surface. Those deposits with abundant pumice blocks apparently had less mobility and velocity; they formed long narrow tongues or lobes that have high, steep margins.



Pyroclastic flow deposit.

The cumulative effect of these multiple pyroclastic flows is a broad, sloping fan of deposits from the crater floor to Spirit Lake. It has the appearance of coalescing lacy sheets, tongues, and bulbous lobes with sinuous steep walled levies, longitudinal and transverse ridges, and fumaroles. Circular phreatic pits 15-300 feet in diameter and 3-65 feet deep dot this landscape. They were created when hot pyroclastic and debris flows covered water in streams, ponds and springs, causing the water to flash to steam. The upward-directed steam explosions reamed holes in the overlying deposits.



Phreatic pit.

Nearly all pyroclastic flows came to rest north of the volcano, traveling to Spirit Lake and the valley of the North Fork Toutle River. The flows banked on the north side of the valley on Coldwater Ridge and pooled in the valley and in the Spirit Lake Basin, infilling irregular topography left by the debris avalanche. Hills of debris avalanche deposits locally protrude through the pyroclastic flow deposits on the pumice plain. Some of the accompanying ash clouds traveled north across the bedrock ridge and into south Coldwater Creek, leaving thin deposits of ash.

Small pyroclastic flows came to rest high on the western, southern, and eastern flanks of the volcano, but few of the resulting deposits are widespread. Locations where these deposits remain are above the headwaters of Ape Canyon, south of Windy Pass in the headwaters of Smith Creek, and in the headwaters of the Muddy River (most of which are overlain by subsequent mudflow deposits).

Heavy Tephra Area: A few minutes after the start of the eruption on May 18, a convecting cloud of hot gas laden with pumice and ash began to billow up from the pyroclastic density flow that accompanied the directed blast. A central column developed from the vent within 20 minutes from the onset of the eruption and lasted most of the day, growing rapidly to altitudes of 75,000 feet or more. Different phases of the eruptive events blanketed the landscape with several different layers of material: 1) basal gray lithic ash containing some organic material, related to the directed blast, 2), tan pumice and rock fragments deposited from the plume of the vertical eruptive column, 3) pale-brown vitric ash related to ash clouds generated by pyroclastic flows on the north slope and to large steam explosions near Spirit Lake, and 4) fine gray ash that settled from the diminished column late on May 18 and early on May 19.

The area devastated by the lateral blast is blanketed by varying depths of one or more of these distinctive units. The heavy tephra area shown on Figure 24 (Geo Resources Post May 18, 1980) in addition to the blast deposits, is covered by a substantial thickness of airfall tephra (material layers 2 and 4). Prevailing winds on May 18 carried ejected material from the vent in an east-northeasterly direction, winnowing the material with coarser sizes and greater depths closer to the cone in a lobe-shaped deposit.

Explosive volcanism accompanied by tephra deposition have characterized previous eruptive episodes at Mount St. Helens. The thickness and volume of the combined tephra of May 18 are similar to those of the major 19th Century airfall deposit, but are an order of magnitude (ten times) less than the largest prehistoric tephra units from the volcano. Correlations and comparisons can be made between individual airfall deposits and variations in eruptive behavior, changing composition and volume of erupted magma, direction and velocity of upper winds, effects of wind fractionalization, and with earlier ash deposits from Mount St. Helens and other similar volcanos.

Mudflow Deposits and Effects: Destructive lahars developed within minutes of the beginning of the May 18 eruption, as hot pyroclastic debris melted snow and glacial ice on the upper slopes of the cone. Large areas of the volcano above timberline were scoured by lahars on the morning of May 18, especially on the east and west flanks. Many mudflows stopped on the lower flanks of the volcano, and others were dammed temporarily behind debris deposits; many, however, coalesced and began to move through the major drainageways. These lahars descended Muddy River, Pine Creek and the South Fork Toutle River drainages. In the upper reaches of these drainages, the flows appear to have originated as wet lithic avalanches, locally reaching velocities of as much as 100 miles per hour. As velocities decreased away from the mountain, these avalanches changed into mudflows. The mudflows, which were laden with logs and forest debris, took out roads and bridges on the southeast side of the mountain.

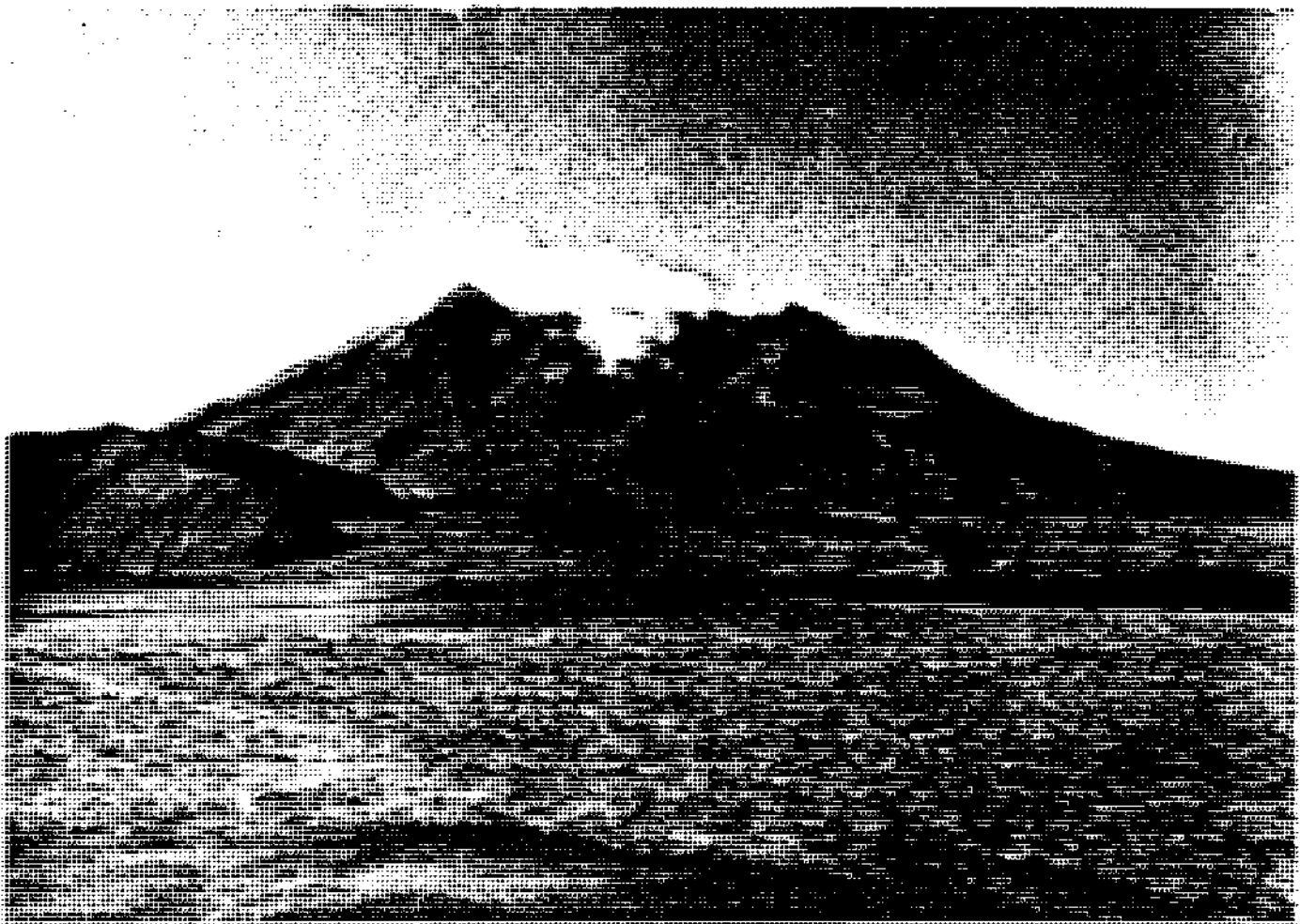
The most voluminous mudflow originated by slumping and flowage of water-saturated deposits of the debris avalanche in the upper North Fork Toutle River Valley. It was made up of many smaller mudflows and took hours to develop because individual small flows crossing the hummocky surface of the avalanche deposit became ponded in closed depressions and could break out and merge with adjoining mudflows only after filling the depressions. In the process, the mud picked up heat from the volcanic materials in the avalanche deposit and became steaming hot. This mudflow did not reach peak stage until the early evening and night of May 18. Combined with the major mudflow which traveled down the South Fork Toutle River, this mudflow destroyed homes, roads, and bridges, vehicles and equipment, and inundated broad areas of the Cowlitz River floodplain.



South Fork Toutle River Mudflow.

Although the largest 1980 lahars were devastating in their impacts on channels and floodplains, the effects were less than those of some earlier pre-1980 Mount St. Helens lahars.

Alteration of the Cone, Including the Breached Crater: Volcanic activity approximately 350 years ago at Mount St. Helens climaxed with the extrusion of a dacitic dome at the summit of the volcano. During the earthquake activity and explosive steam and ash emissions between March 20 and May 18, 1980, a new crater began to form on the north side of the volcano's summit accompanied by fumaroles, ground ruptures, and "bulging" on the north flank. This activity shattered the 350 year old summit dome. On May 18, following a magnitude 5+ earthquake, the entire north flank gave way. The slope failed along a surface intersecting the newly formed crater at the summit followed by a succession of multiple, retrogressive slope failures, and the failed material cascaded north and west to form the resulting debris avalanche. As a result of the removal of the north flank, collapse of the summit, and eruptive enlargement of the crater, the appearance of the cone was radically altered. The peak was reduced in elevation by 1,300 feet crested by a jagged rim enclosing a crater open to the north. The horseshoe-shaped "amphitheater" has a precipitous drop of approximately 2,000 feet from rim to crater floor, which is approximately 3/4 miles wide. An estimated 0.6 cubic miles of material failed from the mountain, including complete removal of two glaciers from the north flank of the volcano and the removing the upper portion of most others. Seventy percent of the glacier volume that had existed before May 18 was removed. The slide boundary was probably somewhat influenced by layering within the modern cone and the shape and strength of the underlying older Mount St. Helens deposits. The boundary is nearly at the base of the steep volcanic cone on the north side.



Breached crater on the north flank.

New Lava Dome: In early 1985, the dome in the volcano was some 800 feet high, its basal diameter 2,500 feet. The dome covered approximately 40 percent of the crater floor. Two earlier domes were destroyed by subsequent eruptions. The volcano's dacite lava has a pasty consistency when it is molten, and it tends to pile up over the vent rather than to flow laterally. The dome has a rough, shattered appearance in part due to rapid cooling but mostly from the expansion and shattering of the solidified outer crust as more molten lava is forced upward by the great pressure in the magma chamber underlying the volcano. The magma column seems to be rising intermittently. The outer solidified shell of this magma column is an imperfect seal, and fluctuating amounts of gas continuously escape to the atmosphere.



New lava dome.

Reworked Volcanic Deposits: During the May 18, 1980, and subsequent explosive eruptions, material was deposited on the cone of Mount St. Helens. This hot material melted snow and ice, generating mudflows which in some locations traveled down valleys adjacent to the mountain. Some of this material remained on the cone and precipitation, snowmelt, and erosion moved a portion of this remaining material downslope to the base of the volcano. This shifting material has continued to move down minor tributaries and some of the material has been deposited in the vicinity of Kalama Springs and the upper portion of the Cave Basalt Flow. In some areas of timber not directly affected by the eruptions, the material has been deposited in sufficient depths to result in tree kill. It has also directly affected several roads in the vicinity of Ape Cave.

Pre-1980 Features

Pine Creek Assemblage: Pyroclastic flows and lahars swept down the southeast side of Mount St. Helens 2,500-3,000 years ago during the Pine Creek Eruptive Period. These materials aggraded (filled) the Pine Creek Valley; since then the stream has downcut through these deposits, exposing them in steep valley walls nearly 200 feet high in places. The assemblage was formed during two or more episodes of explosive volcanic activity at an old Mount St. Helens volcano which coincided with, but predated the modern cone. This valley fill extends from the base of the modern volcano southeastward to the Lewis River Valley and thence 40 miles downstream. In the Lewis River Valley the deposit is mostly concealed by three large reservoirs.

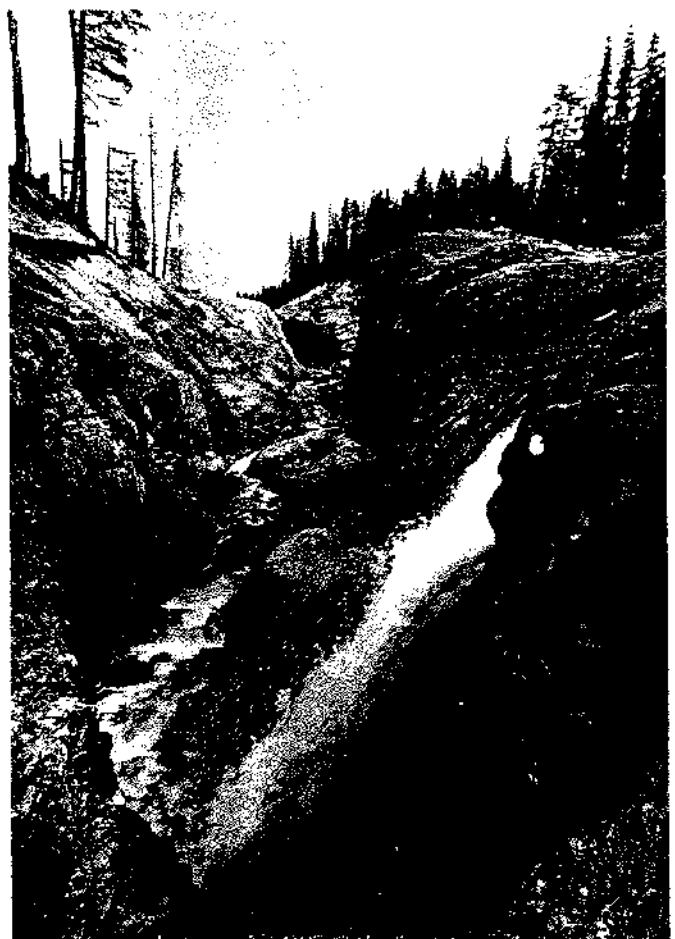
Sugar Bowl: During the Sugar Bowl Eruptive Period (1,150 years ago), a dacite dome was extruded on the north slope of the volcano. This dome is a high knob on the northeast flank of the breached crater.

Andesite Lava Flows: Known as the "worm complex" because of the appearance of its flow structures, this andesite lava flow, approximately 300-400 years old, was extruded near the former summit and flowed part way down the southeast flank of the cone. This eruption occurred during the Kalama Eruptive Period and was followed by the extrusion of the dacite dome which formed the summit of the volcano prior to May 18, 1980.

Cave Basalt Flow: Approximately 1,900 years ago, during the Castle Creek Eruptive Period, fluid lava was extruded from a vent on the south flank of Mount St. Helens and flowed down a stream valley incised in older pyroclastic flow deposits. The upper part of the lava flow is covered by younger lava and pyroclastic flows and is poorly exposed. Vertical and horizontal tree molds (also referred to as tree casts or wells) are common near the flow margins and are particularly well displayed in the vicinity of Lake Cave. Other common surface features

includeropy or corded textures, pressure ridges, and tumuli that are often cracked or collapsed (a tumulus is a dome shaped circular solid or hollow surface feature). Most of the known hollow tumuli of the Cave Basalt are collapsed, leaving raised-rim craters. An extensive subsurface network of lava tubes developed within the flow. In some areas, portions of the tube roof have collapsed forming small openings or skylights, and such openings provide access to uncollapsed portions of the tube. These resultant linear caves have developed parallel to the direction of lava flow. Lava flowed around an older bedrock knob, resulting in a heavily vegetated "island" within the more sparsely vegetated basalt flow.

Muddy River Falls: One of the impacts of the mudflow which coursed through the Muddy River Gorge was the removal of soil and vegetation high on the canyon walls. The newly exposed strata offers evidence of many previous events dating as early as 13,000 years ago. These strata include a bed of till (nonsorted material deposited by a glacier), several old pumice layers, and an intracanyon lava flow. This flow, approximately 2,000 years old, is relatively resistant to erosion, resulting in spectacularly prominent rock columns and waterfalls within the canyon.



Muddy River Gorge.

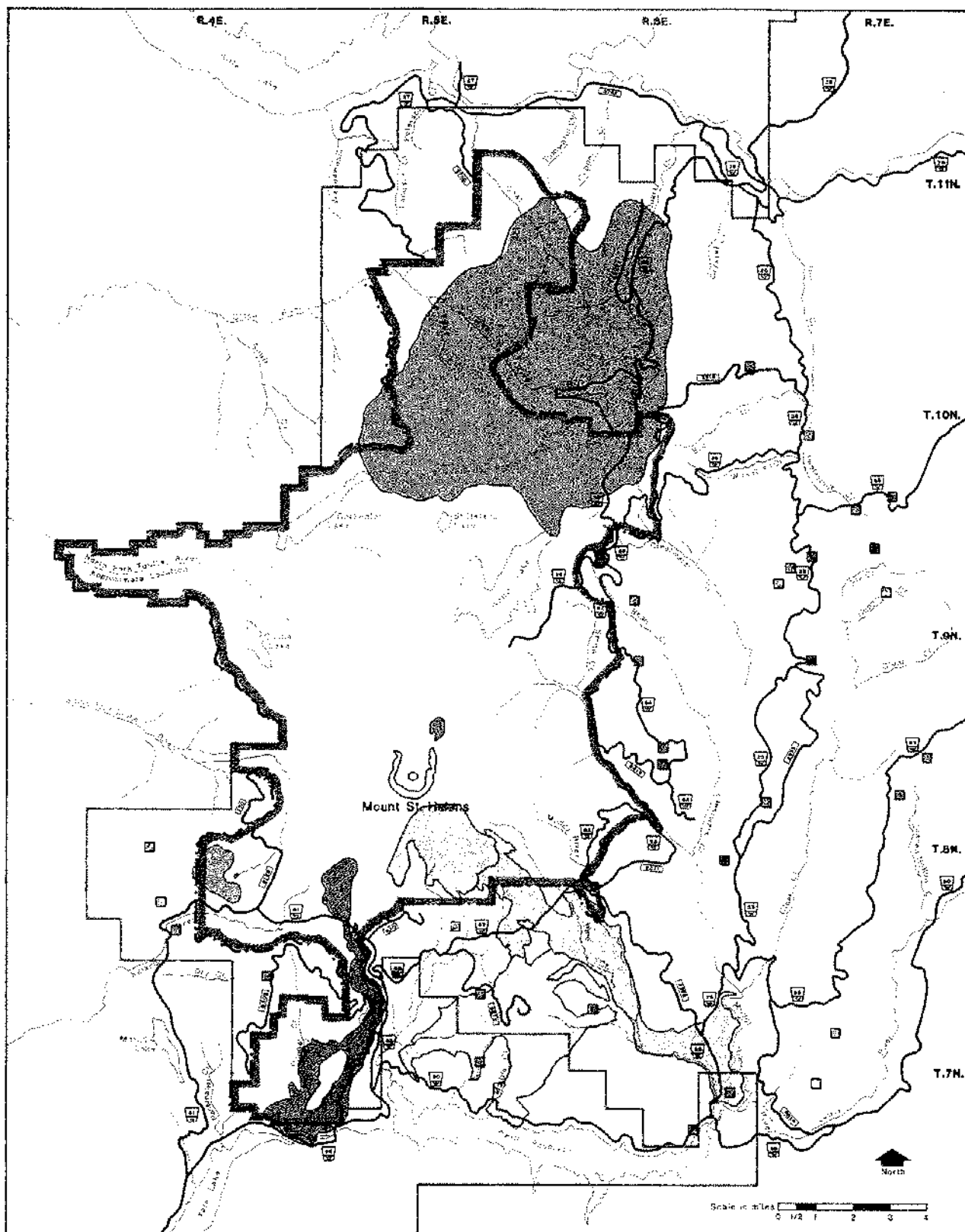


Figure 25

Adjacent Features Not Directly Related to Mount St. Helens Volcanism

(Also shown on Figure 25, Pre 1980 Geological Features)

Marble Mountain: Approximately 10,000 years ago, a series of volcanic eruptions produced Marble Mountain, a broad, low landform known as a shield volcano. This volcano consists of a fluid type of lava (basalt) which flowed rapidly away from the vent, and minor accumulations of cinders and volcanic bombs.

Goat Mountain: Goat Mountain, west of Mount St. Helens, is a volcanic plug approximately 2 million years old. Being relatively resistant to erosion, it is seen today as a prominent steep-sided landform.

Spirit Lake Pluton: The prominent highlands north of Spirit Lake and to a minor extent Goat and Strawberry Mountains to the north and east are the Spirit Lake Pluton. This intrusive rock body is approximately 16 million years old; it was formed from molten rock material which cooled beneath the earth's surface. Subsequent regional uplift and erosion has exposed the resistant rock material.

Other Geologic Resources

Caves are a geologic resource of considerable importance in the Monument. The Cave Basalt lava flow, which emerged from the south flank of the volcano approximately 1,900 years ago, was

of a particularly fluid nature and formed many lava tubes. To date, 37 caves have been discovered in accessible portions of the tubes. Many of the caves are nondescript, but several are of international significance.

To better understand the value of this cave system, Forest specialists met with speleologists most familiar with the Cave Basalt area in 1981. A matrix system was developed to rate the significance of caves on a scale of 1 to 5. Categories included geologic, biologic, cultural, interpretive, and research values, appeal to speleologists, and appeal to the public. For geologic values, those with a 4 rating contain unusual features or exhibit geologic processes not often found within the region. Those with a 5 rating contain unique features or processes found in few other caves in the world. By assigning the highest value to four caves in this area and the next highest to five, resource planners attested to the importance of the Cave Basalt area. The area's biological and cultural significance are discussed in other portions of this chapter.

The location of the Cave Basalt flow is shown on Figure 25 of this document.



Entrance to one of many caves in the cave basalt lava flow.

Common Variety Mineral Materials are primarily rock materials for road construction and stream protection. Locations where these sources have been developed adjacent to the Monument are shown by category (developed, closed, depleted) on Figure 25.

Locatable Minerals: (See Mining Activity, below).

Geothermal: Although great interest in the geothermal resources around Mount St. Helens has been generated by the volcanic activity, tests conducted prior to the 1980 showed little promise of economically recoverable geothermal resources. In 1979, three shallow temperature gradient holes were drilled near Mount St. Helens in an attempt to find indications of subsurface heat. Results of the tests, financed by the State of Washington, were inconclusive; temperatures found were lower than expected.

Groundwater: A comprehensive inventory of the groundwater resources in the Monument is lacking at the present time. When groundwater evaluation and development is required, it will be done on a site specific basis.

Geologic Conditions and Processes

Land transformed by the volcano is discussed from many perspectives in this document. This section began with a description of Geologic Features of significance to scientists and the viewing public. A later section, Volcanic Hazard & Associated Risks, considers the volcano as a potential threat to public safety. Here they are "geologic forces" as described by the Act (Sec. 4 b1): unique conditions existing on the pyroclastic flow, blast pyroclastic flow, debris avalanche, and mudflow and tephra deposits as well as the potential hazard of slope failure outside of these deposits. Conditions on the recent volcanic and volcano-related deposits include oversteepened, unstable slopes beside newly formed stream channels, debris flows on steep slopes, and rill and gully erosion. (See discussion of the hydrologic dimension of these conditions below.) A recognition of the sensitive nature of this terrain is critical in planning developments within the Monument.

Figure 26 shows the location of the two forms of slope failure, slides and debris flows. Although this Figure does not show slope failures west of Mount St. Helens, failures do exist in those areas. Unfortunately, this area has not been mapped in detail; it will be closely evaluated during project planning and design. A more detailed description of these and another failure mode, rockfall, and their significance follows:

--Slides: This form of ground movement, including slumps and earthflow, is rotational and/or translational failure in soil, bedrock, or both types of material. Several slides of this type existed in and immediately adjacent to

the Monument prior to the 1980's eruptions. The destruction of live vegetation by the May 18, 1980, blast may lead to accelerated or reactivated slide movement. Reduced evapotranspiration is likely to persist for decades in the blast area because plant recovery is slowed by the deposits of nutrient-deficient tephra. Reduced evapotranspiration could, however, be partially offset by the lower infiltration capacity of the tephra deposits compared to typical forest soil.

This type of failure can pose a significant hazard to transportation and other facilities in design, construction, and maintenance.

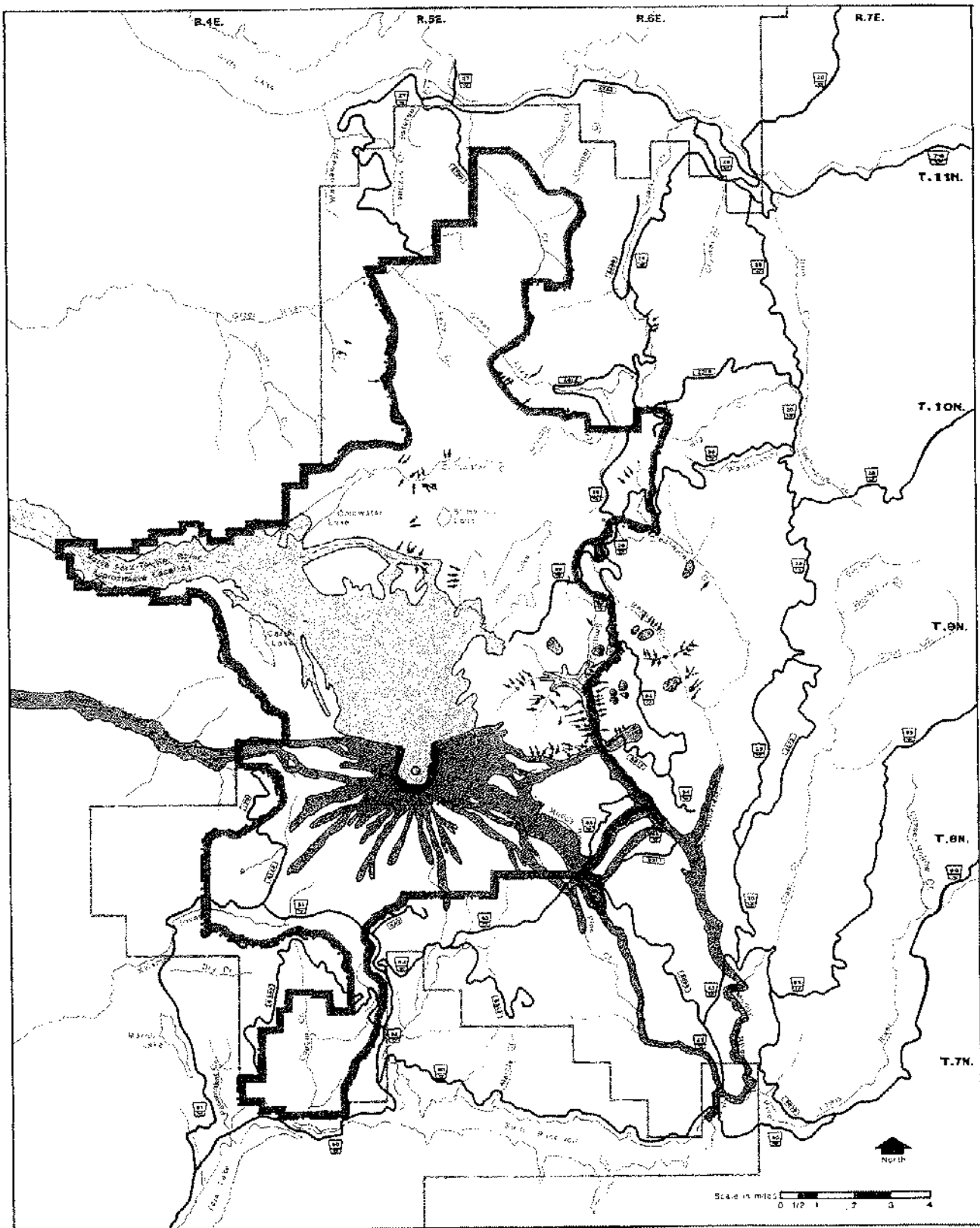
--Debris Flows: These features include debris slides, debris flows, and debris avalanches. The materials involved include soil, partly or completely decomposed bedrock and/or a combination of these materials. Such failures occur as a result of saturation of the deposit which increases pore pressure and reduces cohesion. Movement consists of rapid progressive failure and liquifaction of the mass, with consequent flow of the fluidized mass downslope. Flows most commonly originate on slopes of 25-45 degrees. The path taken by flowing debris is controlled by local topography and generally follows stream courses.

Shallow flows are common in steep mountain terrain mantled with granular soils, typical of land surrounding Mount St. Helens. Conditions leading to this type of failure are perhaps somewhat exaggerated in and adjacent to the Monument because of a large area with deep (greater than 12 inches) tephra deposits from pre-1980 eruptive episodes. A significant increase in this type of mass movement has occurred since 1980, and the number of new failures has increased yearly. A significant number appear to have occurred in 1980, triggered by groups of trees blown off of steep slopes with shallow soils. Since then, most have occurred during the wet seasons in areas of downed timber.

Rockfall: This phenomenon and resulting talus deposits are common in steep areas predominated by rock cliffs. Caused by toppling and fall-type failures due to mechanical weathering processes, rockfalls present a hazard to people or facilities downslope. Within the Monument, rockfall is particularly evident on the crater walls. Active rockfall in some portions of the crater has built talus slopes which abut talus from the newly formed dome.

Other Geologic Conditions & Processes: The location of the deposits discussed below are shown on Figure 26.

Mudflow Deposits and Effects: The present channels affected by mudflows are unstable and are adjusting rapidly to changes in sedimentation and hydrologic conditions. Continued erosion will release much sediment from previously stable pre-1980 channel and



Legend

- | | |
|--|-------------|
| National Monument Boundary | Slide |
| National Forest Boundary | Debris Flow |
| Existing Roads | |
| Streams | |
| Pyroclastic Flow and Debris Avalanche Deposits | |
| Mudflow Deposits | |
| EFFECTS | |
| Rock Fall | |

Geologic Conditions

Figure 26

floodplain deposits, as well as from sediment deposited on May 18, 1980, and since. In the upper portions of drainages affected by mudflows, mud and debris "ran up" the sides causing considerable scour and removal of vegetation, soil, colluvium and older mudflow deposits and producing some oversteepened, unstable slopes outside the channel. Rapidly fluctuating runoff, changing channels, and bank failures present a hazard to people, and complicate the location of roads and structures.

Pyroclastic Flow and Debris Avalanche Deposits: Pyroclastic flow and debris avalanche deposits north and west of the volcano and the blast deposit in the area affected by the May 18, 1980 lateral blast, though unique geologic resources, also present a potentially hazardous condition to people and particularly to roads and structures. The soil deposits are granular in nature and exhibit low infiltration capacities and increased susceptibility to rill and channel erosion. Since pre-existing drainage channels were severely disrupted, new drainage channels are still developing. The result is a continually changing landscape characterized by rapidly forming deeply incised channels with oversteepened potentially unstable banks. This is a potential hazard to foot travelers; facility design and location would be difficult.

Area of Heavy Tephra Deposition: Prevailing winds on May 18, 1980, resulted in the heaviest deposition of tephra northeast of the volcano. This area was previously characterized by steep slopes and incised drainages. Soil here is also granular with low infiltration capacities creating a condition favorable to the development of rills and gulleys and greatly increasing the risk of debris flows. This is shown by the large concentration of debris flows in the tephra area, Figure 24.

WATERSHED RESOURCES

Rivers and Streams

The Mount St. Helens National Volcanic Monument lies at or near the headwaters of three major river basins: the Toutle River, including the North and South Forks and the Green River; the Lewis River with its principal tributaries, the Muddy River and Pine Creek; and the Kalama River.

The approximately 138 miles of perennial streams within the Monument can be characterized by the type of damage inflicted by the May 18, 1980, eruption and lateral blast. Three basic groupings are possible: those channels mainly north/southwest of the mountain, which were essentially untouched and have their basic stream and riparian ecosystem intact; those channels affected only by the lateral blast and rainfall ash and pumice; and those additionally affected by volcanic mudflows and/or pumiceous pyroclastic flows which occurred in front of the mountain. The Green River and its tributaries

are examples of the second grouping. There are large amounts of woody debris in and across these channels and they carry an increased sediment load resulting from direct deposition of tephra by the initial blast and from hillslope erosion. The Muddy River, Pine Creek, and the North and South Forks Toutle River were all affected by volcanic mudflows and represent examples of the third grouping. In addition, the upper portions of the North Fork Toutle River were severely impacted by the primary debris avalanche. New channels cut by the rivers through these deposits account for much of the sediment load. Woody debris that existed previously in these channels was either buried during the volcanic event, transported out of the system, stored in debris piles along the banks, or is embedded in the volcanic mudflows.



Clearwater Creek.

Hydrologic monitoring, conducted by the U.S. Geological Survey, is continuing within the Monument. The objectives of data collection and analysis are to define conditions before and immediately after the eruptions and to monitor hydrologic changes over time (Figure 27, Gaging Stations). In conjunction with the above, the Soil Conservation Service operates a series of snowpack gaging stations and the National Oceanic and Atmospheric Administration operates precipitation gages. They provide an overall network to assess the hydrologic response of the volcanically affected watersheds and provide early warning to downstream communities of potential high water or flooding, which can be either volcanically or climatically induced. The following stream or lake gaging sites have been identified as critical for the early detection of flooding: Spirit Lake West, Spirit Lake Hummock, Coldwater Lake #1, Coldwater Lake Exit Channel, Castle Creek Lake, Elk Rock 3, and South Fork Toutle River near Spotted Buck Mountain (Childers, 1982). The above gages and a series of auxiliary gages used to track flood peaks downstream are all operated by the U.S. Geological Survey.

Soils and Sedimentation

The May 18, 1980, eruption of Mount St. Helens and subsequent events delivered thick deposits of landslide debris, pyroclastic and mudflow materials to major drainages. The Toutle River drainage was impacted most severely. Partial or complete removal of pre-eruption soil occurred on some slopes to the north of the volcano as a result of the blast or wave action from lakes.

New airfall pumice and ash (tephra) were deposited over the Mount St. Helens National Volcanic Monument in depths ranging from one inch south and southwest of the volcano to 22 inches northeast of the volcano. Depth and texture of tephra varies with distance and direction from the mountain. For a short time after the eruption there was at the surface a 1/4 to 1 inch crust of fine silty ash. Erosion has since altered this layer, leaving coarse pumice exposed over much of the surface.

Before the eruption, forest soils, rich in organic matter at the surface, had relatively good water infiltration and overland flow was extremely rare. Immediately following the eruption, surface runoff, because of the thin ash crust, drastically increased. This increased the rate of erosion. As a result, sediment transport to downstream areas is an ongoing problem. Debris avalanche and stream bank erosion has also generally increased.

There are three major sources of sediment to streams within the Monument: ejected volcanic ash and tephra deposited either directly in the channels or on the hillslopes in the blast area; debris avalanche and pumiceous



Highly eroded streambanks.

pyroclastic flow deposits in the upper 13.5 miles of the North Toutle Valley; and volcanic mudflow deposits, from 3 to 15 feet deep, in the major channels. The relative contributions of each of the sources to the sediment load of the streams has and will continue to change through time with increasing infiltration rates of surface deposits affecting hillslope hydrology (Swanson, et al, 1982). Channels stabilize as natural revegetation of denuded slopes progresses.

Sediment derived from airfall ash and blast ejecta is transported by erosion from hillslopes to tributaries, then to mainstem channels. The impact of blast and tephra deposition has resulted primarily in changes in hillslope and low order tributaries, with relatively minor changes in mainstem channels. The debris avalanche and volcanic mudflows, however, have directly affected channel form and processes in mainstem channels (Lisle, et al, 1982). The movement of sediment in blast affected channels is a complex process. Aggradation and degradation are interrupted by periodic erosive debris torrents triggered by surficial landslides or the breakup of sediment storage area, such as those behind debris jams.

The mudflows completely or partially buried the pre-eruption channels and as new ones are established, especially during winter flood events, the sediment loads of these channels will remain high. These winter floods or high flows have incorporated large sediment loads by enlarging channels and by migrating laterally against highly erodible banks (Lisle, et al, 1982). The debris avalanche in the North Fork Toutle River will be a source of sediment for years to come. The U.S. Army Corps of Engineers has estimated in its Comprehensive Plan that the debris avalanche can be expected to yield a total of between 750 million to 2 billion cubic yards of sediment.

In the first year after the eruption, most of the total sediment yield for the North Fork Toutle Watershed (19 million cubic yards) was contributed by the debris avalanche, 77 percent. Hillslope erosion contributed 16 percent, the North Fork Toutle mudflow, 5 percent, and the tributary channels, 2 percent (Lehre, et al, 1981). Current studies by Collins (1982) indicate that hillslope erosion has decreased significantly since the winter of 1981-82. The rate of erosion appears to have decreased because readily mobilized material was removed the first winter, less transportable particles armored the surface, and the infiltration rate increased (Swanson, et al, 1982).

Revegetation of the area will bring further reduction in erosion but this is expected to proceed slowly; sediment delivered by streams and rivers will remain high for many years to come. Stevens, et al, (1981) pointed out that initial natural revegetation in the blast area resulted from species present before the eruption. These species emerged through the tephra from surviving roots. The blast altered the plant community the first growing season by screening out those species highly dependent upon seed propagation and those whose roots were unable to penetrate the tephra deposits. Exceptions to the slow recovery of vegetation in the blast area occurred at higher elevations on Mt. Margaret and a number of other, widely distributed areas. In these places, snow still blanketed the ground and protected herbs, shrubs, and understory conifers.

Slope Failures: Mass wasting by landslides and debris avalanches, compared with pre-eruption conditions, increased immediately in areas where tree roots were ripped from the soil by the lateral blast. Swanson, et al, (1982) projects a higher incidence of landslide failures and debris avalanches as a result of strength loss due to decay of root systems not pulled from the soil by the blast. Thus, most landslide activity may occur in the first few years after the May 18, 1980, eruption. Landslide frequency will probably increase over the next several years then decline after the most unstable sites have failed. Swanson, et al, (1982) speculate the decline of landslides will be likely to occur before revegetation and the contribution of revegetation to root strength are significant. Long-term stabilization will occur when native tree species are re-established and have grown extensive root systems.

Natural processes providing research opportunities include mass movement and more gradual erosion, soil development including weathering and mixing of new tephra and old soil, regrowth of surviving plants, and colonization by new.

Floodplains and Wetlands

Most of the major floodplains are defined by the lateral limits of the mudflows that filled the valley bottoms of the North and South Forks of the Toutle River, Smith Creek and the Muddy River. The relatively flat, low-lying areas along the other major streams are also considered to be floodplains for the purposes of this plan--i.e., along the Green River and the Kalama River. Narrow floodplains along many of the smaller streams are approximately identified by associated riparian areas or evident high water marks.

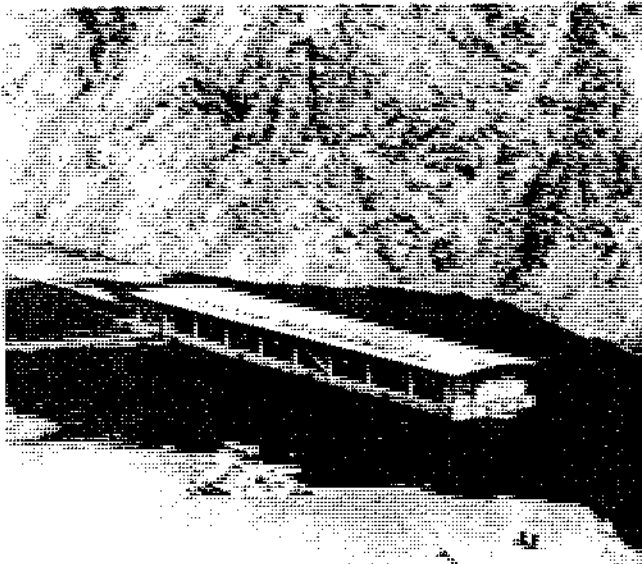
Wetlands--marshes, wet meadows and shallow ponds--are areas inundated often enough to support a prevalence of riparian vegetation and aquatic life. The largest wetlands occur in the Goat Marsh Research Natural Area (206 acres) and on the lower slopes of Mount St Helens, northeast of Marble Mountain (357 acres). Smaller wetlands occur throughout much of the Monument, typically adjacent to small lakes and floodplains. Most wetlands located within the area devastated by the May 18, 1980, eruption were destroyed or are being filled with sediment from hillslope erosion. New wetlands will undoubtedly develop as the area becomes stabilized.

Executive Orders 11988 (Floodplain Management) and 11990 (Protection of Wetlands) direct that action be taken to avoid, to the extent practicable, the long and short-term adverse impacts associated with the occupancy and modification of floodplains and the destruction and modification of wetlands.

Natural Impoundments

The May 18 eruption and accompanying debris avalanche in the North Fork Toutle River blocked North and South Coldwater and South Castle Creeks, creating new lakes of 805 acres and 315 acres respectively. In addition, the debris avalanche completely filled the pre-eruption Spirit Lake causing the water surface to rise 206 feet to elevation 3,404 feet. By the autumn of 1981 Spirit Lake had risen an additional 26 feet. The lake elevation was approximately 3,452 feet by the winter of 1985. Responding to a potential threat of a catastrophic breach or overtopping of the debris avalanche, the U.S. Army Corps of Engineers (COE), at the direction of the President and the Federal Emergency Management Agency, and in consultation with the Forest Service, established an interim pumping station in the southwest corner of the lake. This pumping station consisted of a barge-mounted pumping facility capable of discharging 180 cfs (cubic feet per second) of water through 3,650 feet of buried 60-inch-diameter steel conduit leading downstream to a concrete stilling basin.

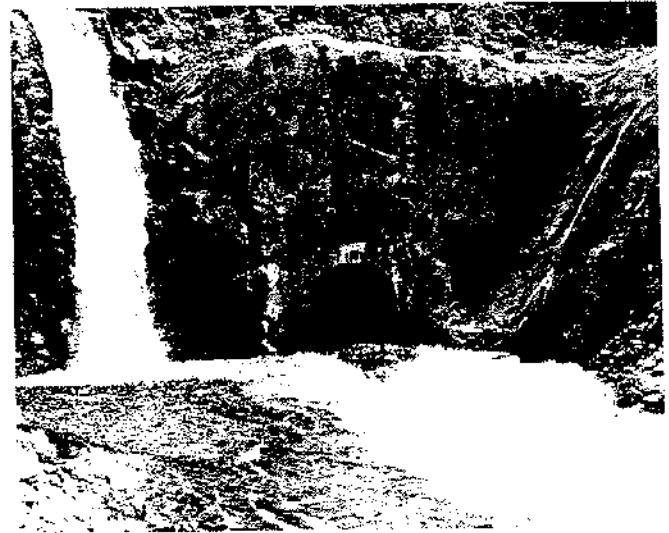
The outflow was discharged across the debris avalanche eventually to the North Fork Toutle River. The outflow followed an existing small channel which initially was greatly enlarged by the discharge, but tended to stabilize over time. An access/service road was constructed from Windy Ridge, across the debris avalanche to the pumping station. The road was of native materials and followed the natural landforms as much as possible. Temporary housing and workshops were constructed on the lakeshore and storage tanks for up to 600,000 gallons of fuel were on site. This pumping facility was designed and used as a temporary measure, and is to be removed by the end of the summer, 1985.



U.S. Army Corps of Engineers Spirit Lake pumping station.

Alternative permanent control measures were evaluated in a Final Environmental Statement, published by the COE in April of 1984. Six action alternatives and a seventh No Action alternative were evaluated. The selected alternative was a tunnel, through Harrys Ridge, draining Spirit Lake water into South Coldwater Creek, which flows into the North Fork Toutle River. At completion, Spirit Lake was lowered and will be maintained at an elevation of 3,440 feet with a resulting lake size of 2,580 acres. Work on the tunnel began in July 1984 and was completed in April 1985. The tunnel which is approximately 8,500 feet long and 11 feet in diameter was constructed using a tunnel boring machine. The COE constructed an access road to the tunnel outlet that crosses the debris avalanche and continues up South Coldwater Creek. The road is constructed of native materials with minimum cut and fill slopes and was constructed on the sidehill just above the debris avalanche deposits in South Coldwater Creek. Temporary housing and workshops were constructed on the debris avalanche below Coldwater Lake. Lake drawdown began in April 1985 and was done in 100 cfs increments with an

allowable peak discharge of approximately 500 cfs. Lowering the lake to elevation 3,440 feet required discharging approximately 2.8 billion cubic feet of water (21 billion gallons), or about 65,000 acre-feet plus inflow.

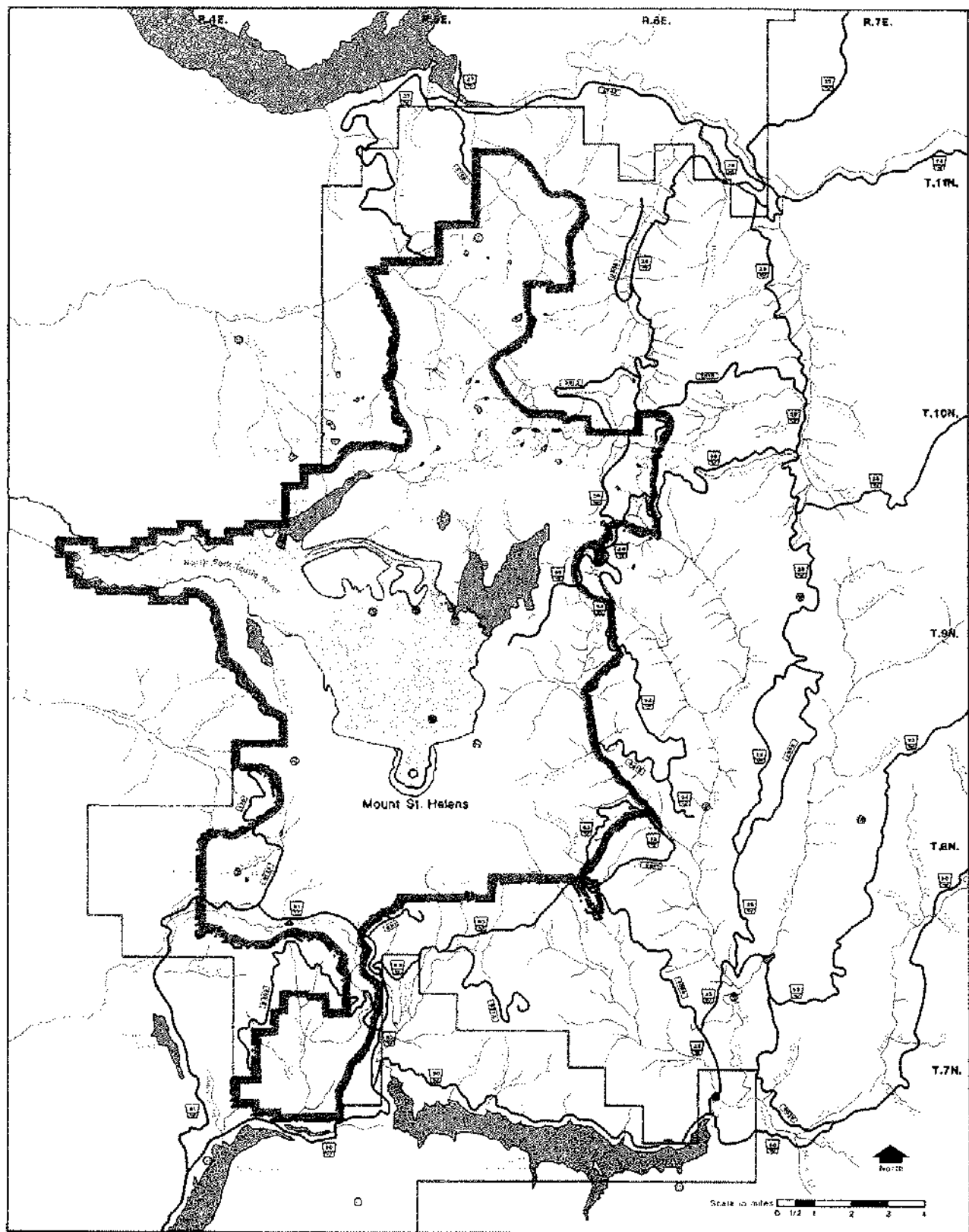


Spirit Lake Tunnel outlet into South Coldwater Creek.

In addition to Spirit Lake, exit channels were constructed on Coldwater and Castle Lakes in 1981. The breach level of Castle Lake is 2,557 feet and that of Coldwater Lake is 2,470 feet. At Coldwater Lake, construction equipment was used to modify the irregular surface of the debris avalanche deposit, filling in low spots which could conceivably have formed an uncontrolled outlet for the lake. This modified area was used in 1984-85 for the temporary housing and workshops needed for tunnel construction crews.



Castle Lake formed when the debris avalanche blocked South Castle Creek.



Legend

- | | |
|---|--|
| National Monument Boundary | USGS GAGING STATIONS |
| National Forest Boundary | Geo-Stationary Earth Satellite Telemetry |
| Existing Roads | SCS SNOTEL STATIONS |
| Streams and Lakes | Meteor-Burst Telemetry |
| North Fork Toutle River Permanent Channel Not Yet Established | NOAA PRECIPITATION STATIONS |
| | Microwave Telemetry |

Water Resources

Figure 27

The Forest Service and the COE signed a Temporary Land Use Agreement that runs from May 1, 1984, through August 31, 1986. The agreement calls for the removal of construction equipment and materials by the above termination date. Temporary improvements installed or developed on National Forest lands will be removed unless abandonment of such improvements in place is agreeable to the Forest Service. Present plans calls for the pipeline from the pumping station to be filled with granular material and left in place. Above ground portions will be cut off and any depressions filled. The stilling basin will be filled with granular material and covered with rock to prevent erosion. The pumping barge, housing facilities and workshops will be removed and the area contoured to appear natural.

Lakes and Lake Fisheries

A total of 48 perennial lakes covering approximately 3,750 acres are within the Monument (Figure 27, Water Resources). Many are small, subalpine lakes located in the Mt. Margaret range north of the mountain. The lakes in the Monument experienced varying degrees of alterations in their water quality and plant and animal life. Those some distances from the mountain and covered with snow and ice experienced the least effect.

Lakes that were in the path of the debris avalanche were most greatly affected. Lakes and newly created ponds located on the north side of Mount St. Helens and close to the mountain experienced major alterations in water chemistry and aquatic life. Heat from the initial blast deposits caused temperature increases. An enlarged (2,560 acres) Spirit Lake had a water temperature of 90.9° F (32.7° C) at the surface on May 19, 1980, compared with a typical May surface water temperature of 50° F (10° C) (Dahm, et al, 1981). The water quality of lakes was severely degraded as a result of the debris avalanche and lateral blast. In addition to great quantities of volcanically ejected materials, a large volume of organic debris from the surrounding coniferous forest ecosystems was deposited. Bacterial populations increased as a result of the enriched supply of inorganic nutrients, the abundance of organic carbon leached from the woody debris, and the elevated water temperatures (Dahm, et al, 1981). By August 1980, biological communities in some lakes shifted entirely to communities that can live in water which contains no oxygen.

The major impact to most of the lakes in the Mt. Margaret Backcountry was in the effect on plankton and benthic communities. This was due to highly turbid water conditions caused by the suspended volcanic ash. However, these lakes still contained intact, although reduced, populations of plankton, aquatic insects, crayfish, and freshwater clams. Vertebrates such as salamanders and fish also survived the eruption in these lakes. By 1982, most of these lakes were no longer turbid and plankton communities were at or near pre-eruption levels.

In the years following the May 1980 eruption, inflow of water from rain and snow has generally improved the water quality of Monument lakes. Present water quality conditions in nearly all of the lakes are at or near pre-eruption levels, and the biological communities have responded correspondingly. Lakes on the south and west side of Mount St. Helens were affected only by small amounts of ash. These lakes are at or near pre-eruption conditions. Spirit Lake has also responded in a similar manner, with turbidity greatly decreased and dissolved oxygen levels adequate for most pre-eruption aquatic organisms, including fish.

The condition of lakeside riparian habitat varies widely. Vegetation is recovering slowly around the devastated lakes. The distribution of shrubs is irregular, depending upon the distance between the lake and the volcano as well as the degree of winter erosion and deposition of tephra (McKee, undated). The heavily impacted debris avalanche lakeshore of Spirit Lake will recover very slowly. On blast area lakeshores, shrubs, forbs, and grasses are recovering from surviving rootstock in protected sites. Down logs crisscross the littoral and riparian zones of some lakes, and these down logs and scattered standing dead trees replace the older timber stands which once surrounded the Mt. Margaret lakes. Lakes in the Vanson area and on the south side of Mount St. Helens are still surrounded by green forest which was affected to varying degrees by ashfall.

Potential riparian habitat for wildlife is greatest in lake basins which are broad, rather than steep walled, cirque lakes, and where lakes have adjacent wetlands, cliffs, talus slopes, and standing dead trees for cavity habitat. Vegetation in broad lake basins will recover more quickly than in less stable, steep walled basins, providing habitat at an earlier date.

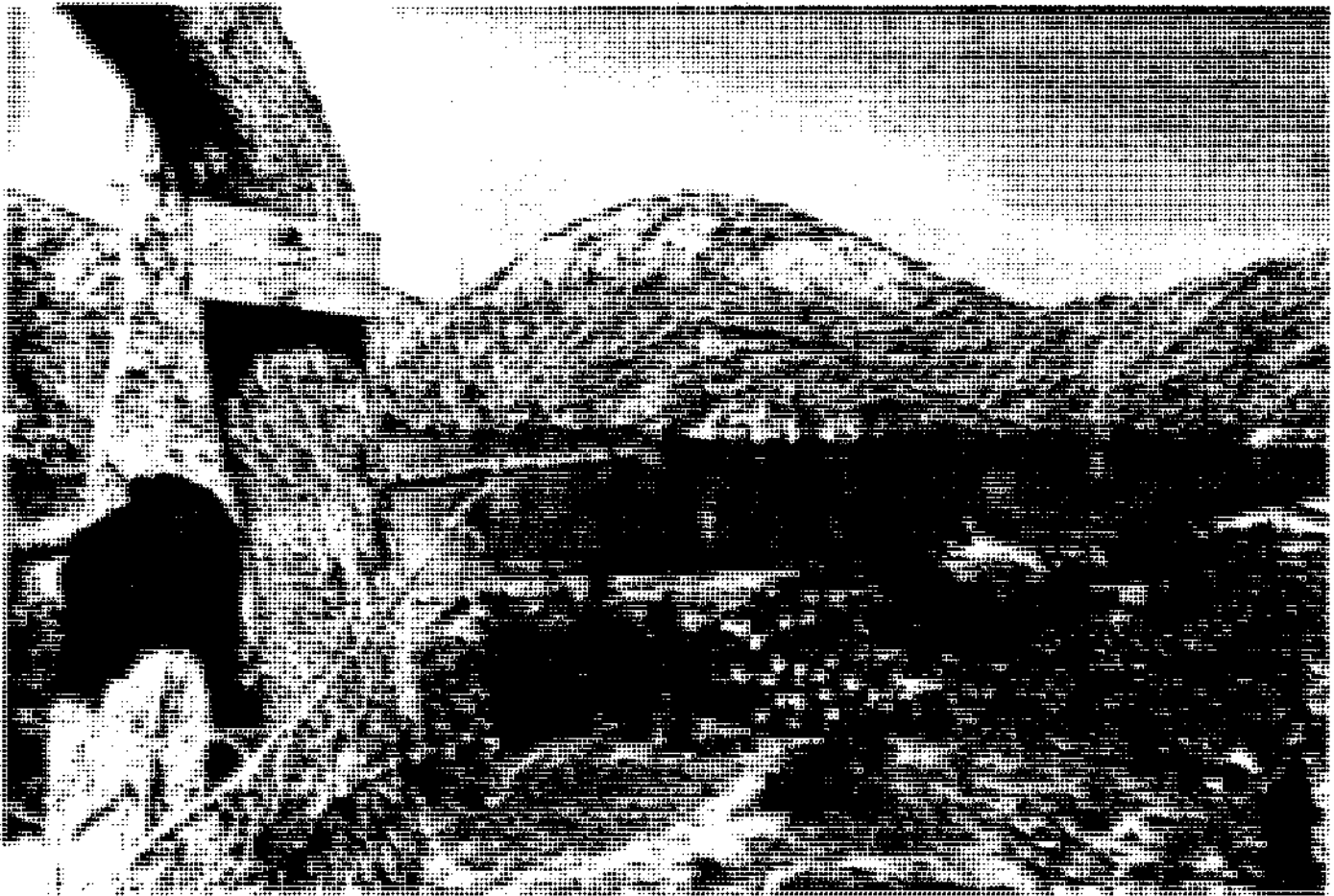
Except at Spirit Lake, reptiles and amphibians generally survived at lake habitats within the volcano-impacted area. Birds and mammals are repopulating lakes from less damaged areas, as suitable habitat becomes available.

Prior to the eruption, steelhead, silver salmon, and sea-run cutthroat trout from the North Fork Toutle River ascended to Spirit Lake. The alpine lakes in the Mt. Margaret range, naturally barren of fish, had been planted with cutthroat, rainbow, and brook trout since the early 1900s. It is unlikely that fish survived in Spirit Lake and none are thought to reside in the new Castle and Coldwater impoundments. Lake trout survived in St. Helens Lake. Surveys have shown that fish did survive in 70 percent of the lakes in the Mt. Margaret area. In general, lakes stocked with cutthroat trout lost them, but brook trout, a heartier species, survived. In 1980 and 1981, fish in these lakes relied on terrestrial insects as a food source, but by 1982, they were again feeding on aquatic invertebrates. Prior to the eruption, phytoplankton populations were limited in most lakes, but decaying debris and molybdenum from ash have fertilized lakes, raising post-eruption phytoplankton counts.

Spawning habitat was limited in these high elevation lakes prior to the eruption, and is more limited now, due to ash which was deposited on spawning gravels. However, as of 1984, brook trout were reproducing in Shovel, Meta, and Obscurity Lakes, and cutthroat trout in Lower Venus Lake.

Lake fisheries populations are managed by the Washington Department of Game, under their Statewide Strategic Plan, Regional Operations Plan, and harvest regulations set by the State Game Commission. In addition, Washington Department of Game has prepared a Monument fisheries management plan, which they will propose when the lake fish stocking issue is reexamined.

Washington Department of Game estimates that 4,100 annual visitor days (12 hours per visit) were spent fishing on Monument lakes prior to the May 18 eruption. No figures are available on fishing use now, but it is confined primarily to peripheral lakes, such as Meta Lake, undamaged lakes south of Mount St. Helens, such as Blue, Goat Marsh, and McBride lakes, and a few visitors to some of the Mt. Margaret lakes. All lakes in the Monument have lower fish population levels than before the eruption, due to lack of fish stocking, as well as volcano effects. All lakes except Grizzly and Ryan are open for fishing, except for any lakes within the volcano hazard closure zone in effect at a given time.



Panhandle Lake in the Mt. Margaret Backcountry.

Wetlands

Goat Marsh, which is within a Research Natural Area, is the largest and most important wetland habitat in the Monument. It escaped serious impact from the eruption and is still heavily used by elk for calving, wallowing, and grazing. Numerous species of birds (including waterfowl), reptiles, and mammals reside there. Some other lakes and ponds within the Monument are shallow enough to be called marshes.



Goat Marsh Research Natural Area.

Stream and Streamside Habitat

There are 138 miles of perennial streams in the Monument, two-thirds of which lost streamside vegetation to the volcano (Figure 28). Where vegetation survived, in-stream habitat was affected by deposits of ash and pumice. Only the Kalama River, on the southwest, and Goat Creek, a tributary to the Cowlitz River, escaped injury from the debris avalanche and mudflows.

As habitats recover, animals enter from the fringe areas and follow stream corridors into the blast zone and mudflows. Sprouting has occurred as erosion exposes buried plants and root systems. Streamside areas and other wetlands were among the first areas to revegetate and provide cover.

Early successional, algae-based communities of aquatic invertebrates--midges and other invertebrates--are rapidly recolonizing streams.

Mainstream salmon and steelhead habitat was lost in the North and South Forks of the Toutle River as well as the Green River. Despite ash and pumice erosion from the hillside, Washington Department of Game electrofishing and spawning surveys indicate that flushing of five sediments from spawning gravels in the South Fork Toutle and Green Rivers has already occurred. In general, habitat recovery and fish repopulation are occurring at a much more rapid rate than expected. The mainstream of the North Fork Toutle is not yet good habitat, but is being used as a pathway to and from the ocean by the adults and juveniles. Lack of shading streamside vegetation allows a continuation of water temperature problems existing before the eruption in the North Fork Toutle River. Most stable large woody material in the stream channels was lost during the eruption. The material remaining continues to provide some summer cover and winter survival areas for fish. Access of salmon and steelhead to habitat in the Green River is limited by a partial or complete migration barrier about 1.5 miles inside the Monument boundary. Small tributaries to resident trout streams are providing fish to recolonize the mainstems. Trout streams have many problems in common with salmon and steelhead streams, such as continuing sediment input to the stream from the hillside and lack of streamside vegetation for shade and bank stability.

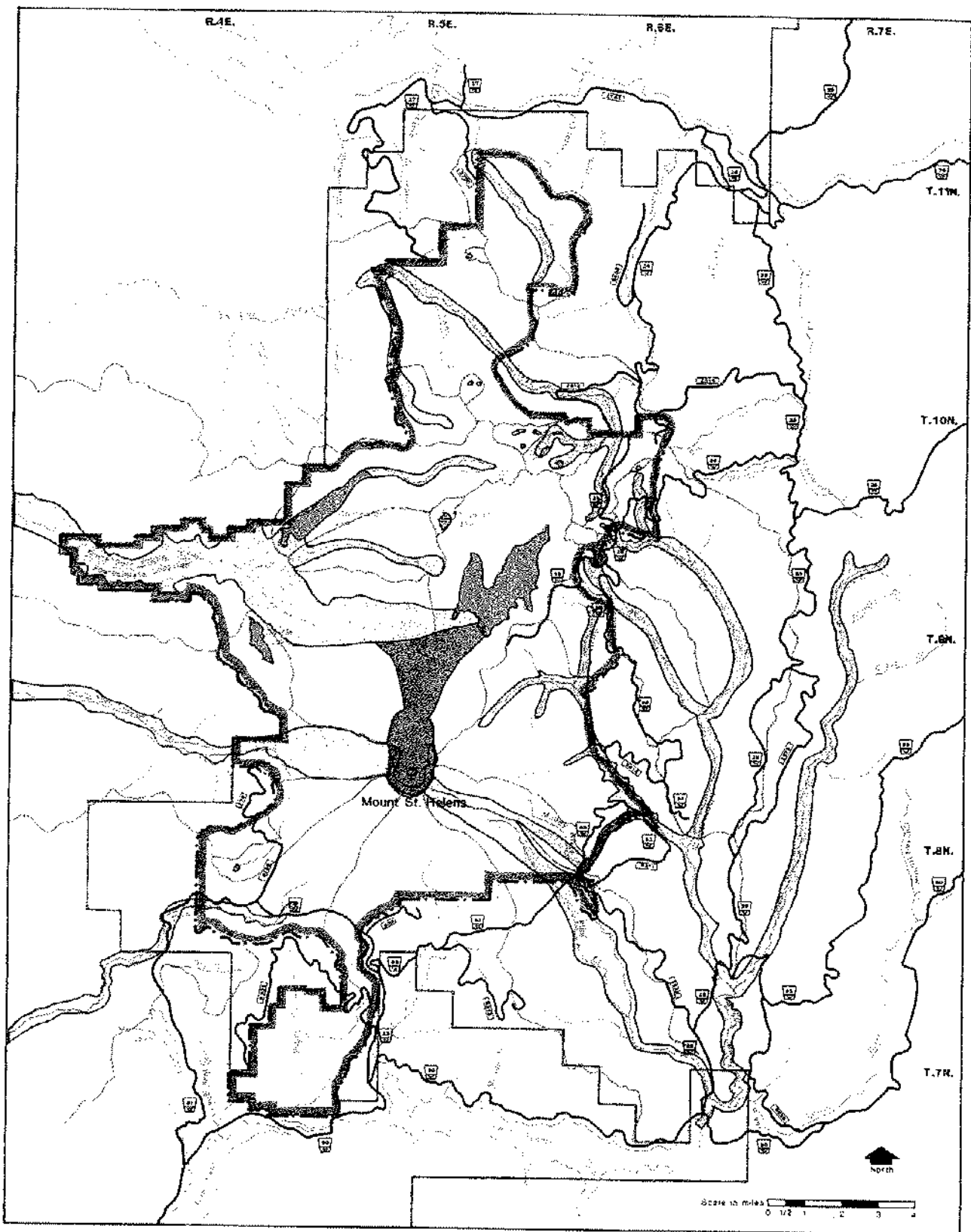
The Kalama River contains a small population of native cutthroat and a limited number of brook trout entering from McBride Lake. Food production is inhibited by year-round low temperatures and a pumice gravel bottom, which does not provide good spawning habitat.

The broad spectrum of types and degrees of disturbance to streams in the Monument provide a wealth of research opportunities. They include interactions among land forms, geomorphic processes, development of aquatic communities, terrestrial wildlife, vegetation succession, and nutrient cycling.

Stream Fishing

Washington Department of Game estimates that 4,300 visitor days (12 hours per visit) were spent annually fishing streams in the area which is now the National Monument. Stream fishermen worked the banks of the North Fork Toutle River, casting for steelhead. Coastal cutthroat, silver salmon, dolly varden, winter steelhead, mountain whitefish, and sculpin were found in the tributaries of the Toutle, Kalama, and Cowlitz Rivers, within the boundaries of the present NVM. The Department of Game planted 250,000 steelhead smolts annually in the Toutle River. Pine Creek and Clearwater Creek, in and near the Monument, had resident cutthroat trout fisheries.

Fish surviving in tributaries of the South Fork Toutle and returning from the ocean are repopulating the Toutle River. The Washington Departments of Game and Fisheries are reintroducing anadromous fish into the Toutle



Legend

- National Monument Boundary
- National Forest Boundary
- Existing Roads
- Streams
- Lakes
- Stream Corridors
- Watershed Boundaries

Gullies and Fumarole of Crater/Pyroclastic Flow Areas

Stream Corridors, Watersheds and Lakes

Figure 28

River System as streams become suitable. In addition to habitat recovery, the Corps of Engineers sediment control activities will determine anadromous fish populations in the Monument.

Tributaries to Swift Creek, the Muddy River and the Green River are providing sources of resident cutthroat trout for reestablishing fisheries. At the present time, Washington Department of Game has closed fishing within the Monument on the North Fork and South Fork Toutle Rivers and the Green River, and their tributaries. Other streams in the Monument are open for fishing, and the Toutle and Green Rivers are open to fishing outside the Monument.

Stream fish populations are managed by the Washington Department of Game and Washington Department of Fisheries, under their Statewide Strategic Plans, Regional Operations Plans, and harvest regulations set by the Washington Game Commission.

TERRESTRIAL WILDLIFE

Non-Aquatic Animal Habitat

The Monument includes diverse terrestrial wildlife habitats, from subalpine meadows to old growth forests, and from denuded areas overlaid with debris, mud, or ash and pumice to those where pre-eruption vegetation remains intact. The type and intensity of volcanic damage depended on location, distance from the mountain, and whether or not snow covered ground vegetation on May 18, 1980. About 74,800 acres of older forest and subalpine communities were set back to unvegetated or grass and forbs or shrub communities. These devastated areas are being gradually recolonized by animals entering from fringe areas or through streamside corridors which revegetate more readily. There are 16,750 acres of mature and old growth forest remaining on the south and far north sides of the Monument. Twenty percent of these acres are assigned to five spotted owl management units. The Northern spotted owl is listing by the Forest Service as a Sensitive Species, and by the State of Washington as Threatened.

Conditions for wildlife were most radically altered in the blowdown area north of Mount St. Helens, approximately 26 percent of the Monument. A few small mammals such as deer, mice, and pocket gophers survived under extreme conditions. Gophers are burrowing and churning ash into the soil, increasing the number of plant species living within the mound mixture (MacMahon--undated). The number of bird species is determined by proximity to the blast zone. Bluebirds feed in the blowdown area but nest elsewhere.

Only about 4 percent of the Monument contains trees killed by the volcanic blast but that remain standing. These areas are primarily in the Mt. Margaret (1,600 acres) and Upper Green River (1,130 acres) areas; some have retained live understories. The dead trees offer some

cover to deer and elk (Merrill, et al, undated), but the primary importance of this scarce habitat lies in providing habitat for cavity dependent wildlife, including such species as woodpeckers and bluebirds. Because of the natural attrition of dead tree habitat as trees decay and fall to the ground, habitat for cavity dependent species will become even more limited through time, until the distant future when blowdown and devastated areas again support stands of large trees. There are also mudflow-killed trees, at Kalama Springs, which provide habitat for cavity-using wildlife.

Most birds occur only where an understory and/or overstory survived or resprouted from root stock. In areas lush with lupines and huckleberries, hummingbirds are present in large numbers. Two colonizing species, dark eyed juncos and pine siskins, are taking the place of most of the original birds. They are generalists, or omnivorous feeders. On the more protected south side near Butte Camp, the same number of bird species occur as before the eruption, including ptarmigan (Manuwal, undated). Waterfowl nest at Blue Lake and Goat Marsh, where the habitat is unaltered by volcanic activity.

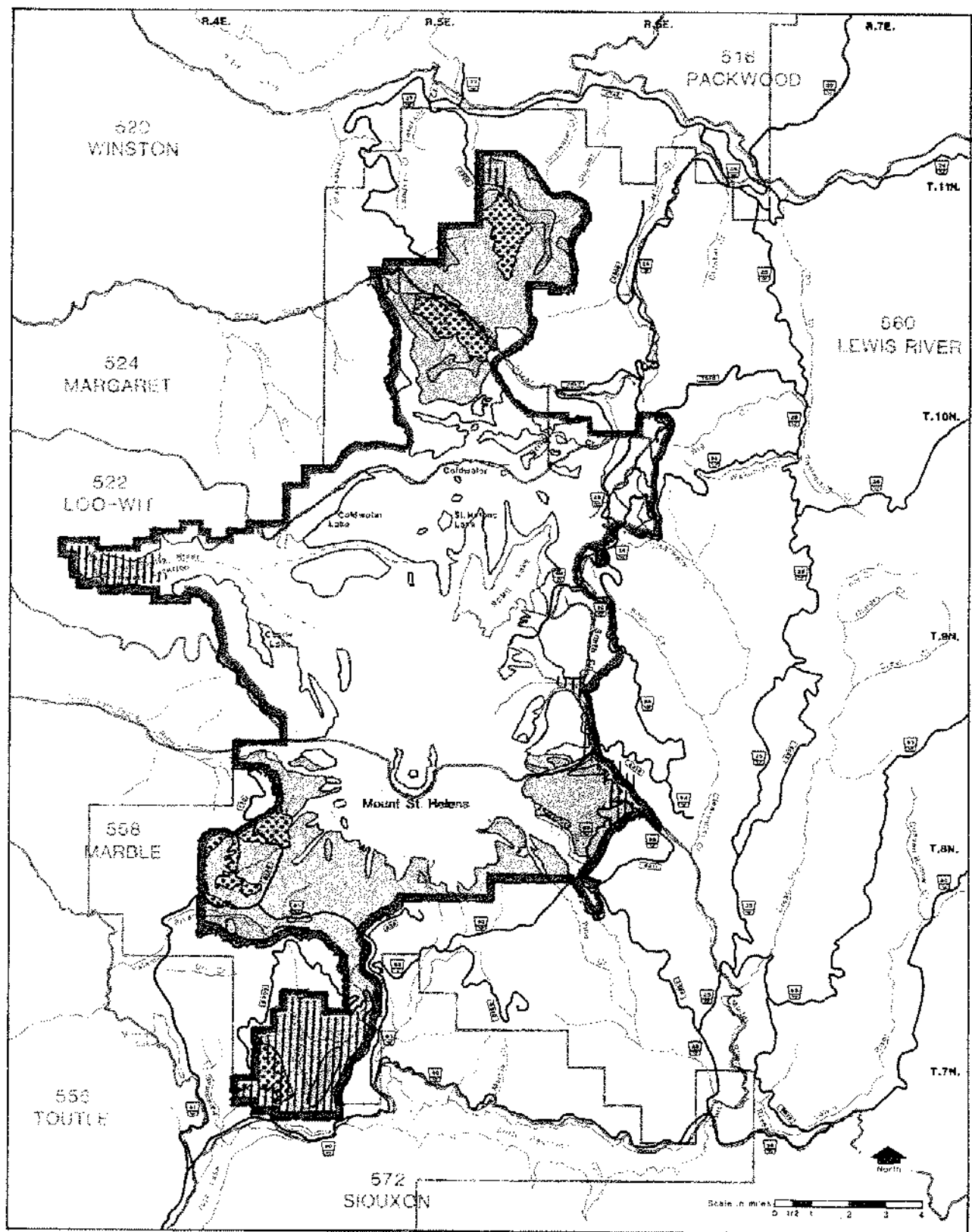
No federally listed threatened or endangered species occur within the Monument. State listed and Forest Service sensitive species are discussed in later sections.

Game Habitat and Hunting

Black-tailed deer and Roosevelt elk are native to Mount St. Helens. Key spring, summer, and fall elk use areas within the Monument include the Goat Marsh RNA and meadows north of the Marble Mountain peak. The Cave Basalt, Smith Creek, and Muddy River areas in the south end of the Monument provide wintering habitat for elk and deer. Winter range is very limited in availability and quality in the elk herd's area. There are approximately 8,300 acres of deer and elk winter range within the Monument (Figure 29). Vegetation on winter range within the Green and Toutle River drainages and Smith Creek drainage (approximately 2,700 acres in the Monument) was removed by the volcanic eruption and mudflows. The Muddy River winter range was also impacted by mudflows. Approximately 5,600 acres of winter range in the Goat Creek drainage and Kalama River area in the Monument received minor deposits of pumice and ash.

The remainder of the Monument was deer and elk summer range prior to the eruption. Much of this vegetation was removed by the May 1980 eruption. Deer and elk are sighted frequently within and near the Monument, particularly in areas where the blast and green areas come together.

Parts of the Monument contain some of the highest deer and elk densities in the state. The Marble Game Management Unit, which includes the south slopes of Mount St. Helens, has an average elk and deer density of 13.2 and 30.7 per square mile respectively, the highest elk density of any unit of its size in the state and ranked third in deer



Legend

- | | |
|--|-----------------------------------|
| National Monument Boundary | Standing Dead Trees |
| National Forest Boundary | Devastation and Unvegetated Areas |
| Existing Roads | Blowdown |
| Streams | Deer and Elk Winter Range |
| Standing Green | Game Management Unit |
| Old Growth | |
| Spotted Owl Management Units (Old growth and mature) | |

Major Wildlife Habitat Types

Figure 29

density. Other game management units which are partially within the Monument are the Margaret, Toutle, and the new Mount St. Helens Units, which include Monument devastated area, the Winston Unit, which includes the Vanson area of the Monument, and the Lewis River Unit, on the east and southeast (Figure 29). All are deer and elk units. Monument deer and elk habitat in the Marble, Winston, and Lewis River Units is largely intact, while Monument portions of the other units are recovering from extensive volcanic eruption and mudflow impacts.

Approximately 830 elk and 1,700 deer were harvested within and adjacent to the Monument during 1982. Special hunting restrictions require harvesting only branch antlered deer and elk on some game management units. In the ten years prior to the eruption of Mount St. Helens, there was an average of 22,400 annual visitor days (measured in standard 12 hour days) spent hunting within just the area which is now the Monument. After the eruption, this has been reduced to 7,500 annual visitor days, due to a combination of reductions in fish and wildlife populations and habitat reductions, closure of the volcanic hazard zone, and lack of access to much of the Monument.

Black bear also occur in the area and 31 were harvested in 1982. There has also been some harvesting of grouse, quail, doves and pigeons, and trapping of furbearers, such as coyote, bobcat, beaver, and marten. About 2,000 visitor days annually were spent in hunting and trapping of these species.

Deer and elk populations, and other game and nongame wildlife populations, are managed by the state, under the Department of Game's Statewide Strategic Plan and Regional Operations Plan. Harvest regulations are set by the State Game Commission.

Cave Basalt Habitat

There is a zone between light and dark that is home for distinctive associations of plants and animals. Some animals spend their entire lives in caves, some use or require them for certain parts of their lives (i.e., hibernation or reproduction), others use caves only incidentally. The cave basalt area contains a number of unique subterranean ecosystems. There are in the Monument 37 or more known caves, some of which may be interconnected. While certain caves have been extensively explored, others are less known.

Bats that are dependent upon caves have very specific environmental requirements for hibernating and raising young in communal nurseries. Several caves are recognized as critical hibernation habitat for the Townsend's big-eared bat (Senger and Crawford, 1984). The big-eared bat hibernates during the winter and disturbance during this period can deplete the animal's limited fat reserves to the extent that it is unable to survive the winter. Nursery and hibernation sites are all very sensitive to disturbance. Populations of the big-eared bat

have declined in Washington and Oregon, with the species extirpated from several former use sites and from several portions of the state of Oregon. Most of the big-eared bats occurring in western Washington occur in the Mount St. Helens and Mt. Adams areas. The Department of Game has designated it as Proposed Threatened, and Region 6 of the Forest Service has listed it as sensitive. Two other subspecies of the big-eared bat are already federally listed on the Threatened and Endangered list. Five species of myotis bats and big brown bats are also known from eight caves. The caves are utilized as roosting sites in summer and fall, and as winter hibernation sites. Certain caves are used as nursery sites from May through July. Ape Cave has been nearly abandoned by bats and other caves are also experiencing a rapid decline in use by bats. Improperly timed recreational activities and other human disturbance are a major cause of decline in big-eared bat populations.

Bats are an important link in some cave ecosystems. Bat guano is a substrate for slimes which in turn support a variety of invertebrates including spiders and insects. Most of the large number of species and individuals inhabiting the caves survived the eruptions. Many invertebrate species which winter in caves, however, were caught above ground during the blast and were not found in January 1981 surveys (R. Crawford, 1983). Several new species have recently been collected and are known from only a single cave. Among these are an unusual ancient mite harvestman and the only known root scale insect found in any cave. Insects that are physiologically adapted to permit activity at sub-freezing temperatures, the snow crane flies and rock crawlers, inhabit only certain caves. The Mount St. Helens Grylloblatid is a small wingless insect which is found only in the Mount St. Helens Cave Basalt lava flow.

Caves containing water bodies are rare habitat for aquatic cave-dwelling flora and fauna.

Larch Mountain Salamanders, proposed for State listing as a Sensitive species, have recently been discovered in the mouths of two of the Basalt Area caves. To date, the Larch Mountain salamander has not been found at other sites in the Monument, but could also occur at timbered sites with rocky soils. It does not appear to be sensitive to disturbance from recreational use, but rather to habitat alteration or elimination.

The biology of the caves had not been studied in a systematic manner before the eruption. A biological survey of 17 caves was completed by the Forest in 1984. This survey will be used as the biological data base for further management planning in the Cave Basalt Area. Caves are influenced by natural and human-caused conditions above ground as well as by direct disturbances within; above ground events can alter moisture and nutrients entering the cave, expose caves to flooding or mudflows, and alter adjacent habitat which may be required by cave-using species. Factors that have contributed to the loss of the flora and fauna of Ape Cave may include excessive human traffic and the combined effects of erosion,

flooding, clearcutting, road building, pollution, and the introduction of foreign species.

A detailed management plan for the Cave Basalt Area will be completed within two years, based on the biological survey of the caves, and on their geologic and cultural resources. Current and projected susceptibility to disturbance will be established with accessibility determined by location and existing and planned development, a primary consideration. Planners will then develop and implement measures additional to those included in the Comprehensive Management Plan.



R. Crawford, University of Washington, inventorying cave fauna.

VEGETATION

Numerous geologic events occurring simultaneously during the May 1980 eruption, created a wide variety of substrates for ecosystem development. Future plant growth will occur in environments ranging from moderate to very severe. Debris flow material and mudflow deposits are quite unconsolidated and highly erodible. Much of it is hummocky, nutrient poor, and susceptible to compaction; drainage is locally impeded. Ash and lapilli present in tephra fallout areas are also highly erodible and nutrient poor; in addition, the droughty high temperature surface is often very hostile to new growth.

The future direction of plant recolonization on sites most heavily impacted by the eruptions will be determined by erosion, deposition, and the species available. The erosion of debris and tephra, which exposes the former forest floor or exhumes surviving plants which can then resprout, will play a major role at many sites in the blast and airfall areas. Plant establishment via seed germination will show greatest success on sites where protection from harsh environmental factors is offered. Downed timber may be beneficial in creating such microsites. In the long term, plant

communities which develop on Monument lands should resemble those which existed during the pre-eruption period. These communities will, however, be shaped by the new mix of species, climatic and soil conditions which will develop in the new landscape.

Because the natural disturbance has been extreme, much of the area must be considered highly susceptible to disturbance by human activities. Future development may adversely influence certain natural ecological and geomorphic processes. In addition, a number of sensitive ecosystems were present prior to the eruption. These include the alpine communities on the upper slopes of Mount St. Helens, the subalpine meadows north of Spirit Lake, the lava flow forests of the Cave Basalt Area, and the wetlands of Goat Marsh Research Natural Area. The extent to which the introduction of exotic plants and animals to the disturbed ecosystems will affect natural ecologic succession is not known. Some plant and animal species may not naturally regain the ranges they had prior to the eruption for many years or decades. Community ecology literature stresses the susceptibility of disturbed ecosystems to invasion by outside species. Development must proceed carefully, therefore, to be in accordance with the major theme of legislation which created the Monument, "allowing geologic forces and ecological succession to continue substantially unimpeded".

Communities of plants and many other organisms are recovering rapidly in refugia (areas sheltered from blast effects) on the northeast flank of the mountain and the Spirit Lake Basin, the most devastated portions of the Monument. Soil biota is undergoing significant changes which will influence future plant successions. Plants, in turn, have a large effect on soil biota through element cycles. The interactions between plant and herbivore communities and the population dynamics (birth and death) in these developing communities are also very important research areas. Unimpacted and slightly impacted ecosystems are needed as control areas.

Threatened, Endangered, or Sensitive Plant Species

Plants that are classified federally as Threatened or Endangered are not known to exist on the Forest or within the Monument.

Two state listed Sensitive plant species are known to occur within and around the Monument.

1) Fringed pinesap grows in deep coniferous forests and occurs at three sites. An approved management plan exists for this species.

2) Green-fruited sedge occurs at two locations on sandy/rocky banks.

Potential habitat exists for northern grape fern in moist, semi-open areas. Lance-leaved grape fern, which grows in moist, wet places in montane areas, occurred near Windy Pass prior to the eruption. This habitat may still exist and there may be more south of Windy Pass.

CLIMATE

The climate of the Monument is influenced by the blocking effects of the Cascade Mountain Range on westerly winds of marine air masses and easterly winds of continental air masses. Precipitation and temperature are generally typical of a maritime climate with wet, relatively mild winters and dry, cool summers.

Mean annual precipitation ranges from 65 inches in the Cowlitz River Valley to over 140 inches on the upper slopes of Mount St. Helens. The wet season begins in the fall, reaches a peak during the winter months, then gradually decreases through the spring. About 45 percent of the annual precipitation falls during the three-month period of November, December, and January, and about 75 percent during the period of October through March. July and August rainfall normally accounts for less than five percent of the annual precipitation.

Much of the annual precipitation occurs as snow, which increases with elevation. In the Muddy River drainage (2,000 feet at the New Muddy River and 2,100 feet at the Smith Creek Road snow courses), the snowpack averages from 2 to 4 feet in depth with 9 to 15 inches of snow water content. At the 3,200-foot elevation near June Lake, the spring snowpack averages 7 feet in depth with 37 inches of snow water content. At 4,400 feet elevation at the Plains of Abraham on

the northeast slopes of Mount St. Helens, the spring snowpack averages 13.6 feet in depth with 77 inches of snow water content.

Under the treeless, post-eruption conditions, snowpacks can be affected by changing wind patterns and generally faster melt rates in the spring due to the almost total exposure to solar radiation. A thin deposit, probably less than an inch of ash on the surface of the snowpack, can increase melt rates and, conversely, a thicker deposit can act as an insulating layer and retard snow melt.

At Spirit Lake (3,240-foot pre-eruption elevation) on an average July day, temperatures range from 45° F near sunrise to 72°F in mid-afternoon. January average temperatures range from 24°F at night to 33°F during the day. Below freezing temperatures occur on most nights between late October and early May. Summer and winter temperature extremes frequently occur during periods of east winds or when the air is under the influence of a continental air mass. Temperatures may drop to -15°F during the winter and reach the upper 90s in the summer. Temperature extremes will probably be more severe under treeless, post-eruption conditions. In general, temperatures elsewhere within the Monument can be expected to decrease or increase three to four degrees with each 1,000-foot increase or decrease in elevation.



Air quality is impacted by strong winds and volcano emissions.

AIR QUALITY

The surface of most of the Monument is covered with a layer of ash varying from two inches to over a foot in depth. Winds and any activities can create a dust problem in the summer. During past summers (1981 and 1982) visibility has been almost totally obscured by west winds blowing up the Toutle River drainages. This condition is worsened by strong east winds during dry weather in late summer and fall.

There are no major human-caused point sources of air pollution within or adjacent to the Monument.

The volcano regularly exceeds sulphur dioxide emission levels; since it is a natural event, however, it is not classified as a point source.

At times, smoke from slash burning outside the Monument substantially impairs visibility in the Monument. The proposed Washington State Implementation Plan (SIP) calls for a 35 percent reduction in emissions from slash burning by 1990.

At present, there are no comprehensive emission inventories for this area from which baseline particulate pollutant levels can be derived. Department of Ecology officials, however, consider this to be an area not directly impacted by pollution from human activities (Nelson, April 18, 1983).

FOREST INSECTS AND DISEASE

Pest damage in the area prior to the eruption was caused primarily by Douglas-fir beetle, largely in old-growth Douglas-fir along the bottoms of eastside drainages. Scattered groups of beetle-killed Douglas-fir have been detected in each of the townships along the eastern boundary of the Monument.

In the Mount St. Helens area, windstorms typically result in small, widely scattered amounts of windthrown Douglas-firs susceptible to Douglas-fir beetle breeding. Generally this is enough host material to support endemic beetle populations which annually kill scattered, small groups of trees. Occasionally tree damage caused by storm, fire, or flood will result in a substantial beetle population increase which will move into and kill significant numbers of adjacent green trees. In the past, these population increases have been attributed in large part to (1) widespread, concentrated accumulations of downed or damaged host material, (2) relatively warm, dry conditions during the tree growing season, and (3) relatively high winter temperatures. These high population levels will generally collapse one to two years after beetles have moved into healthy, green trees.

Two other bark beetle species, silver fir beetles and fir root bark beetles, which are collectively called silver fir beetles, caused some damage to Pacific silver fir in the Mount St. Helens vicinity between 1947 and 1954 (Thomas, 1956). Only about one half of the area on the north end of the Monument which survived the volcanic blast was involved in that infestation. No significant silver fir beetle damage has been reported within the Monument boundaries since that time.

All tree species that occur in the Monument area are known to be susceptible to one or more species of native decay fungi. Several years of infection may result in structural defects and, eventually, death of the tree. True firs and hemlocks are highly susceptible to decay. Concern about decay fungi is centered in public use areas, where people could be injured and property damaged. This risk can best be reduced by removal of high hazard trees or by directing the public away from areas near high hazard trees.

HUMAN ACTIVITIES

RESEARCH AND SCIENCE

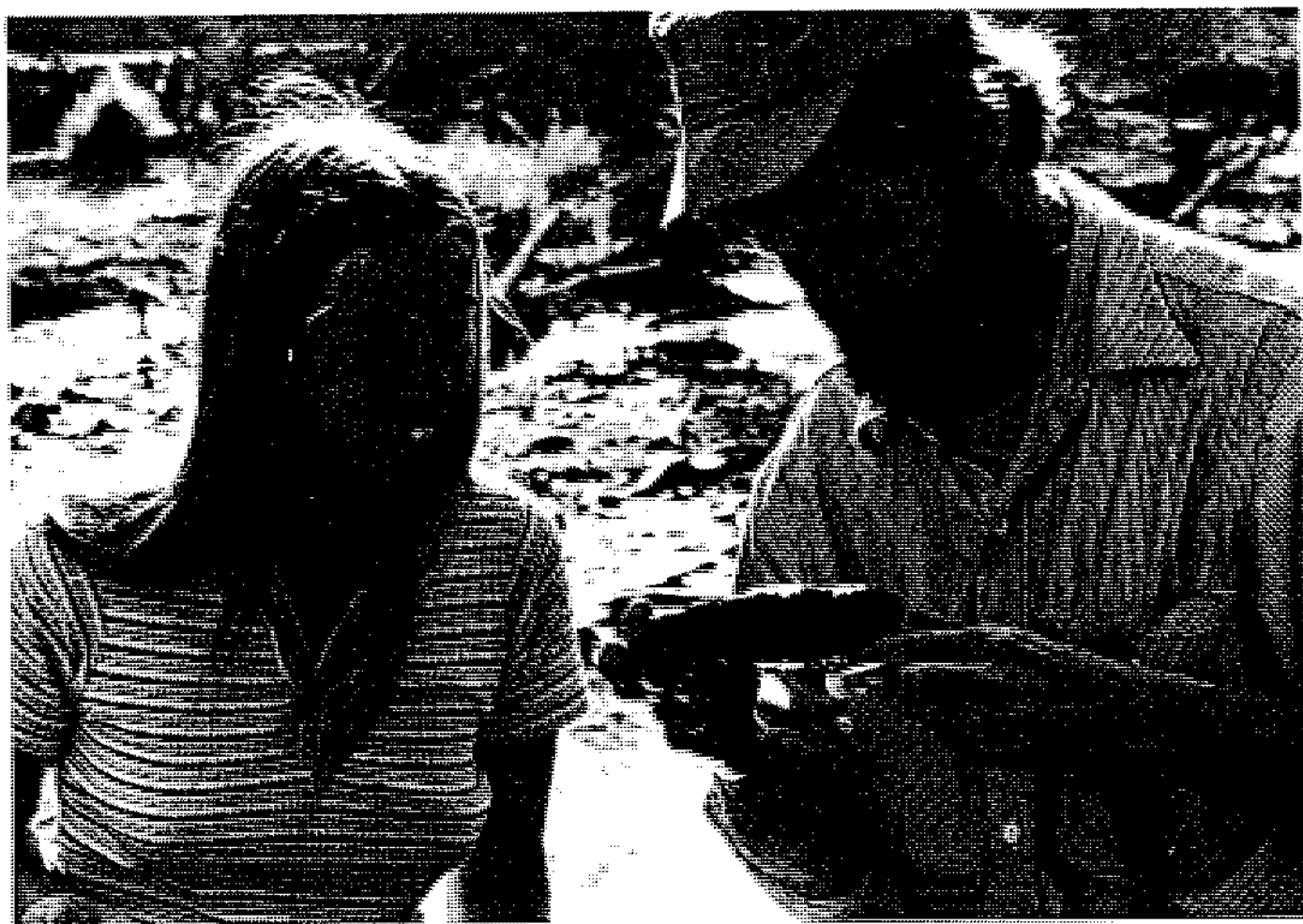
Scope and Significance

The landscape and ecosystem within the Monument are of extremely high scientific importance (Figure 30). Opportunities for basic and applied research and for public education are unparalleled. The term "research" here is used in the broad sense encompassing geophysical, hydrological, biological, and meteorological studies as well as investigations into the sociological and psychological dimensions of the phenomenon. The Natural Features and Processes, described above, provide many of the research opportunities on and around the mountain.

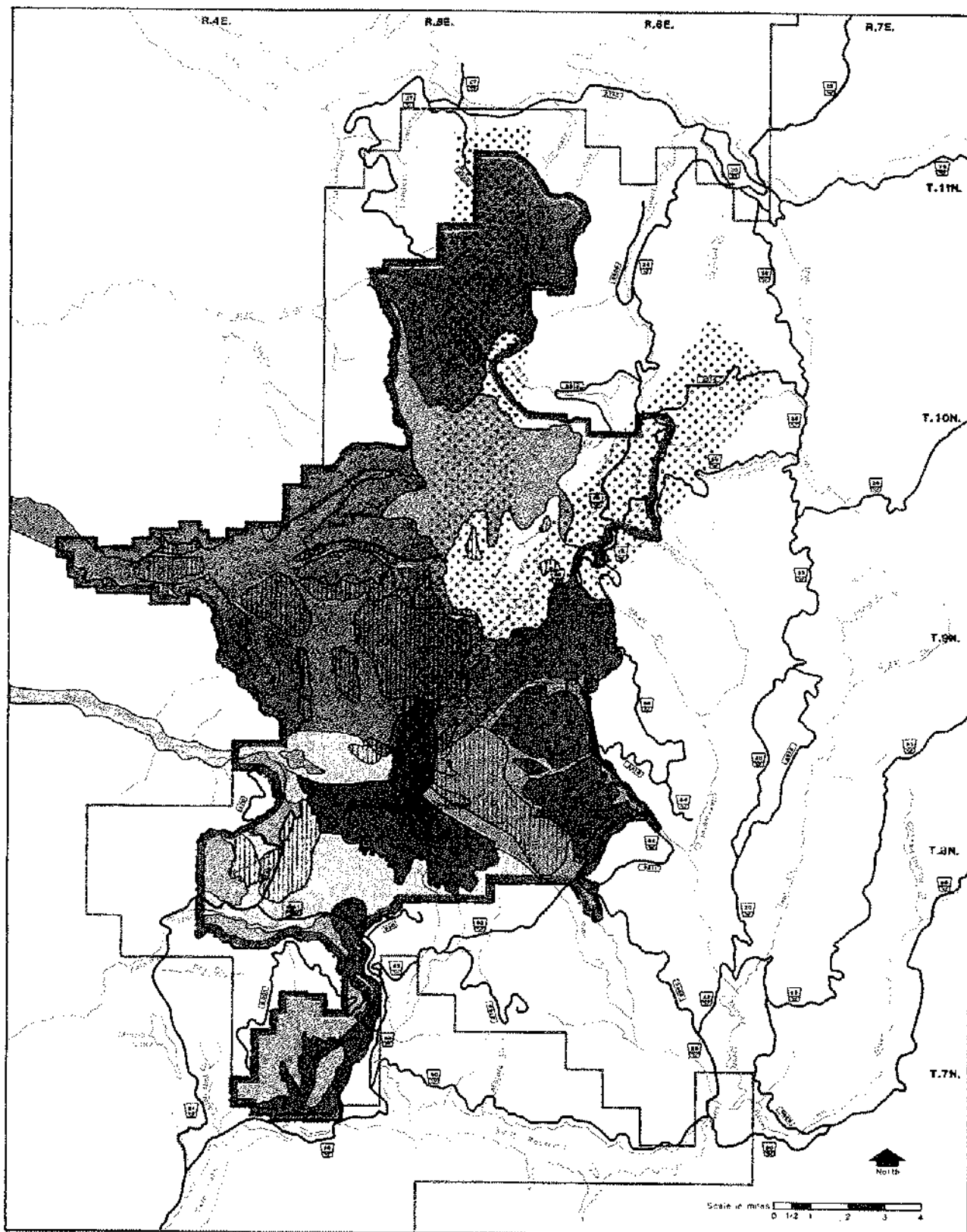
A measure of the Monument's significance to basic and applied research is the size of investments in facilities, programs, and monitoring activities that have been made in the area since March, 1980. The U.S. Geological Survey has established the David A. Johnston Cascade Volcano Observatory with a staff of more

than 75. It monitors hydrologic and volcanic activity to enhance understanding of natural processes, predict hazards, and contribute to hazard-mitigation planning.

The National Science Foundation, U.S. Geological Survey, the Forest Service Pacific Northwest Forest and Range Experiment Station, Weyerhaeuser Corporation, and other organizations and institutions have funded more than \$6,000,000 worth of biological and geological research each year between 1980 and 1983. More than 300 studies involving over 500 scientists were in progress across the Monument and adjacent areas by October of 1982 (Figure 31). Additional studies have been performed in the fields of sociology, economics, and health. The investment in Mount St. Helens research greatly exceeds that of major geological/ecological research sites elsewhere in the United States, e.g., H.J. Andrews Experimental Forest, Oregon, approximately \$1,600,000 per year; Coweeta Hydrologic Laboratory, North Carolina, \$2,200,000 per year; Hubbard Brook Experimental Forest, New Hampshire, \$1,200,000 per year; Hawaii Volcanoes National Park, under \$2,000,000 per year.



Researchers



Legend

National Monument Boundary	Muddy-Smith System	High Country
National Forest Boundary	Above Treeline (S)	Upper Green River
Existing Roads	Devastated Uplands (NE)	Complex Lahar, Pyroclastic Flows
Streams	Devastated Uplands (NW)	Micro Features Within Major Ecological Features
Cave Basalt	Crater	Gradients of Volcanic Impact and Ecological Response
Green Forest (SW)	South Toulte Mud Flow	
Green Forest (SE)	Debris Avalanche	
Green Forest (N)	Spirit Lake Basin	

Ecological Features With High Scientific Value

Figure 30

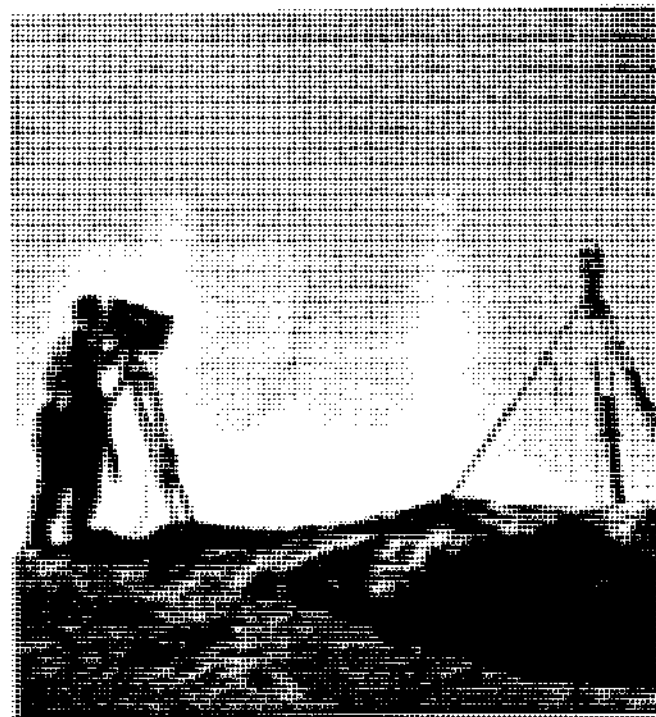
The international importance of scientific work within the Monument is large. Numerous technical exchanges have occurred among scientists, engineers, and land managers from other countries; many have visited the mountain. Scientists contending with volcanic activity elsewhere--Indonesia, Japan, and Mexico--have availed themselves of hazard prediction and mitigation data gathered at Mount St. Helens.

The spectrum of research activities is very broad. A compilation by the St. Helens Forest Land Research Cooperative identified more than 200 studies in the categories of soils, vegetation, streams and lakes, geology, vertebrates and invertebrates, agriculture, sociology and economics, health, and atmospheric sciences. Studies which address techniques for predicting sediment yields, regenerating commercial forests, and assessing the quality of blown down timber for various uses exemplify applied science. Basic research includes study of the mechanics of mudflows and linkages between microbial, insect, and plant succession. In many instances, the distinction between basic and applied research is blurred; subjects which may seem esoteric are found to have very immediate applications. The geochemistry of gas emissions from the volcano, for example, has provided critical information about pending eruptions and other changes in volcanic activity.



Researcher studying erosion.

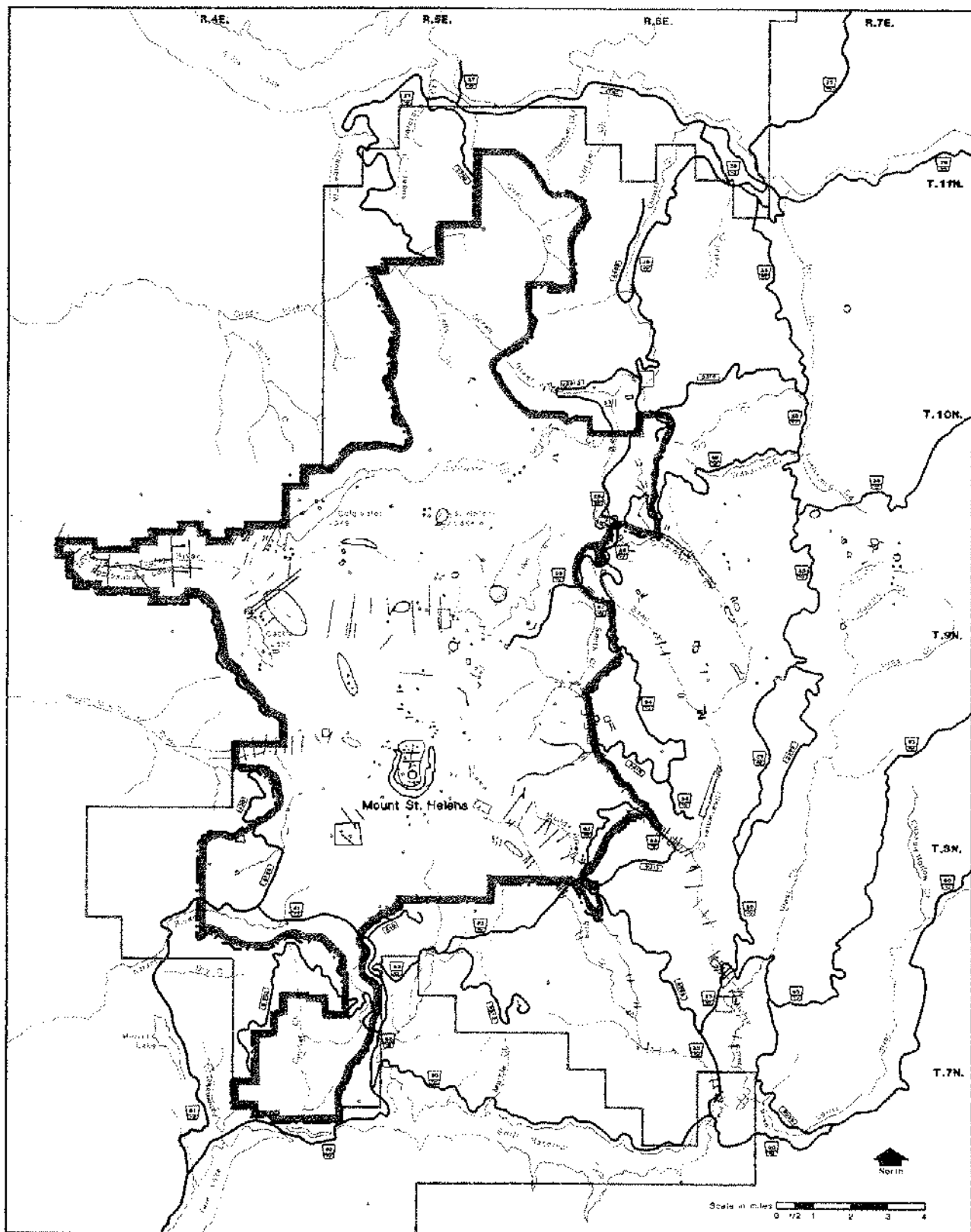
A most obvious value of research within the Monument is the practical and immediate returns from applied research, most conspicuously in the realm of geology. For people the world over who live near volcanos, few subjects are as important as predictive capability. Similarly, the residents of Longview-Kelso, Washington, and those elsewhere who may be menaced by unstable impoundments, have a very direct interest in analysis being performed on lakes impounded by the debris avalanche. Findings here have been and will be instrumental in developing strategies for protecting life and property downstream. The U.S. Geological Survey, for example, has established a Flood/Mudflow warning system for people living along the Toutle and Cowlitz Rivers.



Monitoring to improve predictability.

The implications of biological studies have also been far-reaching. Forest managers and researchers cooperatively established a series of planting trials which are expected to substantially increase the efficiency and potential for success in forest regeneration. Basic research on the microbiology of streams, lakes, and thermal seeps identified unexpected pathogens in certain water bodies. This led to a program designed to warn workers and visitors to the area about possible health hazards and to suggest precautions.

Scientific values at Mount St. Helens have been and will be increasingly recognized at both the national and international levels as the detailed record of geologic, hydrologic, and ecological events is compiled; it will provide a continuously improving foundation for future studies.



Legend

- National Monument Boundary
- National Forest Boundary
- Existing Roads
- Streams

GEOLOGIC & HYDROLOGIC STUDIES

- US Geological Survey
- Army Corps of Engineers
- Soil Conservation Service

ECOLOGICAL STUDIES

- Forest Service Pacific Northwest
- Forest & Range Experiment Station

Current Research Study Sites

Figure 31

Access to the Restricted Zone

Researchers wishing to enter the Restricted Zone in the Monument must have a Forest Service permit. A screening process has been developed to ensure that research within the restricted zone is scientifically valid. Based on the expected level of volcanic activity, the Emergency Coordination Center (ECC) at the Gifford Pinchot National Forest determines the size of and access to the restricted zone.

Research Conditions Requiring Management Direction

Protection of Established Research Plots and Natural Processes and Features: Broad scale natural features or processes with high scientific value are currently protected by the controlled access to the restricted zone and by limited access elsewhere in the Monument. Protection of research plots from disturbance by development is based on the record of plots in the Total Resource Information (TRI) system (see Coordination & Documentation). Scientists are requested to document sites when they obtain permits to enter the restricted zone. The effectiveness of protection of plots and broad scale features and processes will decrease if the restricted zone shrinks because of reduced volcanic activity.

Communication: Present lines of communication between managers and the scientific community are restricted to brief, periodic interaction with the Scientific Advisory Board and contacts between individuals in a variety of circumstances, many of them random. The program for communication between the Monument staff and the research community is very limited.

Coordination and Documentation: Agencies such as U.S. Geological Survey, Forest Service Pacific Northwest Forest and Range Experiment Station, institutions, and individuals have programs which are internally coordinated and some informal coordination occurs among researchers. At present, however, there are no procedures for avoiding useless duplication, linking potentially complementary studies, or identifying important but neglected research. One result is that scientists usually plan their studies without considering the information needs of managers.

Documentation of research sites is provided on the Total Resource Information (TRI) system with records available at the Monument Headquarters, Ansoy, Washington, at the Forest Supervisor's Office in Vancouver, Washington, and in Corvallis, Oregon, at the Forestry Sciences Laboratory. It has been difficult, however, to achieve complete documentation. This difficulty may increase as the size of the restricted zone shrinks; it is hard to gain scientist participation in the documentation system if they do not have to contact Monument managers for access permits. Monument personnel are placing records in computer files which can be

accessed by site, scientist, and topic. There is a collection of published and unpublished reports on Mount St. Helens research at the Washington State Library in Olympia.

Access: Access to many potential research sites is often restricted to helicopters. Some sites in green forest, e.g., Goat Creek, have neither trails nor helicopter landing sites.

Facilities: Researchers camp in the Monument with a permit. The nearest public campgrounds are about one hour's drive from the devastated area. A trailer at the Pine Creek Work Center was available to scientists in 1982. There are currently no laboratories or other support facilities, e.g., counter space, sample storage space, and drying areas. The Cispus Environment Education Center, about an hour's drive northeast of the Monument, offers the closest, relatively inexpensive accommodations.

Long-term Records: Currently, many individuals and agencies collect data on environmental and geological conditions on the Monument and records are available from the agencies which collect them as long as they choose to maintain them. There is no catalog listing records in existence, dates of collection, and location of data.

RECREATION AND INTERPRETATION

Current State of Visitor Industry

In spite of the attractiveness of the region to visitors, even before the eruption of Mount St. Helens, the visitor industry was relatively undeveloped in the four county area surrounding the Monument (McPhee et al, Nov. 1983). In 1980, lodging employment, measured in absolute terms, totalled 1,040 workers. Relative to population, it amounted to 3.1 employees per thousand residents, considerably below the state figure of 4.4. Also reflecting the lack of development in the regional visitor industry were lower earnings in hotels and motels. Annual income in 1980 averaged \$7,365 per employee, \$750 below the state figure. The total number of jobs directly or indirectly associated with the visitor industry represented about 5.7 percent of the employment in the region. This share, again mirroring the relatively undeveloped state of the regional industry, amounted to one in 17 local jobs, substantially less than the one in 10 job ratio found in the state. Statistics indicate that the visitor industry offers more broadly based development potential, particularly in Cowlitz, Lewis, and Skamania Counties.

TABLE 7

Estimate of Visitor Days to the Former Mount St. Helens Ranger District

By Recreation Activity:	Year 1979 thousand visitor days
Viewing outdoor scenery	110.2
Driving for pleasure	130.6
Snowmobiling	13.6
Boating	10.1
Hiking, walking	33.1
Swimming	9.8
Fishing	11.0
Camping	117.2
Organizational camping	20.0
Picnicking	8.5
Skiing	13.0
Snowplay	30.0
Hunting	45.1
Nature study	11.3
Mountain climbing	7.8
Gathering forest products	9.0
Interpretation	10.9
Caving	7.7
*Other	3.1
Total	602.4

Source: Forest Service, Recreation Management System.

*Includes 1,600 visitors days of horse riding.

Past and Present Recreation

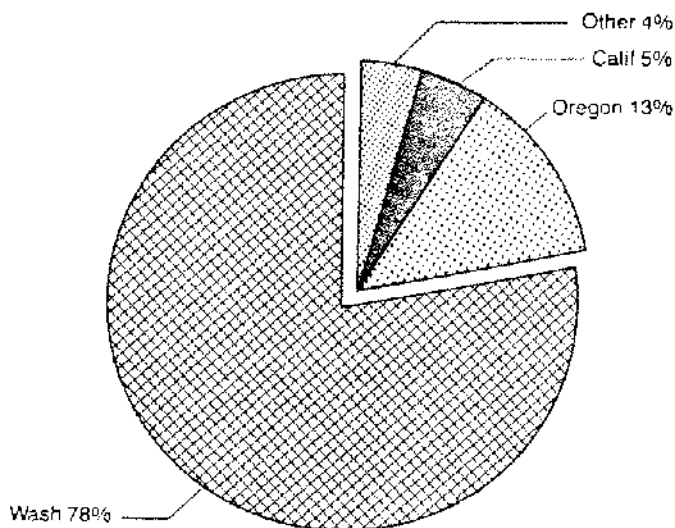
Traditional Recreation: Mount St. Helens has been a recreational area for many years. The Spirit Lake Basin was the most heavily used recreation area in the Gifford Pinchot National Forest prior to the recent volcanic events. On the mountain's south side, recreation was minimal until 1957, when roads began opening the area. Visitation at Ape Cave doubled from 1976 to 1979, when an estimated 39,000 people explored the cave.

Visitation elsewhere in what is now the Monument grew with increases in the local population and the development of more recreation sites. It was at an all-time high in 1979 (Table 7).

Recreation increased more than 12 percent a year in the 1970's; the growth rate of winter sports was 40 percent. Most visitors to the area came from eight counties in southwest Washington State and three counties in Oregon (see Figure 32.)

All this was dramatically changed by the events of May 18, 1980, and thereafter. Some traditional recreation opportunities once available in the Spirit Lake Basin may be provided in other portions of the Forest. But others, particularly those associated with Spirit Lake, are gone.

Origin of Visitors/Pre-1980



In the past the critical market or influence area that drove the growth of visitor use to the area was local.

Source: USDA FS recreation user study, 1977.

The Volcanic Monument Recreational Experience

The eruptions of 1980 transformed a regional recreation area into an internationally recognized landmark. Public interest was monumental. To meet the public's demand for information and interpretation, the Forest Service opened two visitor centers in 1980. One, located north of the Monument near Interstate 5 and U.S. 12 remains open.

Prior to the eruptions, travel from the west had been along State Route 504 (the Spirit Lake Memorial Highway), large portions of which were destroyed by mudflows on May 18, 1980. In 1982, the public was provided access to Hoffstadt Viewpoint, which afforded a view of the debris flow's lower reach and, in the distance, Mount St. Helens. Also, in 1982, access from the east was provided on weekends to a limited portion of the area. In 1983, Road 99 was extended to a viewpoint overlooking Spirit Lake and providing a close view of the north side of the volcano. An all day round trip from Interstate 5 is required to reach this vantage and the final 15 miles is over a single lane road with turnouts. Despite its inconvenience, the popularity of

this trip is producing over-crowded and unsafe traffic conditions. Post-eruption visitation to Mount St. Helens is estimated to have been 759,000 in 1983. (Includes 374,000 visitor to the Visitor Center.)

Table 8: Current Mount St. Helens Visitation

Location	thousands of visits	
	in Monument/outside Monument	
Visitor Center		374
North Corridor	218	
Southwest Corridor	142	
South, County Road 135	15	
West, SR 504 to Hoffstadt VP		250
Total	375	634

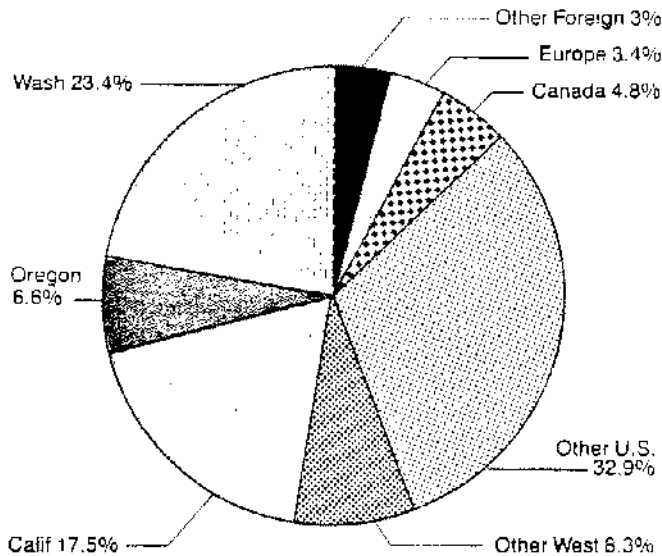
Most of the visitor use to the Monument occurred at the viewpoints along Road 99. Approximately 80,000 of these visitors received interpretation through a scheduled naturalist program which included talks at the viewpoints, guided walks to key features, and special environmental education activities for school groups.



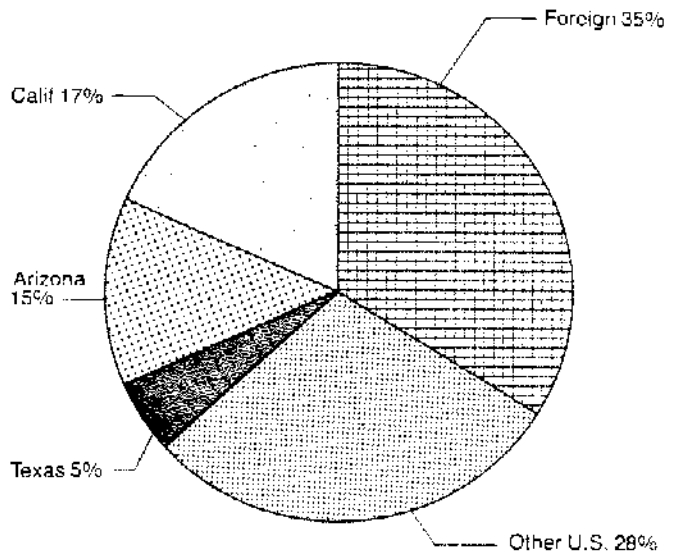
Naturalist presentation at Windy Ridge Viewpoint.

Origin of Visitors, Mount St. Helens Visitor Center Compared to the Grand Canyon

Origin of Visitors, Mount St. Helens Visitor Center, 1983



Origin of Visitors, Grand Canyon



Source: U.S.F.S., Visitor Center Use Study

Source: U.S. Park Service, Grand Canyon National Park

Figure 33 shows the similarities with the origins of visitors to the Visitor Center with origin of visitors to the Grand Canyon. The Mount St. Helens area of influence has changed from local to national and international since the eruption. (Compare with Figure 32.)

Recreation Opportunity Spectrum

The eruption on May 18, 1980, created a unique setting for recreation. The powerful landscape and continuing volcanic activity has a strong and lasting effect on the human psyche. The psychological response of the individual with the resulting increased awareness, strong feelings, motivations, and adaptive responses are critical to the recreation experience.

The eruption changed the recreation desires and expectation of the visitors. Prior to the eruption, visitors came to the area to take part in traditional forest recreational activities in a setting of peaceful scenic beauty similar to other areas in the high Cascades. Since the eruption, some visitors still come seeking the traditional recreation activities, but the majority come seeking the Mount St. Helens recreation activities such as viewing the new landscape, receiving interpretation, and exploring the area. The visitors experience new perspectives on the role of volcanos in their lives, some have feelings of fear and risk taking, and others feel nostalgia about the preeruption conditions.

The Recreation Opportunity Spectrum is a system that combines these activities, settings, and experiences and allows them to be measured. This inventory system is described in detail in Appendix G. The present inventoried ROS expressed in area is shown in Table 9.

Table 9. Existing Opportunity Spectrum Classes.

ROS Class	Percent	Acres
Primitive	18	19,506
Semi-primitive (non-motorized)	51	56,932
Semi-primitive (motorized winter only)	(27)	(30,000) ¹
Roaded Natural	31	33,892
Rural		15 ²
	100	110,330

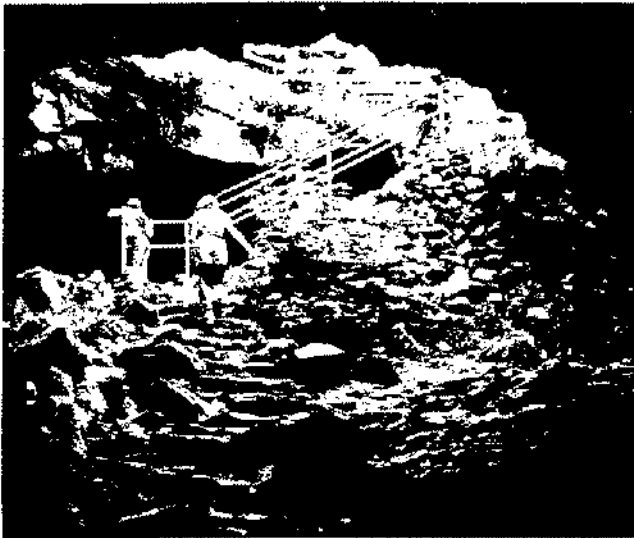
¹Duplication of area shown under semi-primitive (non-motorized) and is not included in the total.

²Visitor Center area is also not in the total.

Recreational Facilities

Existing Developments: The only recreation sites within the Monument boundary which escaped devastation by the 1980 eruption are discussed below:

--Ape Cave is widely known in the Pacific Northwest. Approximately two miles in length, it is the longest unitary lava tube cave within the continental United States. The existing recreation site consists of a paved parking area for 20 cars and one bus, a steel stairway at the mid-point and upper end of the cave, a double unit vault toilet, an information display constructed in 1968, and a trail from the upper to lower entrances.



Stairway at the lower entrance to Ape Cave.

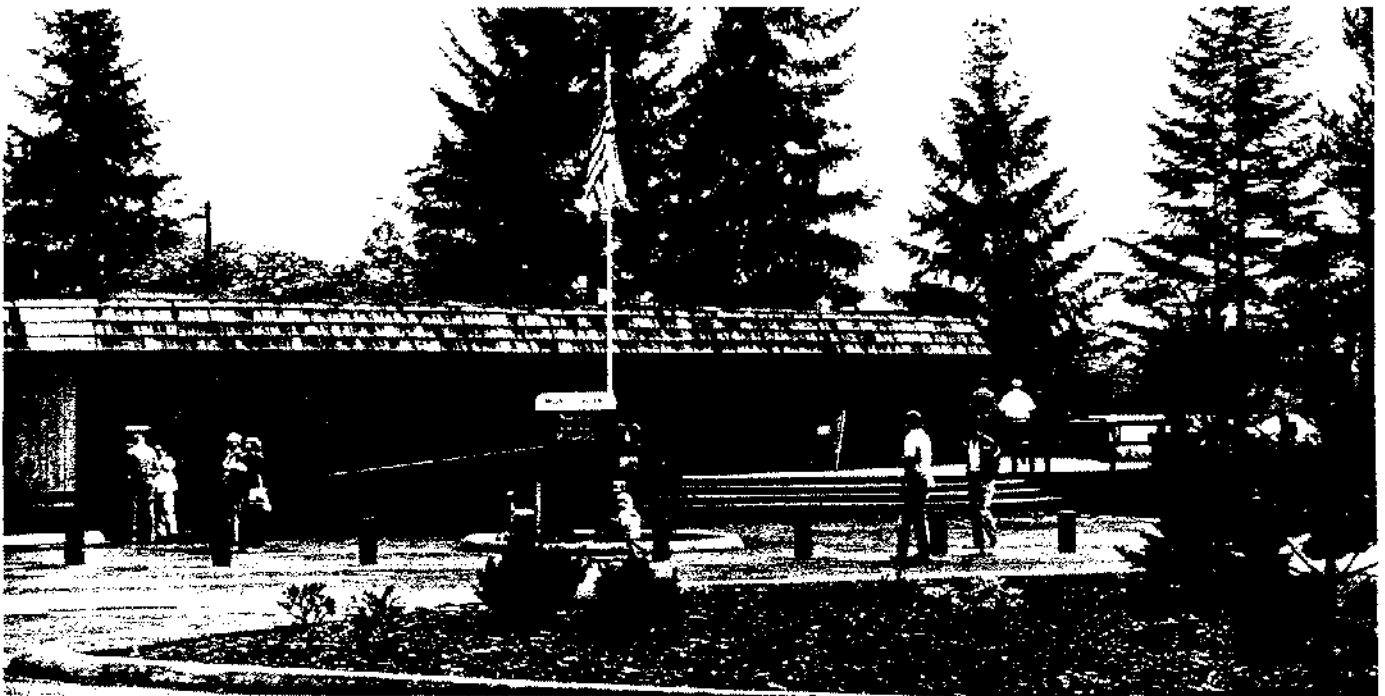
--Kalama Springs Campground was a 16 family unit facility; it was extensively inundated by an alluvial mudflow as a result of the eruption. About half of the units are covered with up to three feet of deposits. Its main attractions are the Kalama River flowing out as a spring from underneath a lava flow and the five acre McBride Lake within walking distance. A five unit day use picnic area was developed in 1983.

--Lava Cast Picnic Area is a 10 unit facility constructed in 1968 to provide for visitors to the Lava Tree Cast Area nearby. The site includes paved parking for 10 cars, pit toilets, pedestal grills, and picnic tables. Unmarked primitive trails lead to the many tree and log casts.

Other Facilities Used by Monument Visitors:

Mount St. Helens Visitor Center: Implementation of this Comprehensive Management Plan will, as volcanic hazard abates and the land recovers, bring visitors to the mountain. In the interim it has been necessary to bring the mountain to visitors by means of media presentations at a visitor center.

Located at Lewis & Clark State Park near the junction of Interstate 5 and U.S. 12, the center is operated by the Forest Service. The center's modular building has a large display area and a theater capable of seating 100 people. Parking, however, is a limiting factor; paved parking is available for only 65 passenger cars, 15 trailers, and 3 buses.

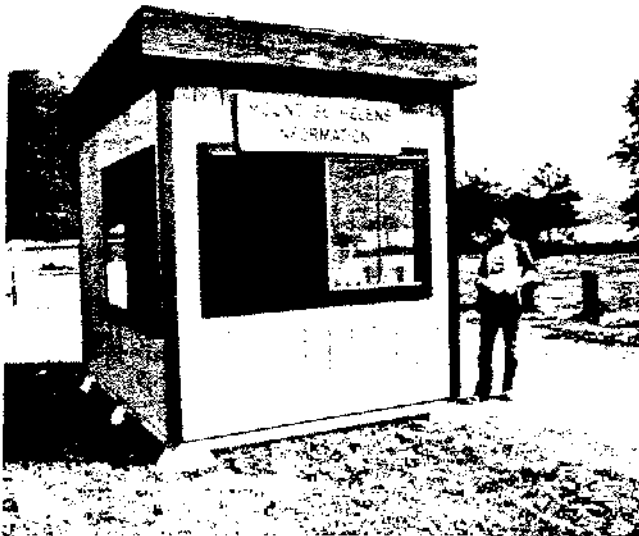


Forest Service Visitor Center at Lewis and Clark State Park.

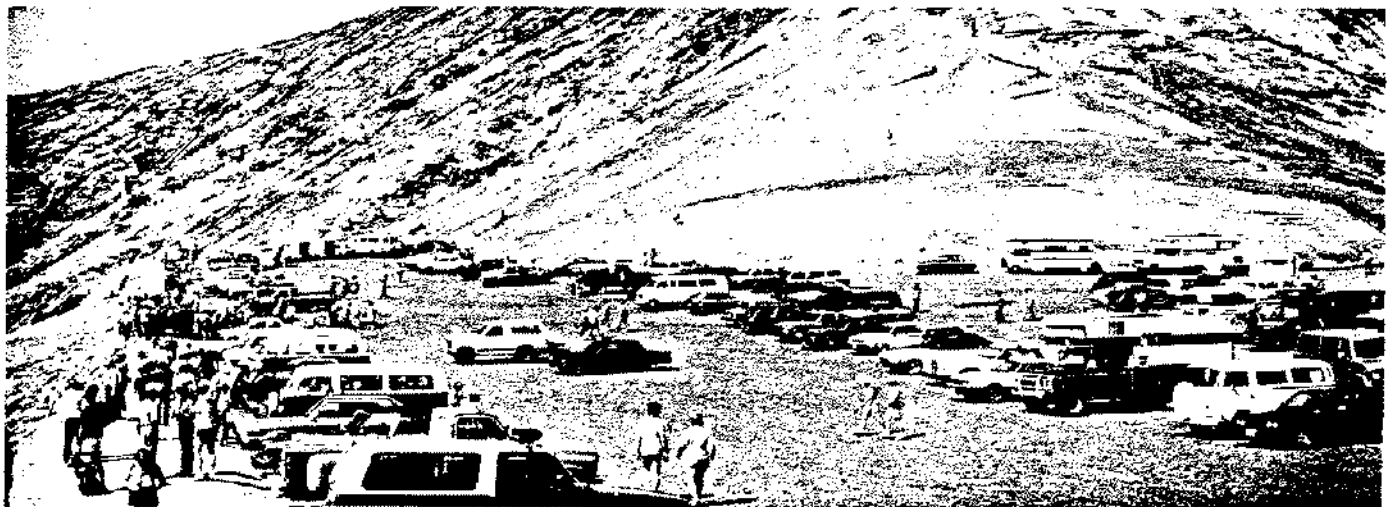
A permanent center will be constructed at a location by Silver Lake within Sequest State Park. The site is along State Route 504 (the Spirit Lake Memorial Highway) approximately five miles east of Interstate 5. An architectural and engineering firm is currently under contract to provide the final site plan and construction drawings for buildings and displays. The new building, capable of accommodating 600 people at one time, will include an indoor volcano viewing area, a multiple purpose room, and a large display and exhibit hall featuring a model of the Mount St. Helens area.

Information Stations: Temporary facilities were constructed and staffed in 1982 to provide information on road conditions, regulations, traffic safety, and places where visitors can best view evidence of the volcanic eruptions.

--Yale information facility, operated by the Forest Service under an agreement with Pacific Power & Light Co., is located at the Yale Reservoir boat ramp parking area, one mile west of Cougar.



Temporary information station at Yale Recreation site.



Windy Ridge Viewpoint.

--Iron Creek information station is located adjacent to the Iron Creek Campground on Road 2500, approximately seven miles south of Randle. It is a modified trailer and visitors must park and walk to obtain information. Parking for 10 passenger vehicles and a bus is provided, as well as toilets and an informational kiosk.

--Outlaw Ridge, an unmanned kiosk information site, was provided by Skamania County and the Forest Service along Road 54, immediately west of the junction with Road 30.

--The Pine Creek information station is located in the building which housed the St. Helens Ranger Station office prior to the 1980 eruptions. It has been modified to serve as a visitor contact station. Paved parking for 20 passenger cars and temporary toilets are provided. The other buildings at the former ranger station are being used as a seasonal work center.

Interpretive Sites and Viewpoints: Ten viewpoints with interpretive signs were constructed within the Monument or on nearby road corridors in 1982 and 1983, as a result of the recommendations in the Interim Interpretation and Recreation Development Program. The five most significant are:

--Muddy River; a paved parking area accommodating about 10 vehicles, two temporary interpretive signs, a bulletin board and a site identification sign.

--Bear Meadow; a 15 vehicle parking area with a temporary interpretive sign, a site identification sign, a two-unit vault toilet, and five picnic tables.

--Meta Lake; a paved parking turnout for about five vehicles, a 1/8 mile unsurfaced trail to Meta Lake, and an interpretive and site identification sign.

--Windy Ridge; a paved parking area for 110 vehicles, two interpretive signs, and 10 portable single-seat toilets.

--Lahar Viewpoint; a 10 vehicle parking area with short trail and interpretive sign.

--Road 26 Boundary Trailhead; a 30 vehicle parking area on the west side of Road 26.

Campgrounds: Two existing campgrounds are on travel routes leading to the Monument and could be directly impacted by increased visitor use associated with the Monument.

--Iron Creek Campground; a 54 unit facility, presently being expanded to 92 units, is located on the Cispus River about 11 miles south of U.S. 12. Paved access roads and parking spurs are provided.

--Lower Falls Campground; a 16 unit primitive camping area by a waterfall on the Lewis River. It is located about 15 miles east of Mount St. Helens.

Supporting Developments Provided by Private Landowners and Other Governmental Agencies: Outside and adjacent to the Monument several private and other governmental agencies provide recreational facilities on non-federal land expanding recreational opportunities for people visiting the area. (Table 10.)

The Cispus Center, located on the site of a 1930's Civilian Conservation Corps (CCC) camp, is leased to the Association of Washington School Principals and operated as the Cispus Learning Center for students from all over the State. There are 17 buildings on 45 acres at the Center. A large kitchen and dining hall, dormitories, an infirmary, a gymnasium, classrooms, and a library are included in the complex, which can accommodate 252 people.

In addition to use by students, the facility has accommodated university groups studying Mount St. Helens.

Table 10. Supportive State and Private Developments.

Park Name	Location	Number of Sites		Owner
		Camp	Picnic	
PP&L				
Merwin Park	Merwin Reservoir		135	Pacific Power and Light Co.
Speelyai Park	Merwin "		25	"
Saddle Dam	Yale "	14	10	"
Yale Park	Yale "		30	"
Cougar Park	Yale "		15	"
Cougar Camp	Yale "	45		"
Beaver Bay	Yale "	63	5	"
Swift	Swift "	93	5	"
Eagle Cliff	Swift "		10	"
Crescent Bay	Merwin "	80 *		"
Mossyrock	Riffe	60		Tacoma Light Co.
Mossyrock	Riffe	60 *		"
Sequest	SR 504	82	133	State Dept. of Park & Rec.
Sequest	SR 504	29 *	10 *	State Dept. of Park & Rec.
Merrill Lake	Road No. 81	10	--	State D.N.R.
Cowlitz River	Cispus confluence	60 *		Lewis County PUD
Hoffstadt Viewpoint	SR 504	(500 car parking)		Cowlitz County
Volcano View	SR 503	78		Private
Total		536	378	

*Planned

Dispersed Recreation

Off-Road Vehicles (ORVs): The Gifford Pinchot National Forest's Travel Plan has established policy for managing this recreational use within and around the National Volcanic Monument.

Many of the places previously used by ORVs in the Monument, particularly snowmobile areas, were in the volcano blast zone. Most snowmobiling now occurs on roads south of the mountain and demand is greater than available parking.



Road 83 snow trail.

In cooperation with the Washington State Parks and Recreation Commission, a snowmobile trail project grooms and also removes snow from some of the major roads on the south side of the mountain. Inadequate space is available presently for parking; traffic jams are frequent as vehicles towing trailers loaded with snowmobiles turn and park along the road shoulders.

Fishing, Hunting, Trapping: Wildlife and fisheries related recreational activities have historically been popular in the area which is now the Monument. The south slope of Mount St. Helens is one of the most popular areas in the state for elk hunting, and Monument streams and lakes were popular for anadromous and resident fishing. There were, on the average, 61,700 visitor days (measured in standard 12 hour days) spent annually in hunting, fishing, trapping, wildlife viewing and photographing, and other wildlife and fish-related activities, prior to the 1980 eruption of Mount St. Helens. In 1983, after destruction of a large portion of their habitat, and with the closure of the volcanic hazard zone, the moratorium on the stocking of fish in Monument lakes since 1980, and little access to much of the Monument, this figure was reduced to 15,100 visitor days. As habitat recovers, and access improves, wildlife and fish use will increase.

Horseriding: The Mt. Margaret Backcountry areas, Green River, Vanson Peak, and Spirit Lake Basin were heavily used by horseriding recreationists prior to the eruption.

Mountain Climbing: The good year-round highway access to Timberline parking lot on the north side of Mount St. Helens made it one of the most popular mountain climbing areas in the Northwest. Interest in scaling the now famous, if lower, peak will undoubtedly be great but that activity has been precluded by a restricted access zone for an indeterminable period.

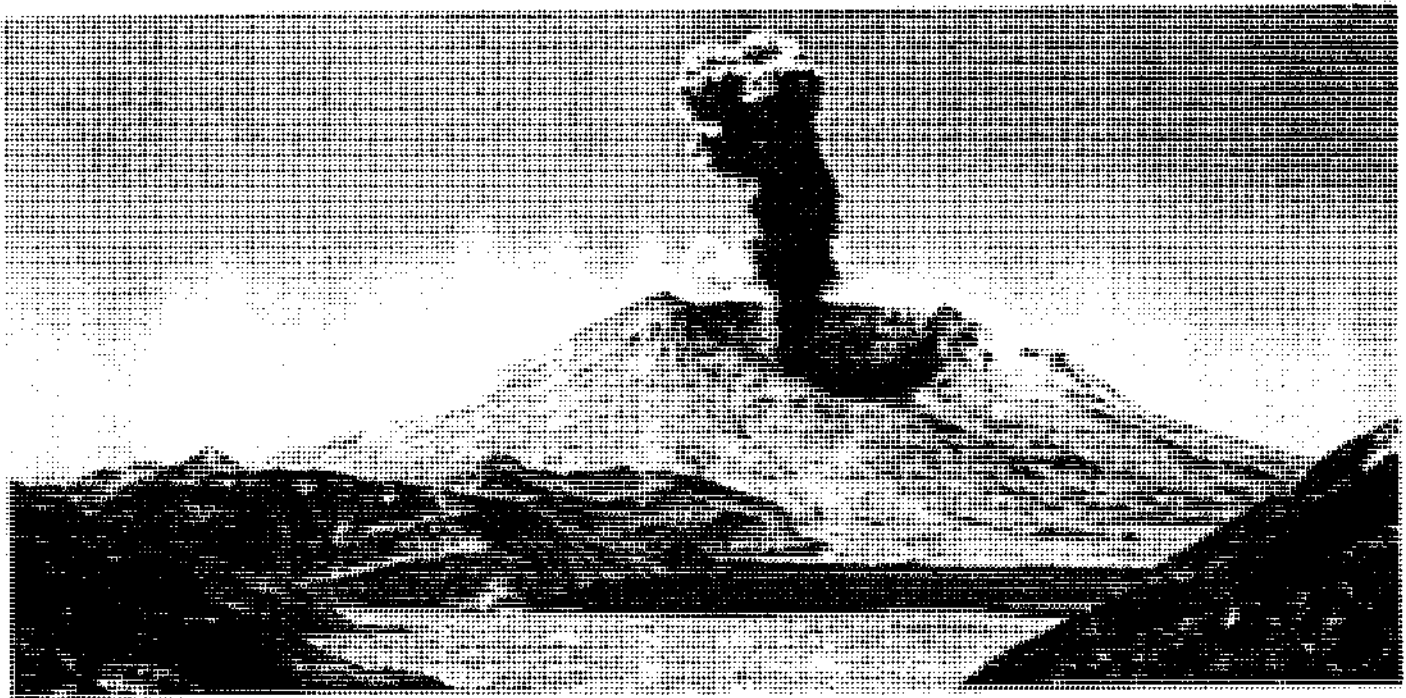
Cross-Country Skiing and Snow Play: The popularity of cross-country skiing increased dramatically during the late 1970s in the Spirit Lake Basin. It has increased on the south side of the mountain since the eruption closed the basin, creating congestion along Road 83.

Gathering Forest Products: A large number of people spent much of their time in the Spirit Lake basin gathering various types of huckleberries and blackberries, mushrooms, firewood, and beachwood specimens.

VISUAL RESOURCES

The crater containing a massive new lava dome, visible from low elevations because of the immense breach in the crater's northern side, is the visual focal point of the Monument. This "window into time" is and will remain one of the most extraordinary sights on earth.

A major area north of Mount St. Helens was drastically altered by the effects of the May 18, 1980, eruption. It is a new land devoid of most or all of the old vegetative cover. The rugged underlying terrain has been exposed producing a feeling of openness similar to that experienced in southwestern deserts. New, visually arresting landforms were created by the eruption and erosion is changing many of them rapidly. Many new lakes were formed and others were altered by the eruption. The complicated dynamics of the blast left timber blown down in endlessly varied ways; many textural patterns--jackstraw, uni-direction, and spiralled--can be seen. Strips of standing dead trees are a silver gray border which delineates the extent of the devastation area and contrasts starkly with the adjacent green forest. Rock outcrops, streams, and waterfalls long hidden are now exposed to view. Combinations of these elements in steep topography produce a new, compelling, and unique Cascade landscape.



The visual focal point of the Monument is the north face of the mountain.

Visual Resource Capability

Approximately 87 percent of the information humans receive is based on sight and, in the Monument, vision is even more dominant than usual. To protect the visual qualities of the area is to safeguard overall values, aesthetic and interpretive. The level of visual sensitivity is high; visitors travel great distances to "see" the volcanic area. They expect the much publicized and photographed volcanic features to be in a natural condition. Features of visual importance include not only the volcanic cone and nearby water bodies, but also the debris-avalanche, mudflows, and vegetation on the edges of the blast zone.



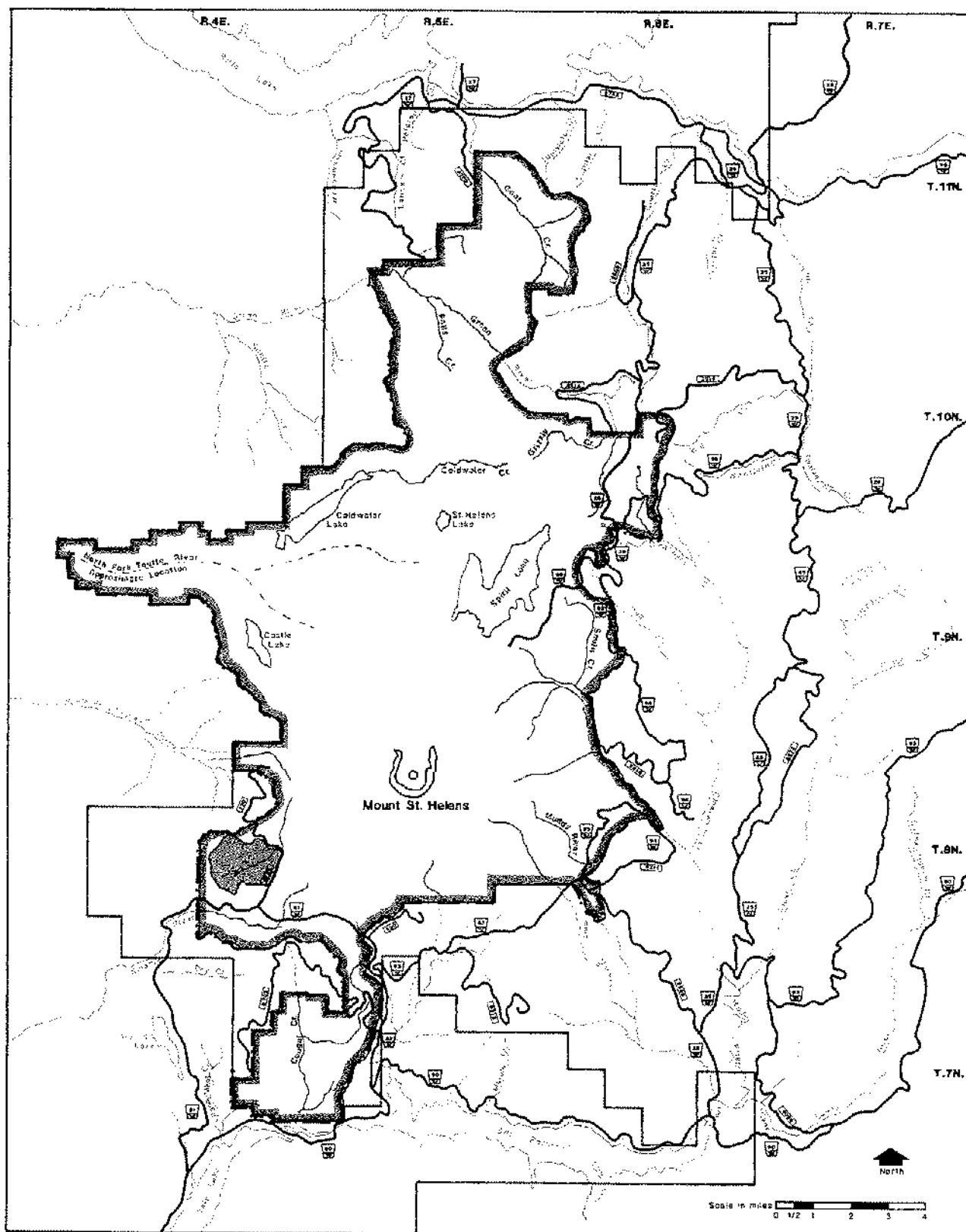
Debris avalanche.

The visual resource is defined by the subcharacter type within the Monument. The area has been classified as Recent (High) Cascades landscape character type. For planning in the Monument, this was broken down into 13 different character subtypes; each has been described and depicted (Figure 5, Chap. II).

Because of four factors--high scenic quality, visual accessibility, high user sensitivity, and Monument classification--the Visual Quality Objective (VQO) of Retention will apply in most of the Monument. Management activities in Retention areas must not be visually evident, they must repeat the characteristic form, line, color, and texture of the natural landscape. Research Natural Areas within the Monument have a more restrictive VQO, Preservation; the only alterations which may occur are those inherent in natural, ecological processes. Management activities, except for very low impact research facilities, are prohibited.

Much of the area affected by the eruption has a very low ability to absorb modification by human activities because of the virtual absence of vegetative screening. This will change to some extent in a relatively short period of time. Visual descriptions of the character subtypes for each portion of the Monument will be used as a yardstick to determine if a proposed activity will meet the Preservation or Retention VQOs (Figure 34).

As the natural processes continue, many of the original blast effects will be obscured or lost. The area, however, will retain much of its current character for many years to come. As successional changes take place, they will



Legend

- National Monument Boundary
- National Forest Boundary
- Existing Roads
- Streams
- Retention
- Preservation

Visual Quality Objectives

Figure 34

develop in unpredictable ways due to the unusual conditions. This recovery process will provide exceptional visual experiences for many years until, eventually, the area returns to the westside Cascade forest character of its surroundings.

Land adjacent to the blast area appears much as it did prior to the eruption, with some exceptions. Tephra on the forest floor provides a greater contrast with the green forest. The contrast is similar to that of snow cover in the winter. Beneath the canopy and understory, vegetation has been reduced east and northeast of the mountain giving the Forest a more open appearance.

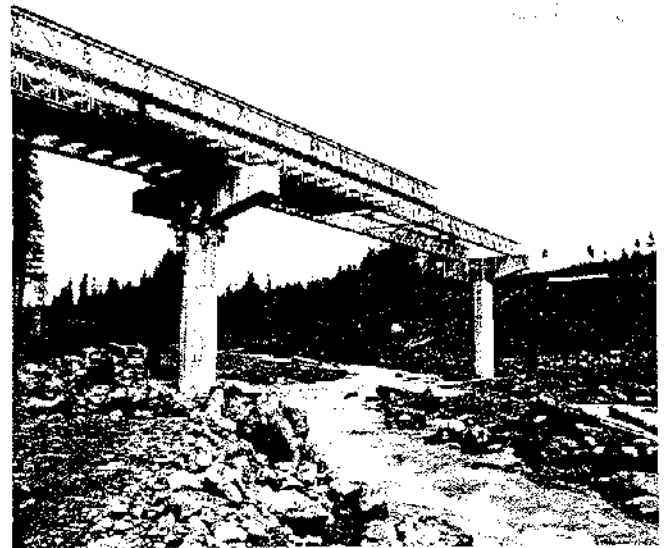
The area is visible from many vantages within and around the Monument. Aerial viewing is also very popular. Commercial volcano flights in small private aircraft are offered from many airfields around the mountain and are a common sight over the Monument.

TRANSPORTATION

Roads

Since the May 1980 eruptions, approximately 175 miles of road in or providing access to the Monument have been constructed or reconstructed. Seven interim bridges and one permanent bridge have been built, one bridge reconstructed, and a major culvert installed. Plans call for the replacement of interim (temporary) bridges within 3 to 5 years. Approximately 24 miles of the road construction/reconstruction is within the Monument boundary. Many of the roads in the south, southwest, and southeast sections of the Monument were essentially unaffected by the

eruption. There are also some sections of road in the Coldwater area which were isolated by the debris avalanche. They are not accessible and have not been included in the mileage totals.

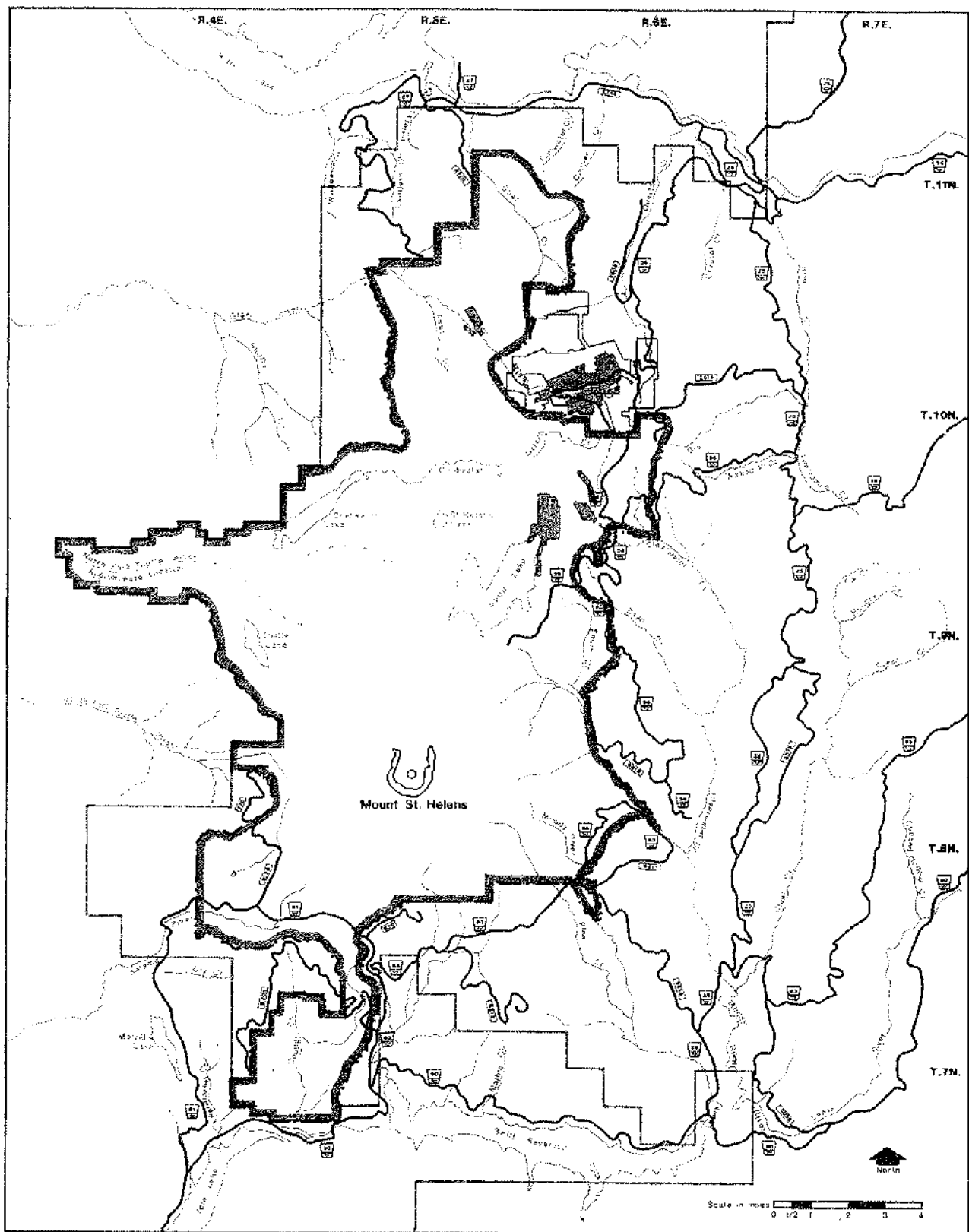


Temporary bridge on Pine Creek.

Since the eruption, road construction and reconstruction outside of the Monument have taken place primarily to provide access for timber salvage. Salvage is 90 to 97 percent complete and weekday closures to nonlogging traffic will be much less frequent, providing access for more recreational visitors. Future timber sales on adjacent National Forest land and some private holdings will be hauled over several roads which border the Monument (Roads 99 and 83) and others which pass through the Monument (Roads 81, 8123, and 8303).



Industrial and recreation traffic on Road 25.



Legend

- National Monument Boundary
- National Forest Boundary
- Existing Roads
- Streams
- Patented
- Unpatented
- Outstanding Mineral Rights
(Forest Service has surface rights only)

Mining Claims

Figure 35

State Route 14 (south) and U.S. 12 (north) provide primary access to the Monument. Further access is by State Routes 141 (southeast), 500, 502, and 503 (southwest), 505 (northwest), and 504 (west). State Route 504 (the Spirit Lake Memorial Highway) ends at the debris dam just east of Camp Baker, about 10 miles from the Monument boundary. Prior to the May 18, 1980, eruption of Mount St. Helens, State Route (SR) 504 started at Interstate 5 near Castle Rock, passed through the communities of Toutle, Kid Valley, and St. Helens; and continued to Spirit Lake and on up to the timber line on Mount St. Helens. From Toutle to Spirit Lake, SR 504 followed along the North Fork of the Toutle River. With the eruption of Mount St. Helens, the easterly 25 miles of highway was completely destroyed from the vicinity of the community of Camp Baker to the end of the route. Between Toutle and Camp Baker several sections were damaged or destroyed. Most of these sections have subsequently been reconstructed.

SR 504 ends about 2 miles east of the community of Kid Valley with a temporary route constructed to the debris dam about ten miles from the Monument boundary. The Washington State Department of Transportation is in the process of bringing the existing roadway up to a modified highway standard of two 12-foot lanes with 4 foot shoulders.

The need exists now for the highway to be reconstructed eastward from near Camp Baker to provide public access to the area for recreation, timber management, scientific study, and access to private homes and lands. SR 504 provided the only public access into the area from the west prior to the eruption. Further reconstruction of SR 504 is called for in Alternatives C, D (Modified), F, and G.

MINING ACTIVITY

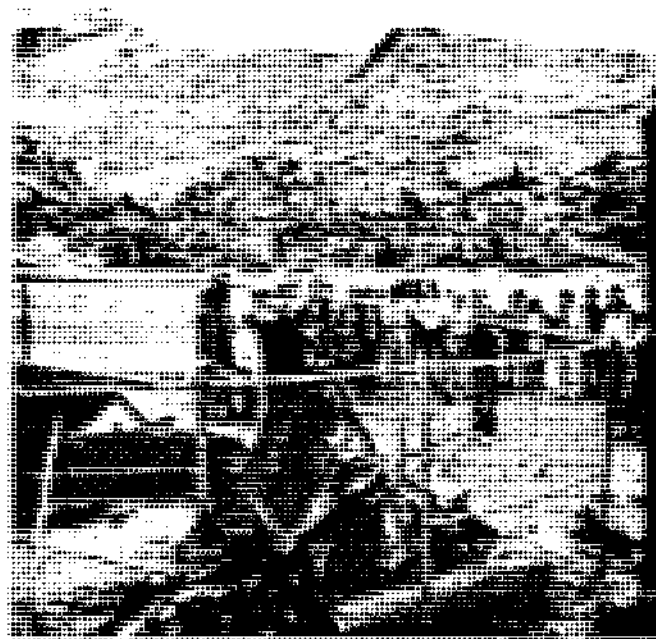
There are only two patented claims within the Monument (Figure 35). The Forest Service is in the process of acquiring these through exchange. The Mimie Lee Mines in Section 2 and 3, T. 10 N., R. 5 E., are owned by Champion International. The other patented claim is the Chicago Mines in NW 1/4 Sec. 32 and SW 1/4 Sec. 29 T. 10 N., R. 6 E., W.M.

CULTURAL RESOURCES

Human history of the Mount St. Helens area began with Native Americans thousands of years before the written record. It is a continuing story, told today with photographs, films, and interpretive displays, as well as the written word.

Cultural resource management is concerned with the evidence people leave behind demonstrating their use of the land. When this evidence is put together, it has the potential to reveal what humans did here long ago and what their lives were like. Each piece of information is a crucial element in reconstructing the past.

The car parked near Meta Lake at 8:32 a.m. on May 18, 1980, testifies to the power of Mount St. Helens. The car was physically moved across a road by the explosion, and the paint was sand-blasted from its surface. Plastic in its interior was melted, while the tires remained intact.



Miner's car near Meta Lake.

There is also cultural significance in legends and stories about Mount St. Helens. They tell us how the mountain was perceived by the storyteller, and that people have always pondered the relationship between human beings and nature. An account recorded in 1861 of an ascent of Mount St. Helens with Indian guides describes the guides' reluctance to cross the snow line, beyond timberline and grassy meadows. The guides protested that the attempt to go further "would bring upon us the sore displeasure of the Sah-hah-ly Ty-ee of the mountain, who would inflict upon us a severe penalty for our temerity" (Loo-Wit Lat-Kla, 1861).

Prehistoric Sites

Despite a recent oral tradition that warned of a mountain with a temper, it is unlikely that prehistoric (prior to EuroAmerican contact) Native Americans always avoided the Mount St. Helens area. Between eruptive periods, when the forest offered berries, browse for game, and other resources, the area was almost certainly visited. While the mountain was active and for a period thereafter, the area was probably avoided. A lifestyle and strong religious beliefs based upon nature would have imposed a healthy respect for an erupting volcano.

Monument lands were probably utilized by several Indian groups at different times for hunting and gathering. This would have occurred primarily in

the summer and fall, when weather did not restrict access. It is likely that Cowlitz groups were the earlier occupants, yielding later to the Klickitat Indians (Spier, 1936; Ray, 1974). Native Americans from other tribal groups may also have traveled through the area and/or used it for resource gathering. In 1853, the first non-Indians to enter the Forest interior noted Indian groups occupying the valleys between Mount St. Helens and Mt. Adams (Jermann and Mason, 1976).

There have been no isolated artifacts or archaeological sites found within the Monument boundaries to date. This lack of artifactual evidence most likely relates more to depth of ashfall deposits from this and previous eruptive periods and the paucity of field reconnaissance (less than one percent of the Monument has been investigated for cultural resources) than to absence from the area by Native Americans. Less than ten miles north of the Monument boundary, remains of prehistoric tool manufacture were found beneath four feet of ash deposits and date to about four thousand years ago. An isolated artifact was found less than one-half mile outside the Monument's west boundary. Communication between the Forest and Indian groups ancestrally associated with the area is on-going.

Historic Sites

The earliest recorded settlement around the mountain by EuroAmericans was directly related to the geology of the area. The St. Helens Mining District, organized in 1892, was heavily promoted as the closest mining district to Portland and "one of the most promising properties of the Pacific Northwest". Copper was the primary ore extracted, with gold and silver in lesser amounts. Before ceasing and being labeled "a field full of disappointments" in 1912, the mining district had donated copper for a statue of Sacajawea for the 1905 Lewis and Clark Exposition (now in a Portland park) and had even sold stock to Theodore Roosevelt (Jermann and Mason, 1976).

Timber harvest, still a primary industry in the area, began south of the Toutle River in 1887. Between 1900 and 1915 a number of families settled along the Toutle River in what is now the western portion of the Monument. The community became known as Elk Creek and was serviced by its own post office between 1912 and 1917. The Forest Service established the earliest Ranger Station in the area in 1910 and by 1916 had erected a lookout on the summit of Mount St. Helens. The post was later abandoned because lookouts were often above the clouds, unable to view the forest they were supposed to be watching. In the 1930s and early 1940s, roads, trails, signs, trail shelters, and buildings were constructed in what is now the Monument by the Civilian Conservation Corps. The same sturdy "Cascadian" architectural style proposed for Monument construction was used in the early

structures, many of which were still standing at the time of the May 1980 eruption. The Portland YMCA camp, established at the south end of Spirit Lake in 1911, moved to the north end in 1951. Early mining activity had caused the county to build a road to Spirit Lake in 1901. It remained unpaved until 1946 and is today State Route 504, the Spirit Lake Memorial Highway.

During the 1940s, recreational homes and commercial development increased. Harry Truman's St. Helens Lodge, Harmony Falls Lodge, Boy and Girl Scout camps, and two YMCA camps operated around Spirit Lake. The Forest Service operated a visitor information station, a large picnic ground, a large campground, and a boat launching ramp during the recreation season. Three other campgrounds on the lake were accessible by boat or trail. Other Forest Service facilities included a horse camp in the area and the Timberline complex, which included a small campground, interpretive signs, a viewpoint, parking, and trailhead facilities. Spirit Lake Lodge and recreation homes were located near the North Toutle River west of the lake.

Under most conditions, the amount of past land use by humans and the constancy of that use over time are indications of the amount of prehistoric and historic evidence that may be found. Table 11 and Figure 35 provide an inventory of potential sites in the Monument. The likelihood of locating these sites, however, will be dependent upon several factors: the distance from the mountain, the amount of debris (ash, mud, or water) accumulated at a particular place, the depth of the proposed ground disturbing activity, and, obviously, what actually remains at each site. Historic remains, such as those associated with the St. Helens Mining District, have been located but few other sites have been investigated.

Caves

There are at least eight caves, rock shelters, and lava tubes (herein referred to as "caves") in the Forest known to be archaeological sites. Caves were most likely used as temporary shelters during the late summer-early fall, and do yield remains indicative of the diet and lifestyle of prehistoric people. Along with stone cutting and grinding tools, evidence of the butchering of deer and mountain sheep and the use of salmon was found. Human use of caves in the Forest has been dated by radiocarbon methods to as early as 4,000 years ago.

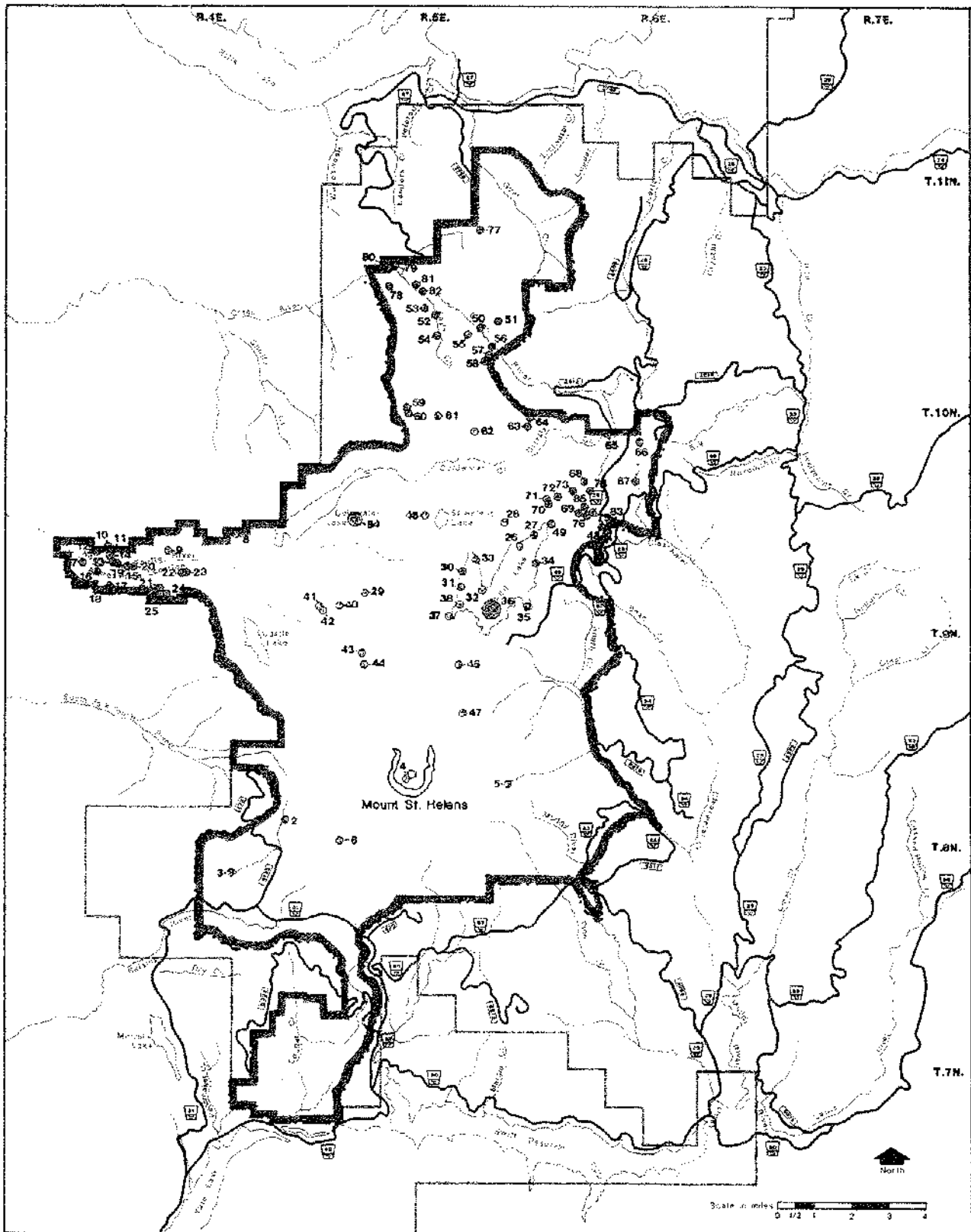
Washington's first commercial cave was discovered in 1895 by Ole Peterson. For several years and for a small fee, Peterson conducted parties through the cave. Guests who came to tour the cave stayed in a log house adjacent to the cave's lower entrance. None of the caves within the Monument boundaries have yet been investigated for cultural resources but it is expected that at least some of them contain prehistoric or historic artifacts and/or information.

Table 11: List of Inventoried Cultural Resource Sites.

Few of the sites listed below and identified on Figure 36 have had field investigation; inventory forms were prepared on the basis of historic records or data provided by informants. Only sites within the boundaries of the Monument are included. An estimate of when they were used is given and there is an indication of whether a field investigation has been made. A key to the symbols follows:

+ - field investigated	I - Inundated site
- - no field investigation	U - Unknown
B - Buried site	R - Reported site
E - Existing site	N - Documented and evaluated for the
D - Destroyed site	National Register

Site Name	Use Period	Field Check	Estimated Condition
1. Ole's Cave	1895-1940s	-	U
2. Coldspring Cabin	unknown	-	U
3. McBride Lake Cabin	pre-1916	-	U
4. Mount St. Helens Lookout	1917-1940s	-	D
5. Ape Canyon Miners Cabin	unknown	-	B
6. Butte Camp	pre-1916	-	U
7. Building or cabin	pre-1916	-	B
8. Charles Maratta Cabin	1900-1940	-	B
9. Willis Bell Cabin	1900-1920	-	B
10. Harvey Knight Cabin	1900-1920	-	U
11. J.M. Baldwin Cabin	1900-1920	-	U
12. Frank McCormick Cabin	1900-1915	-	U
13. Frank Sifer Cabin	1900-1915	-	B
14. W.A. Rowe Cabin	1900-1915	-	U
15. J.M Couch Homestead	1900-1930s	-	B
16. William Simmons Cabin	1900-1915	-	B
17. Fred Stankey Cabin	1900-1920	-	U
18. Frank Monahan Cabin	1900-1915	-	U
19. Cabin site	1900-1915	-	U
20. Gould Homestead	1910-1960	-	B
21. H.W. Jackson Cabin	1900-1920	-	B
22. W.V. Hyde Cabin	1900-1930s	-	B
23. Hans Hanson Cabin	1900-1930s	-	B
24. L.R. Wakefield Cabin	1900-1930s	-	B
25. Arthur Gilfeather Cabin	1900-1930s	-	B
26. Camp Loowit	1930s	+	I
27. StHelens Hike Club Cabin	1930-1980	+	I
28. Lange Mine	1904-1910	+	D
29. Weller Cabin & Mine	1900-1910	+	B
30. Cabin	unknown	-	I
31. Mining Tug Boat	1900-1915	+	I
32. W.F. West Cabin	pre-1907	+	I
33. Bear Creek Cabin	pre-1907	+	I
34. Falls Lode Mining Camp	1904-1920	-	I
35. Camp	pre-1920	-	I
36. Spirit Lake Ranger Station Historic Dist.	1900-1980	+	B
37. Harry Truman Barn	1925-1950s	+	B
38. Henry Coe Dam	1900-1920s	+	B
39. Lange Road	1901-1980	-	B
40. Lois Bright House	pre-1907	+	B
41. Toutle River Ranger Sta.	1910-1913	+	B
42. Toutle R. Trail Shelter	pre-1901?	+	B
43. Harry Truman Cabin	post-1939	+	B
44. Game Warden Cabin	post-1939	+	B
45. Bright Mine & Cabin	1907-1920	+	B
46. Coldwater Fire Lookout	1936-1960s	-	U
47. Longview Ski Club Cabin	1939-80	-	U
48. Meta Lake Trail Shelter	1936-1968	-	U
49. Sweden Mine	1900-1920	-	D
50. Minnie Lee Mine & Cabin	1899-1930s	-	E
51. Deadmans Creek Cabin	1900-1910	-	U



Legend

- National Monument Boundary
- National Forest Boundary
- Existing Roads
- Streams
- Cultural Resource Sites

Cultural Resource Sites

Figure 36

Table 11: List of Inventoried Cultural Resource Sites. (Continued)

52. Lower Falls Creek Cabin	unknown	-	R
53. Luzerne Mine & Cabin	1904-1916	-	E
54. Upper Falls Creek Cabin	pre-1916	-	U
55. Independence Mining Camp	1904-1916	-	U
56. Black Mountain Mine Claims House	1903-1913	+	N
57. Black Mtn. No. 1 & 2 Mines	pre-1909	+	N
58. Black Mtn. No. 3 Mine	pre-1907	+	N
59. Cabin site	pre-1916	-	U
60. Cabin site	pre-1916	-	U
61. Cabin site	pre-1916	-	U
62. Snow Lake Cabin & Dam	1904-1930s	-	U
63. Copper Pot Dam	ca.1909	+	N
64. Copper Pot Mine	pre-1909	+	N
65. Grizzly #1 Claim Cabin	1902-1910	+	N
66. Big Blue Mine Cabin	pre-1912	-	R
67. Ghost Creek Cabin	pre-1909	-	U
68. Chicago Cabin & NW Discovery Mine	1900-1916	+	D
69. Mary No. 6 Mine	1904-1910	+	E
70. Norway Cabin #1	1905-1915	+	D
71. Norway Mine	1905-1915	+	D
72. Norway Cabin #2	1905-1915	-	D
73. Cabin site	pre-1916	-	U
74. Chicago No. 1 Cabin	1900-1920	+	N
75. Mt. Fairy Mine & Cabin	1896-1915	+	N
76. Mary No. 1 & 2 Cabin & Mines	1900-1915	+	N
77. Vanson Peak Lookout	1930-1960s	-	U
78. East Miners Creek Cabin	unknown	+	N
79. Big Falls Cabin Site	1905-1960s	+	E
80. Big Falls Mine	1904-1914	-	U
81. Cabin site	pre-1916	-	U
82. Cabin site	pre-1916	-	U
83. Parker car	May 18, 1980	+	E
84. Coldwater Ridge Logging Equipment	May 18, 1980	+	E
85. Black Rock Mine	May 18, 1980	+	E



Coldwater Lookout, site No. 46.

Volcano Sites

In March 1980 the Cascades started another step in their evolution. Native and EuroAmericans had witnessed eruptions of Mount St. Helens in the 1800's, but those of us alive today had seen little of the type of activity that created the Cascades. Natural curiosity drew a small number of people to the area to see and record with cameras the type of geologic event that helped shape the Pacific Northwest. The morning of May 18, 1980, however, was different from other volcano-watching mornings; no one expected the forceful blast to the north that the mountain unleashed.

Volcano sites are cultural resources which attained their historic importance in seconds, rather than the standard 50 years. The significance of these items and sites is in what they communicate to us about the heat, force, and power of a volcanic eruption. Curiosity about the way other humans reacted to and confronted this geologic event helps to put things in perspective for people. Wanting to see, feel, and understand an event both scary and awesome draws people now as it did those who were watching the mountain on the 18th of May, 1980. A unique opportunity exists to preserve and present the story for future generations.



Damaged logging equipment on Coldwater Ridge.

Many of the structures, vehicles, and much of the logging equipment altered by the volcano's activity were originally outside the Monument boundaries. Most were recovered by owners or their relatives, removed for exhibit by local entrepreneurs, or looted. An interpretive site has been established at the Parker Car at Meta Lake. Others, such as the Coldwater Ridge Logging Equipment and Black Rock Mine, are being studied for possible protection and interpretation.

PUBLIC SAFETY HAZARDS

Air Traffic

Airspace around Mount St. Helens is frequently crowded. An article in the Pacific Northwest Magazine (Oct., 1983) referred to the mountain as a "Flying Circus." There have been seven known aircraft crashes and an estimated 80 "near miss" incidents since the 1980 eruptions (Myers, 1983).

The U.S. Geological Survey uses helicopters to transport scientists monitoring the mountain to measurement sites in the crater and on the slopes. The Forest Service, U.S. Army Corps of Engineers, U.S. Soil Conservation Service, and various other government agencies make frequent flights for administrative purposes. They operate under permit and use a suggested radio frequency and flight direction to avoid conflict.

Commercial air charter services within 100 miles of Mount St. Helens convey an estimated 3,000 visitors to the mountain each year, many of them news media representatives. Concessionaires and other small entrepreneurs located closer to the mountain (within 25 miles) specialize in scenic volcano flights for another 3,000 visitors annually. Private pilots take their families and friends on mountain flights and commercial airline pilots sometimes alter flight paths to gain views inside the crater.

The Federal Aviation Administration's (F.A.A.) Northwest Mountain Region has the responsibility for regulating the air space. The Seattle Enroute Control Facility in Auburn, Washington, monitors the area on radar and reports that traffic is heaviest during times when the mountain is or is thought to be active. On these occasions, an average of 20 aircraft are flying around the mountain at any given moment throughout the daylight hours.

The F.A.A. has no special restrictions on the area in force except when volcanic activity precipitates an emergency declaration (F.A.A., 1983).

Hydrologic Risk and Water Quality

Hydrologic Risk--Within the devastated area, stream channels contain large amounts of woody debris and carry an increased sediment load resulting from direct deposition of tephra by the initial blast and from hillslope erosion. Those drainages affected by mudflows, pyroclastic flows, and the debris avalanche were severely impacted by additional volumes of sediment. As a result, these stream channels are in an actively developing stage.

Channels affected by mudflows (Pine Creek, Smith Creek, Muddy River, South Fork Toutle River) are characterized by an intricate network of interlacing channels and sediment bars. During periods of increased runoff, channel locations change abruptly. These conditions will prevail for the foreseeable future.

The Spirit Lake basin and North Fork Toutle River drainage were primarily impacted by the debris avalanche and pyroclastic flow events. In these areas, the terrain is characterized by rapidly forming, deeply incised channels with oversteepened, potentially unstable banks.

On the steep terrain northeast of the volcano blanketed by tephra deposits, main stem channels and their tributaries have been periodically impacted by volumes of tephra deposited by hillslope erosion and debris flows.

In all of the areas described above, hydrologic processes have been altered and are subject to rapid, unpredictable changes. Siting and design of facilities (such as roads, trails, bridges, parking areas, and buildings) and public use in these areas must consider these active processes and will involve a certain degree of risk, both to the facility and potentially to the public.

Water Quality--The amount of water quality degradation in devastated area lakes (and to a lesser extent, streams) vary with the type and degree of volcanic disturbance. In some areas, bacterial populations increased as a result of the enriched supply of inorganic nutrients, the abundance of organic carbon leached from woody debris, and the elevated water temperatures. The Washington State Department of Social and Health Services and independent researchers have conducted bacteriological tests of Monument lakes and streams for two potentially pathogenic bacteria (Legionella and Klebsiella pneumonia). The 1983 data indicate that Klebsiella pneumonia is not present often enough or in high enough numbers to present a public health concern. This same data appears to support observations that Legionella are more common in waters within the devastated area than in nearby water outside of the impacted area. The reports further states that a substantial threat to public health does not exist in the area or its waters but caution is warranted since all of the health implications are not yet fully understood.

Volcanic Hazards and Associated Risk

The Monument bears silent testimony to the potential hazards of Mount St. Helens. Present hazards are not as serious as those of May 18, 1980, but must be kept in mind. We distinguish here between hazard (a volcanic event that can damage, injure, or kill) and risk (expectable loss of life or property that is near the volcano).

Hazards: Mount St. Helens has exhibited a wide range of volcanic activity in the past 40,000 years, from violent explosive eruptions to quiescent lava flows. The following eruptive hazards are the most likely to occur at Mount St. Helens:

Airfall tephra: Volcanic ash and larger fragments (collectively called tephra) are ejected upward from a vent by explosive eruptions. Large fragments fall close to the vent; smaller particles drift downwind, eventually falling and

forming a lobe-shaped blanket that becomes thinner and finer-grained with increasing distance from the vent. The probability of a major ash-producing eruption is low for the short-term and slightly higher over the long-term. Such an eruption would probably be preceded by telltale changes in the volcano's seismicity, ground deformation, and other premonitory activity.

Pyroclastic flows are ground-hugging masses of hot, dry rock fragments mixed with hot gases, flowing down the volcano's slopes at high speeds. They commonly reach temperatures of hundreds of degrees Celsius and speeds of 30 to 90 miles per hour. Pyroclastic flows generally follow valleys or other depressions, but can have enough momentum to overtop hills or ridges in their path.

Pyroclastic flows have occurred frequently at Mount St. Helens. Most occur during explosive eruptions, and as with major airfall tephra deposition, would probably be foreseen by changes in the mountain's behavior. However, small pyroclastic flows could be generated during lava dome development.

Pyroclastic surges are relatively dilute mixtures of rock particles and gases that flow away from a volcanic vent at high speed. They are similar to pyroclastic flows, but are less confined to valleys and other topographic lows. Like most pyroclastic flows, surges occur during explosive eruptions. Laterally directed blasts, such as from explosions from the side of a lava dome, are closely related to pyroclastic surges.

Lava flows and domes result from relatively quiet eruption of molten rock that flows away from the vent as a molten stream (lava flow) or that piles up over a volcanic vent (lava dome). Depending on chemical characteristics of lava and the volume of lava erupted, lava flows may reach distances of several miles from their source. Domes grow directly on the vent and are not a direct hazard outside the crater. One hazard associated with the formation of a dome is that the flanks of growing domes are typically unstable and occasionally collapse to form pyroclastic flows. Eruptions from late 1980 to the present have been building a large lava dome in the crater of Mount St. Helens.

Mudflows Eruptions onto snowpack may melt the snow and cause mudflows. Mudflows follow streamcourses and topographic depressions. The volume of material, water content, and steepness of slope determine the distance a mudflow travels. Small mudflows may be expected to form during the small scale explosive activity that has been associated with dome growth at Mount St. Helens; large mudflows are less likely in the near future but could well occur during the long term.



View southward of Mount St. Helens from Harrys Ridge showing effects of catastrophic snow avalanche and flood of 19 March 1982. The avalanche, which originated from the crater walls and flowed 8.4 km to the pumice plain and Spirit Lake, is the darker marginal deposit. Most of the area was swept by a flood that originated by eruption-induced melting of snow on the crater floor behind the dome. U.S.G.S. photograph by R. B. Waitt, Jr.

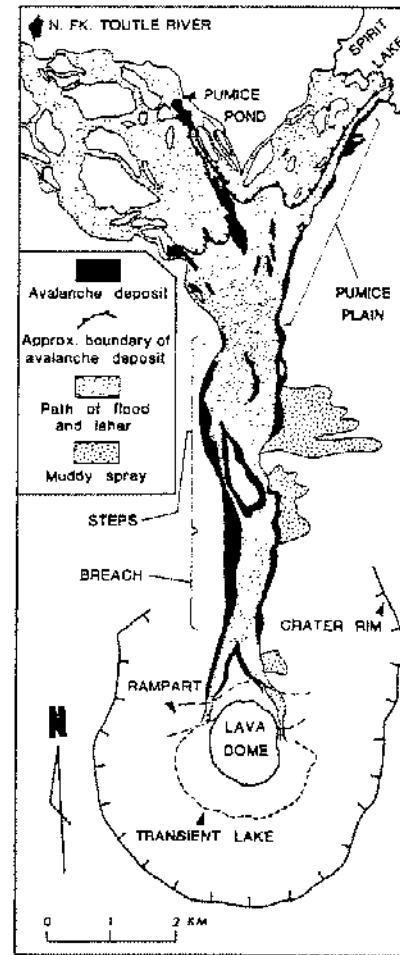


Figure 37 showing distribution of deposits and paths of catastrophic snow avalanche and flood from Mount St. Helens on 19 March 1982. Published in *Science* v. 221, p. 1395 (1983).

Volcanic risk:

Risk of property damage, damage to structures: Structures in unprotected lowlands immediately north and northwest of the crater would be at high risk from pyroclastic flows, pyroclastic surges, or mudflows. Structures would be at lesser risk from tephra fall (ash fall), and proper engineering and provision for ash removal from rooftops can minimize this risk. Roadways and related structures are at risk from mudflows along channels leading from Mount St. Helens.

Risk of injury or death: Visitors to the Monument will, in general, not be subject to risks any higher than risks of everyday life. The greatest potential risk to life would be in areas subject to pyroclastic flows and surges, and to a lesser extent from mudflows. Ashfall does not pose a serious risk to life; persons caught in ashfall should take shelter if possible and breathe through a moist cloth, in the same way as they would if they encountered heavy dust.

Quantification of risk

Some areas of the Monument are inherently safer than others, and some volcanic hazards are more likely to occur than others. A method for quantifying volcanic risk was presented in U.S. Geological Survey Open-File Reports 82-396 and 84-272, entitled "A Method for estimating intermediate and long-term risks from volcanic activity, with an example from Mount St. Helens, Washington," and "Semiquantitative assessment of changing volcanic risk at Mount St. Helens, Washington," respectively.

A map from the latter report is included here (Figure 38, Zones of Volcanic Hazard). The map shows zones in which visitors would be at higher or lower risks from the volcano. Rows and columns of letters for each zone (see key on facing page from Figure 38) indicate approximate risks of death, per year, for different patterns of visitation (from full-time occupancy to occasional visitation), and different short-term states of the volcano (from quiet to explosive eruption).

Only risks of death are shown; risks of injury are similar. The estimates are based on sparse data and include subjective judgments by the author of these reports; actual risks may be at least 10 times higher or lower than shown here.

The map and accompanying tables shown in this section are based on current understanding of volcanic hazards and risks and on current conditions of the volcano. These conditions can change at any time, which could in turn change hazard zone boundaries and volcanic risk within the Monument.

Table 12. Volcanic risks at Mount St. Helens compared with death rates from familiar causes (expressed as annual probabilities of death, for "average" participating individuals)

Levels of Volcanic Risk (corresponding to letters in Figure 37)	All Causes, based on mortality tables, for different age groups, U.S.	Occupational	Miscellaneous
1.0 (10^0) ----- A			
0.1 (10^{-1}) ----- B	Age 90, (2.3×10^{-1}) Age 80, ($0.9-1.1 \times 10^{-1}$)		
0.01 (10^{-2}) ----- C	Age 60, ($1.8-2.1 \times 10^{-2}$) Avg, age-weighted (6.4×10^{-3}) Age 40, (3×10^{-3}) Age 20, ($1.1-1.8 \times 10^{-3}$)	War U.S. forces in WWII, Korea, Vietnam ($2-5 \times 10^{-2}$) Helicopter pilots (6×10^{-3}) Deep sea fishing (3×10^{-3}) Logging (2.5×10^{-3}) Avg 33 hazardous occupations (1.2×10^{-3}) Mining & quarrying (1×10^{-3})	Drug abuse (8×10^{-3}) Smoking (5×10^{-3}) (?) Cardiovascular disease (2.9×10^{-3}) Cancer (1.3×10^{-3})
0.001 (10^{-3}) ----- D		Construction (7.2×10^{-4}) Agriculture (6.3×10^{-4}) Transportation & utilities (3.8×10^{-4}) Law enforcement (2×10^{-4}) Government, civilian (1.3×10^{-4}) All U.S. workers (1.2×10^{-4}) Manufacturing (1.0×10^{-4})	Accidents--all types (4.5×10^{-4}) Car accidents (2.5×10^{-4})
0.0001 (10^{-4}) ----- E		Trades (8×10^{-5})	Accidental falls (8×10^{-5})
0.00001 (10^{-5}) ----- F			Drowning, U.S. (4×10^{-5}) Firearm accidents (1.4×10^{-5})
0.000001 (10^{-6}) ----- G			Floods, world (2×10^{-6}) Tornadoes, U.S. (1×10^{-6}) Earthquakes, world (8×10^{-7}) Hurricanes, U.S. (5×10^{-7}) Volcanic eruptions, world (1×10^{-7})

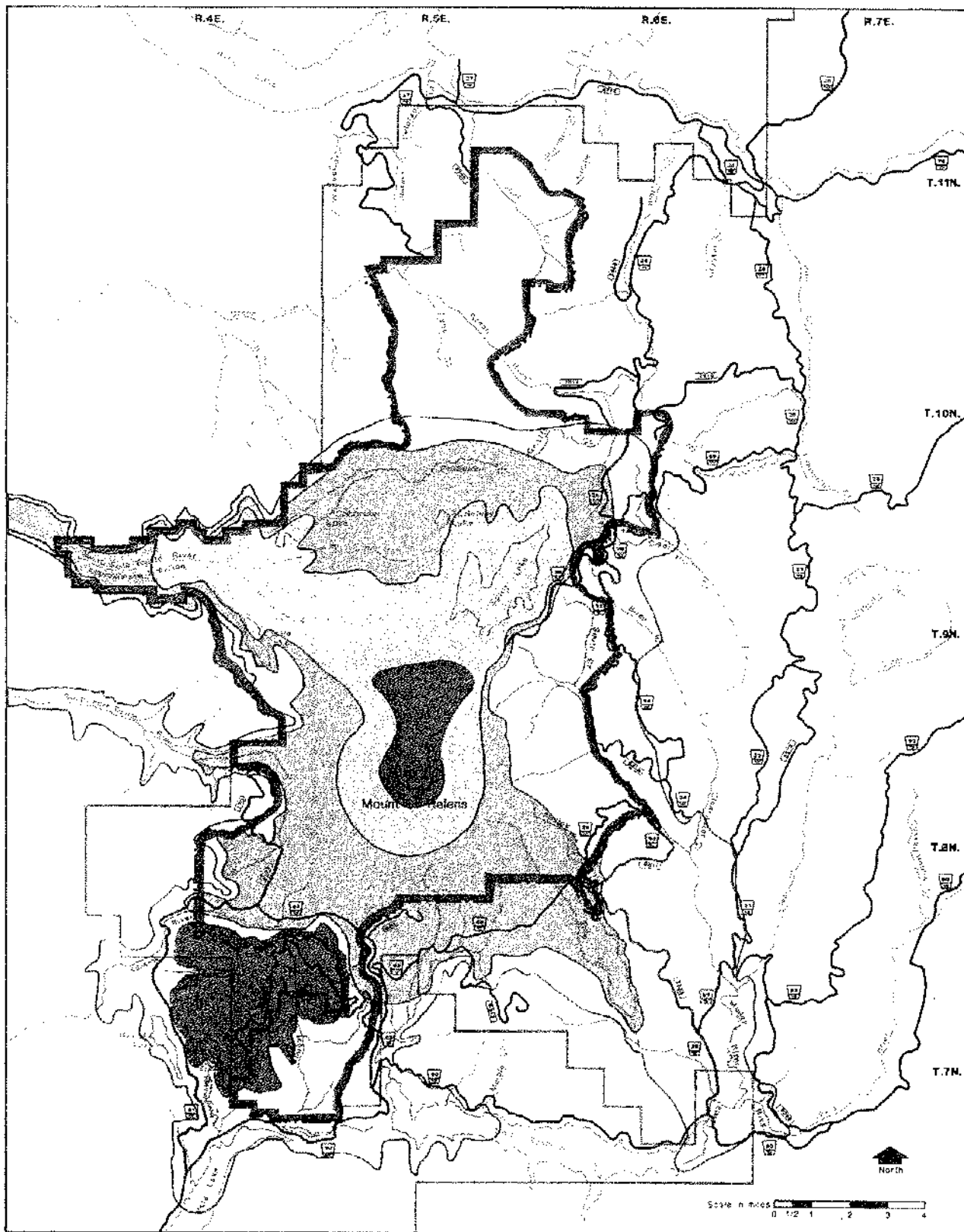
Risks labeled H, I, and J on the explanation of Figure 38 are lower than most familiar risks.
From Newhall (1984)

The map indicates that 1) volcanic risk varies by several orders of magnitude around the mountain according to location; valleys are generally more dangerous than ridges, 2) risk is by far the highest near the volcano, and 3) a visitor would be at some risk anywhere in the Monument, although in most areas that risk is very low. Risk for those who receive and heed warnings is roughly three orders of magnitude (1000 times) lower than for those who do not. For comparison, Table 12 shows familiar risks that correspond to letters in the rows and columns (matrices) of Figure 38.

Figure 38 shows risk to an individual. This is the risk that an individual might compare to whatever what level of risk he or she is willing to accept. The Monument must also consider risks to a population, i.e., risk that one or more of a large number of visitors would be killed or

injured by the volcano. There are various ways to estimate the risk to a population. For this discussion, we simplify the question by equating many short-term visitors with one "composite visitor" who is in the area 20% of each year. The risk that one or more of the short-term visitors will be killed or injured is approximately the risk described by Case 2 (row 2 in the risk matrices, Figure 38). In general, the risk that someone in the visitor population would be killed is 10 to 100 times higher than the probability that any one short-term visitor would be killed.

The Monument must also consider the likelihood of damage to structures (e.g., buildings). Given the uncertainty of the estimates in Figure 38, Case 1 may be used to approximate the risk of major damage to structures, with the assumption that the structures cannot be moved even if a serious hazard is predicted.



Legend

- National Monument Boundary
- National Forest Boundary
- Existing Roads
- Streams
- Zone I
- Zone II
- Zone III
- Zone IV
- Zone V

Note: explanation of hazard zones and risk levels is shown in table 12

Zones of Volcanic Hazard

Figure 38

ESTIMATES OF VOLCANIC RISK FOR VARIOUS HAZARD ZONES, PATTERNS OF EXPOSURES, AND TIME PERIODS

	HAZARD ZONES														
	ZONE I			ZONE II			ZONE III			ZONE IV			ZONE V		
	CASE 1- RESIDENT	CASE 2- WORKER	CASE 3- VISITOR	CASE 1- RESIDENT	CASE 2- WORKER	CASE 3- VISITOR	CASE 1- RESIDENT	CASE 2- WORKER	CASE 3- VISITOR	CASE 1- RESIDENT	CASE 2- WORKER	CASE 3- VISITOR	CASE 1- RESIDENT	CASE 2- WORKER	CASE 3- VISITOR
LONG-TERM RISK TO STRUCTURES	A			B			C			D			E		
LONG-TERM RISK TO LIFE	A	C	D	B	D	E	C	E	F	D	F	G	E	G	H
INTERMEDIATE-TERM RISK TO LIFE	B	D	E	C	E	F	D	F	G	E	G	H	F	H	I
SHORT-TERM RISK TO LIFE, DURING:															
QUIET	C	D	F	D	E	G	E	F	H	F	G	I	G	H	J
SLIGHT UNREST	A	C	D	B	D	E	C	E	F	D	F	G	E	G	H
SEVERE UNREST	A	C	D	A	D	E	B	E	F	C	F	G	D	G	H
DOME GROWTH	A	C	D	B	D	E	C	E	F	D	F	G	E	G	H
EXPLOSIVE ERUPTION	A	B	C	A	C	D	A	D	E	B	E	F	C	F	G

Letters A-J in the above boxes indicate the risk level to residents, workers, or visitors in specific areas of the Monument (vertical columns, based on length of stay and type of eruptive activity (horizontal columns). The table below shows the range of probability of a person being killed in a year's time at each of these risk levels.

RISK PROBABILITIES

A- 1/10 - 1 PER YEAR
 B- 1/100 - 1/10
 C- 1/1,000 - 1/100
 D- 1/10,000 - 1/1,000
 E- 1/100,000 - 1/10,000
 F- 1/1,000,000 - 1/100,000
 G- 1/10,000,000 - 1/1,000,000
 H- 1/100,000,000 - 1/10,000,000
 I- 1/1,000,000,000 - 1/100,000,000
 J- 1/10,000,000,000 - 1/1,000,000,000

How to Use This Map and Legend

1. Determine the Hazard Zone of Concern (Zones I-V) on Figure 38.

2. In the matrix, find the vertical column that corresponds to that hazard zone, and to the appropriate level of exposure (Cases 1-3), based on the amount of time that an individual may be exposed to volcanic hazards in a year.

Case 1 - Resident, 100%
 Case 2 - Worker with 2-way radio, 20%
 Case 3 - Individual visitor, 1%

3. Find the horizontal column for the appropriate time period and volcanic eruptive state.

4. The letter in the box where the vertical and horizontal columns intersect is the risk level and can be used in the table to the right to determine the range of probability of death occurring in a year's time.

5. Turn the page, and use Table 12 to compare this estimated range of probability with familiar risks.

Example: Determine the risk to a one-time visitor on the south shore of Spirit Lake during a quiet period. Hazard Zone II, exposure Case 3 and quiet indicate risk level G, highlighted as an example in the matrix. The level G corresponds to a risk of between 1 in 10,000,000 and 1 in 1,000,000 probability of being killed in a given year; or about the same risk of death as from floods, tornadoes, or earthquakes worldwide.

Deciding Acceptable Levels of Volcanic Risk:
The U.S. Geological Survey reports and maps do not designate any areas as "safe." Safety is defined by the level of risk and uncertainty determined to be acceptable. Such judgments are made by public safety officials and Forest administrators, not geologists.

In March of 1980, in response to earthquake activity in the vicinity of the mountain, a limited Forest closure was initiated by the Forest Service. Avalanche was thought to be the immediate danger. By April, after volcanic activity began, a larger closure zone was established. The Forest Service closure zone applied only within the Forest boundary; that of the State of Washington applied both within and outside the Forest. After May 18, the closure boundary was greatly enlarged, resulting in closure of most of the Forest for a time.

Since 1980, improved predictions and declining volcanic activity have resulted in reduction of the closure zone to its present configuration. Over time, the boundary will contract or expand depending on the volcanic activity.

Seismic Hazard

The Monument is crossed by what is referred to as the St. Helens Seismic Zone. The zone runs roughly from east of the volcano northwest through Coldwater Lake towards the Cowlitz River. The zone is not an earthquake fault (fracture or zone along which there has been ground movement) but rather a concentrated area of earthquake epicenters. There may be a fault associated with this zone, but it has not been observed. The largest known magnitude earthquake associated with this zone is 5.5 on the Richter scale, and earthquakes are postulated to potentially reach magnitude 6.5. This information has and will be used in the design of Monument facilities to minimize seismic risk associated with this zone.

LAW ENFORCEMENT

Law enforcement in the Monument is cooperatively performed by the Forest Service, State, and local law enforcement agencies. A cooperative enforcement agreement with Skamania County assigns one full time county deputy to the Monument. Several other deputies work primarily in the Monument and are funded by the State of Washington. Officers work closely with the Washington State Department of Game to enforce road closures during the hunting season.

State and Federal laws and regulations in the Monument are intended to protect the public, Forest Service employees, Forest resources (including the scientific, ecological, and social values of the volcano), and property. Day to day management of people in the Monument is difficult and complex. The objective of the law enforcement plan is to develop and maintain a program of voluntary compliance with laws and regulations.



Skamania County Deputy Sheriff performing duties.

FIRE MANAGEMENT

Fire History of the Mount St. Helens Area

The natural fire regime of the National Forest as a whole is typified by infrequent but catastrophic large fires. Historically, fire has been the primary forest disturbance, larger fires initiating stand replacement. Large fires, however, account for only a small percentage of all fire occurrences; most firestarts remain less than ten acres in size.

Three elements influence the development of large fires; characteristics of the forest fuels, periods of seasonal drought, and east wind episodes. The two basic sources of ignition in the St. Helens area--recreation activity and lightning--occur throughout the fire season but ignition probability begins to rise in midsummer as fuels dry out. Roughly 65 percent of all firestarts occur in July and August, but the majority remain small. Most of the larger fires, and virtually all of the catastrophic fires, occur during September, or from late August to early October. Seasonal droughts of at least four to six weeks duration have preceded most of the larger fires and east winds have been associated with all the most severe fires in this century. The occurrence of east winds peaks in the spring and fall; they are most frequent in September. On a yearly average, west of the Cascade Crest, over 60 percent of the total area burned occurs in September.

Natural fire rotation for the entire Forest is estimated at 290-415 years, while fire rotation for the Monument is estimated at 550-780 years

(Table 13). These estimates are based on historical fire records and fire reconstructions. Fire size and frequency have decreased in this century with the advent of organized suppression, but large fires continue to occur, following the same patterns of seasonal drought and autumn east wind episodes. Actual fire frequency for both the Forest and Monument may be longer than that estimated from the historical record, since the extremely large fires associated with settlement around the turn of the century may not be representative of long-term cycles (in September of 1902, 22 percent of the entire Forest was on fire at one time). But there is reason to believe the rotation estimates are fairly accurate. Some of the strongest east winds in the Pacific Northwest occur on this Forest, and returns of large fires are common, both of which indicate shorter fire frequencies. All of the larger fires on this Forest in the last century have returned at least once, most during east winds; some have returned as many as six times. Large amounts of unburned fuel and standing snags that remain after major fires increase the fire danger of an area as regeneration proceeds. This phenomenon has obvious implications for existing blowdown and fringe fuels in the Monument.

Table 13. Natural Fire Rotation.

	Forest	Monument
1830-1930 (Historic/Settlement)	290 years	585 years
1930-1980 (Suppression)	2,500 years	5,000 years
1830-1980	220 years	790 years

(Based on Gifford Pinchot National Forest fire records and fire reconstructions.)

Natural Fire Rotation is the time necessary for fires to burn the equivalent acreage of a given area (some parts of the area may burn more than once, while others may not burn at all).

The Monument area has a longer fire rotation than the rest of the Forest for several reasons. Most of the Monument is higher elevation, subalpine forest where less fuel accumulates and the snowpack remains longer. Many areas within the Monument are sheltered from maximum east wind exposure. Also, it is apparent that fire has created less disturbance in the Monument area, over time, than eruptions, mudflows, and avalanches from the volcano itself.

Impact of the 1980 Eruptions

The May 18, 1980, lateral blast of Mount St. Helens left tens of thousands of acres of blowdown timber and thousands more of standing dead fringe. Lightning and heat generated by the eruption started fires in several areas around the volcano, primarily in drainages to the northeast as the eruption cloud drifted with

prevailing winds. The initial ashfall was followed by several weeks of rain, extinguishing or dampening many of the fires. Subsequent eruptions on May 25 and June 12 deposited more ash over the area, but hundreds of small fires continued to burn.



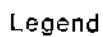
Standing dead trees near fringe of the blast area.

An emergency volcano fire plan was prepared in May and by the end of June a fire camp was set up at Trout Lake, Washington. Suppression emphasis was placed on fires burning near the fringe zone, where the greatest potential for large fire escape was thought to exist. Suppression activities were greatly limited due to uncertain hazards and transportation difficulties. Fire crews were accompanied by helicopters at all times, and firefighters were required to carry special safety equipment in the unusual environment. Fires continued to burn throughout the summer, smoldering slowly from log to log beneath the ash.

By the end of 1980, it was clear that fire danger around Mount St. Helens was not as great as had been feared, at least for the short-term. The May 18 blast had disintegrated or buried virtually all of the fine fuels less than three inches in diameter. These are the fuels that carry a fire and are responsible for its rate-of-spread. Although the eruption created large areas of heavy fuel loading, ranging from 200-700 tons per acre (TPA), the extensive layer of ash removed continuity from the fuelbed and acted as a retardant to the fires that were ignited.

Changes--1980-1983

Infra-red photographs of the Mount St. Helens area taken early in 1981 showed that scores of fires continued to burn beneath the ash. These fires were monitored throughout the summer of 1981 and fires that had burned the previous year were carefully re-inspected. The 1981, 1982, and 1983 fire seasons were relatively mild and no new fires occurred in blast zone fuels.



- * Includes water and natural unvegetated areas

Figure 39

Salvage logging of volcano timber began on private land in 1981 and on National Forest land in 1982. These operations helped to reduce the overall fire hazard by breaking up large blocks of blowdown and fringe. When Congress created the National Volcanic Monument in August of 1982, more than 26,000 acres of blowdown and over 5,000 acres of fringe were placed in a protected status. More than 35,000 acres of general forest were also included within the Monument boundary.

Observations made at several points in the Monument area between 1980 and 1983 revealed significant changes in fuel characteristics. Ash has eroded or settled in all areas, exposing many of the fine fuels previously covered. Wind and snow have begun to strip remaining branchwood in fringe areas, adding to the fuel load. Wind effects have been most pronounced on steep slopes, where breakage in some areas has increased the less than three inch fuel load from zero in 1980 to more than 23 tons per acre in 1983.



Fuel buildup under standing dead timber.

Revegetation has begun in all areas, progressing most rapidly in the fringe. Species composition is similar to the regeneration occurring after a high-intensity fire, and new litter is accumulating over the ash.

An important condition was observed during slash burning adjacent to the Monument in the summer of 1983. With fuels lying over ash and pumice, ash absorbs moisture and increases reflectivity

leaving ground fuels drier and warmer than usual. Consumption of less than three inch fuels has been over 94 percent, even where total fuel loads have been light and discontinuous.

The Monument has been divided into three zones for fire management purposes: Zone I (confine strategy), devastated area; Zone II (control strategy), blowdown and fringe; Zone III (contain strategy), general forest (see Figure 39 and description of fire management strategy in Appendix K).

Fuel loading as of October, 1983, averaged 50 tons per acre in the fringe and 212 tons per acre in the blowdown. Less than three inch fuels average 10 tons per acre in the fringe and 6 tons per acre in the blowdown. This compares with an average general forest fuel loading of 22 tons per acre, with 3 tons per acre less than 3 inches.

SOCIOECONOMIC CONDITIONS

This section provides a brief overview of some current socioeconomic characteristics of the four county area around Mount St. Helens; Clark, Cowlitz, Lewis, and Skamania Counties. Direct socioeconomic effects of each Monument management alternative will vary within this region. A description of historical and current conditions will provide a basis for identifying effects of implementation (next chapter). The primary reference for this section is Mount St. Helens National Volcanic Monument: the Economic Impacts of Development Alternatives (McPhee et al, 1983.) This study was commissioned for use in the development of this plan and contains additional detailed information.

Influence Area

The Mount St. Helens National Volcanic Monument is located in the southwestern region of Washington State (Figure 3, Chap. I), close to the center of the four county area. On the western edge of the area, major population and business centers occur along the Interstate 5 corridor. They include Portland-Vancouver, Longview-Kelso, Chehalis-Centralia, Olympia, and Seattle-Tacoma. Access to the Monument is good from all sides except from the east, where the Cascade Mountains create a partial barrier.

Four major road corridors provide primary visitor access to the Monument (Figure 3, Chapter I--vicinity map, and Appendix M).

1. North--U.S. 12 to the north of the Monument, connects with Interstate Highway 5 at Exit 68, and travels east past the towns of Morton and Randle. Then Forest Roads 25 and 99 turn south at Randle and connect with the Monument.

2. West--State Highway 504 (the Spirit Lake Memorial Highway) provides major access to the west side of the Monument, from the junction with Interstate Highway 5, Exit 49, near Castle Rock. The upper end of this road, which was destroyed by floods and mudflows resulting from the eruption,

now terminates at the debris dam near Camp Baker. Several alternatives propose an eastward extension of this route.

3. Southwest--State Highway 503, beginning at the junction of Interstate Highway 5, Exit 21, at Woodland, travels east to Yale Lake. Then County Road 3190 continues east through the town of Cougar, where it joins Forest Service Roads 90 and 81 to the Monument.

4. South--The Wind River Road (County Road 135, 71, and 51) runs north from State Highway 14 at Carson, ultimately connecting with Forest Road 90, providing access to the south and east sides of the Monument.



Tourism related business opportunities have increased as a result of the interest in the mountain.

Past Economic Growth

Population in the region increased by 86,000 people between 1970 and 1980 (Table 14). This 3 percent growth rate was substantially greater than the 1.9 percent rate for the state increasing the region's share of Washington's population from 7 to 8 percent. Clark County, with a growth rate twice that of the state, accounted for two-thirds of the new residents.

According to the 1980 census estimates, 335,700 people, one out of every twelve residents of the state, live in the four counties around Mount St. Helens (Table 15).

Total personal income has increased, but at a slower rate. It rose from \$928 million to \$3.2 billion, or 13.3 percent. That is 1.2 percent faster than the state average. Adjusted to account for inflation, the growth rate was 6 percent.

In 1980, total personal income for the area was \$3.2 billion. The per capita income of \$9,654, 6 percent less than the state average, reflects a higher unemployment rate. Compared with the state average of 7.9 percent, the jobless rate was 8.9 percent. Fifty-six percent of the jobs and income in 1980 were generated in Clark County. Cowlitz and Lewis Counties accounted for 25 and 17 percent respectively and Skamania contributed three percent.

TABLE 14
ECONOMIC GROWTH IN MOUNT ST. HELENS REGION, 1970-1980

Variable	1970	1975	1980	1970-1980 Average Growth Rate
Population (thous. of persons)				
Mount St. Helens Region	249.8	287.2	335.7	3.0
Clark County	129.6	156.9	192.7	4.0
Cowlitz County	68.8	74.4	79.7	1.5
Lewis County	45.6	49.5	55.4	2.0
Skamania County	5.8	6.4	7.9	3.1
Washington	3,413.2	3,567.9	4,132.2	1.9
Personal income (\$ million)				
Mount St. Helens Region	928.3	1,642.8	3,240.8	13.3
Clark County	487.4	880.1	1,845.6	14.2
Cowlitz County	260.8	454.6	797.0	11.8
Lewis County	163.1	279.6	534.9	12.6
Skamania County	17.0	28.5	63.3	14.0
Washington	13,658.0	22,422.0	42,641.0	12.1
Persons employed (thous. of persons)				
Mount St. Helens Region	91.1	103.7	125.4	3.3
Clark County	47.4	54.5	69.5	3.9
Cowlitz County	25.3	28.9	30.9	2.0
Lewis County	16.4	18.2	21.2	2.6
Skamania County	2.0	2.1	3.8	6.6
Washington	1,281.0	1,391.0	1,826.0	3.6

TABLE 15
ECONOMIC PROFILE OF MOUNT ST. HELENS REGION, 1980

Variable	Clark County	Cowlitz County	Lewis County	Skamania County	Mount St. Helens Region	Percent of State
Land area (square mile)	627	1,144	2,423	1,672	5,866	8.8
Population (thous. of persons)	192.7	79.7	55.4	7.9	335.7	8.1
Density (persons/sq. mile)	307.3	69.7	22.9	4.7	57.2	92.1
Personal income (\$ millions)	1,845.6	797.0	534.9	63.3	3,240.8	7.6
Per capita income (\$)	9,579.3	9,996.2	9,653.1	7,974.2	9,653.9	93.6
Persons employed (thous. of persons)	69.5	30.9	21.2	3.8	125.4	6.9
Unemployed rate (%)	7.1	10.8	11.4	12.8	8.9	112.9

TABLE 16
EMPLOYMENT AND INCOME IN MOUNT ST. HELENS REGION, 1980

Sector	Employment (Thous. of jobs)	Labor and Proprietors' Income (\$ mil.)	Average Annual Income (\$)	State Average Annual Income (\$)
Resources	6.9	87.0	12,609	10,707
Agriculture	4.9	45.6	9,306	9,097
Forestry, fishing, and mining	2.0	41.4	20,700	22,647
Manufacturing	30.7	688.9	22,440	23,565
Food products	1.8	31.7	17,611	18,683
Wood products	12.2	251.6	20,623	20,158
Paper products	6.7	187.5	27,985	27,669
Metal products	3.1	94.3	30,419	27,275
Machinery	1.4	33.9	24,214	20,959
Other manufacturing	5.5	89.9	16,345	24,988
Nonmanufacturing	65.4	924.5	14,136	15,234
Construction	9.0	202.0	22,444	20,921
Transportation, communications, and utilities	5.2	122.7	23,596	23,588
Trade	25.0	281.7	11,268	12,890
Finance, insurance, and real estate	4.3	65.5	15,233	17,608
Services	21.9	252.6	11,534	13,424
Government	21.7	324.8	14,968	14,949
State and local government	16.9	248.3	14,692	14,859
Federal government	4.8	76.5	15,938	15,121
Total	124.7	2,025.2	16,241	16,296

The region's increase in population and income was not accompanied by corresponding increase in jobs. Thirty-four thousand more people were employed between 1970 and 1980, a 3.3 percent growth rate. This compares with the state average of 3.6 percent and is attributable to a number of people moving to Vancouver, Washington, but working in Portland, Oregon.

Per capita income and the unemployment rate are better measures of a region's economic condition than alterations in income and employment. The relationship between the region and the state figures on per capita income and unemployment remained very constant throughout the decade.

Industrial Structure

The region has little of the industrial diversity of Washington State (Tables 16 and 17). Local basic industries are heavily concentrated in three activities, wood, paper, and metal product manufacturing. Together, they accounted for 72 percent of manufacturing jobs and 77 percent of manufacturing income. Moreover, in spite of a 25 percent downturn in lumber production in 1980, two-thirds of the increase in manufacturing income between 1970 and 1980 took place in these three industries.

With much of its land covered by forests, the region's chief economic resource is timber. The four-county area, with only 8 percent of Washington's population, had 24 percent of the state's employment in wood products and 38 percent of the jobs in paper products. This work was provided by Weyerhaeuser, Crown Zellerbach, Boise Cascade, and many smaller operations.

The region's second most important resource is electricity generated by dams on the Columbia River. Aluminum producers, who require large amounts of electricity for the aluminum reduction process, are attracted to sources of inexpensive electricity. Availability of this power, the state of the region's economy during the depression, and the demand for light metals for aircraft during World War II prompted the federal government to encourage the aluminum industry to locate in the Northwest. The Aluminum Corporation of America (Alcoa) constructed the first plant in Vancouver in 1940. Shortly thereafter, Reynolds Metals Company built a plant in Longview. Forty years later these facilities are still operating and contribute 28 percent of the production capacity of aluminum reduction plants in Washington. Some 2,700 workers are employed in the two plants, nine percent of the region's manufacturing employment and, because of their relatively high salaries, 13 percent of earnings in manufacturing.

Other elements of the region's basic sector are agriculture, forestry, fishing, mining, food products, machinery, and other manufacturing (exclusive of printing and publishing, and stone, clay, and glass products). In 1980, 13,700 workers held jobs in these industries.

This was about three fifths of the amount of employment in forest products and metals. With relatively low wages, particularly in agriculture, this portion of the basic sector earned \$210 million compared with \$533 million in forest products and metals. This dominance, however, is changing. Industries other than forest products and metals, particularly machinery and other manufacturing, created 3,500 new jobs between 1970 and 1980. And these statistics do not take into account a fledgling electronics industry, which will provide a strong stimulus for regional growth in the next 10 to 20 years.

Although the basic sector is the principal force behind economic growth, it is not the major provider of jobs. In 1980, nonmanufacturing and government, the so-called nonbasic sector, accounted for 85,000 of the region's 125,000 jobs. Moreover, while manufacturing created only 3,000 new employment opportunities between 1970 and 1980, the nonbasic sector added 30,000, increasing from 63 percent of total employment to 70 percent. The development of a more service-oriented economy, which follows a national trend, partially explains the increase in nonbasic employment. A more fundamental factor operating in the growth process, however, is the small gains in labor productivity for trade, services, and government compared with manufacturing. Since low productivity reflects itself in low wages, the long-run growth of the nonbasic sector from the standpoint of income is less dramatic. For example, the nonbasic share of total labor and proprietors' income in the region rose from 59 in 1970 to just over 61 percent in 1980. In fact, if not for the slump in wood products at the close of the decade, the share would have remained almost constant. The nonbasic sector, in general, is relatively undeveloped in the Mount St. Helens Region, particularly in the higher-paying specialized trade and service industries. This is not unexpected, considering proximity to Portland, a large metropolitan center serving the commercial needs of this part of the Northwest.

Social Factors

Three social factors are important to both visitors traveling to the Monument, and to residents living along the major road corridors described above: (1) the availability of visitor services (including restaurants, overnight facilities, gas stations, and emergency services); (2) local lifestyles and values (including the types and seasonality of employment); and (3) land uses, plans, and zoning.

Visitor Services: All four major routes into the Monument presently have limited visitor services that are generally adequate for local residents, but are overwhelmed by Monument visitors during peak use weekends.

Local Lifestyles and Values: The four access routes fall within rural areas where local employment is especially dependent on timber or other resource-based industries. Local residents therefore depend heavily on the National Forest for both their livelihoods and for primarily

dispersed traditional recreation experiences. Since resource-based employment is often seasonal, employment levels tend to fluctuate relatively widely with the seasons. These close ties between residents and natural resources tend to lead to strong proprietorial feeling about nearby National Forest lands. High value is placed upon self sufficiency and isolation from urbanized areas. An exception is urban/suburban Clark County and the Longview-Kelso area along the Interstate 5 corridor that have more diversified commercial development. Residents in these areas generally view the National Forest more as a recreational resource.

Land Uses, Plans, and Zoning: The four-county area covers 5,366 square miles of land area, or about 9 percent of Washington State. Forty-one percent of the area is in Lewis County, 29 percent in Skamania County, 19 percent in Cowlitz County, and 11 percent in Clark County.

Clark County has adopted both a comprehensive plan and zoning ordinances; Cowlitz and Skamania Counties have comprehensive plans but no county zoning ordinances; and Lewis County has no plan and no zoning.

TABLE 17
EMPLOYMENT BY COUNTY IN MOUNT ST. HELENS REGION, 1980
(Thousands of Jobs*)

Sector	Clark County	Cowlitz County	Lewis County	Skamania County	Mount St. Helens Region	Percent of State
Resources	2.6	1.1	3.0	0.2	6.9	6.8
Agriculture	2.2	0.7	1.9	0.1	4.9	5.5
Forestry, fishing, and mining	0.4	0.4	1.1	0.1	2.0	14.6
Manufacturing	13.1	11.5	5.4	0.7	30.7	9.7
Food products	1.2	0.1	0.5	0	1.8	5.7
Wood products	2.0	5.5	4.0	0.7	12.2	23.6
Paper products	3.3	3.4	0	0	6.7	38.3
Metal products	1.7	1.4	0	0	3.1	10.9
Machinery	1.1	0.3	0	0	1.4	5.3
Other manufacturing	3.8	0.8	0.9	0	5.5	3.4
Nonmanufacturing	34.9	17.6	10.8	2.1	65.4	5.8
Construction	4.2	2.6	0.7	1.5	9.0	8.0
Transportation, communications, and utilities	2.6	1.6	0.9	0.1	5.2	5.4
Trade	13.3	6.2	5.1	0.4	25.0	5.7
Finance, insurance, and real estate	2.7	1.1	0.5	0	4.3	4.2
Services	12.1	6.1	3.6	0.1	21.9	5.8
Government	12.0	4.9	4.0	0.8	21.7	6.0
State and local government	8.7	4.4	3.4	0.4	16.9	7.0
Federal government	3.3	0.5	0.6	0.4	4.8	4.0
Total	62.6	35.1	23.2	3.8	124.7	6.4

*Includes wage and salary employment and self-employed workers.

IV. Environmental Consequences

INTRODUCTION

This chapter provides the basis for the comparisons of the alternatives found in Chapter II. Environmental effects can be either direct or indirect, short term or long term. They vary in importance from negligible to those that are extremely significant.

The environmental effects described in this chapter are presented in the same order as the Affected Environment was described in Chapter III. Climate, air quality, and forest insects and disease will be affected negligibly, if at all, by implementation of any of the alternatives; they are therefore not discussed. Cost effectiveness does vary between alternatives and this subject was added.

Alternative D (East and Westside Moderate Development) was presented as the preferred alternative in the Draft Environmental Impact Statement (DEIS). Based on public comments on the DEIS, this alternative was modified to form the selected alternative, Alternative D (Modified). No new significant environmental consequences, other than those already identified as part of the alternatives presented in the DEIS, result from these changes to form Alternative D (Modified, Selected).

NATURAL FEATURES & PROCESSES

GEOLOGY

As indicated in Chapters II and III, two aspects of the geologic resource in the Monument are discussed separately: 1) geologic features, and 2) geologic conditions and processes.

Effects to Volcanic Features Common to All Alternatives

The primary impacts to geologic features in all alternatives are produced by the construction of roads, trails, and other facilities. Impacts are generally confined to discrete areas of construction and they can include disturbance by burial or excavation, disruption of natural stratigraphy by the mixing of strata, and the alteration of natural drainage patterns by grading, which can increase sedimentation and removal through erosion. Impacts to blast effects common to all alternatives are cutting and removal of standing dead or downed trees for road, trail, and facility construction, and disruption or removal of blast deposits. These types of impacts are long term and irreversible.

The following considerations were taken into account in comparing the effects of development on geologic features: 1) the sensitivity of the feature to disturbance; 2) the percent of the feature affected; 3) the location of the development in relation to the feature (on the margin or in the center); 4) the uniqueness of a feature; 5) the severity of the impacts; 6) the potential for mitigation; 7) the duration of impacts; and 8) the potential cumulative effects. In general, higher numbered alternatives would create many more instances of incremental impacts because they call for more miles of road and trail construction. A road by itself may not impact a large portion of a geologic feature but its significance changes when, as in Alternatives F and G, it is accompanied by a number of others.

Effects to Other Geologic Features Common to All Alternatives

Caves: Due to the significance of geologic values in some Monument caves and their sensitivity to disturbance or removal of physical features, high levels of visitation can result in adverse impacts. The impacts would be long term, qualitative and quantitative in nature, and irreversible. Alternatives propose various levels of access to the caves area. The general public is currently unaware of the location of most of these sensitive caves. With increasing access to the area and improved parking and development, however, some will be discovered and geologic features will sustain adverse impacts. All alternatives will continue access to Ape Cave, so adverse impacts there will continue; the cumulative effect will be further degradation of geologic values. Only one sensitive cave, Little Red River, will remain closed to the public in all alternatives.

Mitigating measures for protection of these sensitive caves include signing to increase public awareness, access by permit only, and cave closure by gate. These will be accomplished on a case-by-case basis.

Mineral Materials: Forest system roads utilize mineral materials as road aggregate during construction, operation, and maintenance. Use of this material by mining, processing, and removal from materials sources represents a long term, irreversible, nonrenewable resource commitment. The use of the mineral material resource is not expected to produce serious on-site effects in the Monument. Figure 25 (Chap. III) shows the location of numerous nearby common mineral material sources. Their use will not directly impact the Monument, and

will be necessary to facilitate access. Although some areas adjacent to and within the Monument may experience spot shortage and longer than optimum rock haul distances, the known quantity is sufficient for foreseeable long term needs. The Act does not specifically bar extraction of common mineral materials from within the Monument. If such extraction is contemplated, the standards and guidelines contained in the Forest Rock Resource Management Plan (June 1982) concerning location, design, and operation will be followed.

All alternatives will utilize this resource to some degree. The range is from an estimated additional 30,000 cubic yards of rock material in Alternative B to approximately 100,000 additional cubic yards in Alternative F. The latter figure would deplete only a minor fraction of total known reserves in the area.

Groundwater: The extent of the groundwater resource within and adjacent to the Monument is not known. Extraction and public consumption of potable groundwater is proposed at various locations within the Monument in all alternatives. The extent of the resource at specific sites will be evaluated on a case-by-case basis. Since, for the most part, the groundwater resource in these areas is renewable, this extraction is considered a short term resource commitment.

Effects to Geologic Conditions and Processes Common to All Alternatives

This subject is discussed from two perspectives: 1) the effects of human activities on geologic processes and 2) the effect of the geologic processes on constructed facilities. The first is partially addressed here in the description of effects common to all alternatives; the latter is treated in the discussion of individual alternatives. The term "geologic conditions and processes" is referred to by some as "geologic hazards". That term has been avoided here because it is subjective; conditions and processes are not hazards in themselves. They were defined at a general level of resolution. There are probably active processes requiring protection that have not yet been identified and, conversely, it may be determined that areas currently presumed to be active and sensitive can sustain development with minimum impact. A mitigating measure for all alternatives, therefore, will be site specific evaluations of proposals by geology/geotechnical specialists at the project design level.

Some processes described as "geologic forces" in the Monument Act are hydrologic in nature, and are presented under that heading.

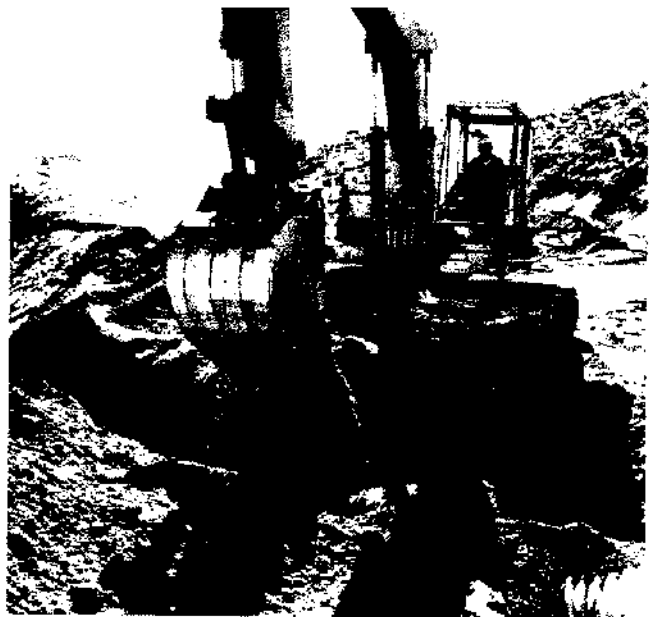
Impacts have been identified for each alternative and consist of intervention which halts, initiates, or accelerates natural geologic processes. They can result from road and facility construction, spoils disposal, and

erosion from disrupted drainages, including headcutting and oversteepening of deposits.

The comparison of effects on geologic conditions and processes took into consideration the same factors described above in the consideration of geologic features.

Slope Stability (General): As can be seen on Figure 26 (Chapter III), slope failures are a naturally occurring process throughout the Monument. Although a natural process, areas of unstable slopes are quite sensitive to disturbance. Slight changes in slope geometry, surface and subsurface drainage, and slope loading can greatly accelerate or initiate slope failure. The Act specifically states that management of the Monument shall "... allow geologic forces . . . to continue substantially unimpeded." For this reason, planning for any development within the Monument must consider impacts to unstable slopes and the possibility of initiating new slope failures.

Developments with the highest potential to alter unstable slopes are: 1) those which involve excavation and placement of earth materials; and 2) those which disrupt natural surface or subsurface drainage and thereby concentrate or remove water. This occurs primarily during road, trail, and facility construction.



Reconstruction of Road 99

Impacts to slope stability may be short or long term (depending on the specific location) and are often irreversible and cumulative without large scale and costly intervention. This is particularly true on steeper slopes where failures may continue and enlarge downslope. Continued use of some roads, for example Road 99, has already resulted in some short-term adverse effects. In some locations where roads existed prior to 1980, the road prism has acted as a repository of soil materials which failed

since 1980. Removal and disposal of this material in reopening the road has reactivated failures upslope from the road and the excavated material, when sidecast, has initiated debris flows downslope. Improperly placed culverts and concentrated runoff has also accelerated slope failure in some areas. This will continue in all alternatives.

Mudflow Deposits and Effects: These are unique geologic/hydrologic conditions and processes and planning for developments, particularly roads, must include provisions to contend with oversteepened, unstable slopes and channel migration. It will be difficult to design safe, cost effective roads to cross them while allowing natural processes to continue substantially unimpeded. All alternatives will produce some adverse effects; the cumulative effect is compared by alternative. Direct impacts to stream channels are presented in the Watershed section below.

Pyroclastic Flow and Debris Avalanche Deposits: Due to high susceptibility to rill and channel erosion, these areas will be even more difficult to cross with roads than mudflows. All alternatives which place facilities in these areas will affect these processes to some degree; the cumulative effects are compared by alternative. Direct impacts to stream channels, again, are presented under the Watershed heading.

Area of Heavy Tephra Deposition: The area north and east of the volcano was blanketed by up to several feet of tephra. The nature of this material, combined with steep topography, has resulted in active rill and gully erosion and the risk of debris flows has greatly increased. Developments in this area, primarily roads, have already accelerated these processes. All developments in this area will further effect these processes to some degree; the cumulative effect of these impacts addressed by alternative.

Effects of Alternative A on Geologic Resources

Geologic/Volcanic Features: Current development activities are resulting in few instances of disturbance to geologic features in the Monument but that will change over time as the restricted zone decreases in size. Significant local erosion and removal of the pyroclastic flow and debris avalanche features is occurring at the outlet of the temporary drainage facilities for Spirit Lake. Deposits have been obliterated and mixed by installation of the drainage facility and required grading and access, particularly Road 99. Continued use and maintenance of Road 99 has accelerated erosion and removal of the tephra feature adjacent to the road. Continued use of some roads on the south side of the mountain affected by the reworked volcanic deposits has resulted in local grading and/or removal of the tephra feature; reopening of the Kalama Springs picnic area has had the same effect. Reopening and continued use of Road 83 crossing the Pine Creek mudflow is resulting in grading and surface modification of this feature

where it is crossed by the road. The same type of impact is occurring to the Smith/Muddy mudflow feature due to continued use of Road 92 between the junction of Road 83 and Ape Canyon. These impacts are long term, irreversible, and qualitative in nature, primarily occurring immediately adjacent to the developments.

Caves: The current situation provides road access to the caves on Road 8303, with a 15 space parking facility and picnic area at Lava Cast; and a 20 space parking area at the main entrance to Ape Cave. Trail No. 239 provides access to the upper end of Ape Cave. Road 81 provides access to some caves in the upper portion of the Cave Basalt flow.

Effects of Alternative A on Geologic Conditions and Processes

The primary impacts on natural processes by development activities are on the pyroclastic flow and debris avalanche features near Spirit Lake, the reworked volcanic deposits south of the mountain, and along Road 99. At Spirit Lake, concentrated runoff from the lake level stabilization is locally accelerating erosion and sedimentation of these processes. These impacts are long term cumulative, and unavoidable. South of the mountain, reopening and continued use of Road 81 and Road 8303 has effected the unimpeded movement of the reworked volcanic deposits. Road 81 north of Ape Cave is seasonally graded through this material to provide access. These short-term impacts will continue as long as the roads remain open. The effects may be locally cumulative and irreversible and could affect features downslope. Along Road 99, reestablishment and continuing maintenance has accelerated upslope erosion and the frequency of debris flows adjacent to the road. These impacts are long term, qualitative in nature, and may be irreversible without costly intervention. The area effected is generally close to the road except locally on steeper slopes where it extends to greater distances.

Effects of Alternative B on Geologic Resources

Geologic/Volcanic Features: Implementation of this alternative will result in increased local minor impacts to geologic features due to development activities. Facilities at Coldwater Lake and trail construction near Castle Lake will result in impacts to the debris avalanche feature in the immediate vicinity of these developments. Trail construction (Trail No. 238) on the southwest side of the mountain will impact a small portion of the mudflow feature crossed by the trail. Relocation of Road 8303 near Ape Cave will locally impact the Cave Basalt feature. Construction of new parking and picnic facilities at Kalama Springs could result in long term, irreversible impacts to a small portion of the reworked volcanic deposits in the area unless avoided by these developments.

Trail and parking area construction in the vicinity of Meta Lake and the Parker Car and in the Mt. Margaret Backcountry area will result locally in long term, irreversible impacts to the blast effects immediately surrounding the development. Abandoning the former Road 92 from Road 83 junction to Road 94 on the Smith/Muddy mudflow will reduce further impacts to this feature. Improving Road 99 to double lane standard would locally accelerate the removal of the tephra feature.

Caves: This alternative increases slightly the level of development at Ape Cave and the Lava Cast area. Access will remain the same as in Alternative A, with the addition of a short loop trail at Lava Cast. Road 81 will be closed in the upper caves area, which will somewhat reduce visitation. Seasonal closures will be instituted for Lake Cave and Ole's Cave, but a hazard warning sign at Lake Cave will increase the interest in this sensitive cave and may increase visitation. Since dispersed camping is allowed in the Cave Basalt area, the discovery and visitation of sensitive caves will be more likely.

Effects of Alternative B on Geologic Conditions and Processes

The primary impact will result from the construction and use of roads and trails. Disturbance will occur adjacent to these travel routes and consist of accelerated erosion and possible acceleration or initiation of debris flows. It will, in most cases, be long term, qualitative and quantitative, and irreversible. Impacts could occur from trail construction on Johnston Ridge, near Castle Lake, and on steep slopes in the Mt. Margaret Backcountry.

Effects of Alternative C on Geologic Resources

Geologic/Volcanic Features: In addition to effects identified for Alternative B, this alternative will produce additional adverse effects locally to geologic features. Impacts to the debris avalanche will be evident adjacent to a paved access road to Johnston Ridge and adjacent to facilities at Coldwater Lake. Trail construction near Castle Lake and between the Sheep Canyon viewpoint and Castle Lake (216.6) may produce local impacts where the debris avalanche, mudflow, and possibly the blast pyroclastic flow feature at the head of Castle Lake are crossed. Construction of trails 216.3, 216.4, and 216.7 will impact minor portions of the mudflow. Relocation of public parking in the vicinity of Ape Cave and reestablishment of Road 81 will impact a small portion of the Cave Basalt feature. Upgrading Road 83 and former Road 92 between the 83 junction and Ape Canyon, including aggregate surfacing, will result in minor but long term and irreversible qualitative impacts to the mudflow features. Construction of a bridge across Smith Creek, involving placement of fill material on the mudflow, will result in long term, irreversible, qualitative/quantitative impacts to a small

portion of the feature. Extension of the Independence Pass trail will result in a minor local loss of undisturbed blast effects, as will trail construction in the Mt. Margaret Backcountry and construction of a trail to Strawberry Mountain Lookout.

Caves: Increased parking at Ape Cave may increase visitation and attendant impacts there. Reopening Road 81 could also increase visitor use of the upper caves area.

Effects of Alternative C on Geologic Conditions and Processes

The natural processes of erosion and channel migration will locally be accelerated on the debris avalanche and pyroclastic flow features due to trail construction. Reopening of Road 81 north of Ape Cave will interfere with the natural movement of the reworked volcanic deposits in the area.

Effects of Alternative D (Preferred) on Geologic Resources

Geologic/Volcanic Features: Local effects on geologic features, in addition to those described in Alternative C, will occur in this alternative. Facilities at Coldwater Lake will cause impacts to the debris avalanche feature. Impacts identified in Alternative C from construction of the road to Johnston Ridge will not occur in this alternative. An aerial tram will replace the road, and the tram service road will cause little if any impact on the debris avalanche. Trail construction from Castle Lake to the Coldwater area (221.1) and from the Sheep Canyon area to north of the mountain (216.8) will locally impact the debris avalanche and pyroclastic flow features. Construction of trail 1.5 on Johnston Ridge will cross that portion of the debris avalanche feature which overtopped the ridge and will erase some surface texture of the feature. Relocation and expansion of parking at Ape Cave, building construction, and upgrading and relocation of Road 8303 will locally impact the Cave Basalt feature. Reconstruction and graveling of Road 81 will locally impact the reworked volcanic deposit feature by mixing strata. Trail construction from Harmony Creek to Spirit Lake and higher levels of trail construction in the Mt. Margaret Backcountry will locally impact blast effects. Placement of gravel on Road 99 to Spirit Lake, construction of facilities at the lake, and trail construction at the lake and to Harrys Ridge will further impact the debris avalanche and pyroclastic flow features. Upgrading Road 99 from junction with Road 25 to Windy Ridge will result in the impacts described in Alternative B.

Caves: This alternative will increase parking and development at Ape Cave and reconstruct Road 8303 to double lane standard. These developments will increase public access to the upper caves area.

Effects of Alternative D (Preferred) on Geologic Conditions and Processes

In addition to impacts identified in Alternative C, increased trail construction will locally affect the natural processes of erosion and channel migration on the debris avalanche and pyroclastic flow features. Trail No. 216F onto Harrys Ridge will cross numerous active debris flows and could further accelerate this process in these areas. Impacts to the natural processes along Road 99 will be as described in Alternative B.

Effects of Alternative D (Modified/Selected) on Geologic Resources

Geologic/Volcanic Features: The primary impacts currently occurring to geologic features in the Monument are the result of the recently completed temporary pumping of Spirit Lake, including necessary road access. Minor local impacts, short term in nature, have occurred to the tephra feature along Road 99, along Road 81 where it is crossed by the reworked volcanic deposits south of the volcano, and along Road 83 where it is crossed by the Muddy/Pine mudflow. Implementation of this alternative will cause local long-term impacts to the debris avalanche due to facility construction near Coldwater Lake. This impact will be permanent, much of which will occur in areas subjected to short-term impacts from Corps of Engineers Coldwater Lake stabilization in 1981 and Spirit Lake tunnel construction in 1984. Construction of Trail No. 1.5 from the Johnston Ridge Observatory to Harrys Ridge will locally impact The Spillover (that portion of the debris avalanche which overtopped the ridge) by surface modification of the feature. Similar local short-term impacts will occur from construction of several trails on the flanks of the volcano (216.6, 216.3, 216.4, 216.7), crossing portions of the debris avalanche, pyroclastic flow, and mudflow deposits. Relocation and expansion of parking facilities, and relocation of Road 8303 in the vicinity of Ape Cave, will locally impact the Cave Basalt feature, as will minor construction activities at Lava Cast picnic area. Local long-term impacts to the blast effects will occur from trail and facility construction in blast affected areas. Upgrading Road 83 across the Muddy/Pine mudflow, including the addition of aggregate surfacing, will result in long-term qualitative local impacts to this feature.

Caves: Current impacts to the cave resource are occurring primarily to Ape and Lake caves. These are long-term qualitative effects including minor vandalism, collection of rock specimens, and minor degradation of the cave ecosystems. Increased development and access in the Cave Basalt Area, particularly at Ape Cave and Lava Cast picnic area, will likely increase impacts to the caves somewhat. Increased use of these developed sites may also lead to discovery of nearby sensitive wild caves, with the potential for adverse impact.

Effects of Alternative D (Modified, Selected) on Geologic Conditions and Processes

Since cessation of pumping of Spirit Lake, oversteepened slopes in the North Fork Toutle River basin will begin to slowly stabilize and effects of the pumping activity diminish. With the abandonment of the pumping station access road, geologic processes will gradually remove most traces of man's activities in Spirit Lake Basin. South of the mountain, reopening and continued use of Roads 81 and 8303 has affected the unimpeded movement of the reworked volcanic deposits. These impacts may locally become cumulative and irreversible as the long-term movement of the material is permanently altered in these areas. Along Road 99, re-establishment and improvement of the road on steeper slopes may result in short-term increases in slope stability problems and erosion. Construction and maintenance of roads and trails on steeper slopes may result in local increases in erosion and/or minor slope failures. Trail construction areas which may result in this type of impact include the steep slopes on Johnston Ridge and Harrys Ridge, near Castle Lake, and in the Mt. Margaret area. Also, some trail construction on steeper dissected portions of the debris avalanche, pyroclastic flow, and mudflow deposits may cause local slope failures or increased erosion.

Effects of Alternative E on Geologic Resources

Geologic/Volcanic Features: In Alternative E, limiting access to the Coldwater area to trails will reduce disturbance there to minor, local impact to the debris avalanche along the trail. Impacts in the mudflow area will be of a similar magnitude to those in Alternative D with long term impacts from a bridge crossing the Smith/Muddy mudflow. Construction of a parking facility for 100 cars and a 100 seat amphitheater at Spirit Lake will impact the debris avalanche and pyroclastic flow. Upgrading Road 99 to Spirit Lake to double lane standard will increase long term, irreversible impact to the debris avalanche. Trail 225 from Road 99 to Road 94 will cross the blast pyroclastic flow feature in Smith Creek.

Caves: This alternative will increase developments identified in Alternative D and D (Modified), which could produce more public use of the caves. Almost all of the increase will occur near Ole's Cave because of a day use parking facility, 12 unit campground, and an information/concession building. The extension of Trail 239 from the Upper end of Ape Cave to Road 81 could lead a few additional users to less known caves in the area.

Effects of Alternative E on Geologic Conditions and Processes

Impacts will be generally similar to those described for Alternative D and D (Modified). In addition, Trail No. 225 crosses numerous active debris slides and could further accelerate this process.

Effects of Alternative F on Geologic Resources

Geologic/Volcanic Features: In Alternative F reconstruction of State Route 504 from near Camp Baker to Johnston Ridge will cause major local long term, irreversible impacts to the debris avalanche feature in the vicinity of Coldwater Lake and to a portion of the feature on Johnston Ridge. The same kind of impacts will occur on the blast pyroclastic flow feature in South Coldwater Valley. Additional impacts to the debris avalanche will occur in the Coldwater Lake area due to construction of more and larger buildings and parking facilities. The placement of road fill for construction of a tie road across the South Fork Toutle River outside of the Monument to access Castle Lake will cause long term, irreversible impact to a portion of the mudflow feature. Construction of a slightly larger picnic area at Kalama Springs could slightly increase impacts to the reworked volcanic deposits than those in Alternative D. Expansion of the Lava Cast picnic area will result in impacts to the Cave Basalt area. Abandonment of former Road 92 between Road 83 junction and Road 94 will reduce continued impacts to the Smith/Muddy mudflow. Impacts in the Spirit Lake area will be similar to those identified for Alternative E. Impacts to blast effects in the Mt. Margaret Backcountry will occur due to more trail construction.

Caves: This alternative will significantly increase public access to the caves area. There would be no extension of Trail No. 239 but construction of new trails (243, 233, 232, and 236) could lead some additional users to relatively unknown caves in the dispersed recreation area. Alternative F also increases the capacity of developed sites at Ape Cave, Lava Cast, and Ole's Cave.

Effects of Alternative F on Geologic Conditions and Processes

In addition to the impacts identified in Alternative E, reconstruction of State Route 504 from near Camp Baker to Johnston Ridge will increase erosion and possibly initiate or accelerate debris flows on steeper slopes and impacts along Road 99 will be similar to Alternative D and D (Modified).

Effects of Alternative G on Geologic Resources

Geologic/Volcanic Features: In the Coldwater Lake area, facilities for visitors will result in impacts to the debris avalanche. Construction of a double-lane gravel road from Coldwater to Spirit Lake will locally increase impacts to the debris avalanche and pyroclastic flow features. This alternative does not, however, include Alternative F's road crossing of the South Fork Toutle River mudflow feature or Trail 238 across the mudflow feature. More and larger facilities will be constructed in the Spirit Lake area, resulting in increased impacts to the pyroclastic flow and debris avalanche features. More trail construction in the

Mt. Margaret Backcountry area will result in increased local impacts to blast effects.

Caves: Access to caves and development in this alternative will be at a level midway between Alternatives E and F except that a larger development near Ole's Cave, with a concession and tours, will be provided, resulting in increased public visitation and higher potential for adverse impacts.

Effects of Alternative G on Geologic Conditions and Processes

Impacts to natural processes in this alternative would be the same as those identified in Alternative E.

WATERSHED RESOURCES

Effects Common to All Alternatives

Soil Sedimentation: Natural revegetation of denuded hillslopes within the Monument will occur over a period of one to two decades, gradually reducing surface erosion and channel sedimentation. Management activities have the potential to disrupt recovery in all the alternatives to varying degrees. In order to estimate the effects of the various management alternatives, it was first necessary to identify those ongoing physical processes which potentially could be altered. They are as follows:

- Channel migration and development.
- Sheet, rill, and gully erosion.
- Sedimentation.
- Mass wasting--slumps, slides, etc.

It was determined that the proposed management activity which had the greatest potential for effecting the above processes was the construction and/or reconstruction of roads.

An erosion/sedimentation model was applied to the roads within the Monument. As processes are altered by these roads, the effects are reflected downstream. Outputs by watershed and alternative are presented in Appendix I.

Slides: Land slides have an effect on sediment production where they are crossed by trails and roads. Roads have a much greater effect than trails. They can undercut an active land slide, increasing its movement and the sedimentation it produces. The road cut and fill, in addition, will increase the natural process of land slide activity by removing soil, over-steepening the area, and increasing weight on the slide from road bed and fill placement. Trails produce the same effect but on a much smaller scale. Land slide activity is usually active for long periods before stabilizing and road construction usually increases that duration.

Channel Migration and Development: How channels develop within the Monument is tied generally to

the geomorphology (characteristics of land forms) and hydrology of a watershed and more specifically to the geomorphic characteristics of the channel system. Due to the heavy ash and tephra layer in the devastated area and the tremendous quantities of mudflow material filling many of the major drainages, channels are in an actively developing stage. Of particular interest in this regard are Smith/Muddy/Pine, Coldwater/North Toutle, South Toutle, and Green River. Channel alterations produced by human activities are of two basic types--direct and indirect. Indirect changes may result from activities such as deforestation and soil compaction which alter the flow regime of a watershed. Direct channel changes are those brought about by some direct and generally purposeful action upon the stream channel. These are generally related to engineering schemes to alleviate existing or potential flooding, sedimentation or erosion, or to protect bridges or roads from being washed out. Management activities proposed in the various alternatives fall broadly into the category of direct channel changes.

When channels are constricted or controlled by such engineering projects, a number of things can occur, especially in actively changing channels such as those on the mudflows. If channels are constricted, deposition of sediment tends to occur upstream while erosion is accentuated on the downstream side. If roads are constructed and armored along these actively eroding channels, the road tends to cut off the development of channel meanders or force the channel to a new location. Degree and magnitude of change, both on-site and downstream is dependent upon specific channel conditions and the type of actions imposed upon them. At this time there are no firm engineering designs for the bridge crossings involved. Designs could feasibly run from long span structures with piers outside of the channel having no effect on channel processes to short span structures requiring armored fills across the floodplain and channelization both up and downstream. The latter would seriously alter natural channel processes.

Another process which is common to the practice of road construction and thus common to all of the alternatives, is the necessary use of relief culverts to route ditch line water below the road prism. This outfall water can initiate gullying and sedimentation, the effects of which can be transported throughout a drainage system. This is particularly important in those devastated watersheds north of the mountain.

There are a number of proposed bridges which are common to all alternatives (Table 18). These are located outside of the Monument proper.

Table 18: Proposed Bridge Locations Common to All Alternatives:

<u>Road Number</u>	<u>Location</u>
25	Pine Creek
25	Muddy River
83	Upper Pine
90	Lewis River (Eagle Cliff)

The bridges all cross channels which were affected by mudflows generated from the southeast side of Mount St. Helens. Past experience with bridges in similar locations, prior to the eruption, indicates that during those periods of maximum streamflow and corresponding channel changes, the loss of the approaches or fills to the bridge proper was a common occurrence. In addition, the majority of the approaches impact the floodplain of these channels. Locally, channel development processes are altered by design attempts to route and contain streamflow at a specific location. Due to the rapidly changing channels in most of the streams, these control efforts would need to be carried considerably upstream to assure long term success of the crossing.

The outlet associated with the U.S. Army Corps of Engineers pumping facility at Spirit Lake has greatly enlarged a channel across the debris avalanche. Erosion, channel migration, and downcutting were significant in this area immediately following the beginning of pumping. With the completion and opening of the permanent tunnel through Harrys Ridge, the pumping station has ceased to operate. Initial drawdown of Spirit Lake through the tunnel has resulted in severe disruption of the ponded blast deposits in the upper reaches of South Coldwater Creek and generally increases downcutting and widening throughout the stream. The lower reach of the stream consists of a large alluvial fan.

The effects of the Corps of Engineers activities are common to all of the proposed management alternatives.

Sewage Effluent: The post-eruptive soils are similar to those prior to the eruption concerning properties affecting sewage effluent. Therefore, pre-eruption engineering tests are valid for estimating effluent characteristics and groundwater effects. Sewage effluent is of particular concern in close proximity to lakes, rivers, and streams; along ridge tops; and in research study areas.

Monument soils have extremely high rates of percolation and could result in groundwater and/or lake contamination by sewage effluent if located near lakes, rivers, or streams. On many ridge tops, the soils are shallow to bedrock and could effect the functioning and establishment of drainfields associated with these locations. Effects on research studies could be through ground and/or lake water contamination and effects on vegetation recovery rates where effluent discharge influences soil moisture regimes. Properly designed septic tank and constructed leach fields will probably not pose a threat. Where contamination is a risk, waste treatment methods which eliminate this potential should be installed. The selection of the proper type of waste treatment will be influenced by slope, soil depth, and location. Waste treatment can be accomplished through a range of methods including septic tanks with leach fields, vault toilets, and compost toilets.

Effects to Floodplains and Wetlands: Floodplains within the Monument are highly active with constant changes in channel form and location especially in those channels associated with the debris avalanche and/or mudflows, such as, the Muddy River and the North Fork Toutle River. Blast only affected channels and their associated floodplains are more stable than those mentioned above but are still in quite an active state, changing and responding to climatic events and sediment inputs. Affects to the functioning of these floodplains come generally from direct engineering projects proposed to either cross or abut the floodplains thus restricting the floodway from functioning in a complete fashion or forcing the channel to a new location. Bridge design can run all the way from long span structures with abutments located outside of the floodplain, in which there would be no effects to its function, to short span structures which would require armored fills out onto the floodplain and channelization upstream to assure any sort of permanence, the latter could seriously effect the functioning of these floodplains, by restricting the natural develop of side channels and causing ponding and sedimentation upstream of the crossing. The various alternatives differ in the number of proposed crossings on the floodplains with Alternatives A and B proposing no crossings, Alternative C would cross Smith Creek and construct a road on the floodplain adjacent to it. Alternative D (Preferred) and D (Modified, Selected) would eliminate this crossing. Alternative D (Modified, Selected) would reconstruct a road adjacent to the South Coldwater Creek floodplain and cross the broad alluvial fan at the mouth of South Coldwater Creek. Alternative E would cross the Muddy River outside of the Monument. Alternative F would cross both Smith Creek and the Muddy River and extend State Route 504 to Johnston Ridge across the broad alluvial fan at the mouth of the South Fork Coldwater Creek, a broad floodplain. Alternative G would propose a road across the debris avalanche impacting many of the small and constantly shifting channels and their floodplains which are developing in this area.

The largest and most important wetland within the Monument is Goat Marsh, south of the Monument. Effects are generally associated with human travel through the area on foot and the associated potential for trampling of vegetation and compaction of soils causing erosion but with appropriate controls on visitor use impacts should be negligible. Small wetlands will undoubtedly develop adjacent to many of the lakes in the Mt. Margaret area with the same impacts anticipated. More detail can be found in the section on Lake and Wetland Habitat.

Effects by Alternatives

Alternatives A and B: These two alternatives have equal levels of roading within the Monument and propose no bridge crossings of mudflow affected channels. The temporary location of

Forest Road 92 (between Roads 83 and 94) and the bridge crossing of Smith Creek will be eliminated allowing natural channel processes to proceed in the Smith Creek/Muddy River watershed within the Monument.

Alternative C: This alternative includes the third highest level of roading in the Monument and, in addition, proposes two bridge crossings of mudflow affected channels--Smith Creek (Road 94) and a road across the exit channel from Coldwater Lake, which will access Johnston Ridge. Former Road 92 (Road 94) will be located approximately at its present location, on the 100 year floodplain of Smith Creek. The bridge crossing at this site will be difficult due to the nature of the stream. At present, it is crossed by three temporary bridges. A permanent installation of approximately 500 feet could be constructed outside the margins of the floodplain with limited affects to the channel proper. Any shorter span will require significant channelization, employing large jettystone rock and a high road fill across the floodplain. This bridge will also be constructed in Alternatives E, F, and G.

The bridge crossing of the Coldwater Lake exit channel should have few affects as flow is regulated, within limits, by the control structure on the lake. Created by the Corps of Engineers to avert flooding, this channel does not operate within the full range of an unregulated channel. This bridge will also be constructed in Alternatives D, D (Modified), F, and G. In Alternative F, it will be constructed by the Washington State Department of Transportation as part of State Route 504 to access Johnston Ridge.

Alternative D (Preferred): This alternative has approximately the same amount of road within the Monument as Alternative C. A notable feature will be elimination of temporary Road 92 and the bridge across Smith Creek.

An additional feature of this alternative will be the construction of a low standard gravel road to Spirit Lake from the present Windy Ridge viewpoint. This road would cross a portion of the debris avalanche, an area of extremely active channel building. No bridges will be required, instead culverts or hardened dips will be used at stream crossings. The affect upon channel processes will be constriction of flow with some local heavy erosion on the downstream side of the culverts.

Alternative D (Modified, Selected): This alternative has approximately the same amount of road within the Monument as Alternative B. A notable feature of this alternative is the elimination of the access road from Windy Ridge to Spirit Lake across the debris avalanche. Channel processes thus will be allowed to proceed naturally. An additional feature of this alternative would be closing of the access road to Castle Lake and the elimination of planned facilities there. Access to this lake

will be by trail. The number of visitors to the lake should be less, thus allowing lakeshore recovery to proceed relatively less disturbed. As in Alternative D, no bridge will be constructed across Smith Creek.

An access road up South Coldwater Creek will be constructed/reconstructed in this alternative. The first 4.5 miles of this road will be on the approximate location of the existing road, built for tunnel construction at Spirit Lake. Portions of the road will require reconstruction and armoring with rock for protection. This armoring tends to cut off the natural meanders of a sediment rich channel system like South Coldwater Creek. However, put in the perspective of the channel disruption caused by the Spirit Lake drawdown, the effects of road armoring would be minimal. The remaining 2.7 miles will be constructed to Johnston Ridge across an area of active rilling and gullying. Concentration of road runoff through relief culverts could tend to locally accelerate erosion of rills and gullies.

Alternative E: This alternative has the same road density as Alternative B. Notable features will be elimination of the road to Johnston Ridge and the bridge crossing of the Coldwater Lake exit channel. This would allow channel processes to continue uninterrupted in the Coldwater Creek drainage. An additional feature of this alternative is construction of a road between Roads 83 and 94 along Smith Creek. Effects from these crossings are the same as described in the other alternatives, for onsite conditions. Effects, again, will be influenced by the type of bridges built. Long spans with footings located outside of the floodplain will probably have little effect upon channel processes while a short span with rock and reinforced fills would cause sediment deposition above the constriction and tend to accelerate erosion downstream. The type of channel work necessary to ensure the permanence of such a bridge will also seriously alter natural channel processes.

Alternative F: This alternative includes the second highest level of roading within the Monument. Its most notable feature occurs outside of the Monument, the crossing of the South Fork of the Toutle River. The mudflow in this area defines the boundaries of active channel building activity. Any structure crossing this channel will, at least locally, impair channel processes in a manner similar to bridges crossings other mudflow affected channels, described above. Another features of this alternative is removal of former Road 92 from the floodplain along the west side of Smith Creek. The Road 92 bridge across Smith Creek would be constructed with effects as described above; access will require the construction and reconstruction of a tie-through route on the adjacent hillslopes. This road, 94-8300710, crosses numerous deeply incised drainages on very steep slopes. Soils along the route are subject to land slides, the effect of which will be accelerated erosion and sedimentation. Smith

Creek will be crossed again downstream in the approximate location of the confluence with the Muddy River (Road 83).

State Route 504 will be extended from near Camp Baker to Johnston Ridge crossing the exit channel for Coldwater Lake and South Coldwater Creek twice, once on the broad alluvial fan at the mouth and again near the headwaters where the debris avalanche overtopped Johnston Ridge. The access route traverses extremely steep sideslopes with past evidence of small slumps and failures. These can be expected to continue. The effect of this road, from both the crossings and the anticipated mass failures, will alter natural processes locally, as described in other alternatives. But it also poses the the potential of mass failures adding material to the stream channel; this could seriously alter channel processes throughout the drainage.

Alternative G: The alternative includes the highest level of roading within the Monument. It is very similar to Alternative F with the exception that access to Johnston Ridge will not be constructed. This road will be replaced by one traversing the debris avalanche from Coldwater Lake to Spirit Lake where it will join with the access road from Windy Ridge. It is estimated that this road will require a minimum of three bridges. The debris avalanche is in a highly active, developing state; there is enlargement and widening of existing channels and development of new ones after almost every climatic event. This route will intercept many of these existing channels and certainly impede the development of them by artificially routing and/or constricting flow.

Lake & Wetland Wildlife Habitat

Effects Common to All Alternatives: Access to lakes may have several types of effects on lake and lakeshore habitats, associated marshes, deltas, cliffs, and talus slopes. One potential effects is the trampling of vegetation which is recovering or being established, and the compaction of soils, delaying vegetative and water quality recovery. This could particularly be a problem around the Mt. Margaret high elevation lakes, which were largely denuded of vegetation in the May 1980 eruption. Camping near lakeshores and heavy foot traffic around lakeshores and associated wetlands are most likely to cause trampling and compaction. The second type of detrimental effect is disturbance or harassment of wildlife in these areas due to hiking, camping, and other recreational uses. These human activities reduce wildlife use of lake areas, even when harassment is not intentional. Many of the Mt. Margaret lakes have associated wetlands, cliffs, standing dead trees, or talus slopes which increase their habitat value. The third type of effect of human access to lakes is alterations to water quality and thereby to aquatic habitat quality.

The effect of access on Monument lakes is determined by two factors: how many lakes are accessed by roads or trails and how much control there is over camping at sensitive lakes. The significance of access depends on the sensitivity of a lakeshore to damage from visitor use.

The amount of access in the Mt. Margaret Backcountry and whether or not lakes are stocked with fish will determine the amount of fishing opportunity provided there. These same factors will influence the presence or absence of fish in many of the lakes, and the balance of fish and aquatic invertebrates in the lakes. Whether or not lakes will be stocked with fish will be determined in the Fish and Wildlife Management Plan.



Sensitive shoreline at backcountry lake could be impacted by increased visitation.

Effects of Alternatives

Table 19 shows the Monument lakes which are accessed by road or trail under each alternative, and indicates which lakes have associated wetlands, cliffs or talus, and the sensitivity rating for each lakeshore area.

Alternative A: This alternative has road or trail access to only eight Monument lakes, and two lakes of the highest sensitivity levels (1 and 2) are accessed. Access to the sensitive Mt. Margaret lakes from Norway Pass is cross country. Little backpacker and camper use of these Mt. Margaret lakes would be expected, so there would be low impacts to these lakeshores and lake water quality, and little risk of significant damage to either. Inaccessible lakes with reproducing fish populations would be likely to become overpopulated, with resulting stunting of fish and decreased populations of aquatic invertebrates. This alternative protects sensitive lakeshores from damage resulting from recreational use by providing little access. This lack of access, however, severely limits the opportunity for fishing. The potential for impacts to shorelines and water quality at the eight lakes accessed would

be greater than in other alternatives, since Monument lake-oriented recreation would be concentrated at these sites. Meta Lake would be the most likely to be detrimentally impacted. However, most use here will be confined to a viewing platform and a trail around only part of the lake's perimeter.

Alternative B: Seventeen lakes will be accessed under Alternative B. Camping will be allowed at Panhandle, Boot, Snow, and Obscurity Lakes in the Mt. Margaret Backcountry area and the use level will be expected to be high. Panhandle, Snow, and Obscurity Lakes are very sensitive to damage from lakeshore compaction and trampling of vegetation. In this alternative, there is no limit on the number of campers or length of stay, nor is there a permit system to easily monitor the level of use. Since the demand for camping would likely exceed the capacity of the Mt. Margaret area for camping without damage, there is a high risk of overuse, with damage to lakeshores and potential for water quality degradation. Other lakes are also likely to be used as the trail system provides access to facilitate cross-country travel. This undirected travel could be more damaging than directed travel on a trail. As no campsites will be designated, there will be a risk of camping occurring on lakeshores and deltas. Fishing pressure at the accessed lakes will be high. If lakes are not stocked with fish, fish populations will soon become very low, with resulting increases in aquatic invertebrates and lowered attraction for fishing. Self-reproducing fish populations at Shovel and possibly Venus Lakes will build, with stunting of fish and decreased populations of aquatic invertebrates.

A road and moderate level of public use at Coldwater lake will introduce the risk of detrimental water quality effects from the road, vehicles, and litter, and trampling of the lakeshore, but none of these effects are expected to be significant at this large lake.

Alternative C: In addition to the access described in B, one additional Mt. Margaret lake, Shovel Lake, is accessed by trail and has designated campsites. Deer and St. Helens Lakes are also accessed by trail. Off-trail use around St. Helens Lake is not restricted. This increased number of accessed lakes would relieve some fishing and camping pressure by distributing use. Shovel is not a particularly sensitive lake. Camping permits limit the length of stay in this alternative, but do not limit the number of campers to the number of designated campsites. Overuse in the Mt. Margaret area, and particularly at the five lakes with campsites, is likely to occur, with potential for lakeshore damage and water quality degradation. Camping may also occur at undesignated sites. If lakes are not stocked with fish, the accessible lakes will be fished out quickly, increasing aquatic invertebrates and decreasing the fishing opportunity.

Table 19: Lake Sensitivities and Associates Special Habitats Showing Access by Alternative.

Habitat Location	Lake Name	Sensitivity (1 = Most)	Wetlands	Cliff/Talus	Type of Access by Alternative								
					A	B	C	D	D Modified	E	F	G	
Green Timber	Coldspring	2	X		T	T	T	T	T	T	T	T	T
	Goat Marsh	3	X		T	T	T	T	T	T	T	T	T
	June	3	X										
	McBride	4	X		R	R	R	R	R	R	R	R	R
	Unnamed #3	1	X										
	Vanson	5	X		T	T	T	T	T	T	T	T	T
	Blue	4	X		T	T	T	T	T	T	T	T	T
	Crane *	3	X										
	Deadmans *	5	X		T	T	T	T	T	T	T	T	T
	Deer *	2	X		T	T	T	T	T	T	T	T	T
Green Islands	Strawberry *		X										
	Unnamed #2*	5											
Standing Dead Timber	Island	4	Potential										
	O'Connor	5										T	T
	Heart	3		X									
	Meta **	3			R	R	R	R	R	R	R	R	R
	Panhandle **	1			T	R	T	T	T	T	T	T	T
	Unnamed #4												
	Venus, upper **	3											
	Venus, lower **	4		X				T	T	T	T	T	T
	Frog Pond	2											
	Ghost							T	T	T	T	T	T
Mostly Blown Down Timber	Grizzly	1	Potential	X									
	Shovel	3	Potential	X									
	Snow	1	Potential										
	St. Charles	2	X		R	R	R	R	R	R	R	R	R
	Unnamed #1	4		X									
Blown Down Timber	Root	4	Potential	X									
	Castle***												
	Coldwater***		Potential										
	Holmstedt	1	Potential	X									
	Obscurity	2	Potential	X									
	Spirit***			X									
	St. Helens***			X									
	Total Accessed (Road)				3	5	5	5	6	5	6	6	6
	(Trail)				5	12	15	17	16	16	17	17	17
	(1 or 2 Sensitivity)				2	5	7	8	7	7	7	7	6

* Edge of green/blast zone.

** Mix of standing dead and down trees.

*** Sensitivity of large impoundments not rated; information on Ghost, Strawberry, and Unnamed #4 shorelines is inadequate to rate sensitivity.

Note: St. Helens and Spirit Lake visitors will be restricted to the trails. (Research Protection Class I.)

Type of Access
T = Trail
R = Road

OT = Restricted to on Trail
OR = Restricted to on Road

Nonaccessed lakes with self-reproducing fish populations will become overpopulated, with the fish becoming stunted in size, and with decreased populations of aquatic invertebrates. Seven sensitivity level 1 or 2 lakes are accessed; three have designated campsites, attracting overnight use.

A road and moderate public use level at Coldwater Lake has the risk of water quality effects from the road surface, vehicles and litter, and the lakeshore will have some trampling, but these effects are not likely to be significant to a lake of this large size.

Alternative D (Preferred): Two additional Mt. Margaret lakes, Venus and Holmstedt, are accessed in this alternative, with campsites designated at Venus Lake. June Lake also has trail access. Twenty-three lakes are accessed, including eight high sensitivity lakes, and six Mt. Margaret lakes have designated campsites. Permits are required for overnight camping at the Mt. Margaret lakes, and the number of permits is limited to the number of designated campsites. These designated sites are located away from lakeshores, thus reducing compaction, trampling, and water quality degradation from campsites. The shorelines of Venus and June Lakes are not highly sensitive to use. Holmstedt, on the other hand, is a very sensitive lake. Although a high number of lakes are accessed, and the maximum number of campsites provided, the permit system allows control over and monitoring of use, at least partially mitigating the high use level. Fishing would be dispersed over most lakes. If lakes are not stocked with fish, the fish in lakes without self-reproducing populations would be quickly depleted, making them undesirable for fishing.

Recreational use at Coldwater Lake is slightly increased over that in Alternative C, but no gasoline motors are allowed on the lake. Water quality degradation is unlikely to occur at a significant level. Some trampling and compaction may occur to the lakeshore, but, overall, this is unlikely to occur over a significant portion of the lakeshore.

Alternative D (Modified, Selected): Twenty Monument lakes are accessed, including seven sensitivity one or two lakes, with camping at five Mt. Margaret lakes. Although Venus Lake does not have trail access, some cross-country access will continue to occur, and may increase. Permits are required for overnight camping at Mt. Margaret lakes, and are limited to designated campsites away from the lakeshores. Lakeshore compaction and water quality degradation from camping will be unlikely as long as the permit system is enforced. There is an intermediate level of overall access to lakes in this alternative, and the highest (along with alternatives D, E, F, and G) number of Mt. Margaret campsites.

Fishing would be dispersed over most lakes. If lakes are not stocked with fish, the fish in lakes without self-reproducing populations would be quickly depleted, making them undesirable for fishing. Aquatic invertebrates would increase while fish populations decrease.

Recreational use at Coldwater Lake is slightly increased over that in Alternative C, but no gasoline motors are allowed on the lake. Water quality degradation is unlikely to occur at a significant level. Some trampling and compaction may occur to the lakeshore, but, overall, this is unlikely to occur over a significant portion of the lakeshore.

Alternative E: Twenty-one lakes are accessed, including seven high sensitivity lakes, and six Mt. Margaret lakes have designated campsites. Permits are required for overnight camping at the Mt. Margaret lakes, and the number of permits is limited to the number of designated campsites. These designated sites are located away from lakeshores, thus reducing compaction, trampling, and water quality degradation from campsites.

Under this alternative, there is only trail access to Coldwater Lake, and no motorized boats are allowed. No significant impacts to its lakeshore or water quality will occur due to recreation visitor use.

Although a high number of lakes are accessed, and the maximum number of campsites provided, the permit system allows control over and monitoring of use, at least partially mitigating the high use level. Fishing would be dispersed over most lakes. If lakes are not stocked with fish, the fish in lakes without self-reproducing populations would be quickly depleted, making them undesirable for fishing.

Alternative F: Gasoline motors on Coldwater Lake present some risk of pollution due to gasoline spills. Public use at the Coldwater Lake site would be slightly above that of Alternative B, with a fairly low risk of lakeshore trampling.

Two more Mt. Margaret lakes are accessed than in Alternative E, for a total of twenty-three Monument lakes. Seven sensitivity 1 or 2 lakes are accessed, three of them having campsites. The two additional lakes are of relatively low sensitivity, so the increase in effects would not be large. Camping is limited by permits issued only for designated sites. The risk of lakeshore damage and lake water quality degradation is the highest of all of the alternatives, but this risk is tempered by the use of the camping permit system. Use would be the most dispersed of all of the alternatives, and the most controlled.

Fishing would be dispersed over most lakes. If lakes are not stocked with fish, the fish in lakes without self-reproducing populations would be quickly depleted, making them undesirable for fishing.

Alternative G: Gasoline motors are allowed on Coldwater Lake and this site also has the highest visitor use level, presenting a risk of water quality and lakeshore degradation.

Twenty-three Monument lakes are accessed, including six sensitivity 1 or 2 lakes, three of which have campsites. A permit system allows control over the number of campers at six Mt. Margaret lakes with camping and the highest level of control over recreational use is employed. This will reduce the risk of trampling, compaction, and water quality degradation from campsites, partially mitigating the high level of recreational use. Fishing would be dispersed over a number of lakes. If lakes are not stocked with fish, those lakes without self-reproducing populations will be quickly depleted, making them undesirable for fishing. Without fish, aquatic organisms will increase in these lakes. Lakes with self-reproducing populations will be heavily fished, and may be depleted of catchable sized fish.

Control of Visitors: There is a direct correlation between the amount of visitor use per lake basin and habitat disturbance and vegetative damage. Control of visitors, which varies between alternatives, and location of facilities can reduce disturbance.

Control Level

- Information provided to inform users of resource sensitivities (Alternative A only).
- Measures to reduce use where it is excessive, e.g., signing or removing facilities that attract heavy visitation (Alternative B only).

- Campsites will be designated away from lakeshores. Overnight camping permits which limit the length of stay in an area will be required (Alternative C only).
- Overnight camping permits will be required; the number of permits will be restricted (Alternatives D, D (Modified), and E).
- Highest level of control. Measures include seasonal closures, the designation of a trip itinerary, no campfires, and restriction to trails (Alternatives F and G).

Aquatic & Streamside Habitats

Predicted effects result from overall public access and construction and development levels, as well as site-specific stream and streambank effects. Alternatives differ in miles of roads and trails. As they increase, more stream crossings occur producing on-site detrimental effects on water quality and potential compaction and trampling from public access to streambank areas.

Overall levels of sediment produced from roads will not differ significantly among alternatives, and overall stream water quality will not vary. However, stream crossings, site construction, and road use may produce localized aquatic habitat impacts. In-stream habitat recovery rates and fish population recovery rates in streams will not change by alternative. Stream fishing days provided in each alternative are included in Table 20.

Table 20. Monument Fishing Visitor Days Provided by Each Alternative.

	A	B	C	D	D (Modified)	E	F	G
With lake stocking	7,100	11,400	12,300	13,600	13,600	11,000	14,100	13,600
Without lake stocking	7,100	7,100	7,300	7,300	7,300	7,300	7,300	7,300

Alternative A: This alternative has low levels of facility construction and roading; 75 miles of existing road will be used, 40 miles of it open to public travel, and there will be no new road construction. Visitation will be concentrated around these existing roads, localizing effects. Trails are also at a minimal level (32 miles). This alternative will produce low levels of disturbance to streams and riparian vegetation. There are no proposed bridge crossings of mudflow-affected channels and no new recreational facilities will be developed.

Alternative B: Roading in Alternative B will decrease to 57 miles, 37 miles open to public travel. There is a low level of facility construction. Seventy-four miles of trail access will increase trampling of riparian vegetation. Roads 25 and 99 are double-laned. Road and trail access is provided at Castle and Coldwater Lakes which will locally impact sensitive debris avalanche areas.

Alternative C: Alternative C has 68 miles of road in the Monument, 51 miles open to public travel. There are two proposed bridge crossings of mudflow channels; Smith Creek at Road 94, and across the outflow from Coldwater Lake. State Route 504 is reconstructed from near Camp Baker to Coldwater Lake with a single-lane extension to Johnston Ridge. Road 25 is double-laned. Ninety-six miles of trails are provided. Trail and road access is provided to the debris avalanche. There is a trail in the Pine Creek-Muddy River alluvial fan. The additional access will result in moderate riparian trampling.

Alternative D (Preferred): Alternative D has the same level of roading as C, 68 miles, with 55 miles open to public travel. There are 148 miles of trails. Roads 25 and 99 are double-laned.

Alternative D (Modified, Selected): Alternative D (Modified) has 68 miles of road, 55 of which are open to the public for travel, and 159 miles of trail. Roads 25 and 99 are double-laned. Effects of an access road up South Coldwater Creek, the majority of its length on the location of the existing road, will cause minimal additional channel disruption from the Spirit Lake drawdown.

Alternative E: Alternative E has 67 miles of road, with 58 miles of it open to public travel. The trail system is similar to that in D, with 154 miles. Public use of Castle Lake, Spirit Lake, and the South Fork Toutle River drainage is increased. There are two bridge crossings in the Muddy River drainage and a trail system in the Muddy River/Pine Creek fan areas.

Alternative F: This alternative has 77 miles of roading, 72 open to the public, and 181 miles of trails. There is a road crossing of the South Fork Toutle River mudflow outside the Monument.

Former Road 92 is removed from the Smith Creek floodplain, but the new 94 and 83 roads cross dissected drainages on steep slopes. Smith Creek is crossed near the confluence with the Muddy River. State Route 504 from near Camp Baker to Johnston Ridge crosses the Coldwater Lake exit channel and crosses South Coldwater Creek twice, once on the alluvial fan near its mouth and once on the debris avalanche.

Alternative G: The 78 miles of road (73 open to the public) in this alternative is similar to that in Alternative F. There are 161 miles of trail. Road access to Johnston Ridge is replaced by a road traversing the debris avalanche from Coldwater Lake to Spirit Lake with three bridge crossings. This road will also intercept many channels in this highly unstable area. Alternative G poses the highest risk of adverse effects on streams and streamside vegetation.

TERRESTRIAL WILDLIFE

Effects Common to Alternatives

Increased visitor use, which can be expected to occur under all alternatives, will have an detrimental effect on wildlife habitats and populations.

Effects of Alternatives on Availability of Successional Stages

The eruption of Mount St. Helens produced extraordinary conditions for wildlife. Five major categories of successional habitats, used by a broad spectrum of wildlife species, are considered in this discussion of environmental effects. They include: old growth timber stands; green timber stands younger than old-growth; areas of standing blast-killed trees with surviving seedling understories or recovering shrub or forb and grass understories; areas of blowdown trees with various stages of re-emerging and re-establishing grass, forb, or shrub ground cover; and devastated areas largely denuded of vegetation and devoid of downed trees. Each of these types has its own associated wildlife community. The importance of impacts on these areas depends upon the abundance of the habitats and the number of wildlife species which use them. Old growth is species-rich, supports habitats found nowhere else, and would require many years to replace. It is habitat for the Northern Spotted Owl, a Forest Service sensitive and state-listed species.

Standing dead tree areas are important habitat for species which use tree cavities and down logs. It is scarce on the Monument, available on 4 percent of the area. Blowdown areas, which are more extensively available, provide habitat for a lesser number of species which use down logs in early successional stages. Some of these logs will continue to be available as stands of trees begin to grow up around them.

Blowdown adjacent to green timber stands is used by more wildlife than blowdown in the interior of the Monument. Human use of wildlife areas, which have no cover for deer and elk, creates a harassment. Certain areas provide habitat for unusual forms of wildlife. Bacterial communities in fumaroles on the debris avalanche, for example, are micro-organisms associated with primordial life.

Old Growth (including Spotted Owl Management Units)

Effects Common to All Alternatives: No alternative proposes new roads or facilities in old growth or spotted owl management units.

Effects Specific to Alternatives: Alternatives differ in miles of road and trail retained or constructed in the Monument's 16,750 acres of old growth (see Table 21).

Standing Dead Tree Areas

Effects Common to Alternatives: There are approximately 4,400 acres of standing dead trees in the Monument. Most is in the Mt. Margaret Management Concept Area. Without knowing the exact location of trails, it is not possible to measure how much trail will intersect patches and areas of standing dead trees. Table 21 shows the miles of trail which each alternative will construct in the Mt. Margaret Area, and road miles in all standing dead tree areas.

Green Forest Stands Other Than Old-Growth

These areas are located primarily at the north and south ends of the Monument (in the Cave Basalt area, Goat Marsh, on part of the mudflow, and in the Backcountry Management Concept Area). In addition to their importance as wildlife habitat, they are eventual replacements for existing old-growth ecosystems. Developed sites, common to all alternatives, are the Lava Cast area and Ape Cave, both in the Cave Basalt area. An interpretive site or picnic area is planned at Kalama Springs in Alternatives C through G, and McBride Campground is planned in Alternatives E through G.

Effects on Uses of Wildlife (consumptive and non-consumptive)

The opportunity for hunting will not vary by alternative. No areas within the Monument are closed to hunting in any alternative. Although access to certain specific areas is more available in some alternatives than others, overall access does not vary greatly, and increased road access in an area is offset by lowered animal numbers where there are roads with traffic on them. The demand for hunting within the Monument will continue to increase. By the year 2,000, 20,000 annual hunter days will be spent in the Monument. In the Monument plus adjacent influence areas addressed in this plan, there will be 35,700 hunter days each year. Wildlife appreciation, such as viewing and photographing wildlife will also be high (see Table 22).

Table 21: Miles of Road and Trail by Vegetative Condition by Alternative

Vegetative Condition: Alternative	Old Growth Miles		Standing Dead Miles		Younger Green Timber Miles	
	Trail	Road	Trail	Road	Trail	Road
A	3	10	4	1	18	13
B	4	10	29	3	19	14
C	7	7	28	2	24	14
D	8	8	35	2	20	15
D (Modified)	5	8	34	25	20	15
E	7	5	31	2	22	14
F	14	6	35	4	25	9
G	12	6	32	3	26	9

Table 22: Wildlife Appreciation User Days

	A	B	C	D	D (Modified)	E	F	G
Inside Monument	27,100	31,500	32,300	33,600	33,600	31,000	34,100	33,600
Monument and Influence Area	48,600	56,300	57,500	59,800	59,800	55,000	60,700	59,800

Deer & Elk Winter Range

Effects Common to All Alternatives: There is an increase in visitor use of winter sports areas and travel on major roads open in the winter. Human use of deer and elk winter range creates harassment and reduces the number of animals an area can maintain. No new roads will be constructed in winter range.

Effects by Alternative

Alternative A: This alternative has an undeveloped Sno-park area on Road 83 inside winter range. It is an area where the road is plowed wider to allow parking, rather than a planned Sno-park. It is congested and harassment to wintering big game from snowmobiles and skiers would be significant.

Alternative A has about 4 miles of road within winter range along Smith Creek, but it will not be plowed in winter. Road 83 in the Cave Basalt area will be plowed to Road 81 for access to the Sno-park and snowmobile trails.

Alternative B: This is the best alternative for winter range because there are no Sno-parks or roads plowed to access winter sports areas.

Alternatives C, D (Preferred), and E: One Sno-park will be constructed on the south end of the Monument outside of winter range. Road 83 will be plowed through winter range along the Forest boundary to Road 8312, which accesses the Sno-park. Approximately one-half mile of Road 81 will be plowed through winter range to access a snowmobile trail in the Kalama area. Impacts to winter range will be minimal, assuming that no winter sports parking is provided along this section. Use will be directed to areas outside of winter range.

Alternative D (Modified, Selected): One Sno-park will be constructed outside of winter range, in the southern end of the Monument. Road 83 will be plowed through winter range along the Forest boundary to Road 8312. Goat Marsh will be closed to snowmobiling. No other roads in winter range will be plowed, and other roads in winter range will be closed to travel. Parking for winter sports use will be located outside of winter range. Impacts to winter range will be minimal.

Alternative F: Alternative F will produce the highest level of disturbance in winter range, with a ski Sno-park and a snowmobile Sno-park on Road 81 near the Forest boundary; one-half to one mile of Road 81 will be plowed for access. Road 83 is plowed along the Forest boundary, intersecting the periphery of winter range, to access the Marble Mountain area Sno-park.

Alternative G: Alternative G is similar to F, but has one Sno-park rather than two on Road 81 near the Forest boundary. One-half mile of Road 81 to the Sno-park and Road 83 are plowed to access the Marble Mountain Sno-park.

Deer and Elk Summer Range

Effects Common to All Alternatives: Public use and disturbance of elk and deer on summer range will increase in all alternatives. All alternatives will continue the cooperative road management program with Washington Department of Game in the Marble Game Management Unit.

Effects by Alternatives: Effects on deer and elk summer range were rated by identifying effects on natural processes. Table 23 shows those effects on the various categories of summer range.

Table 23: Effects on Summer Range Habitat

Area	Green (W. Hemlock & Silver Fir)		Old-Growth		Natural Openings	
Habitat Value	(Cover)		(Cover & Forage)		(High Quality Forage)	
Alternative	%Area(1)	Level of Effect (2)	%Area Affected	Level of Effect	%Area Affected	Level of Effect
A	1	x 1	1	x 3	2	x 2
B	1	x 1	1	x 3	1	x 3
C	1	x 2	1	x 3	1	x 2
D	1	x 2	1	x 3	2	x 2
D (Modified)	1	x 2	1	x 3	2	x 2
E	1	x 3	1	x 3	2	x 2
F	2	x 3	2	x 2	2	x 3
G	2	x 3	2	x 3	2	x 3

Area	Standing Dead		Blowdown		Devastated	
Habitat Value	(Some Cover/Forage Recovering)		Mobility Limited (Future Forage)		(Potential Forage)	
Alternative	%Area(1)	Level of Effect (2)	%Area Affected	Level of Effect	%Area Affected	Level of Effect
A	1	x 4	1	x 1	1	x 2
B	2	x 4	1	x 2	1	x 2
C	2	x 4	1	x 1	2	x 3
D	2	x 4	2	x 2	2	x 3
D (Modified)	2	x 4	2	x 2	2	x 3
E	2	x 4	1	x 2	2	x 3
F	2	x 4	2	x 4	3	x 4
G	2	x 4	2	x 2	3	x 4

(1) % Area Affected (Magnitude)

- 1 - 0-20%
- 2 - 21-40%
- 3 - 41-60%
- 4 - 61-80%
- 5 - 81-100%

(2) Effect of Development (Significance)

- 1 - No disruption of area
- 2 - Minor disruption of area
- 3 - Moderate disruption of area
- 4 - Major disruption of area
- 5 - Entire area compromised by impact

Acres of deer and elk habitat lost³ in new road construction and reconstruction of existing roads vary from 0 to 120, but this magnitude is an insignificant percentage of the habitat area (less than 1 percent) in all cases. Open traveled roads reduce the capability of an area to support wildlife. Table 24 shows the reduction in the capability of the Monument to support deer and elk, due to public travel on roads.

Table 24: Effects of Roads

Alternative	Density of Open Road Inside Monument (Mi./Mi ²)	Reduction in deer and elk habitat capability due to open roads
A	.25	10%
B	.23	10%
C	.32	12%
D	.34	13%
D (Modified)	.34	13%
E	.36	14%
F	.45	16%
G	.46	16%

Developments at Key Summer Habitat Sites:

Following are developments in alternatives which occur in high value summer range habitat areas. Under all alternatives, side roads off the Marble Mountain Road would be closed, improving this important habitat area by reducing harassment.

--Alternative A Trail 237 will lead from Road 8123070 to Goat Marsh Lake in the Goat Marsh Research Natural Area (RNA). This is an important calving, rutting, and summer use area for elk.

--Alternative B: This alternative will remove Trail 237 to Goat Marsh Lake and close Roads 8123070, 8123171 and 8123173 reducing human use of this sensitive area. It will establish a viewpoint on Road 8312 onto Marble Mountain with parking for four cars. This will increase visitor use of a road which overlooks calving meadows and high value summer and fall elk habitat.

--Alternative C: Trail 237 from Road 8123 into Goat Marsh Lake appears again in this alternative. Road 8123070 will become part of the trail. Roads 8123171 and 8123173 at the north end of the Goat Marsh RNA will be closed, providing some benefit to habitat in that area. The viewpoint on Marble Mountain Road also reappears, with the same consequences as in Alternative B.

--Alternative D (Preferred): Road 8123070 and Trail 237 into Goat Marsh Lake will be retained, with a trailhead at the end of 8123070 and parking for five cars. Roads 8123171 and 8123173 will be closed. The effect on habitat will be similar to that in Alternative C, with perhaps greater use due to the trailhead and parking. Alternative D has the same viewpoint on Marble Mountain as Alternatives B and C.

--Alternative D (Modified, Selected): There will be no trailhead or parking at the end of Road 8123070. Roads 8123171 and 8123173 will be closed. All will maintain and improve the habitat capability of Goat Marsh. The habitat capability of the Marble Mountain meadows will also be maintained. Both areas are key elk habitats. Alternative D (Modified) will have the least detrimental effect on deer and elk summer range.

--Alternative E: The same management in the Goat Marsh area as Alternative D occurs in this alternative. In addition, a campground is established at McBride Lake. The same viewpoint as in Alternative B-D is placed on the Marble Mountain road.

--Alternative F: In this alternative, Trail 237 from Road 9123 to Goat Marsh Lake is extended along the west side of the marsh to the top of

Goat Mountain. This will extend human use farther into this sensitive habitat area and increase harassment. In addition, Roads 8123171 and 8123173 will be improved, rather than closed, as in previous alternatives; this will increase use and disturbance at the north end of the RNA. Alternative F has a campground near McBride Lake and Road 8100600 will be paved to access it. The viewpoint with parking for four cars on the Marble Mountain Road also appears in this alternative.

--Alternative G: The Goat Marsh area's trails and roads will be managed as in Alternative F. The Marble Mountain viewpoint will be constructed as in Alternatives B-F.

Other Developments: Other developments in summer range habitat occur at McBride Lake and Kalama Springs. In Alternative B, Road 8100600 west of McBride Lake is closed, improving habitat in that area by reducing harassment. In Alternatives A, C, and D, the road is open. In Alternatives E, F, and G, a campground is developed at the end of that road and the road paved, greatly increasing use at McBride Lake.

The five unit picnic area at Kalama Springs in Alternative A is replaced with an interpretive site with the same amount of parking and road to the springs in Alternative B and C. In Alternatives D and E, the road to the springs is reconstructed and a six unit picnic area and interpretive sign installed. In Alternatives F and G, the picnic area is enlarged to eight units and the road to the springs paved. A 12 unit horse camp is built, with a series of horse and hiker trails, and a trailhead on Road 90.

Other Habitat Effects

Waterfowl habitat: Blue Lake and Goat Marsh have waterfowl nesting habitat. All alternatives have a trail near Blue Lake and a road to Blue Lake. They differ only in whether the portions of the road presently closed is reconstructed.

Ptarmigan habitat on the slopes of Mount St. Helens: In all alternatives, climbing Mount St. Helens will be popular and there is potential for affecting ptarmigan habitat. Site-specific evaluations for trail and campsite location will be necessary to avoid or mitigate effects.

Cave Basalt Habitat, Effects Common to All Alternatives: Caves vary in accessibility, recreational interest, biological resources, and current levels of use. Some contain sensitive wildlife habitat. Disturbance to wildlife and damage to cave habitat would result with uncontrolled use. These effects will be long term and cumulative except for possible short term disturbance during the construction of facilities.



Increase in number of visitors could impact cave habitat unless controlled.

A biological survey of the caves was made in 1983-84 and a Management Plan for the Cave Basalt area will be completed by 1986. That plan will include measures to protect caves based on biological information and an examination of accessibility. Five levels of biological concern and sensitivity to human intrusion are identified below. These were based on sensitivity levels established in 1981 during a meeting of Forest Service recreation and wildlife specialists, scientists, and cave interest groups. Categories 4 and 5 have been revised to include current State of Washington sensitive species status and recent information about unique invertebrate species found in the caves.

--Sensitivity Level 5: Contains Townsend's big-eared bat hibernating or nursery habitat and/or Larch Mountain Salamander habitat. The former has been proposed as a threatened species and the latter as a sensitive species by the State of Washington.

--Sensitivity Level 4: Contains unusual organism or habitats not often found in the Region, but not unique, and unique species which live in places inaccessible to humans (cracks, small tunnels, etc.) or those which can withstand some human intrusion. They also can be places used to a minor extent by the big-eared bat.

--Sensitivity Level 3: Contains biota not commonly found in the area but existing in several caves in the area.

--Sensitivity Level 2: Biota common to or typical of caves in the area.

--Sensitivity Level 1: No sensitive biota.

Effects by Alternatives: The number of caves could be easily accessed by the public in each alternative is shown in Table 25 below.

Table 25: Number of Caves Potentially Accessed* by Road and/or Trail

	<u>Sensitivity Levels of Caves</u>			
	5** (most sensitive)	4	3	2
Alt. A	4	5	2	5
Alt. B	2	3	0	2
Alt. C	2	3	0	2
Alt. D	2	3	0	2
Alt. D (Modified)	2	3	0	2
Alt. E	3	3	0	1
Alt. F	4	5	2	5
Alt. G	4	5	2	5

*Directly accessed or within short hiking distance of a road or trail.

**Under all alternatives, these caves will be closed by closure orders during the period of highest sensitivity. Lack of access greatly increases the effectiveness of closures.

Alternative A: Ape Cave will continue to be interpreted and developed for recreational use. The level of visitation is set at 100 persons at one time (PAOT). Access to the entire Cave Basalt area facilitates a high level of visitation. Road 8300030 at the south end of the Cave Basalt area will be open to traffic and Road 81 will be maintained.

Alternative B: Circumstances at Ape Cave are similar to those in Alternative A. No caves have direct road or trail access but road access is within a short hiking distance of six caves (see Table 26). Road 8300030 would not be maintained so it would become less negotiable by passenger cars over time. The washed out portion of Road 81 would not be reconstructed, eliminating through traffic.

Alternative C: Visitation at Ape Cave will increase to 130 PAOT. The washed out portion of Road 81 is repaired, providing a loop drive through the northern end of the area. Road 8300030 would not be maintained, gradually closing it to passenger vehicles.

Alternative D (Preferred): Ape Cave is developed for increased use; the capacity would be 160 PAOT with lamp rentals and guided tours provided by a concessionaire. Road 81 will be reconstructed and improved, providing a loop drive. Road 8300030 will be closed and gated, greatly reducing access to caves in the southern end of the Cave Basalt area.

Alternative D (Modified, Selected): Road 81 is improved, providing better access and more traffic to the upper caves area. Closure of the 8300030 will reduce access to the lower caves area. Ape Cave will have further degradation, due to a very high level of visitor use. A concessionaire present at the cave will help limit potential damage due to inappropriate equipment and littering.

Under Alternative D (Modified), as under all of the alternatives, the most sensitive Townsend's bat habitat caves will be closed by closure orders. Reduced access from the present level will increase the effectiveness of these closures.

Alternative E: Use at Ape Cave will be the same as in Alternative A. A campground with a capacity of 60 PAOT will be constructed about one mile from Ole's Cave with a trail leading to the cave entrance. Road 8300030 will be "abandoned" (not maintained), reducing access over time. Road 81 is reconstructed and improved, providing a loop drive and increasing traffic through that portion of the area.

Alternative F: Developed recreational use will be increased at Ape Cave and Ole's Cave. The capacity of Ape Cave will increase to 190 PAOTS with guided tours and lamp rentals provided by a concessionaire. Ole's Cave Campground will be developed to a capacity of 125 PAOTS, with a trail to the cave entrance connecting with Trail 232 and providing access to the cave from both east and west. Road 8300030 is paved to the campground. The Road 81 loop will be reconstructed, as in Alternatives C, D, and E.

Alternative G: Ape Cave will remain at the present (Alternative A) use levels. Ole's Campground will be developed to a capacity of 250 PAOTS, with a trail to the cave entrance connecting with Trail No. 232, as in Alternative F. Road 8300030 is abandoned (not maintained) but not gated. Use by vehicles would decline over time but it provides trail access to that area. Road 81 is reconstructed and improved, as in Alternatives C and F. A trail is constructed from Ape Cave to Road 81 Road.

VEGETATION

Effects on vegetation result primarily from roads and trails which, with one exception, increase access incrementally by alternative (Alternative E restricts west side road access). They are closely related to impacts identified under "Watershed Resources," specifically, "Lake and Wetland Wildlife Habitat", "Stream and Streamside Wildlife Habitat," and "Terrestrial Wildlife." Many of the mitigation measures called for in these sections also apply to vegetation.

Alternative A: The major feature of this alternative is the minimal level of facility construction and road access provided to the many sensitive habitats in the Monument. This will provide the least long term disturbance of plant community succession over the broadest portion of the Monument. The concentration of traffic upon

a few major corridors, however, will probably produce some long term disruptions of natural vegetation there. Severe vegetative impact is occurring during hunting season south of Mount St. Helens by off-road hunter camping.

Plant succession in the unstable tephra deposits along the Road 99 corridor will also be locally altered. The impact of foot traffic, construction activity, and dispersal of exotic plant species have influenced the ecosystem here.



Typical hunter camp on Road 83.

Alternative B: The greater level of access in this alternative will result in more trampling of vegetation than in Alternative A. It will also disperse traffic more widely throughout the Monument, however, which may reduce the concentration of impacts in some areas.

The trail along the east flank of Mount St. Helens will traverse numerous areas of instability. Those on mudflow and tephra substrates are most likely to be disrupted, slowing the recovery of vegetation. The same is true at Johnston Ridge and Mt. Margaret, which will also be accessed by trails. Trails, however, can also limit the area which is disturbed.

Alternative C: Increased road and trail access will additionally increase the likelihood of disturbance, slowing the recovery of vegetation. Trails to sensitive upper elevations on Mount St. Helens and increased access to the Mt. Margaret Backcountry will increase the potential for impacting the immediate and long term successional processes along access corridors. Trail and road access to the debris avalanche near Castle and Coldwater Lakes could increase (but also confine) disruption of vegetation. The debris avalanche is a highly sensitive ecosystem with an unstable substrate. Construction there could result in local but significant and long term damage to plant succession.

Horse travel in sensitive habitats will adversely effect plant succession in two ways, by grazing and by the spread of exotic weed seeds in animal droppings. It will also disrupt plant composition along trails.

Alternative D (Preferred): A trail extension across the debris avalanche will increase levels of foot traffic in this sensitive environment but confine it primarily to the trail. Damage to vegetation in the immediate vicinity is likely to be long term. Completion of a loop trail around the north flank of Mount St. Helens opens sensitive ecosystems in the pyroclastic flow area southwest of Spirit Lake to foot traffic. Plant recovery there is proceeding very slowly and will be impacted. Bus travel along a new road to Spirit Lake will create additional impacts as large numbers of people are delivered to this area in periodic pulses. The controlled access, however, will facilitate monitoring and mitigation of impacts.

The aerial tram to Johnston Ridge from State Route 504 will prevent much damage to recovering vegetation in the debris avalanche area. Road and facility construction on Johnston Ridge, however, will significantly disrupt vegetation succession patterns there by concentrating traffic in a small, highly sensitive area. Vegetation recovering in the vicinity of the proposed interpretive/picnic site at Castle Lake and the sensitive ecosystems near the Ape Cave facility will also be impacted.

Alternative D (Modified, Selected): A trail extension across the debris avalanche will increase levels of foot traffic in this sensitive environment but confine it primarily to the trail. Damage to vegetation in the immediate vicinity is likely to be long term. Completion of a loop trail around the north flank of Mount St. Helens opens sensitive ecosystems in the pyroclastic flow area southwest of Spirit Lake to foot traffic. Plant recovery there is proceeding very slowly and will be impacted.

Single lane road construction from Coldwater Lake to Johnston Ridge will impact portions of the debris avalanche, but in areas already substantially modified in efforts to stabilize the Coldwater Lake blockage. A road has already been constructed across the debris avalanche and along South Coldwater Creek to facilitate construction of the Spirit Lake tunnel outlet. Continued maintenance of the roadway will locally disrupt, but also confine the impacts on vegetation. These disturbances would cause localized long-term disruptions in plant succession. Road and facility construction on Johnston Ridge, however, will significantly disrupt vegetation succession patterns there by concentrating traffic in a small, highly sensitive area. Vegetation recovering in the vicinity of the sensitive ecosystems near the Ape Cave facility will also be impacted.

Alternative E: The recovery of vegetation will be additionally disturbed in this alternative by emphasis on roaded recreation near Castle Lake, Spirit Lake, and the South Fork Toutle River. Foot traffic along and at the terminus of developed access roads will result in trampling in environments with unique characteristics. All were relatively high blast impact areas and consist of mudflow or debris substrates, which are hostile environments for plant establishment.

Helispot construction at Bean Creek and on Johnston Ridge will provide minimal disruption to vegetation if the number of visitors is controlled. Construction of a campground at McBride Lake, however, will result in long term impacts to the sensitive ecosystems in the upper Cave Basalt area. It will also, however, concentrate foot traffic to definable, manageable areas.

Alternative F: Roads across the debris avalanche to Johnston Ridge, across the South Fork Toutle River, and along the east shore of Castle Lake will produce additional impacts to vegetative recovery. Foot traffic will be substantially increased in these sensitive plant habitat areas. New trails up the south face of Mount St. Helens, in the Cave Basalt area, along Coldwater Lake, and in the Mt. Margaret Backcountry will also impact sensitive plant environments.

The horse camp on Road 81 in the Cave Basalt area will concentrate disturbance to vegetation from foot traffic and animal grazing. Recreation developments on Johnston Ridge, at Coldwater Lake, and at Spirit Lake will also harm plant succession.

Alternative G: This alternative dramatically increases public access by both road and trail to many ecologically sensitive sites. It has the greatest potential for disrupting natural vegetation successional processes. The debris avalanche area and land affected by pyroclastic flows near Spirit Lake will be severely and extensively damaged by the construction of State Route 504. Initial construction activity, periodic maintenance, and increased vehicle and foot travel will have a cumulative adverse effect on natural succession there.

Extensive increases in trails in the Mt. Margaret Backcountry, tephra fallout area, and Cave Basalt area will also have a long term adverse impact on vegetation. Numerous developments at Ape Cave, Castle Lake, Coldwater Lake, Spirit Lake, and in the tephra fallout area will concentrate foot traffic with harmful consequences to plant succession.

SUMMARY OF THE NATURE OF IMPACTS ON NATURAL FEATURES AND PROCESSES

Geologic Features

Activities affecting geologic features such as disturbance by burial or excavation, by disruption of natural stratigraphy (mixing of strata), or, in the case of standing dead or downed trees in the blast area, by cutting or removal, represent direct impacts both quantitative and qualitative in nature, long term and irreversible.

Activities which alter drainage patterns (such as excavation, grading or placement of fill material) leading to sedimentation onto or erosion of geologic features represent impacts which are both qualitative and quantitative in nature, indirect, long term, irreversible, and cumulative in effect.

Geologic Conditions and Processes

Activities such as road, trail, and facility construction involving excavation or placement of material or removal of vegetation leading to changes in slope geometry, or surface or subsurface drainage (thereby concentrating or removing water) which initiates or accelerates slope failures represent impacts which are both qualitative and quantitative in nature and are irreversible during this planning period. The impacts can be direct (such as road cut failure) or indirect (such as channelization of road drainage through slope failure). The impacts can be short or long term, primarily depending on site conditions such as physical properties of materials and slope geometry. Areas exhibiting steep slopes and loose, non-cohesive soils (such as the area of heavy tephra deposition) are particularly susceptible to slope failure. Such failure can represent a long term and cumulative impact unless halted through the application of stabilization techniques.

In the areas affected by mudflows, pyroclastic flows and the debris avalanche, oversteepened slopes adjacent to newly forming or rapidly changing stream channels are extremely sensitive to development activities. In these areas, impacts can be long term and cumulative.

Watershed Conditions and Processes

Erosion, sedimentation, channel migration and development, and landslides are all part of the natural processes ongoing in the Monument. Newly forming channels in areas affected by the mudflows and in those areas affected by the debris avalanche are extremely sensitive to disturbance. In these areas impacts can be long term and the effects of them transmitted downstream in a cumulative manner. Effects to blast effected channels can be either short or long term, direct or indirect, depending upon the nature of the disturbance involved. Blast effected channels will tend to stabilize quicker than those forming on the mudflows or debris

avalanche and impacts to these channels will come mostly from changes in hillslope hydrology, i.e., infiltration and runoff.

Effects to floodplains will come mainly from engineering attempts to cross them with bridges or to construct roads adjacent to them. Floodplains within the Monument are very active and the above engineering schemes will tend to restrict the floodway by employing large riprap to assure permanence of the structure. These impacts are generally direct, long term and the effects of the changes they cause can be cumulative downstream.

Effects to wetlands come mostly from human occupation or visitation to these areas. The largest wetland in the Monument is Goat Marsh, although there are smaller ones scattered throughout the area. Trampling of vegetation and compaction of soils are the typical impacts anticipated. These are generally direct impacts but with appropriate controls and avoidance can be considered short term and not cumulative.

Terrestrial Wildlife

Most effects on habitat are cumulative and long term, extending beyond 1990. The only short term effects would be harassment and very minor habitat alteration due to the actual construction of facilities and roads. Removal of habitat areas and use of roads and facilities are long term effects. The removal of habitat acreage for facilities, however, is of low significance compared with the effects of human use and resulting harassment of wildlife.

Vegetation

Unavoidable adverse impacts on vegetation will occur on development sites and adjacent areas. The installation and maintenance of roadways, parking areas, trails, and buildings will result in removal of all plants. Precipitation will be diverted away from these impermeable structures to adjacent areas where native and exotic species that benefit from disturbance and/or added water increase in number and/or size. Early successional stages of plant life will dominate construction zones managed by vegetative recovery, which will have a different appearance than the vegetation that may have been. The primary impact on plants as a result of trampling in or near campgrounds, trailheads, and other facilities will be death of tree seedlings and other small plants. Secondary effects, such as compaction of soil, will lead to decreases in germination potential, retardation of plant growth, and ultimately in a change in species composition. Other adverse effects of use, especially around campgrounds, roads, and trails will include carving on trees, cutting trees and shrubs for firewood, and picking wildflowers. As they are identified as hazards, trees will be removed, accelerating the change in species composition.

HUMAN ACTIVITIES

RESEARCH & SCIENCE

The various measures used in estimating effects--scientific communication, documentation, monitoring--are highly interrelated. Research coordination, for example, depends on effective programs of documentation and scientific communication. Protecting scientific values depends on virtually all aspects of the administrative system for science activities in the Monument. Despite this high degree of interaction, the effects of alternatives are estimated and compared in the two broad categories of administration and protection. Administration includes scientific communication; documentation and coordination of research activities; facilities for research; collection and maintenance of long term records; access; review of proposed developments; and monitoring of effects of past and current activities. The protection category addresses specific concerns about developments which can jeopardize the research effort.



Monitoring for predictability.

There are many unknowns in anticipating and comparing the effects of proposed alternatives: what areas will have high research value in the future; what will the patterns and intensities of visitor use be like; what will be the effects of developments and use on rare ecosystems about which little is known? Consequently, an administrative system involving monitoring in the field and review is established in order to identify developing and potential problems. The monitoring and review systems are also the basis for readjusting the system for protecting natural processes and features so that it is most effective and efficient.

Mitigation measures are described for the most part in the descriptions of the alternatives, where various levels of control on use are

specified in the definition and assignment of Protection Classes. In some instances further mitigation is possible where research plots are damaged to the extent that they must be abandoned. New plots may be established in similar nearby areas. In such instances, however, the valuable long term record of the primary plot loses its continuity with substantial irretrievable losses in scientific value.

Protection is considered by estimating effects of individual developments proposed by each alternative. Three levels of magnitude are assigned: high (H), moderate (M), and low (L).

Alternative A

Administration--Limited communication with the scientific community hinders efforts to document and coordinate research and to monitor and review effects of past and proposed developments and activities. An up-to-date interpretive program, which is of crucial importance in such a dynamic landscape, will be difficult to maintain.

Effective documentation of research is difficult to achieve because of limited communication with the scientific community. Documentation will be incomplete because new entries to the record system will be limited to permits for access to the restricted area, a small fraction of the total area of the Monument.

Opportunities to coordinate research activities are substantially limited by the absence of a science coordinator and involvement of a panel of scientists active in Monument research. In addition to the potential failure to protect scientific values and established research plots, limited coordination will result in inefficient use of research investments because of possible unnecessary overlap of studies and failure to address problems of particular importance to management.

The very limited living and working facilities for researchers will continue to restrict opportunities for documentation and coordination of research and for research itself.

A minimal system for collecting and maintaining long term records will hinder both research and management of the Monument. Management will be handicapped by inadequate records for interpretive programs and about changes in vegetation, animal populations, and landscape features. The records that are kept are uncataloged and widely dispersed; they are not likely to be fully utilized.

Limited access to many parts of the Monument--including the debris avalanche/pyroclastic flow area, Mt. Margaret Backcountry, and Goat Creek watershed--will significantly discourage research in these areas and increase its cost. Areas that could be readily accessed by trails or roads are accessible almost exclusively by helicopter under this alternative.

Introduction and removal of organisms by both recreationists and researchers (ill-conceived experimentation, destructive sampling) can result in significant alteration of natural processes under this alternative because of limited controls.

Effects of use are not monitored in a systematic fashion, so substantial degradation of scientific values can occur before it is possible to reverse or mitigate problems.

Limited mechanisms for reviewing the effects of past and proposed developments and activities from a research perspective will increase the potential for loss of scientific values and damage to research plots.

Protection--Specific Concerns with Developments in Alternative A (L indicates low magnitude of effects.)

- L The trail to Butte Camp may lead to a level of recreational use that would damage site of intensive, integrated research.
- L Ape Cave subject to continued degradation of environmental conditions and other caves are being heavily used with limited constraints.
- L Recreational trail in the Cedar Flats RNA may affect research opportunities, particularly with respect to wildlife.
- L ORV access to entrances of Power Line Caves could lead to further environmental degradation of that cave system.

Alternative B

Administration--Lack of involvement by scientist active in Monument research will restrict programs of interpretation, documentation, coordination, review, and liason with the scientific community and Scientific Advisory Board (SAB). The result will be less effective use of the SAB and the guidance it can offer. Also the local scientific community will feel that it has no influence on management of the Monument. Consequently, when problems arise Monument management and the local scientific community are more likely to be in conflict than to be sharing responsibility for decisions.

Failure to have an active system for gaining scientist participation in the documentation program will result in incomplete documentation. A significant number of studies will not be documented, hindering efforts to protect research plots and coordinate research.

Coordination is limited both by incomplete documentation and by failure to actively seek researcher use of common sites where research activities are compatible or, at best, complimentary.

Both researchers and management will benefit by some camping spaces being provided for researcher use. However, lack of more permanent living facilities such as trailers and sample preparation facilities will limit the efficiency

of research in the area, adding to its cost and limiting its contribution to the interpretive program.

By cataloging, collecting, and maintaining its own records the Forest Service will provide a valuable set of long-term records for use by managers and researchers. Absence of a catalog of the data sets of others, however, will limit the usefulness of those records. For example, many individuals and agencies outside the Forest Service are collecting repeat photographs that would be extremely valuable for interpretive programs and these records of landscape changes would not be available to Monument managers under this system of long-term record keeping.

Access to a number of very significant research sites is limited, notably the pyroclastic flow area and the west end of the debris avalanche.

Reliance on an education program to control the introduction and removal of organisms creates a significant risk of inadvertent introduction/removal by recreationists and/or researchers. This is most likely to be a factor in the most sensitive landscape/ecosystem units such as the debris avalanche and pyroclastic flow areas.

The monitoring program will offer some capability to identify problems within one or two years after they develop. The limited intensive and extensive nature of the monitoring program, however, creates a significant risk of problems reaching an irreversible level before they are detected, especially in the most sensitive areas, such as the debris avalanche and pyroclastic flow areas.

Preparation of an Annual Report on Protection of Scientific Values will provide an opportunity to assess protection of natural processes and features under the administrative system provided in this alternative. Absence of review by the Scientific Advisory Board and scientists active in Monument research, however, will deprive the program of the broad local and national perspective and experience available.

Protection--Specific Concerns with Developments in Alternative B

- L Trail to Butte Camp may encourage a level of recreational use which could damage a major research site.
- L Minnie Peak trailhead and its gentle trail into high lakes country will contribute to heavy recreational use of high lakes increasing the probability of disturbing fragile lake and lakeshore ecosystems.
- L Road access to edges of central debris avalanche (Castle and Coldwater Lake areas) may lead to uncontrolled foot traffic onto that sensitive feature despite mitigative measures.
- L Trail to June Lake may lead to significant ecological damage to that sensitive feature, which serves as a control (lightly ashed) for lake research.

- L Ape Cave subject to continued degradation of environment (though less so than in A), and controls on the use of other caves are very limited.
- L Trail in Cedar Flats Research Natural Area may affect research opportunities, particularly those associated with wildlife.

Alternative C

Administration--Systems for scientific communication, documentation, and coordination provide the necessary basis for effective protection of scientific values and research plots.

Providing camping and more permanent living facilities for researchers will increase their efficiency and aid management's efforts at documentation and coordination of research.

By collecting and maintaining its own records and cataloging the relevant data sets of others the Monument will provide a good base of information for use by managers and researchers. However, failure to continue appropriate monitoring efforts terminated by other organizations reducing their involvement in the area will reduce the value of some of the unique long-term data sets being generated in the Mount St. Helens area.

Access to a number of very significant research sites is limited, notably the pyroclastic flow area and the west end of the debris avalanche.

Introduction and removal of organisms is controlled in an appropriate manner throughout the Monument, except in the Butte Camp, upper Muddy River and Pine Creek fan, and Spirit Lake Basin, areas where intensive, integrated research programs are underway in areas of high sensitivity to introduction/removal.

The monitoring program provides the ability to identify problems within one to two years, which will be adequate except in the sensitive areas of Butte Camp, upper Muddy River and Pine Creek fan, and Spirit Lake Basin.

Review of the Annual Report on Protection of Scientific Values by the Scientific Advisory Board and a panel of scientists active in Monument research will help assure the protection of the debris avalanche/pyroclastic flow area under the administrative system provided by this alternative. The Report, however, would be limited to areas within Protection Class 1. Issues may arise in management of highly sensitive features at Butte Camp, upper Muddy River and Pine Creek fan, and Spirit Lake Basin, not included in Protection Class 1, which would benefit from review by the SAB.

Protection--Specific Concerns with Developments in Alternative C (M indicates a moderate magnitude of effects; L indicates low)

- M High concentration of visitors (via shuttle bus) on Johnston Ridge may lead to significant degradation of site, including introduction and removal of organisms.
- L Road access to center of debris avalanche, the Castle and Coldwater Lake areas, may lead to uncontrolled foot traffic onto that sensitive feature despite mitigative measures.
- L Recreational trails in and adjacent to Goat Marsh and Cedar Flats RNAs may lead to significant compromises of research opportunities, particularly in terms of wildlife.
- L Trail near Butte Camp and Pine/Muddy fan areas may lead to damage to these major research sites.
- L Ape Caves are subject to continued degradation (though less so than in A), and controls on other caves is limited.
- L Snowplay activity may occur in Pine/Muddy fan and Goat Marsh areas.

Alternative D (Preferred)

Administration--Systems for scientific communication, documentation, and coordination provide the necessary basis for effective protection of scientific values and research plots.

Providing camping, other living, and laboratory facilities to researchers will increase their efficiency and their contribution to the interpretive program as well as aiding management's efforts to have scientific communication and to coordinate research.

The Monument achieves maximum benefit of long term records for use by managers and researchers by collecting and maintaining its own records, cataloging data sets of others, and assuming appropriate monitoring efforts of other organizations as they reduce their involvement in the Mount St. Helens area.

Access is limited to the west end of the debris avalanche and the Goat Creek basin, significantly restricting research in these areas.

Introduction and removal of organisms are controlled in an appropriate manner.

The monitoring program provides an opportunity to detect problems within one year in the most sensitive areas and within two years in areas of lower sensitivity.

Review of the Annual Report on Protection of Scientific Values by a panel of researchers active in Monument research and, in the case of the most sensitive features, by the Scientific Advisory Board will help assure protection of scientific values and research plots.

Coordination, documentation, and the conduct of research are enhanced by facilities provided in this alternative. Researchers are encouraged to make contact and cooperate with management when

some facilities are provided and the use patterns of the area are more effectively controlled. Well located facilities encourage research and make research dollars go farther.

Protection--Specific Concerns with Developments in Alternative D (H indicates a high magnitude of impacts; M-medium, L-low)

- H Road and trail access to central debris avalanche will lead to some uncontrolled foot traffic and probable introduction/removal of organisms in that sensitive area despite mitigation measures.
- H Public access to shores of Spirit Lake will lead to uncontrolled foot traffic and probable additional introduction/removal of organisms in that sensitive area.
- M Public vehicular access (cable way and shuttle bus) to Johnston Ridge will lead to alteration of the natural environment in that area.
- L ORV access to entrances of Power Line Caves could lead to further environmental degradation of that cave system.
- L Trail system in Butte Camp area may lead to damage of this major research site.
- L Recreational trails in and adjacent to Goat Marsh and Cedar Flats RNAs may significantly affect research opportunities, particularly those associated with wildlife.
- L Trail across north flank of volcano may encourage uncontrolled visitation of fumaroles in that area.
- L Snowplay activity may affect Pine/Muddy fan and Goat Marsh areas.
- L Horse use on southwest side of the mountain may lead to introduction of seed to areas of 1980 deposits.

Alternative D (Modified, Selected)

Administration--Systems for scientific communication, documentation, and coordination provide the necessary basis for effective protection of scientific values and research plots.

Providing camping, other living, and laboratory facilities to researchers will increase their efficiency and their contribution to the interpretive program as well as aiding management's efforts to have scientific communication and to coordinate research.

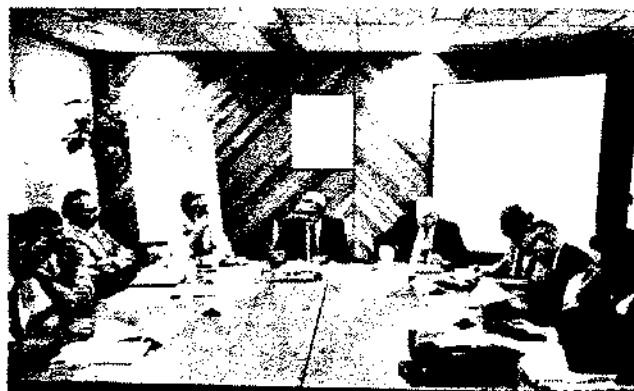
The Monument achieves maximum benefit of long term records for use by managers and researchers by collecting and maintaining its own records, cataloging data sets of others, and assuming appropriate monitoring efforts of other organizations as they reduce their involvement in the Mount St. Helens area.

Access is limited to the west end of the debris avalanche and the Goat Creek basin, significantly restricting research in these areas.

Introduction and removal of organisms are controlled in an appropriate manner. Introduction and removal of fish and wildlife are to be regulated by a cooperative fish and wildlife plan, jointly by the Washington Department of Game and the Forest Service.

The monitoring program provides an opportunity to detect problems within one year in the most sensitive areas and within two years in areas of lower sensitivity.

Review of the Annual Report on Protection of Scientific Values by a panel of researchers active in Monument research and, in the case of the most sensitive features, by the Scientific Advisory Board will help assure protection of scientific values and research plots.



Scientific Advisory Board discussing management of research.

Coordination, documentation, and the conduct of research are enhanced by facilities provided in this alternative. Researchers are encouraged to make contact and cooperate with management when some facilities are provided and the use patterns of the area are more effectively controlled. Well located facilities encourage research and make research dollars go farther.

Protection--Specific Concerns with Developments in Alternative D, Modified (H indicates a high magnitude of impacts; M-medium, L-low)

- M Access to central debris avalanche will lead to some uncontrolled foot traffic and probable introduction/removal of organisms in that sensitive area despite mitigation measures.
- M Public travel access to shores of Spirit Lake will lead to uncontrolled foot traffic and probable additional introduction/removal of organisms in that sensitive area.
- M Public access via shuttle bus to Johnston Ridge will lead to alteration of the natural environment in that area.

- L ORV access to entrances of Power Line Caves could lead to further environmental degradation of that cave system.
- L Trail system in Butte Camp area may lead to damage of this major research site.
- L Recreational trails in and adjacent to Goat Marsh and Cedar Flats RNAs may significantly affect research opportunities, particularly those associated with wildlife.
- L Trail across north flank of volcano may encourage uncontrolled visitation of fumaroles in that area.
- L Snowplay activity may affect Pine/Muddy fan and debris avalanche.
- L Horse use on southwest side of the mountain may lead to introduction of seed to areas of 1980 deposits.

Alternative E

Administration--(Discussion of effects of administrative system same as Alternative C except that E does not provide trail access close to the stream in Goat Creek basin.)

Protection--Specific Concerns with Developments in Alternative E

- H Road and trail access to central debris avalanche (crossing trail and road to Castle Lake) will lead to uncontrolled foot traffic and probable introduction/removal of organisms in that sensitive area despite mitigation measures.
- H Public access to shores of Spirit Lake will lead to uncontrolled foot traffic and probable additional introduction/removal of organisms in that sensitive area.
- M Campground in Section 20 will encourage additional use of Ole's and other caves.
- L Trail system in Butte Camp and Pine/Muddy fan areas may lead to damage of major research sites.
- L Recreational trails in and adjacent to Goat Marsh and Cedar Flats RNAs may significantly affect research opportunities, particularly with respect to wildlife.
- L Trail across north flank of volcano may encourage uncontrolled visitation of fumaroles in that area.
- L Snowplay activity may affect Pine/Muddy fan and Goat Marsh areas.
- L Horse use on southwest side of the mountain may lead to introduction of seed to areas of 1980 deposits.

Alternative F

Administration--Discussion of effects of administrative system is the same as Alternatives D and D (Modified).

Protection--Specific Concerns with Developments in Alternative F

- H Road and trail access to central debris avalanche (crossing trail and roads to Castle and Coldwater Lakes) will lead to

- uncontrolled foot traffic and probable introduction/removal of organisms in that sensitive area despite mitigation measures.
- H Public access and development on shores of Spirit Lake will lead to uncontrolled foot traffic and probable additional introduction/removal of organisms in that sensitive area.
- H Road up South Coldwater Ridge directly impacts unique geological and associated ecological features associated with movement of the debris avalanche over Johnston Ridge and down South Coldwater Creek, as well as having indirect effects on other distinctive features in the area such as warm water ecosystem in South Coldwater valley.
- H Very high level of public access to Johnston Ridge will cause persistent, irreversible environmental degradation of that geologically and ecologically unique area.
- H Trail from north flank of mountain to shore of Spirit Lake is likely to lead to uncontrolled use of fumarole areas.
- M Blue Lake road to head of Sheep Canyon may further stress exemplary stand of Noble fir in that area.
- M Minnie Peak trailhead and high density of low gradient trails in the high lakes country will contribute to heavy recreational use of high lakes increasing the probability of disturbing fragile lake and lakeshore ecosystems.
- L Campground in Section 20 will encourage additional use of Ole's and other caves.
- L Trail system in Butte Camp and Pine/Muddy fan areas may lead to damage of major research sites.
- L Recreational trails in and adjacent to Goat Marsh and Cedar Flats RNAs may significantly affect research opportunities, particularly with respect to wildlife.
- L Trail across north flank of volcano may encourage uncontrolled visitation of fumaroles in that area.
- L Snowplay activity may affect Pine/Muddy fan and Goat Marsh areas.
- L South Fork Toutle River crossing may significantly affect unique geological features produced in that area by the May 18, 1980, mudflow.
- L Snowplay in the South Coldwater Ridge area may affect landscape and ecological recovery on the debris avalanche in that area.
- L Horse use on southwest side of the mountain may lead to introduction of seed to areas of 1980 deposits.

Alternative G

Administration--Discussion of effects of administrative system same as Alternative D and D (Modified).

Protection--Specific Concerns with Developments in Alternative G

- H Trail crossing the central debris avalanche and roads to Castle and Coldwater Lakes) will lead to uncontrolled foot traffic and

probable introduction/removal of organisms in that sensitive area despite mitigation measures.

- H Public access and development on shores of Spirit Lake will lead to uncontrolled foot traffic and probable additional introduction/removal of organisms in that sensitive area.
- H The road between Coldwater and Spirit Lakes will have immediate, direct impacts on unique geological and ecological features in that area, as well as the prolonged effects of providing ready access to the debris avalanche and pyroclastic flows to a very large public.
- H Development and snowplay area at the old Timberline Parking Lot will bring a high number of users into a restricted area of highly sensitive features, such as fumaroles and Spirit Lake shore.
- M Blue Lake road to head of Sheep Canyon may further stress exemplary stand of Noble fir in that area.
- M Minnie Peak trail head and high density of low gradient trails in the high lakes

country will contribute to heavy recreational use increasing the probability of disturbing fragile lake and lakeshore ecosystems.

- L Trail system in Butte Camp and Pine/Muddy fan areas may lead to damage of major research sites.
- L Campground in Section 20 will encourage additional use of Ole's and other caves
- L Recreational trails in and adjacent to Goat Marsh and Cedar Flats RNAs may significantly affect research opportunities, particularly with respect to wildlife.
- L Trail across north flank of volcano may encourage uncontrolled visitation of fumaroles in that area.
- L Snowplay activity from sites south and southwest of the mountain may affect Pine/Muddy fan and Goat Marsh areas.
- L Snowplay in the South Coldwater Ridge area may affect landscape and ecological recovery on the debris avalanche in that area.
- L Horse use on southwest side of the mountain may lead to introduction of seed to areas of 1980 deposits.

RECREATION AND INTERPRETATION

Recreation Experience Supplied

The amount of recreation that can be supplied is measured in Recreation Visitor Days (RVDs). These are calculated for each alternative development and management strategy by: (a) determining the people that can be accommodated at one time (PAOT) on a site or area without causing damage or conflict; (b) multiplying by the number of days in the anticipated use season; and (c) adjusting for length of stay, turnover rate, and weekend/weekday use differences.

These RVDs will occur in a variety of activities. Some of these activities are associated directly with the visitor's desire to be involved with the Mount St. Helens recreation while others are the traditional recreation that occurred prior to the eruption. Since the demand for those two categories of activities was projected by different methods, the RVDs that each alternative would supply are displayed in Table 26 by activities grouped in these two categories.

Table 26: Summary of Recreation Visitor Days Supplied by Alternatives (By Activity)

<u>MOUNT ST. HELENS RECREATION ACTIVITIES</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>	<u>D</u> (Modified)	<u>E</u>	<u>F</u>	<u>G</u>
Viewing Scenery	6.9	46.2	193.3	208.9	207.3	46.5	126.5	95.4
Driving for Pleasure	169.9	247.7	225.6	247.6	247.6	247.6	251.3	278.7
Nature Study	1.9	21.5	26.2	25.9	22.9	25.8	26.9	26.3
Interpretation on Site	3.5	8.8	22.4	26.1	25.7	11.5	27.3	24.4
Visitor Center Use	81.1	81.0	81.0	81.0	81.0	81.0	81.0	81.0
SUBTOTAL (RVDS)	263.3	405.1	548.5	589.5	584.5	412.4	513.0	505.8
<u>TRADITIONAL RECREATION ACTIVITIES</u>								
Snowmobiling	0	0	1.1	5.1	4.4	1.6	6.3	5.9
Boating	0	0	1.5	3.1	3.1	0	3.1	3.1
Hiking, Walking	15.3	19.9	29.6	51.5	54.7	44.2	53.0	46.7
Swimming	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Fishing	7.1	11.4	12.3	13.6	13.6	11.0	14.1	13.6
Camping, Developed	85.5	82.3	112.4	120.3	120.3	120.3	167.7	175.6
Organizational Camping	0	0	0	0	0	11	0	9.2
Picnicking	1.2	2.4	3.5	6.4	5.5	4.8	6.9	7.2
Skiing	0	0	.9	4.4	4.4	1.4	5.5	5.2
Snow Play	0	0	.7	3.2	3.2	1.1	4.0	3.2
Hunting	35.7	35.7	35.7	35.7	35.7	35.7	35.7	35.7
Wildlife, viewing etc.	48.6	56.3	57.5	59.8	59.8	55.0	60.7	59.8
Mountain Climbing	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5
Gathering Forest Products	17.6	17.6	17.6	17.6	17.6	17.6	17.6	17.6
Dispersed Camping	5.3	10.6	21.8	35.8	35.8	35.8	35.8	35.8
Caving	10.5	10.5	13.3	15.7	15.7	20.5	25.7	17.3
Horse Use	1.9	1.1	1.5	1.7	2.4	1.7	4.9	5.8
SUBTOTAL (RVDS)	241.2	260.3	321.9	386.4	389.0	374.2	453.5	454.2
TOTAL RECREATION OPPORTUNITIES (RVDS)	504.5	665.4	870.4	975.9	973.5	786.6	966.5	960.0

Quality of Recreation Experience

The quality of a recreation experience depends on how successful a visitor is in achieving a satisfying experience. Several key contributing factors follow:

Achieving the Desired View--Obtaining a view of the crater and dome is the primary objective of most visitors; achieving it would greatly enhance any trip.

Traffic Congestion--Visitors expect to get away from traffic jams when visiting a park or monument. Encountering heavy traffic would significantly detract from the experience.



Traffic congestion can influence the quality of experience.

Interpretation--Visitors to parks and monuments have learned to expect interpretation. In the case of Mount St. Helens, the public has demonstrated great interest in learning about what they see around them; interpretation will greatly enhance their visit.

Cost of the Visit--Visitors also have learned that visits to parks and monuments usually entail some cost. Some potential visitors, however, will be eliminated if the cost per visit is too high. Cost factors involved in visits to Mount St. Helens are concession fees, driving conditions, and the time required to reach various portions of the area.

Convenience--Availability of good support services, current information, and loop roads add to the enjoyment of visits.

Diversity--Visitors come to the Monument with many preferences on how to achieve their vacation experience. The availability of choices usually improves a vacation experience.

Visuals--The visitor expects to view the key features across an unmodified landscape, and therefore, will receive more satisfaction when the area along major travel corridors is less disturbed by man caused modification. Within the Monument the visual quality objectives and guidelines for facility design described in the management practices common to all alternatives will ensure equal treatment of the visual resources. The concern is for the narrow strips of isolated, nonfederally owned land between major travel corridors and the Monument.

The effects of each alternative on these key factors are as follows:

Alternative A

- **Achieving the Desired View:** Most visitors to the Monument have demonstrated a strong desire to view the crater and dome. This view could only be obtained by hiking the three miles of trail from Road 26 to Norway Pass. The best view provided from a road will be from Windy Ridge Viewpoint. The crater and dome cannot be fully seen from this location.
- **Traffic Congestion:** Auto congestion will continue to get worse as visitation to the Monument increases. The primary travel route to view the mountain will remain Road 99. Traffic volumes are already exceeding the design standard of the road. If this continues, the Forest will be forced to close the road to public traffic to eliminate an unsafe situation. This will result in a park and ride shuttle from outside the Monument to Windy Ridge Viewpoint. The problem of mixing industrial and recreation traffic will continue. Winter parking along Road 83 will continue to cause congestion.
- **Cost to the Visitor:** The lack of good west side access requires traveling a six to eight hour round trip to achieve the best view available. This is estimated to cost approximately \$30 per car. A bus shuttle to Windy Ridge will cost approximately \$3.00 per visitor.
- **Convenience:** Information stations at Iron Creek and Yale provide the latest information on road conditions, traffic and places to visit. This convenience will be eliminated. Water and sanitation facilities will be inadequate to meet the demand. Entry into the Mt. Margaret area and Strawberry Mountain areas will be inconvenienced by the absence of trails. (Hikers desiring access to these areas will have to climb over ash-covered blown down timber.) No toilet facilities will be available in the back-country. If Road 99 is closed, visitors to Windy Ridge will have to leave the privacy of their individual car and ride a shuttle bus.

- User Freedom: The restricted zone based on volcanic hazard will limit user freedom.
- Interpretation: Lack of west side access will result in limited access to the most important interpretive opportunities (the dome, crater, debris avalanche). The ten existing interpretive sites will be maintained. Interpretation at Ape Cave will be limited to signs, a brochure, and volunteers.
- Diversity: The variety of recreation activities will be limited, especially in winter recreation, interpretation, viewing scenery, nature study, and boating. There will be no access into the Mt. Margaret backcountry.
- Visual: Maximum modification could occur on the state and private land along Roads 83 and 2612.

Alternative B

- Achieving the View: Visitors to Coldwater Lake will obtain a marginal view of the crater and dome, partially blocked by Johnston Ridge. Views from Windy Ridge and Norway Pass will be the same as described for Alternative A.
- Traffic Congestion: The Forest Service road from State Route 504 to Coldwater Lake will be highly congested. After this west side access is provided, congestion on Road 99 will be reduced to a level that can be safely accommodated within the design standard. Parking lots at Coldwater Lake and Ape Cave will be congested.
- Cost to the Visitor: Travel over the reconstructed roads to Coldwater Lake will take at least two hours more in time and \$10 in cost than travel on a state route.
- Convenience: Information stations at Yale and Iron Creek will be reduced to kiosks. Travelers on Road 83 will dead end at Smith Creek, and also at the washout on Road 81.
- User Freedom: Camping will be restricted within sight of Roads 83 and 8303 to Ape Cave, causing a large numbers of users, primarily hunters, to camp outside the Monument and drive in as day users.
- Interpretation: Good interpretive opportunities beyond Coldwater Lake are not accessed. Seven additional interpretive sites will be developed. Interpretation at Ape Cave will be limited to signs, a brochure, and volunteers.
- Diversity: Access to Coldwater Lake will provide a limited opportunity to obtain a different experience than that available on existing routes. Expansion of the trail system will provide access to more diverse landscapes.

- Visual: Maximum modification could occur along the reconstructed private roads to Coldwater Lake and along Roads 2612 and 83.

Alternative C

- Achieving the Desired View: A full view of the crater, dome, and debris avalanche will be possible from Johnston Ridge.
- Traffic Congestion: Winter auto congestion on Road 83 caused by snowmobilers parked along the road shoulder will be reduced by the construction of a 40-car sno-park area. Congestion on Road 99 will continue until State Route 504 is reconstructed from near Camp Baker to Coldwater Lake. If traffic volumes continue to exceed the design standards, it will be closed to public traffic.

Expansion of the Ape Cave parking area to accommodate 30 cars and one bus will relieve overcrowding. Alternate haul routes will be provided for industrial traffic on Road 8303, separating trucks from recreation vehicles.

- Cost to the Visitor: A bus shuttle to Johnston Ridge will cost each visitor \$3/round trip.
 - Convenience: Information stations at Iron Creek and Yale will be reconstructed as permanent facilities in their present locations. Visitors entering the Monument from the north on Road 26 will miss the portal. Visitors entering from the south must drive into the Pacific Power & Light Company's boating site at Yale to obtain information.
- Visitors to Johnston Ridge will have the inconvenience of leaving the privacy of their cars and riding a tour bus. A gift shop, food concession and visitor information station will be available at Coldwater Lake.
- User Freedom: Camping outside of developed sites will require registering at the portals, headquarters, or visitor center. Camping will not be permitted along Roads 83 and 8303 to Ape Cave. Use is limited to roads, trails, and developed sites in the debris avalanche area.
 - Interpretation: An observation post at Johnston Ridge will provide the most unique interpretive opportunity by allowing the visitor to observe the U.S. Geological Survey scientist monitor the mountain. A bus concessionaire will provide interpretation to the visitors while transporting them to Johnston Ridge. An additional 14 interpretive sites will be developed. Interpretation at Ape Cave will be limited to signing, a brochure, and volunteers.

- Diversity: The range of recreational activities would be expanded with opportunities to take a bus tour, visit a lookout, go boating, and visit a gift shop and snack bar. In addition, the bus access to Johnston Ridge would create a different experience (free from traffic) along the entire ridge.
- Visuals: The natural appearance of the non-federal lands between SR 504, and Roads 82 and 2612 would be maintained through acquiring a scenic easement. The landowner would agree to meet a retention visual objective, and the government would compensate the landowner for financial losses that occur through meeting the visual objective.

Alternative D (Preferred)

- Achieving the Desired View: A full view of the crater, dome, and debris avalanche will be possible from the Johnston Ridge observation post.
- Traffic Congestion: Auto congestion on Roads 25 and 99 will be reduced when State Route 504 is completed to Coldwater. Road 99 will be one of the first priorities for reconstruction to a double lane paved road which will reduce congestion for four years until State Route 504 is available. There will be considerable congestion during reconstruction which could be reduced by using Road 26 or providing a bus shuttle to Windy Ridge.

Winter auto congestion on Road 83 will be reduced by the construction of a 60-car Sno-park area.

Expansion of Ape Cave parking area will eliminate overcrowding.

Mixing of industrial and recreation traffic will be reduced by providing an alternate route from the Lost Creek area.

Windy Ridge and Smith Creek Viewpoint parking areas will be congested as the demand for the bus shuttle to Spirit Lake will exceed the capacity of the sites. Demand will drop below the site capacity when State Route 504 is completed.

- Cost to the Visitor: The aerial tram to Johnston Ridge will cost about \$5 to \$6 per person. The bus shuttle to Spirit Lake from Windy Ridge will cost about \$3/person.
- Convenience: Information stations at Iron Creek and Yale will be moved to locations along Road 25 and Forest Highway 17; all visitors will drive through them without leaving the car. Some visitors will not favor leaving their cars to ride the aerial tram or bus shuttle.

Visitors traveling Road 83 will dead end at the Smith Creek mudflow.

A restaurant, gift shop, snack bar, and visitor information station will be available at Coldwater Lake. Guided tours and equipment will be available at Ape Cave through a concessionaire. Picnicking shelters and covered tables would be provided to protect the visitor from the harsh environment.

- User Freedom: No camping will be permitted along Roads 83, 8303 to Ape Cave, or Road 81. This will require some traditional users, primarily hunters, to find a camp site outside the Monument and drive in as day users. Permits will be required for camping in the backcountry areas and to climb the mountain. Recreation will be strictly regulated on the debris avalanche, upper Muddy River fan, and Butte Camp research protection areas. An area around Johnston Ridge will be closed to snowmobiling.
- Interpretation: The observation post at Johnston Ridge will provide a very unique interpretive opportunity by allowing visitors to observe and interact with scientists monitoring the volcano. The aerial tram and bus shuttles will provide audiotape interpretive messages or interpreters. There will be guided interpretive tours at Ape Cave. More outdoor amphitheater seating will be provided than in any other alternative. An additional 12 interpretive sites will be developed.
- Diversity: The range of recreation opportunities will be expanded to allow a small amount of pack and saddle use on the south side of the mountain, boating with electric motors at Coldwater Lake, visiting a fire lookout, riding an aerial tram or bus shuttle, eating at a restaurant, purchasing gifts, touring a cave, and renting equipment for caving and cross country skiing. The aerial tram to Johnston Ridge will create a unique experience with traffic along the entire ridge limited to shuttle buses. Loss of primitive opportunity at Spirit Lake due to bus shuttle.
- Visuals: The natural appearance of the nonfederal land between major access corridors and the Monument would be retained through Forest Service acquisition of the land. The land acquired along State Route 504 would be added to the Monument.

Alternative D (Modified, Selected)

- Achieving the Desired View: A full view of the crater, dome, and debris avalanche will be possible from the Johnston Ridge observation post.

- Traffic Congestion: Auto congestion on Roads 25 and 99 will be reduced when State Route 504 is completed to Coldwater. Road 99 will be one of the first priorities for reconstruction to a double lane paved road which will reduce congestion for four years until State Route 504 is available. There will be considerable congestion during reconstruction which could be reduced by using Road 26 or providing a bus shuttle to Windy Ridge.

Winter auto congestion on Road 83 will be reduced by the construction of a 60-car Sno-park area.

Expansion of Ape Cave parking area will eliminate overcrowding.

Mixing of industrial and recreation traffic will be reduced by providing an alternate route from the Lost Creek area.

- Cost to the Visitor: A bus shuttle to Johnston Ridge will cost each visitor \$3 to \$4/round trip. The reconstruction of SR 504 to Coldwater Lake will reduce driving time from I-5 to the Monument for most visitors to about 1/2 of the present situation resulting in reduced cost.

- Convenience: Information stations at Iron Creek and Yale will be moved to locations along Road 25 and Forest Highway 17; all visitors will drive through them without leaving the car.

Visitors to Johnston Ridge will have the inconvenience of leaving the privacy of their cars and riding a tour bus. A gift shop, food concession, and visitor information station will be available at Coldwater Lake.

Visitors traveling Road 83 will dead end at the Smith Creek mudflow. There will be no road access to Castle Lake.

Guided tours and equipment will be available at Ape Cave through a concessionaire.

- User Freedom: Camping will be restricted along portions of Roads 83, 8303 to Ape Cave, and 8123, and in the Goat Marsh Research Natural Area. This will require some traditional users, primarily hunters, to find a camp site outside the Monument and drive in as day users. Permits will be required to camp in the Mt. Margaret Backcountry and to climb the mountain. Recreation use will be strictly regulated on the debris avalanche, upper Muddy River Fan, and Butte Camp high value research areas. Johnston Ridge and the Goat Marsh RNA will be closed to snowmobiles.

- Interpretation The observation post at Johnston Ridge will provide a very unique interpretive opportunity by allowing visitors to observe and interact with

scientists monitoring the volcano. The bus shuttle concessionaire will provide audiotape interpretive messages or interpreters. There will be guided interpretive tours at Ape Cave. More outdoor amphitheater seating will be provided than in any other alternative. An additional 12 interpretive sites will be developed.

- Diversity: The range of recreation opportunities will be expanded to allow a moderate amount of pack and saddle use on the south side of the mountain, boating with electric motors at Coldwater Lake, visiting a fire lookout, riding a bus shuttle, eating at a restaurant, purchasing gifts, touring a cave, and renting equipment for caving and cross country skiing. The shuttle bus to Johnston Ridge will create a unique experience with traffic along the entire ridge limited to shuttle buses.

- Visuals: The natural appearance of the nonfederal land between major access corridors and the Monument would be retained through Forest Service acquisition of the land.

Alternative E

- Achieving the Desired View: A full view of the crater and dome will be possible from the Spirit Lake day use site.

- Traffic Congestion: Overcrowding on Road 99 will continue because the lack of west side access would force those seeking the best view of the mountain to drive around to the east side. Unstable soils and steep side slope along Road 99 will not permit construction of a highway facility capable of handling this volume of traffic. Considerable congestion will occur during reconstruction of Road 99.

The desire for west side access will cause congestion on the road to Castle Lake; access will have to be limited to a bus shuttle during peak hours.

Winter auto congestion on Road 83 will be reduced by the construction of a 60-car Sno-park area.

Congestion at Ape Cave will be reduced when day use parking is provided near Ole's Cave. Conflict between industrial and recreation traffic will be reduced by providing alternate haul routes from the Smith Butte and Lost Creek areas.

- Cost to the Visitor: Achieving the desired view will require driving to the east side, thence to Spirit Lake. This trip will require an extra six to eight hours of driving at an estimated cost of \$30/car.

The shuttle bus to Castle Lake will cost about \$10/person.

- Convenience: Information stations at Iron Creek and Yale will increase convenience for the user, as in Alternative D. Visitors must leave the privacy of their autos to ride the shuttle bus to Castle Lake. Road access to Spirit Lake from Windy Ridge will be improved to a double lane gravel standard, which will be dusty and rough.
- User Freedom: Permits will be required for overnight camping outside of developed sites, except for the backcountry area north of the Green River. Visitors would be restricted to trails in the Research Protection Class I areas (debris avalanche, Spirit Lake Basin, the upper Muddy Fan, and Butte Camp areas).
- Interpretation: The lack of west side access will result in no access to some of the most important interpretive opportunities. Concessionaires will provide interpretation on the shuttle bus and during guided tours of Ole's Cave.
- Diversity: The range of recreation opportunities will be expanded to allow the visitor to participate in horse riding on a few trails on the south side of the mountain, to visit a lookout, to rent equipment and tour a cave, and to drive to the shore of Spirit Lake. The primitive opportunity at Spirit Lake would be lost.
- Visuals: The natural appearance of the nonfederal lands along Roads 83 and 2612 would be maintained through acquiring a scenic easement. The land owner would agree to meet a retention visual objective for financial compensation.

Alternative F

- Achieving the Desired View: A full view of the crater and dome will be available from both Johnston Ridge and the Spirit Lake day use sites.
- Traffic Congestion: Auto congestion on Road 99 will be eliminated once State Route 504 is extended to the observation post on Johnston Ridge. Limited parking near the observation post will cause congestion on high use days. Traffic congestion will be high during the reconstruction of Road 99.

Winter congestion on Road 83 will be eliminated by construction of a sno-park area for 80 vehicles and on Road 25 by plowing sno-park areas at Bear Meadow and Road 25.

Conflict between industrial and recreation traffic will be reduced by providing alternate routes from Smith Butte and Lost Creek areas.

Overcrowding at Ape Cave would be reduced by provisions for day use parking at Ole's Cave Campground and expansion of the Ape Cave parking area.

- Cost to the Visitor: Cost to visit the Monument will decrease with the improved access.
- Convenience: The road connecting State Route 504 to Forest Service Road 81 will provide a convenient loop drive on the west side of the Monument. Information stations at Iron Creek and Yale will increase convenience as in Alternative D. Visitors will be able to drive their cars to Johnston Ridge and to Spirit Lake. A restaurant, gift shop, snack bar, and visitor information station will be available at Coldwater Lake. Guided tours will be provided at Ape Cave. Picnicking shelters would be provided to protect the visitor from the harsh environment.
- User Freedom: A permit will be required for any overnight camping outside of developed sites, except for the backcountry area north of the Green River, where campers will be required to register. Visitors will be limited to trails in the Research Protection Class I areas.
- Interpretation: The observation post at Johnston Ridge will provide a quality interpretive experience to a larger number of visitors because of good highway access. An additional 17 interpretive sites will be developed.
- Diversity: The experience at the key viewing areas will be similar because of the auto access provided. Diversity would be the same as in Alternative D, except this alternative lacks the aerial tram and the fire lookout. The primitive opportunity at Spirit Lake would be lost.

- Visual: Maximum modification could occur along the strip of nonfederal land between the reconstructed State Route 504 and the Monument. Visual management would be the landowners prerogative unless public pressure by the estimated 1.2 million annual visitors along this corridor would result in zoning by the county. Uncontrolled private development such as gas station, gift shops, food service, condominiums, etc., could occur along this corridor and on the private land directly north of the Coldwater Lake complex. The effects would be about the same along Roads 83 and 2612, but with less possibility of zoning.

Alternative G

- Achieving the Desired View: A good view of the crater and dome will be available from Spirit Lake and from several locations along the road from Coldwater Lake to Spirit Lake.

- Traffic Congestion: Overcrowding on Road 99 will continue until State Route 504 is reconstructed from near Camp Baker to Spirit Lake. Road 99 will be either closed or heavily regulated during reconstruction. The road from Coldwater Lake to Spirit Lake will be congested during periods of extensive maintenance necessitated by the erosive nature of the debris avalanche. Winter parking congestion on Roads 83 and 25 will be eliminated. Conflicts between recreation and industrial traffic will be reduced.
- Cost to the Visitor: The expense of visiting the Monument, especially the east side, will decrease.
- Convenience: Visitors entering the Monument from the north on Road 26 will miss the Iron Creek Information Station. Those from the south will have to drive to the Pacific Power & Light Company's Yale boating site. The gift shop, restaurant, and visitor information station will provide for visitor convenience at Coldwater Lake. The continuation of State Route 504 across the Spirit Lake basin to tie into Road 99 provides a loop connection to either the north or south.
- User Freedom: Permits are required to enter the Mt. Margaret area and the Strawberry Mountain portion of the Road 99/Spirit Lake area. They will also be needed for camping outside of developed sites elsewhere within the Monument. Visitors will be limited to trails in the Research Protection Class I areas.
- Interpretation: A large number of geologic features would be accessible for interpretation on the debris avalanche. An additional 15 interpretive sites will be provided.
- Diversity: Road access across Spirit Lake basin will make the recreation experience very similar on all sides of the Monument. Large untrailed or unroaded areas will be more difficult to find. More visitors will be able to enjoy the experience of visiting Spirit Lake. Visitors could participate in the same variety of recreation activities as in Alternative D, with the exception of the aerial tram and the fire lookout.
- Visuals: The natural appearance of the nonfederal land between major access corridors would be maintained through Forest Service acquisition of the land.

Recreation Opportunity Spectrum (ROS)

Each alternative offers visitors differing amount and kinds of recreation opportunities. Those opportunities are described by Recreation Opportunity Classes. Each Recreation Opportunity Class encompasses a set of activities, settings, and probable experience opportunities. These classes are practical divisions along a continuum of recreation opportunities. There are six classes of recreation opportunities associated with the Monument ranging from Primitive to Urban opportunities. The ROS class names provide a general indication of the kinds of recreation opportunities they provide. Primitive classes provide opportunities for recreation far from the sights and sound of man in a natural environment with recreation activities like mountain climbing and cross country travel being common. The recreationist may experience solitude, closeness to nature, tranquility, and self-reliance in an environment that offers a high degree of challenge and risk.

The Urban class provides opportunities for recreation in a primarily manmade environment. Activities like taking part in spectator sports and guided tours with no risk and discomfort. The recreationist experiences affiliation with individuals and groups and entertainment. The other recreation classes provide recreation opportunities between these two extremes. For more information about ROS and the compatible management strategy for each ROS class, see Appendix G.

The alternatives from A to G in general move from the Primitive and Semiprimitive end of the spectrum to the Roaded Natural and Rural end. The shifting of the kinds of opportunities that are provided corresponds closely with the increasing levels of access and development each alternative contains.

The two basic measurements of the consequences of each alternative on ROS are: 1) the number of acres in various ROS classes in each alternative and, 2) the Recreation Visitor Days (RVDs) by ROS class.

The ROS classes were inventoried considering factors such as, the amount and kind of access, development, managerial controls, levels of perceived risk and opportunities for certain kinds of experiences. The criteria used to map the areas and maps of the inventoried ROS classes by alternative are included in Appendix G.

The number of acres of each ROS class is a measure of the area in the Monument that can provide individual ROS class opportunities. This is an important consideration for Primitive and Semiprimitive opportunities where larger areas of land will tend to provide longer and higher quality experiences. Alternatives A and B provide the highest quality Primitive opportunities while Alternatives C, D, and D (Modified) will most likely provide Primitive opportunities that border on Semiprimitive.

Table 27: Summary of Acres of ROS Classes by Alternative

ROS Class	A	B	C	D	D (Modified)	E	F	G
Primitive	19506	17050	10018	10018	10018	0	0	0
Semi-Primitive (Non-motorized)	56932	64925	66838	66154	79212	76215	68507	67246
Semi-Primitive (Motorized) ¹ (Winter Only)	(30000)	(30000)	(30000)	(30000)	(30000)	(30000)	(30000)	(30000)
Roaded Natural ²	33892	28355	33394	34078	21020	34115	41743	43304
Rural	(15)	(15)	80 (15)	80 (15)	80 (15)	(15)	80 (15)	80 (15)
TOTAL	110330	110330	110330	110330	110330	110330	110330	110330

1 Semi-primitive motorized is a duplication of a portion of the semi-primitive area and this area is shown in brackets since it is not added into the total.

2 The 15 acre rural area at the visitor center location at Sequest State Park, is outside the Monument and is excluded from the total.



Some visitors seek challenge and risk.

Roaded Natural--Urban opportunities do not require large land areas so acre figures are not as important a consideration. However, they do provide an index to the area of the Monument that is accessible by motorized access.

Table 27 presents the amount of acres of ROS classes by Alternative.

Recreation Visitor Days (RVDs) were used to measure and compare the amount of opportunities that can be provided by each ROS class. These were determined by first estimating the capacity of each area, facility, or developed site, and then adjusting for seasonal use, patterns of use, length of stay, ROS capacities, and applicable local conditions. The outputs, RVDs, are shown by alternative in Table 28. These output indicate the level of utilization within each ROS class. For example, utilization of the Primitive ROS class increases as access and trailhead facilities are increased.

Table 28: Summary of Recreation Visitor Days Supplied by Recreation Opportunity Spectrum ROS Classes

Thousand Visitor Days Supplied								
	A	B	C	D	D (Modified)	E	F	G
<u>Mount St. Helens Activities</u>								
Primitive	.2	1.5	3.2	3.4	3.2	0.2	.3	.2
Semi-primitive (Non-motorized)	1.1	8.9	24.6	26.1	25.3	10.7	19.3	15.9
Semi-primitive (Motorized)	.5	4.5	12.3	13.1	12.6	5.6	9.0	8.3
Roaded Natural	178.6	295.9	378.4	408.0	405.2	301.2	370.4	374.9
Rural	82.9	94.3	130.0	138.9	138.2	94.7	114.0	106.5
Total	263.3	405.1	548.5	589.5	584.5	412.4	513.0	505.8
<u>Traditional Activities</u>								
Primitive	3.3	3.8	4.9	9.5	9.6	.6	.7	.7
Semi-primitive (Non-motorized)	59.0	66.0	88.0	96.1	98.8	118.9	134.2	131.2
Semi-primitive (Motorized)	20.1	21.2	25.9	24.7	24.8	34.4	39.9	40.1
Roaded Natural	158.7	166.0	197.1	250.1	249.0	219.7	274.7	278.2
Rural	.1	.2	6.0	6.0	6.8	.6	4.0	4.0
Total	241.2	260.3	321.9	386.4	389.0	374.2	453.5	454.2
<u>Total by ROS Class</u>								
Primitive	3.5	5.3	8.1	12.9	12.8	.8	1.0	.9
Semi-primitive (Non-motorized)	60.1	74.9	112.6	122.2	124.1	129.6	153.5	147.1
Semi-primitive (Motorized)	20.7	25.7	38.2	37.8	37.4	40.0	48.9	48.4
Roaded Natural	337.3	461.9	575.5	657.3	654.2	520.9	645.1	653.1
Rural	82.9	94.5	136.0	144.9	145.0	95.3	118.0	110.5
Total	504.5	665.4	870.4	975.9	973.5	786.6	966.5	960.0

Effects of Air Traffic Regulations on Primitive and Semi-Primitive Non-motorized Experience:

Visitors to the primitive and semi-primitive areas are seeking to escape from the sights and sounds of humans. The air traffic congestion described in the Affected Environment (Chapter III) reduces the quality of this experience.

Alternative B restricts air traffic to at least 2,000 feet above the topography over the entire Monument; Alternative C prescribes the same restriction over Mount St. Helens and all of the area to the north. Alternative D and D (Modified) restrict air traffic to at least 1,000 feet above the terrain over the entire Monument and Alternative E over the mountain and all the area to the north.

Opportunities for Recreation Concessions

All of the alternatives will provide opportunities for at least seasonal concessionaires. Road reconstruction will in some cases require a shuttle bus service to allow the visitor to reach key viewpoints. Seasonal permits will be issued for outfitter guide services, lamp rental, vehicle towing, and other services on a case-by-case basis. Long term permits will vary by alternatives.

Alternatives A and B: There will be no long term permits. The public demand for bus tours that currently operate out of Cougar, Washington, will decrease as the restricted zone is reduced in size and road closures are lifted, improving access by auto.

Alternative C: The primary viewing area at the observation post on Johnston Ridge will be accessible only by a concessionaire providing bus service from Coldwater Lake. Estimated visitor use in the year 2000 is 1.2 million visitors to Coldwater Lake of which 400 thousand would use the alternate transportation. There will also be a gift shop and snack bar at Coldwater Lake.

Alternative D (Preferred): A concessionaire will access the primary viewing area at the observation post on Johnston Ridge with an aerial tramway service from Coldwater Lake. Estimated visitor use in the year 2000 is 1.2 million visitors to Coldwater Lake of which 400 thousand would use the alternate transportation. The aerial tramway and supporting buildings will be supplied by the concessionaire. There will be a year-round restaurant capable of serving 100 people at one time, a gift shop, and a snack bar at Coldwater Lake.

Another primary viewpoint, at Spirit Lake, will be accessible only by shuttle bus service from Windy Ridge provided by a concessionaire. It is expected to operate between mid-June and mid-October and be limited by the capacity of the parking spaces available at Windy Ridge and Smith Creek viewpoints.

The current part-time rental of lanterns at Ape Cave will become full-time during the operating

season. The concessionaire will be provided a small building and services expanded to include the rental of other caving equipment, sale of approved publications, and guided interpretive tours.

Alternative D (Modified, Selected): The primary viewing area at the observation post on Johnston Ridge will be accessed by a concessionaire providing a shuttle bus service from the Coldwater Lake complex. Estimated visitor use in the year 2000 is 1.2 million visitors to Coldwater Lake of which 400 thousand would use this concession. This concession will include food and gift services on a year-round basis.

The current part-time rental permit for renting lanterns at Ape Cave will become a full-time permit. The concessionaire will be provided a small building, and services expanded to include the rental of other caving equipment, the sale of approved publications, and guided interpretive tours.

Alternative E: The absence of west side access will produce a demand for helicopter access to the primary viewpoint at Johnston Ridge. It will also increase the demand to visit Castle Lake beyond the capacity of the road system. This will create the opportunity for a shuttle bus service from the end of State Route 504 to Castle Lake.

Alternative F: Snow grooming of the portion of State Route 504 from Coldwater Lake to Johnston Ridge will create an opportunity to operate snowcat tours to the observation post. It will also make snowmobile rental economical. There will be a year-round restaurant, gift shop, a marina, and snack bar at Coldwater Lake.

A concessionaire will rent caving equipment and provide guided tours at Ape Cave.

A concessionaire may operate and maintain the larger campground on the Lewis River (100 units).

Alternative G: There will be the need for the restaurant, snack bar, gift shop, and marina concessions at Coldwater Lake to support visitors to the Spirit Lake complex.

The expanded network of horse trails in the Cave Basalt area will make a horse rental concession profitable in conjunction with the cave tours and equipment rental.

A concessionaire may operate and maintain the larger campground on the Lewis River.

TRANSPORTATION

Roads and Bridges

The management goals and objectives for each alternative require different transportation systems. Changes in the road and trail system by alternative are shown on the alternative maps. The following narratives and accompanying

tables summarize key changes in the transportation system. Table 29 lists numbers and miles of roads standards; Table 31 lists permanent bridges to be constructed.

The proposed construction and reconstruction of roads and bridges are intended for long term, multiple purpose use. This nonstruction activity will not be completely reversible; the additional acreage committed to roads is shown in Table 29.

The direct and indirect effects of transportation methods and routes on other resources (wildlife habitat, watersheds, soils, etc.), on the recreation visitor, and on the costs of these routes are described under those specific headings. The effects of the proposed State Route 504 corridors are described later in this section.

Alternative A is the existing situation and roads will be maintained at their current maintenance levels; no new road construction would take place within the Monument. Temporary bridges along Pine Creek, upper Pine Creek, Muddy River and Lewis River (Eagle Cliff) will be replaced with permanent structures. Conflicts between industrial and recreation traffic will continue, and closures which are instituted to allow safe traffic levels may restrict visitor use of the Monument. Washed-out sections of roads and temporary road locations will not be replaced (e.g., Roads 81, 8123, and 92 along Smith Creek).

Table 29: Changes in Roading by Alternative

	A	B	C	D	D (Modified)	E	F	G
<u>Road miles within the Monument boundary</u>								
Open to public travel	39.6	37.1	51	55.4	55.4	58	72.4	73.3
Not open to public travel (Maintenance Levels 1&2)	34.9	19.7	16.9	12.8	12.5	9.7	4.8	4.8
<u>Total</u>	74.5	56.8	67.9	68.2	67.9	67.7	77.2	78.1
<u>Abandon - # of roads</u>	0	37	31	29	31	29	28	27
-total miles		21.9	14.6	14.1	22.6	13.8	11.7	11.0
<u>Improve/reconstruct</u>								
Single lane - # of roads	0	8	13	18	19	18	28	25
-total miles		39.2	59.9	63	67.5	72.7	116.6	102.4
Double lane - # of roads	0	1	2	1	1	1	1	2
-total miles		4.9	25.9	4.9	4.9	4.9	4.9	25.9
<u>Reconstruct single to double</u>								
- # of roads	0	3	1	3	3	2	3	2
-total miles		45.9	11.4*	28.9	28.9	27.9	28.9	27.9
<u>New construction **</u>								
Single lane - # of roads	0	2	4	5	6	5	9	9
-total miles		0.7	8	8.1	10.8	3	9.5	10
Double lane - # of roads	0	0	0	0	0	1	1	2
-total miles						4.7	12.7	
<u>Acres committed to new construction and reconstruction to double lane (inside NVM)</u>	0	25.5	16*	61	61	58.5	58.5	119.5
<u>State Route 504 Reconstruction</u>								
Upper (miles)			18	18	18		18	18
Lower (miles)			16	16	16		16	16

NOTES:

* Add 16.5 miles and 25.5 acres for reconstructing Road 99.

** Does not include State Route 504 reconstruction.

Alternative B will also generally rely on the existing road system. Portions of roads which were overtopped by mudflows or debris (Road 8123 near Blue Lake, Road 81 west of 8100830 junction, and Road 92 along Smith Creek) will not be reconstructed to permanent road standards. In addition, approximately 37 roads with a total length of 22 miles will be abandoned. Due to somewhat limited west side access (a timber haul route reconstructed to double lane, gravel, 35 miles-per-hour standard), east side roads will be improved to handle traffic volumes. Roads 25 and 99 will be reconstructed to double lane. Improvements will be made to allow trailhead access into the Vanson Peak and Mt. Margaret areas.

Alternative C includes reconstruction of State Route 504 from near Camp Baker to Coldwater Lake and a single lane paved road to Johnston Ridge for administrative traffic and a shuttle bus concessionaire. Approximately 14 1/2 miles, portions of 31 roads, will be abandoned. Roads 92/94 will be managed as a one-way route (south). Road 25 will be reconstructed to double lane and Road 99 will be reevaluated for double lane construction after west side access to Coldwater Lake is provided. Control of traffic volumes in the interim could be provided through use of bus shuttles during the peak season.

Table 30: Bridge Construction Summary by Alternative

Road No.	Location	A	B	C	D	D (Modified)	E	F	G
25	Pine Cr.	X	X	X	X	X	X	X	X
25	Muddy Rv.	X	X	X	X	X	X	X	X
83	Upper Pine Creek	X	X	X	X	X	X	X	X
92	Smith Cr. (Beaver Slide)			X			X	X	X
9211	Muddy Rv.	X	X	X	X		X	X	X
90	Lewis Rv. (Eagle Cliff)	X	X	X	X	X	X	X	X
9210-92	Muddy Rv.						X		
9210-83	Smith Cr.							X	X
	S. Fk. Toutle							X	
	N. Fk. Toutle								3
SR 504	Coldwater Lk. (Exit Channel)			X	X	X		(1)	X
SR 504	(Both Upper & Lower Corridors)			(9)	(9)	(9)		(9)	(9)
Totals - Number of bridges		5	5	7	6	5	7	7	11
SR 504 (Spirit Lake Memorial Highway)				(9)	(9)	(9)		(10)	(9)

Number in brackets indicates number of bridges that would be reconstructed by Washington State Department of Transportation as a part of State Route 504 to Johnston Ridge.

Alternative D (Preferred) also includes reconstruction of State Route 504 from near Camp Baker to Coldwater Lake, but provides access to Johnston Ridge via a concessionaire constructed and operated aerial tram and shuttle bus system. A low standard access road to the ridge will be constructed in approximately the same location as the shuttle bus route in Alternative C. This alternative includes reconstruction of Roads 25 and 99 to double lane; improvement of a temporary road into Spirit Lake to allow shuttle bus and administrative traffic; and abandoning the present Road 92 location.

Alternative D (Modified, Selected) will continue the same level of road access development as Alternative D (Preferred), except access to Johnston Ridge will be by a single lane paved road for concessionaire shuttle buses and administrative traffic; utilizing 4.5 miles of the existing Spirit Lake tunnel construction road along South Coldwater Creek. Approximately 2.7 miles of new construction will be required beyond the tunnel road to reach Johnston Ridge. The section of Road 99, beyond Windy Ridge Viewpoint will continue to be closed to the public; while allowing 2.7 miles of road to naturally obliterate.

Alternative E includes the same basic road system as Alternative D above, except the west side access is not provided. The road into Castle Lake will be managed during peak season for a shuttle bus concession from the end of State Route 504 (current terminus). The road into Spirit Lake will be reconstructed to double lane gravel for public travel.

Alternative F includes extension of State Route 504 from near Camp Baker to Johnston Ridge. Access to Spirit Lake is provided from the east on double lane paved Road 99. A loop system will tie State Route 504 (from near its present terminus) across the South Fork Toutle River to the Road 8123 system near Sheep Canyon. An alternate system for commercial haul will tie the south end of Road 94 to Road 9210 and bridge Smith Creek to Road 92.

Alternative G provides the maximum amount of roading within the Monument. State Route 504 will be extended from near Camp Baker to Coldwater Lake and a Forest Service road will be built to Spirit Lake from Coldwater Lake (double lane paved). With the exception of the South Fork Toutle River Loop (not in this alternative), the rest of the roads are similar to those in Alternative F.

Trails

The trail network generally increases with each alternative (A through G). Table 31 displays miles of trails (inside and outside the Monument boundary) by alternative. More detailed trail locations are shown on the alternative maps.

Table 31: Trail Construction Summary by Alternative

Total Trails By Alternatives		Miles
A	In	31.2
	Out	17.6
	Total	48.8
B	In	74.1
	Out	22.4
	Total	95.7
C	In	95.7
	Out	20.7
	Total	116.4
D	In	148.0
	Out	21.7
	Total	169.7
D* (Modified)	In	158.8
	Out	21.5
	Total	180.3
E	In	154.0
	Out	21.9
	Total	175.9
F	In	181.0
	Out	30.1
	Total	211.1
G	In	161.4
	Out	42.8
	Total	204.2

Alternative A trails are generally pre-1980 trails which survived the eruption. They are located in the area southwest of the mountain (near Blue Lake), along the Green River, along Vanson Peak Ridge, along Tumwater Ridge, and from Road 26 to Norway Pass. The condition of some of these trails is not adequate to meet demand by hikers and horse recreationists.

Alternative B provides trails along the east side of the mountain (connecting Windy Ridge viewpoint, Windy Pass, and the Muddy River area), between Coldwater Lake and Norway Pass, from the Minnie Peak area to several backcountry lakes, from the Mt. Venus area to Green River, and from Road 83 to June Lake.

Alternative C adds trails along Goat Creek to Deadmans Lake, access to more backcountry lakes (but does not include a Minnie Peak connection), a connection between Green River and Vanson Lake, a connecting route along the south and west sides of the mountain between Pine Creek/Muddy River area through Sheep Canyon to Castle Lake, and interpretive trails near Coldwater Lake, and Castle Lake.

Alternative D (Preferred) completes the Round-The-Mountain Trail loop (with construction of the section north of the mountain, between Windy Ridge and the South Fork Toutle River). It also adds trails along the northwest shore of Coldwater Lake, along Smith Creek from Road 83 to Road 99, from Independence Pass to Norway Pass, from Spirit Lake to Harrys Ridge, Tumwater Mountain to Road 2750, and interpretive loops at Castle and Coldwater Lakes.

Alternative D (Modified, Selected) completes the Round-the-Mountain Trail loop, with construction of the section north of the mountain delayed until the physical condition of the area stabilizes. It also adds trails along the north shoreline of Coldwater Lake, along Smith Creek from Road 83 to Road 99, from Windy Ridge to Harrys Ridge, from Independence Pass to Norway Pass, from Harmony viewpoint to Spirit Lake, and an interpretive loop at Coldwater Lake. The Tumwater Mountain Trail No. 218 is tied across Goat Creek to Road 2750 and to Trail No. 217 to form a loop opportunity.

Alternative E includes all Alternative D trails except the South Coldwater Creek/Johnston Ridge area and along Goat Creek. It adds a trail between Coldwater Lake and Castle Lake.

Alternative F increases the number of trails in the backcountry (Vanson and Mt. Margaret), accessing additional lakes. It adds trails in the Goat Marsh/Goat Mountain area, along the Kalama River, along Muddy River (Lava Canyon), in the Cinnamon Peak area, and through the Cave Basalt area. This alternative has the largest number (and miles) of trails.

Alternative G has somewhat fewer trails in the backcountry than Alternative F with slightly less access to high lakes. It does not include the climbing trail on the south side of the mountain or the trail connection between Coldwater Lake and Snow Lake. Total trail capacity of this alternative is slightly smaller than Alternative F.

Effects of Alternatives on Timber (and Other Industrial) Haul):

Alternatives B through G contain various methods of reducing conflicts between recreation and industrial traffic. The costs to construct separate road systems for industrial traffic or to use private roads as haul routes are indicated in the section on cost effectiveness. Traffic conflicts along Road 8303 (past Ape Cave) can be reduced through use of a privately owned road from the Cinnamon Peak area west to Road 81. (This road has been used for other timber sales.) Alternatives D, D (Modified), and F increase the width of Road 8303 to double lane, which will allow mixed traffic. Mixed traffic on single lane roads will occur in all alternatives in the area north of the Monument (Road 27 system). The volume of recreation traffic on these roads will be low. Other roads are described below:

Alternative A does not add any new roads or widen any existing roads. Some road closures may be instituted to minimize conflicts, with preference generally given to industrial traffic.

Alternative B reduces conflict along Roads 25 and 99 by increasing road widths to double lane. Some problems will continue along Road 83 and Road 26. Road 94 could be closed to public travel where it leaves the Monument but conflicts will exist between that point and the junction with Road 99.

Alternative C may produce sporadic conflicts along Road 99 if average daily traffic volume does not support increasing the road width to double lane. Some conflicts will also continue along Roads 26 and 83 and along the Castle Lake access road. Reconstruction of State Route 504 will decrease east side recreation traffic. Road 92/94 from the junction of Road 99 to Smith Creek will be one-way south.

Alternative D (Preferred) improves Roads 99 and 25 to double lane. Some traffic conflicts will continue, however, along Road 83, Road 26, and the Castle Lake access road. Road 94 could be closed to public travel where it leaves the Monument but conflicts will exist between that point and the junction with Road 99.

Alternative D (Modified, Selected) improves Roads 99 and 25 to a double lane asphalt paved Forest development standard. Some traffic conflicts will, however, continue along Roads 26 and 83. Public access rights will not be acquired in the private road leading to Castle Lake. Roads 94 and 2560 will be managed as to not encourage passenger car traffic and may be closed to the public if monitored conditions warrant by the Monument Manager. Some traffic flow conflicts may exist on Road 99 between the Road 94 junction and the Road 26 junction.

Alternative E will produce increased conflicts due to higher east side traffic caused by limited west side access. Road 26 will be one way, north, between Road 99 junction and Ryan Lake. Road 94 will be one way south to Road 9418 junction. Recreation traffic will use Road 9418 across Smith Creek to Road 92 and a tie through for commercial traffic will be constructed between Road 9400390 and Road 9211, using a portion of Road 9210.

Alternatives F & G contain a different commercial traffic route in the Smith Creek/Muddy River area using an extension of Road 94 to Road 9210 and tying across to Road 9211. Public traffic will use a connection between Road 83 and Road 9212 and cross Smith Creek in the vicinity of the existing temporary bridge. Both will route traffic one way northbound on Road 26 between Road 99 junction and Ryan Lake. Conflict will occur in Alternative F on the South Fork Toutle River tie.

Effects on Public Rights

Table 32 displays the public access to be acquired by alternative. Most of these are needed for trailhead access; a few would provide general access to an area (Castle Lake, South Fork Toutle River).

Table 32: Summary of Public Access by Alternative

Road Name/Location	Length	A	B	C	(Modified)		E	F	G
					D	D			
Mining Road (Off Rd 2612)	1.7		*		O	O	X	X	O
WeyCo roads from SR 504 to Coldwater Lake	18		X						
WeyCo 3500 (Coldwater-Minnie Peak)	6.4		*					X	X
WeyCo (Minnie Peak - Green River)	7.8		*					X	
Castle Lake (WeyCo and DNR)	14		*	X	*		X	X	X
WeyCo 30 Mi. Rd. (S. Castle Lake)	3.7				*		X	X	X
S. Fk. Toutle Rv. (tie to Sheep Canyon)	10							X	
WeyCo 2500 Rd. (Green River)	21			*					*
Rd 2700 (Co Rd - lot 2750) (Private road No. 2100)	4.9		*	*	*	*	*	*	*
Rd 2742	1.0						*	*	*
Rd 2742019	1.5						*	*	*
Rd 2150 (to Vanson Peak Trailhead)	13.3		*	*	*		*	*	*
Rights-of-way (Total miles)		0	18	14	0	0	19.4	43.6	24.1
Coop. Agreements (Total miles)		0	34.1	39.2	35.9	4.9	20.7	20.7	41.7

Key to Above Table

X Acquire a right-of-way in fee simple that gives the Forest Service control of the road.

* Enter a cooperative agreement with the land owner to allow public access without Forest Service control of the road. Compensates owner through annual maintenance fees.

O Acquire ownership of the land through which the public rights are needed.

Effects of Alternatives for Isolated Non-federal Land Parcels

The Act directs that all lands and interest in lands within the boundaries of the Monument shall be acquired. This is action common to all alternatives, and the acquisition of the remaining 5,519.80 acres is in progress.

The alternatives propose different methods of dealing with the small isolated parcels of state and private land created by major road corridors near the Monument boundary.

Of particular concern is the area between the recommended upper corridor for the reconstruction of SR 504 in Alternatives C, D, D (Modified), F and G. The 1.2 million visitors expected to use this route in the year 2000 will be looking across a narrow strip of private land between the highway and the Monument to view the debris avalanche.

There are several viewpoints proposed along this highway. Management activities within this strip will be in sharp contrast to the viewers expectation of viewing a natural attraction, and there will be pressure on the landowner to alter management. Also, of concern are similar situations, but with less anticipated visitation, along Roads 83 and 2612, and along Weyerhaeuser Road 3500. The alternatives display a full range of methods to deal with this concern (Table 33). These alternatives were checked against all of the issues for effects and the significant effects are shown in Table 34. For those alternatives that acquire the land, a separate analysis following this Final E.I.S. will be used to select the method of acquisition.

Table 33: Summary of Alternatives for Non-federal Land Parcels Isolated Between the Monument and Major Access Corridors

Road Corridor	A	B	C	D	D (Modified)	E	F	G
	No Action	No Action	Acquire Scenic Easement	Acquire Land	Acquire Land	Scenic Easement	No Action	Acquire Land
State Route 504 ¹	--	--	950	950	950	--	--	1070
Weyco Rd. No. 3500	--	--	210	--	--	--	--	210
Road No. 2612	--	808	808	808	808	808	808	808
Road No. 83 (Sec. 4)	--	675	675	675	675	675	675	675
Total (Acres)			2643	2433	2433	1483		2643

¹ Assumes the Upper Corridor will be selected and also includes the S 1/2, SE 1/4, Section 35, T. 10 N., R. 4 E. directly north of the proposed Coldwater Lake complex.

Acres shown are approximate.

Table 34: Key Effects of Alternatives for Isolated Non-federal Land Parcels

Elements of the Issue	No Action	Acquire Scenic Easement	Acquire the Land
Recreation Visual Quality	Maximum modification of the natural landscape would occur during and following timber harvest. Uncontrolled commercial development would occur in areas suitable for development.	The natural appearance would be retained. Vegetation blocking the view from key viewpoints would be removed to maintain or improve views.	The natural appearance would be retained. Vegetation blocking the view from key viewpoints would be removed to maintain or improve views.
Socioeconomic Conditions	Timber yield would continue to be at the maximum. Slight increase in cost of harvest due to special methods required to minimize conflict with recreation traffic.	Owner compensated for the reduction in timber harvest caused by retaining a near natural viewing experience. Real estate tax would be nearly the same. Yield tax would be reduced at time of harvest.	Forest Service timber base could be reduced by approximately 400 acres if exchange is the chosen method for acquisition. Property taxes to local government would be replaced by the payment in lieu of taxes.
Cost (to the Government)	A, B, and F = 0	Estimated Costs: C = \$792,900 E = \$444,900	The direct cost would be approximately as follows; if the lands were purchased. D = \$1,216,000 D(Modified) = \$1,216,000 G = \$1,321,500

State Route 504 (Spirit Lake Memorial Highway)

The effects of an upper and lower corridor for reconstruction of State Route 504 to Coldwater Lake were estimated by Washington State Department of Transportation and Forest Service specialists. Table 35 summarizes the effects of each corridor by decision criteria (see also Figure 8, Chapter II).

Alternatives C, D, D (Modified), F, and G call for the reconstruction of State Route 504 from near Camp Baker eastward. (Figure 7, Chapter II). This state route terminates at Coldwater Lake in Alternatives C, D, D (Modified), and G, and at Johnston Ridge in Alternative F. In Alternatives C, D, D (Modified), and G either an aerial tram or Forest Service road extend further eastward into the Monument.

The U.S. Army Corps of Engineers has recommended the construction of a single retention structure with minimum downstream sediment control (FEIS, Dec. 84). This structure is proposed for construction on the North Fork of the Toutle River, just above the mouth of the Green River. Other options could potentially be considered by the Corps if there are significant changes in sediment delivery. If the single retention structure were constructed, 5.1 miles of the lower section of SR 504 would be relocated. However, no new effects other than those already identified in Table 35 would occur with relocation of this lower portion of SR 504. Therefore, either route would adequately serve the needs of the Monument.

Table 35: Summary of Effects of State Route 504 Corridors (the Spirit Lake Memorial Highway)

Issue	No Action Alternatives A, B, & E	Effects Common To Both Corridors	Lower Corridor	Upper Corridor
1. Natural Features & Processes				
Geology	No effect.	There will be roadway and fills with some erosion. Mineral aggregate will be used for surfacing and paving.	Due to steeper slopes more chance of slides developing during and after construction. More impact on debris avalanche deposits because of easier access to people.	Lesser impact than lower corridor.
Water-shed Resources	No effect.	Both are above estimated base flood and are above mudflow of N. Fork. Amount of sediment from highway construction is insignificant compared to natural erosion. Could mitigate reseedling, using filter fences, directing runoff overland.	Potential for people to enter debris avalanche area and introduce or remove species and increases erosion.	Greater distance to the debris avalanche reduces potential for impacts by people.
Vegetation	No effect.	Vegetation will be eliminated in roadway areas. Side slopes will be replanted as mitigation measure.	Increased foot traffic to sensitive environment of debris avalanche.	Same as above.
2. Recreation & Interpretation	Restricts access to Monument and other recreation area.	Both will provide westside access for Mount St. Helens visitors on 50 mph standard highway. No significant difference in number of visitors.	Will change NOS of debris avalanche area. Difficult to control visitors in debris avalanche area. Could lead to degradation of resource. Vistas are of smaller area and recovering vegetation block view over time.	Allows viewing mountain & devastation from "superior" position, provides broad area vistas, views will remain over time.
3. Research	No effect.	Both corridors provide access for researchers and visitors.	Has greater potential for NVM visitors to enter the debris avalanche area (high sensitivity to human impact & high scientific value). Appears to intersect at least 2 plots.	Winter months could cause limited access if road not plowed. Does not intersect any known research plots.

Table 35: Summary of Effects of State Route 504 Corridors (the Spirit Lake Memorial Highway) (Continued)

Issue	No Action Alternatives A, B, & E	Effects Common To Both Corridors	Lower Corridor	Upper Corridor
4. Public Safety	Greater chance of vehicle accident on existing logging roads in the area.	Both corridors provide 2 lane paved highway & would have the same capacity for vehicles.	Increased potential for visitors to enter debris avalanche area (Hazardous area until channel reestablishes itself.)	Location is above area of hydrological risk.
5. Transportation	No public access to private and public lands; or to Monument from the west.	Both corridors are double lane paved (2 - 12' lanes) with 4' shoulders and 50 mph design (with some 35-45 mph curves).	15.3 miles total (Camp Baker to Coldwater Lake) 6.6 miles are within NWM. Private industry would probably recommend F.S. acquisition of approx. 10 acres falling between Rt. 504 & NWM boundary. Better potential for year-round use (lower elevation - less snow removal).	25.2 miles total (Green River to Coldwater Lake) 0.5 miles are within NWM. Private industry would probably recommend F.S. acquisition of approx. 950 acres falling between Rt. 504 & NWM boundary.
6. Fire Management	Less potential for manmade fires. Poorer access to fight fires.	No significant fire management effects are distinguishable by corridor.		
7. Terrestrial Wildlife	No effect.	Most vegetation was severely impacted by blast, recovery has started & been vigorous. Highway corridors are mostly through areas with minor ground cover. Both corridors are above valley floor (wetland area). Fish habitat recovery in streams has not begun. Highway construction is not anticipated to have negative effect on fish habitat or movement. Both will have adverse impact on wildlife habitat in the Tottle River Basin (winter range).	More impact on big game due to lower elevation & more impact on long term basis. This corridor is within an important wintering area which was heavily impacted by the eruption and mudflow.	Planting of conifers has occurred in blast zone NE of Camp Baker. Corridor passes through a stand of timber. At least 6 acres would be taken by roadway. This corridor is primarily in summer range which is more abundant than winter range.

Table 35: Summary of Effects of State Route 504 Corridors (the Spirit Lake Memorial Highway) (Continued)

Issue	No Action Alternatives A, B, & E	Effects Common To Both Corridors	Lower Corridor	Upper Corridor
7. Terrestrial Wildlife (Continued)		<p>Approx. 200 acres of land will be removed from production by road-way construction.</p> <p>Both will have minimal effect on smaller wildlife species & birds</p> <p>Mitigation</p> <ul style="list-style-type: none"> (1) Buffer areas (between) highway & riparian and/or wintering areas). (2) We recommend that the Department of Transportation coordinate with the Department of Game and Department of Fisheries to develop fish and wildlife mitigation measures. (3) Game crossings will be provided by the bridge stream crossings. 		
8. Costs	Higher costs for people needing or wanting access to public and private lands.		<p>Est. cost = \$70.2 MM (includes \$283,000 for right of way)</p> <p>Higher cost of maintenance due to steeper slopes and greater potential for slides.</p>	<p>Est. cost = \$64 MM (includes \$658,000 for right of way)</p> <p>Higher winter maintenance costs for snow removal and sanding.</p>
9. Cultural Resources	No effect.	Field investigation will be needed before final highway location with corridor.	May impact some shallow caves and rock shelters.	No known impacts.
10. Cave Area	N/A	N/A	N/A	N/A
11. Socio-economic	Less traffic and need for commercial development along existing lower portion of SR 504.	Both will provide westside Monument access for visitor & will have spillover effect on I-5 corridor communities.	Some impact on private landowners.	Most impact on private landowners, but will have negligible impact on total timber harvest. Could increase forest management costs in corridor area.

CULTURAL RESOURCES

Effects Common to All Alternatives

The current cultural resource site inventory (Table 11, Figure 36 in Chapter III, the Affected Environment) is compiled from historic records and provides information on potential site locations. Few of the 85 sites inventoried within the Monument boundaries have actually been investigated on the ground. No caves within the Monument, Road 25 corridor, or Lewis River have had field investigations for cultural resources. Therefore, the impacts of a given alternative cannot be accurately measured at this time. It is not known whether sites listed in the current inventory will be located during field investigation, and what their conditions might be. Further, it is not known how many additional sites may be found.

Table 36: Potential Impacts to Inventoried Cultural Resource Sites

Forest Service Site Name	MSHNM Management Alternative
1. Ole's Cave	E
2. Coldspring Cabin	A,B,C,D*,E,F,G
3. McBride Lake Cabin	F,G
5. Ape Canyon Miners Cabin	B,C,D*,E,F,G
46. Coldwater Fire Lookout (Site)	B,C,E,G
48. Meta Lake Trail Shelter (Site)	F,G
50. Minnie Lee Mine & Cabin	A,B,C,D*,E,F,G
51. Deadmans Creek Cabin	F,G
52. Lower Falls Creek Cabin	D*,E,F,G
53. Luzerne Mine & Cabin	F,G
54. Upper Falls Creek Cabin	C,D*,E,F,G
62. Snow Lake Cabin & Dam	B,C,D
67. Ghost Creek Cabin	D*,E,F,G
72. Norway Cabin #2	D*,E,F,G
77. Vanson Peak Lookout	A,C,D*,E,F,G
79. Big Falls Cabin Site	A,B,C,D*,E,F,G
81. Cabin Site	A,B,C,D*,E,F,G
82. Cabin Site	A,B,C,D*,E,F,G
83. Parker Car	A,B,C,D*,E,F,G
84. Coldwater Ridge Logging Equipment	D*,G
85. Black Rock Mine	B, D*

Numbers above are keys to location information given in Figure 36 (Affected Environment).

* Both D and D (Modified).

Effects by Alternatives

Prehistoric, Historic, & Volcano Sites: It is estimated that Alternative A, the current situation, will produce the lowest level of potential impacts to inventoried cultural resource sites (Table 36). Ranked in order of increasing levels of potential impacts are Alternatives B, C, E, D (Preferred) and D (Modified, Selected) are the same, F, and G. Potential impacts to inventoried cultural resource sites are estimated to be predominantly associated with trail construction and reconstruction.

Caves: In the Cave Basalt Area, Alternative B provides the best protection to potential cultural resource sites; no new trails or other developments are proposed. In order of increasing levels of potential impacts are A, C, D (Preferred), D (Modified, Selected), E, F, and G. Alternatives E, F, and G open nearly all caves in the area to increased human use, resulting in the possible loss of prehistoric artifacts and information.

PUBLIC SAFETY

Effects Common to All Alternatives

Potentially Hazardous Geological Conditions: No alternative proposes development which would attract concentrations of visitors in areas where slope instability is most serious. Rockfall is a potential hazard only within the crater. Since no alternative proposes public access to the crater, it was not evaluated.

Water Quality: Recent scientific analysis of bacteriological and chemical contamination of lakes and streams within the Monument indicates that levels are similar though slightly higher than background levels elsewhere. It is not considered a significant risk to the public and is not evaluated by alternative. The risk to human health from sewage effluent will be dealt with on a site-specific basis during implementation of this plan.

Seismic Hazard: As discussed in Chapter III, the St. Helens Seismic Zone passes through a portion of the Monument. This seismic zone is not precisely located, but is potentially capable of generating a magnitude 6.5 earthquake. This will be considered in all alternatives in the location and design of public facilities.

Effects by Alternative

Air Traffic Hazards: The primary communications tool that the Federal Aviation Agency (F.A.A.) has to provide pilots with information about special flight regulations in this area is the Seattle Sectional Aeronautical chart. Alternatives B, C, D (Preferred), D (Modified, Selected), and E request the F.A.A. to chart all or portions of the Monument that would have an effect on the public safety in that airspace. The following positive effects would be common to these alternatives:

- Improving communications between pilots by means of a common radio frequency.
- Reducing the number of aircraft in the space between the terrain and the minimum altitude.
- Reducing the number of landings.

These effects vary between alternatives in the portion of the Monument to be charted and the recommended minimum altitude.

Table 37: Proposed F.A.A. Regulations for Monument Airspace

Alternative	Portion of the Monument charted	Minimum Altitude
A	None	None
B	All	2000
C	Mount St. Helens/north	2000
D	All	1000
D (Modified)	All	1000
E	Mount St. Helens/north	1000
F	None	None
G	None	None

Hydrologic Risk: The risk to public safety from hydrologic processes was measured by estimating by alternative the number of structures which could be jeopardized by a large scale hydrologic event. Facilities or structures in areas of active channel building or migration are most vulnerable. Portions of the Monument where these conditions exist are the pyroclastic flow and blast pyroclastic flow deposits, the debris avalanche deposit, mudflow deposits, and tephra deposits.

Alternative A: In this alternative, Road 99 crosses an area of deep tephra accumulations, which could fail during or following a heavy runoff. Road 92 is built on the margin of a mudflow in the Smith Creek/Muddy River drainage, which could be affected by a high runoff event.

Alternative B: In addition to effects identified in Alternative A, this alternative includes facilities at Coldwater Lake on the debris avalanche deposit. Some trails will also be built on the margins of the debris avalanche and mudflow deposits.

Alternative C: In addition to effects described in B, this alternative calls for more trails in the vicinity of mudflow deposits. Also, a permanent bridge will be built across the Smith Creek mudflow and a road to Johnston Ridge will cross the debris avalanche near Coldwater Lake.

Alternative D (Preferred): In addition to effects described above, more trails in potentially hazardous areas are planned in this alternative.

Alternative D (Modified, Selected): This alternative will reconstruct Road 99 in areas of deep tephra, which could locally fail if saturated. Some facilities in the Coldwater Lake area could be effected by high runoff events. Many miles of trails will be built in this alternative on the mudflow, pyroclastic flow, and debris avalanche deposits, which are areas of active channel building and migration, and could be effected by large scale hydrologic events.

Alternative E: To the effects of D, this alternative adds a visitor facility on the pyroclastic flow and debris avalanche deposits on the south shore of Spirit Lake.

Alternative F: In addition to the effects of E, this alternative calls for the extension of State Route 504 from near Camp Baker to Johnston Ridge crossing the debris avalanche and blast pyroclastic flow deposits.

Alternative G: To facilities included in F, this alternative adds a road from Coldwater to Spirit Lake across the debris avalanche and blast pyroclastic flow deposits.

Volcanic Risk: All alternatives except A propose facilities or structures within the current closure zone. Outside this boundary, while there is still a risk factor, it is not considered serious enough to be considered in the comparison of alternatives. No structures or facilities will be built until the level of risk is considered acceptable.

Alternative A: There is no public access within the closure zone in this alternative.

Alternative B: Several trails, portions of State Route 504 and Road 99 to Spirit Lake and visitor facilities at Castle and Coldwater Lakes are within the current closure area in this alternative.

Alternative C: In addition to the above, this alternative calls for the construction of a road and observation post on Johnston Ridge and several additional trails in the closure zone.

Alternative D (Preferred): Two more trails and visitor facilities at Spirit Lake are added in this alternative.

Alternative D (Modified, Selected): This alternative will result in portions of several trails, portions of SR 504, facilities at Johnston Ridge, and at Coldwater Lake to be built within the current closure area.

Alternative E: Access to Johnston Ridge, the observation post, and visitor facilities at Spirit Lake will not be included; otherwise, development is similar to that in D and D (Modified).

Alternative F: In addition to facilities identified in D, this alternative calls for more facilities at Spirit Lake and several additional trails in the closure area.

Alternative G: Facilities in the closure area are the same as in F except that fewer trails are called for and a road from Coldwater Lake to Spirit Lake is included.

FIRE MANAGEMENT

In the absence of management, there is a moderate to high probability that within the next 20 years some fire starts in blowdown or fringe areas of the Monument would burn to a large size at a high intensity level. The effect of increased recreational use is to increase the risk of human-caused ignition and thus potential fire frequency. As both the number of visitors and the potential fire frequency increase by alternative, so does the probability that a threat to public safety, or to resources adjacent to the Monument, may develop.

The magnitude of fire hazard is limited by the total acres of high risk fuel types and by fire

season and other variables. Assuming no fire management, a series of several large fires burning between 2,800 to 10,000 acres are projected during the next 20 years. This projection is based on natural fire rotation estimates, fire season, and fuel characteristics. High risk fuel types are identified in Figure 39 (Chapter III).

The duration of the potential fire hazard varies by fuel type. Fire danger should peak in the fringe areas within the next five to seven years. It should then decrease slowly over time. In the blowdown areas, fire hazard is low now but will slowly increase and peak when regenerating trees and shrubs establish a closed canopy over the logs.

Effects common to all alternatives and effects of implementation (employing mitigation measures) are discussed below.

Effects Common to All Alternatives

None of the alternatives propose any large scale fuel modification that would significantly reduce or alter fire hazard. Therefore, some elements of fire hazard potential remain common to all alternatives. The underlying processes that affect fire hazard in the Monument are physical, and they will vary over time more than they will vary by alternative. Changes in ash cover, fuel loading, lightning risk, and potential fire behavior are common to all alternatives.

Ash Cover and Revegetation: Because ash is by now quite compact, further erosion or settling of ash is expected to have only a slight effect on fuel loadings in the Monument. Revegetation has begun in all areas of the Monument and new litter is beginning to accumulate over the ash. Revegetation is proceeding most rapidly in the fringe; species composition is similar to the regeneration occurring after a high-intensity fire.

Fuel Loading: Changes in fuel loading in devastated areas is dependent on revegetation and litter accumulation rates. There is no concern about fire in the devastated areas during the life of this plan.

Fuel loading in blowdown areas has essentially stabilized by now, after an initial increase as settling ash uncovered some woody pieces and branchwood that were previously buried. Revegetation should begin to offset the retarding effect of the ash cover by 1990 to 1995 in these areas.

The greatest change will continue to occur in fringe areas; much of the remaining branchwood and a percentage of the snags will drop to the forest floor over the next five to seven years. Fringe areas on slopes should continue to accumulate branchwood and snags at a faster rate than fringe on level ground. Revegetation may actually reduce fire hazard in the fringe areas over the next five to seven years, by breaking up and shading concentrated pockets of fine fuels.

Lightning Risk: Fifty years of available data report only 70 lightning fires in the Monument area (a mean of 1.4 fires per year and maximum of six in one year). It is not known whether the climate or weather patterns around Mount St. Helens were changed by the effects of the eruptions. Lightning risk, however, may be increased by a combination of circumstances. Storm cells that produce lightning predominate from the southwest and the northwest. Buildup develops most frequently on the lee side of Mount St. Helens and the Mt. Margaret Backcountry. Lightning also accompanies ash eruptions.

Since 1908, 54 percent of all lightning fires reported in the Monument area occurred northeast of St. Helens in a broad line running from Black Mountain to the upper Clearwater Creek drainage. This area, which is less than 15 percent of the Monument, is now almost exclusively a mix of blowdown and fringe fuel types and is more susceptible to ignition than before the eruption. These circumstances may produce more lightning caused ignitions there in the next 20 years than have occurred in the past.

Potential Fire Behavior: As noted in the Affected Environment (Chapter III), the fire behavior of fuels lying on ash and pumice has changed noticeably since 1980. Implications for fire management include:

--Fire starts in areas of blowdown and fringe, even where fuel loads are light and discontinuous, have spread rates faster than expected. This is especially significant on slopes above 30 percent and in areas with east wind exposure.

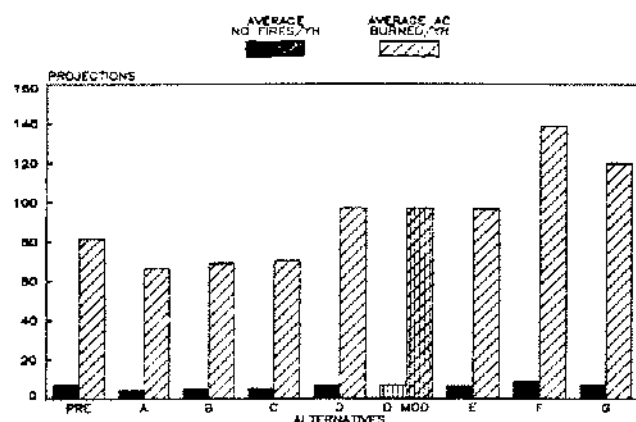
--Fire season and fire danger periods may be more affected by short-term drying periods of three to five days than by long-term weather trends, particularly in fringe areas with sizeable accumulations of less than 3 inch fuels. Fire behavior potential in blowdown areas will respond to seasonal weather trends (1,000 hour fuel moisture) and to the orientation of logs in relation to the slope. Rate of spread and the resulting energy release will be greater where logs lie up and down slope than where they lie across slope.

Effects by Alternative

Human caused risk is the primary variable that changes significantly by alternative. Since the fire environment has been radically altered, it is difficult to project pre-eruption fire occurrence indices. Prior to 1980, most human-caused fires were concentrated around Spirit Lake and were related to recreation activities. Future risk of human-caused fires will depend upon the number and locations of visitors, travel corridors and developed sites. Risk will obviously increase proportionally with the total number of visitors, especially in the blowdown and fringe areas. As the number of visitors, developed sites, campgrounds, miles of road and trail increase by alternative, so does potential fire danger. Table 38 illustrates the effects of visitation and development on fire management.

Figure 40 displays fire size and frequency projections. Alternative A projects the least acres burned, but that alternative does not take into account mitigation measures found in other alternatives. Alternatives B and C would result in the least acres burned while allowing for management activities. Alternatives D and E would result in an increase in acres burned and in greater intensity levels (i.e., more fires in blowdown and fringe fuels). Alternatives F and G would result in the most acres burned at highest intensity levels over time, due to increased fire frequency in blowdown and fringe fuels. Note that Alternative A-C actually display lower fire frequency rates than pre-eruption conditions, and that Alternatives D, D (Modified), and E project only slightly higher rates. (See Appendix I for a description of the methods used to develop fire size and frequency projections.)

Figure 40.
FIRE SIZE AND FREQUENCY PROJECTIONS



Fire Management Strategy: The proposed fire management strategy, including mitigation measures, attempts to balance the concern for public safety with the direction in the Monument Act to allow natural processes to continue unimpeded.

In the fire size and frequency model used, Alternative A shows the least acres burned but this does not reflect mitigation measures available in other alternatives, (such as campfire restrictions and brush disposal). Alternative C would result in the least acres burned while allowing for management activities; it is followed closely by B. Alternatives D, D (Modified), and E would result in an increase in acres burned and higher intensity levels (more fires in blowdown and fringe areas). Alternatives F and G would result in the most acres burned at highest intensity levels over time (largest number of fires in blowdown and fringe areas). Note that prescribed natural fires (Alternatives B through E) would increase acres burned over time only slightly, since the General Forest areas where such fires would be allowed have a low lightning occurrence rate. Limits on fire size and intensity level for natural fires would also minimize the number of acres burned.

Table 38: RVDs and Development Effects on Fire Management

Alternatives		A	B	C	D	D (Modified)	E	F	G
Number of Developed Sites by Fuel Type									
	General Forest	2	4	5	5	5	6	5	6
	Blowdown	7	10	13	13	13	12	13	12
	Fringe	3	3	3	4	4	4	4	4
Miles of Trail by Fuel Type									
	General Forest	27	18.6	34.4	42.3	42.3	42	61.3	62.7
	Blowdown	3	10.6	17.9	31	31	20.4	23.3	28.5
	Fringe	1	16.9	16.7	31.4	31.4	30.4	27.9	24.9
Number of Dispersed Campgrounds by Fuel Type									
	General Forest	1	1	3	4	4	5	6	6
	Blowdown	-	2	2	3	3	3	3	3
	Fringe	1	2	2	4	4	5	5	5
Total RVDs by Fuel Type									
	General Forest	4,541	5,123	8,217	21,139	21,139	27,108	48,291	45,324
	Blowdown	3,941	11,248	16,891	31,426	31,426	11,010	34,669	7,077
	Fringe	480	1,207	1,605	5,862	5,862	10,608	17,248	18,043

COSTS

Capital Investment

The total capital investment required to fully implement each alternative is summarized in Table 39. The actual cost of these facilities was calculated for each individual site planned by management concept areas. Each alternative includes the cost of a permanent visitor center at Sequest State Park. Also included are the costs of several facilities outside the nine management concept areas that are needed to support the Mount St. Helens recreation.

The cost of concession provided facilities, such as the aerial tram, are not included in this summary. A decision on the administrative headquarters location has been made and its cost and the costs of any seasonal work centers is displayed in Tables 39 and J-6 in Appendix J. The costs of preparing the various site specific plans recommended in this document (Interpretive Plan, Cave Basalt Plan, Fire Management Plan, and Backcountry Management Plan) are included in Table 39.

Construction costs for State Route 504 (the Spirit Lake Memorial Highway) are shown as a separate item at the bottom of Table 39.

This is not a direct cost to the Forest Service; it replaces the highway which was destroyed by the eruption and does not exclusively serve the Monument.

Operation and Maintenance

The operation and maintenance costs associated with each alternative are shown in Table 40. They include the costs of administering all rules, regulations and plans and operating and maintaining all facilities. The cost of specific monitoring, identified as mitigation measures in several resource areas, is shown in this table; it was estimated as an annual cost. The costs of operating an emergency coordinating center or providing special staffing needs above the level necessary to operate and maintain the roads, trails, and recreation facilities are not included.

Concession Opportunities

The concession opportunities provided by each alternative are displayed in Table 41. The returns to the U.S. Treasury were calculated using a graduated rate (based on an estimate of gross income) or a flat rate for low income producing concessions.

Opportunities created for the private sector to provide services are covered in the socioeconomic section.

Table 39: Summary of Capital Investment and Other One-Time Costs

(In Thousands of Dollars)

Alternatives	A	B	C	D	D (Modified)	E	F	G
<u>Capital Investment</u>								
Recreation and Other Facilities	411	809	7,586	8,595	8,334	3,629	9,477	7,547
Visitor Center at Sequest State Park	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
Trails	300	1,121	1,423	2,406	2,629	2,233	2,939	2,855
Roads		20,625	9,528	16,534	15,645	17,230	24,617	25,646
Bridges	4,191	4,191	5,791	4,320	3,970	6,391	7,591	7,591
Administration Headquarters and Seasonal Work Centers	2,395	3,014	3,014	3,014	3,014	2,822	3,014	3,014
Rights-of-Way		23	18	0	0	25	57	31
Misc. Other One-Time Costs	111	193	954	1,375	1,425	603	155	1,470
Total Forest Service Costs	12,408	34,976	33,314	41,244	40,017	37,933	52,850	53,154
State Route 504 (Spirit Lake Memorial Highway)			64,000	64,000	64,000		89,400	64,000

(In Thousands of Dollars) 2/

Alternatives	A	B	C	D	D (Modified)	E	F	G
Operation and Maintenance								
Recreation Facilities (Includes \$300 for V.C.)	541	567	859	972	952	772	1,142	1,073
Trails	7	13	16	24	26	24	29	28
Roads	530	455	497	502	490	477	435	241
Monitoring	59	49	72	72	70	74	76	76
Total Annual Costs	1,147	1,104	1,444	1,570	1,538	1,347	1,682	1,718

1/ Does not include costs for snowplowing.

2/ 1985 dollars needed after plan is fully implemented (about 1990), no adjustment has been made for inflation.

Table 41: Summary of Concession Opportunities and Estimated Annual Return to the Government

Alternatives	A	B	C	D	D (Modified)	E	F	G
Experience Description of Concession Opportunities	Existing Mount St. Helens tours \$250	None Mount St. Helens tours \$250	Bus shuttle from Coldwater Lake to Johnston Ridge \$3/user \$25,200 Gift shop/snack bar at Coldwater bus terminal \$28,000	Restaurant facility at Coldwater Lake \$28,000 Aerial tramway from Coldwater to Johnston Ridge \$5 to \$6 user fee Cross-country ski rental at aerial tramway terminal. Flat fee \$500 Bus shuttle from Smith Creek viewpoint/Windy Ridge to Spirit Lake. \$2.50/user \$3,500 Ape Cave lamp and equipment rental and guided tours of the cave. Flat fee \$600 Gift Shop/Snack Bar at Coldwater Lake. \$28,000	Restaurant facility at Coldwater Lake \$28,000 Shuttle bus from Coldwater Lake to Johnston Ridge. \$4-5 user fee Cross-country Ski rental at shuttle bus terminal. Flat fee \$5.00 Ape Cave lamp and equipment rental and guided tours of the cave. Flat fee \$500 Gift Shop/Snack Bar at Coldwater Lake. \$28,000	Helicopter landing at Johnston Ridge. \$3,000 Bus shuttle from Castle Lake from State Route 50H. \$10 user fee \$10,000 Flat fee. \$1,000 Restaurant at Coldwater Lake. \$28,000 Marina at Coldwater Lake. \$750 Gift Shop/Snack Bar at Coldwater Lake. \$500 Potential campground operation at Iron Creek (100 units each) Flat fee. \$2,500	Snowmobile rental and snowcat tours to Johnston Ridge. Flat fee. \$3,500 Ape Cave tours and equipment rental. Flat fee. \$1,000 Restaurant at Coldwater Lake. \$28,000 Marina at Coldwater Lake. Flat fee. \$500 Gift Shop/Snack Bar at Coldwater Lake. \$28,000 Potential campground operation at Iron Creek (100 units each) Flat fee. \$2,500	Horse rental at Olé's Cave. Flat fee. \$250 Olé's Cave tours and equipment rental. Flat fee. \$1,000 Restaurant at Coldwater Lake. \$28,000 Marina at Coldwater Lake. Flat fee. \$500 Gift Shop/Snack Bar at Coldwater Lake. \$28,000 Potential campground operation at Iron Creek (100 units each) Flat fee. \$2,500
Number of Private Concession Opportunities Inside the Monument	(temp. only)	(temp. only)	2 ea.	6 ea.	5 ea.	2 ea.	7 ea.	6 ea.
Return to Treasury	\$250	\$250	\$53,200	\$134,400	\$91,700	\$13,000	\$65,000	\$62,750

SOCIOECONOMIC CONDITIONS

Introduction

Socioeconomic effects associated with the seven alternatives are projected for Clark, Cowlitz, Lewis, and Skamania Counties, utilizing a computer-based simulation model. One very important caution: these projections can only be considered estimates which depend upon a number of modeling assumptions. Therefore, the significance of these projections rests in the relative differences between numbers. More detailed information is presented in Mount St. Helens National Volcanic Monument: The Economic Impacts of Development Alternatives (McPhee et al, Nov. 1983). These socioeconomic effects upon the local region depend upon projected demand, particularly the number of local and non-local visitors to the Monument, their expenditures, and their average length of stay. More information on demand is presented in the "Recreational Demand" section.

Regional Economic Effects

The regional impacts of various levels of developments in the Mount St. Helens National Volcanic Monument are calculated for 1990, 1995, and 2000. Table 42 shows the impacts on four variables: visitors, direct jobs, total jobs, and personal income. Direct jobs are those in restaurants, motels, and other businesses created by visitor spending. Total jobs also count those indirectly supported in the economy because of the respending (multiplier) process triggered by visitor expenditures. In general, the total economic impact in a given year, whether stated in terms of jobs or personal income, varies with the number of direct jobs associated with the alternatives. This figure is roughly proportional to the number of visitors projected by alternative. Minimal changes in visitors, visitor length of stay, and expenditures are projected between Alternative D and Alternative D (Modified). Therefore, the projected number of jobs and income stimulated are estimated to remain approximately the same for both alternatives.

Table 42: Economic Impact of Alternative Developments of Mount St. Helens Monument, 1990-2000

		1990	1995	2000
Alternative A	Direct Jobs (number)	989	1,106	1,236
	Total Jobs (number)	1,766	2,048	2,377
	Personal Income (\$ mil.)*	57.9	97.3	169.2
Alternative B	Direct Jobs (number)	1,470	1,643	1,835
	Total Jobs (number)	2,625	3,043	3,529
	Personal Income (\$ mil.)*	86.1	144.5	251.3
Alternative C	Direct Jobs (number)	1,975	2,208	2,467
	Total Jobs (number)	3,527	4,089	4,744
	Personal Income (\$ mil.)*	115.7	194.2	337.8
Alternative D	Direct Jobs (number)	2,137	2,390	2,670
	Total Jobs (number)	3,816	4,426	5,135
	Personal Income (\$ mil.)*	125.2	210.2	365.6
Alternative D (Modified)	Direct Jobs (number)	2,137	2,390	2,670
	Total Jobs (number)	3,816	4,426	5,135
	Personal Income (\$ mil.)*	125.2	210.2	365.6
Alternative E	Direct Jobs (number)	1,541	1,722	1,924
	Total Jobs (number)	2,752	3,189	3,700
	Personal Income (\$ mil.)*	90.3	151.5	263.4
Alternative F	Direct Jobs (number)	1,909	2,133	2,384
	Total Jobs (number)	3,409	3,950	4,585
	Personal Income (\$ mil.)*	111.8	187.6	326.4
Alternative G	Direct Jobs (number)	1,884	2,106	2,353
	Total Jobs (number)	3,364	3,900	4,525
	Personal Income (\$ mil.)*	110.3	185.2	322.2

*Dollars inflated to the year 2000.

Thus, in 2000, Alternative G, which is expected to attract about twice as many visitors as Alternative A, is projected to generate about twice the number of direct and total jobs. The absolute size of the total impact of Alternative A varies from 1,766 jobs in 1990 to 2,377 in 2000. The latter figure represents only one percent of the total jobs forecast for the regional economy in that year. The number of jobs created by Alternative G varies from 3,364 in 1990 to 4,425 in 2000. The impacts of the remaining five alternatives fall within Alternative A and Alternative G, although Alternatives D, D (Modified), and F are quite close to those in G.

Table 43 gives a more detailed accounting of the economic effects of the various alternatives in

2000. Virtually all of the employment opportunities created by visitor expenditures are found in trade, services, and government. There would also be no permanent reduction in the local unemployment rate. The new visitor-related jobs temporarily lower unemployment, but in-migration attracted by improved economic conditions increases the population and pushes the jobless rate back up.

Construction Related Economic Effects

In addition to the economic effects of visitor expenditures, development in the Monument is expected to give a lift to the regional economy during the construction phase, which is expected to last from 1985 to 1990.

Table 43: Economic Impact of Alternative Developments of Mount St. Helens National Monument, 2000

	A	B	C	D	D (Modified)	E	F	G
Direct Impact								
Expenditures (\$ mil.)*	114.7	169.2	227.2	246.2	246.2	178.2	220.7	217.8
Jobs (number)	1,236	1,835	2,467	2,670	2,670	1,924	2,384	2,353
Earnings (\$ mil.)*	45.1	67.0	90.0	97.5	97.5	70.2	87.0	85.9
Total Impact								
Resident population (number)	6,493	8,345	10,861	11,856	11,856	9,869	11,991	11,909
Jobs (number)	2,377	3,529	4,744	5,135	5,135	3,700	4,585	4,525
Resources	0	0	0	0	0	0	0	0
Manufacturing	48	71	95	103	103	74	92	91
Nonmanufacturing	2,068	3,070	4,127	4,467	4,467	3,219	3,989	3,937
Trade	1,093	1,623	2,182	2,361	2,361	1,702	2,109	2,081
Services	713	1,059	1,423	1,540	1,540	1,110	1,375	1,357
Other	261	388	522	565	565	407	504	498
Government	261	388	522	565	565	407	504	498
Personal income (\$ million)*	169.2	251.3	337.8	365.6	365.6	263.4	326.4	322.2
Per Capita Income (\$ thousand)*	44.1	44.1	44.1	44.1	44.1	44.1	44.0	43.9

*Dollars inflated to the year 2000.

Table 44 shows the regional economic effects of planned construction for each alternative. Whereas Alternative A has a negligible impact on the four-county area, Alternative F directly and indirectly supports a sizeable workforce during the six-year period. For example, in 1985, the \$30 million in construction for that year (one-half for State Route 504) results in 410 construction jobs and 700 other jobs in the economy.

Economic Effects at the County Level

In Table 45, total employment is allocated to the four counties based on the estimated distribution in visitation and the employment estimates in Table 44 for 1990 through 2000. However, the construction impacts from Table 44 are not included. The 1990 estimates for several alternatives are little more than simulations since some of the facilities may not be completed until

after 1990. In addition, the actual number of visitors in 1990 may correspond more closely to estimates for later forecast years, indicating a level of demand in excess of available facilities. For purposes of simplification, the impacts of alternatives on counties will refer to the year 2000. The economic impacts are consistently higher in Lewis and Cowlitz Counties.

Cowlitz County experiences the largest employment gains under every alternative except A and E. Lewis County benefits from the Cowlitz County loss in E, which provides minimum west side access to the Monument. In Cowlitz County, total visitor related employment ranges from 975 in Alternative A to 4,057 in Alternative G in 2000. In Lewis County employment impacts range from 712 in Alternative C to 1,739 in Alternative E. Clark County impacts range from 94 to 81. Skamania County employment impacts for the same year extend from 95 to 205.

Table 44: Economic Impact of Construction By Alternative, 1985-1990

	1985	1986	1987	1988	1989	1990
Alternative A						
Construction (\$ mil.)	0.2	0.1	0.1	0.1	0.1	0.1
Construction jobs (number)	*	*	*	*	*	*
Total jobs (number)	*	*	*	*	*	*
Personal income (\$ mil.)	*	*	*	*	*	*
Alternative B						
Construction (\$ mil.)	8.9	5.9	3.7	3.0	3.5	3.3
Construction jobs (number)	120	80	40	30	40	30
Total jobs (number)	320	230	120	90	120	100
Personal income (\$ mil.)	11.9	8.8	4.9	4.1	6.1	5.1
Alternative C						
Construction (\$ mil.)	24.1	21.7	19.8	19.8	3.5	3.3
Construction jobs (number)	330	280	240	230	40	30
Total jobs (number)	890	810	720	690	120	100
Personal income (\$ mil.)	32.7	30.8	29.5	31.5	6.1	5.1
Alternative D						
Construction (\$ mil.)	27.6	24.0	21.3	21.7	5.6	5.3
Construction jobs (number)	380	310	260	250	60	50
Total jobs (number)	1,030	900	780	750	190	170
Personal income (\$ mil.)	37.6	34.1	32.0	34.3	9.2	8.6
Alternative D (Modified)						
Construction (\$ mil.)	27.6	24.0	21.3	21.7	5.6	5.3
Construction jobs (number)	380	310	260	250	60	50
Total jobs (number)	1,030	900	780	750	190	170
Personal income (\$ mil.)	37.6	34.1	32.0	34.3	9.2	8.6
Alternative E						
Construction (\$ mil.)	9.8	6.6	4.1	3.3	3.9	3.6
Construction jobs (number)	130	80	50	40	40	40
Total jobs (number)	350	230	150	120	120	130
Personal income (\$ mil.)	12.9	8.8	6.2	5.5	6.1	6.8
Alternative F						
Construction (\$ mil.)	30.0	25.2	21.5	20.3	21.3	20.9
Construction jobs (number)	410	320	260	230	220	210
Total jobs (number)	1,110	930	780	690	680	690
Personal income (\$ mil.)	40.6	35.2	32.0	31.5	33.7	35.9
Alternative G						
Construction (\$ mil.)	30.6	26.0	22.6	21.4	5.5	5.1
Construction jobs (number)	420	330	270	240	60	50
Total jobs (number)	1,130	960	810	720	190	170
Personal income (\$ mil.)	41.6	36.3	33.2	32.9	9.2	8.6

In reviewing these employment forecasts, it is important to note there will be construction employment as well. Construction employment range from negligible in Alternative A to 700-1,100 jobs per year for a period of 5 to 6 years in the mid and late 1980s. To some extent the projected growth in visitor related jobs will offset the loss of jobs associated with the completion of construction in the late 1980s and 1990s.

There is no steep up-trend in the employment impacts between 1985 and 2000. In Table 44 employment impacts in Alternatives A and B show some gradual expansion between 1985 and 2000. In Alternatives C, D, and D (Modified), employment actually declines because the termination of construction employment exceeds this gain in visitor industry employment. In Alternatives E through G, visitor industry employment gains exceed the termination of construction employment in 1990. To some extent this suggests that visitor industry related employment gains will offset construction employment losses after 1990.

One of the more difficult questions is which areas or smaller communities within the region are likely to be heavily impacted by this forecasted activity.

Table 46 shows direct visitor industry employment by county for each alternative and the number that would be expected to be employed in or near the Monument as opposed to established larger cities within these counties. These estimates were made from information which indicated that average visitor expenditures in or near Mount Rainier National Park represented about 40 percent of expenditures within the region (Beyers, 1970). Table 47 shows total visitor industry employment by county in or near the Monument. It is likely that the actual impacts would fall within the range of direct and total employment in the two tables, since some of the secondary impacts would occur away from the Monument.

Table 45: Employment Related to the Mount St. Helens National Monument By County, 1985-2000*

County	A	B	C	D	D (Modified)	E	F	G
Lewis								
1990	865	814	529	572	572	1,293	545	875
1995	1,004	943	613	664	664	1,499	632	1,014
2000	1,165	1,094	712	770	770	1,739	734	1,177
Cowlitz								
1990	724	1,601	2,786	3,014	3,014	1,183	2,625	2,220
1995	840	1,856	3,230	3,497	3,497	1,371	3,042	2,574
2000	975	2,153	3,748	4,057	4,057	1,591	3,530	2,987
Clark								
1990	106	131	71	76	76	165	102	135
1995	123	152	82	89	89	191	118	156
2000	143	176	95	103	103	222	138	181
Skamania								
1990	71	79	141	153	153	110	136	135
1995	82	91	164	177	177	128	158	156
2000	95	106	190	205	205	148	183	181
Total, 2000	2,378	3,529	4,745	5,135	5,135	3,700	4,585	4,526

* Excludes Construction Employment from Table 44. In this and subsequent tables employment is not rounded due to small numbers in some cases. That level of accuracy is not intended.

Table 46: Direct Visitor Industry Related Jobs in or Near Monument, 2000

Alternatives	A	B	C	D	D (Modified)	E	F	G
<u>County</u>								
Lewis	224	216	141	152	152	337	143	228
Cowlitz	188	426	745	803	803	308	686	579
Clark	27	35	19	20	20	43	27	35
Skamania	18	21	38	41	41	29	36	35
Total	458	698	943	1,016	1,016	716	891	878

Table 47: Total Visitor Industry Related Jobs in or Near Monument, 2000

Alternatives	A	B	C	D	D (Modified)	E	F	G
<u>County</u>								
Lewis	431	415	271	292	292	648	275	438
Cowlitz	362	819	1,433	1,544	1,544	592	1,319	1,113
Clark	52	67	37	38	38	83	52	67
Skamania	35	40	73	79	79	56	69	67
Total	881	1,342	1,813	1,954	1,954	1,377	1,713	1,688

These employment figures seem small at first glance; but they apply to smaller interior towns or areas near U.S. 12 and State Routes 504, 503, 30, 25, and others. One to several hundred employees could have substantial impacts on areas that may currently have less total employment than the jobs which will be created. Unfortunately there are no employment data on areas of this size. Impacts in or near the Monument discussed below will refer to direct employment only in Table 46. It should be kept in mind that direct impacts will be conservative; some portion of indirect (multiplier) employment will occur in or near the Monument as well.

In Alternatives A, B, and E impacts in or near the Monument are relatively small (458 to 716 jobs). The remaining alternatives employ from 878 to 1,016 in the year 2000 in or near the Monument.

As suggested earlier, these employment impacts seem small, but they are not small in relation to the size of the communities in or near the Monument. For comparison purposes, it might be noted that the large multimillion dollar highway destination complex recommended by the Harrison Price report (Harrison Price et al, 1983) would employ less than 100 people by 1990. Hence, visitor activities that would support one to several hundred employees in communities in or near the Monument represent considerable economic opportunities for interior communities in the Mount St. Helens region.

The number of direct jobs related to the Monument also seems small in terms of total employment in the region. Monument related direct employment in Alternatives D and D (Modified), however, represents one-third of the region's direct visitor industry employment and a substantial part of the region's visitor industry growth by 1990. (Harrison Price, et al 1983). In addition,

Monument related basic employment gains by 1990 are exceeded in only by the machinery industry by 1990.

In this context, Monument related basic employment is one of the few bright spots in the region's economic outlook. It is expected to occur in areas of considerable economic need, the region's slower growth counties. This is a significant regional development, since the overall regional economic forecasts indicate that most of the region's basic growth will be concentrated in Clark County.

General Social Effects

Social impacts by alternative relate primarily to projected growth in Monument visitation to the year 2000, and the projected distribution in visitation among the four major Monument access routes. These projections in visitation by alternative are presented in Table M-1, Appendix M. The four major Monument access routes are described in more detail in Chapter III, "Socioeconomic Conditions:" the northern route (primarily U.S. 12), the western route (primarily State Route 504, the Spirit Lake Memorial Highway), the southwestern route (primarily State Route 503), and the southern route (primarily County Roads 135, 71 and 51--the "Wind River Road").

Three categories of social effects are identifiable by alternative by access route: the availability of visitor services (including restaurants, overnight facilities, gas stations, emergency services); contrasts in local lifestyles and values; and changes in land uses, plans, and zoning. Future demands for visitor services generally increase with numbers of visitors, especially during peak-use summer weekends. Inadequacies in visitor services are

generally expected along the various road corridors, depending upon future levels and distribution of visitation projected by alternative. The distribution of increased future Monument visitation will also stimulate the in-migration of people with contrasting lifestyles and values. Rural residents ("old-timers") already living along the access routes will continue to depend upon local forest resources for both employment and traditional dispersed recreational experiences. New residents ("newcomers") will often come from more urban/suburban backgrounds, placing particular value on Monument-related recreational experiences. This group will include "entrepreneurs" that are interested in tourist-related commercial development. These contrasting views in local lifestyles and values increases potentials for polarization over land uses and economic development. Private land available for increased residential and commercial development is limited, since the road corridors generally follow valley bottoms that are surrounded by National Forest and large commercial timberlands. Competition for tourist-related development of this limited land base can in turn lead to either relatively unregulated (strip) development, or increase the needs for land use regulation. The feasibility of implementing land use plans and zoning depends in part on the current status of county level planning and zoning (described in Chapter III).

Social Effects Common to All Alternatives

Visitor Center use is expected to increase in all alternatives by almost 200 percent by the year 2000. This use will shift to the new Visitor Center at Silver Lake and will put significant demands upon visitor services along Interstate Highway 5 and the lower end of SR 504 (the Spirit Lake Memorial Highway) (the western corridor). Significant private sector development will be needed to meet these demands, which increases contrasts in local lifestyles and values. Limited land use regulation will probably be needed to guide development and reduce potentials for conflicts among varying lifestyles and values.

Monument visitation along the southern corridor (the Wind River Road) is also projected to increase by about 80 percent in Alternative A, to over 300 percent in Alternatives C, D, D (Modified), E, and G. However, actual projected use levels account for less than 5 percent of total visitation in the year 2000, so demands for visitor services are expected to be accommodated without significant private sector development. Consequently, significant contrasts in local lifestyles and values will probably be avoided, and additional land-use regulation will not be called for.

Social Effects By Alternative

Alternatives A, B, and E have similar projected distributions in road corridors. The heaviest use will be concentrated along the northern (U.S. 12) route (between about 35 and 60 percent of total use in the year 2000), followed by the

southwestern (SR 503) route (between about 25 and 40 percent of total use). Consequently, social impacts will be concentrated primarily along these two routes. Visitor services are currently marginal along these corridors, and shortages are expected by the year 2000, especially on summer weekends. Demands for visitor services along the western (SR 504) corridor will be partially offset by expected development near the Visitor Center at Silver Lake. Contrasts in lifestyles and values between "old timers, newcomers, and entrepreneurs" could increase potentials for social polarization along the northern and southwestern routes, particularly over economic growth on limited available land. Relatively unregulated commercial and residential development could occur along these corridors without limited land use regulation (such as limited zoning).

Alternatives C, D, D (Modified), and F tend to concentrate projected use along the western (SR 504) road corridor (growth in visitation ranges from about 115 percent to over 200 percent increases by the year 2000). Consequently, visitor services will be overextended for most of each summer without substantial development of both public and private support services. This development will increase contrasts in local lifestyles and values, increasing potentials for polarization. Competition between tourist oriented development and more traditional resource-based uses (primarily commercial timber management) may lead to demands for increased land use regulation. Visitor use along the northern (U.S. 12) road corridor grows from about 3 to 30 percent in these alternatives by the year 2000, probably not enough to stimulate significant social effects. Use of the southwestern corridor more than doubles under Alternative F (about 115 percent), possibly stimulating social effects similar to those described above for Alternatives A, B, and E.

Alternative G levels of visitation will probably stimulate social effects similar to those described for Alternatives C, D, and F, except that the extension of SR 504 will tend to distribute high levels of use relatively more evenly among the northern (U.S. 12), western (SR 504), and southwestern (SR 503) road corridors. Thus this alternative will require even greater increases in visitor services along all these three corridors, increasing the possibilities for polarization in lifestyles and values, and increasing the possibilities for polarization lifestyles and values, and increasing demands for more extensive land use regulation.

Gasoline Consumption by alternative is related to both energy requirements for Monument visitors and the demand for gas stations along the access corridors. Gasoline consumption by visitors is based on projected visitor use (year 2000) and is estimated to be about 3.0 million gallons in Alternative A (4.2 gallons per visit), 4.1 million gallons in B (3.5 gallons per visit), 4.8 million gallons in Alternatives C, D, and D Modified (2.8 gallons per visit), 4.5 million gallons in E (4.0 gallons per visit), 5.5 million

gallons in F (3.2 gallons per visit), and 6.0 million gallons in G (3.4 gallons per visit).

Effects on Minorities, Women, and the Economically Disadvantaged

There are other benefits from the economic impacts related to the Monument. These will be a wide range of opportunities for youth, minorities, women and the economically disadvantaged.

Many of the jobs will be entry level in transportation, restaurants, motels and other services for those unskilled or being retrained. Many of the jobs will be available in the summer months for youth from low income families. Many of the construction jobs will be in occupations which could employ out-of-work forest products workers. In addition, managerial opportunities will be available. Small business opportunities will also emerge, especially in the interior areas. The range of opportunities could be quite broad for women, minorities and the economically disadvantaged, especially in areas that have traditionally experienced slow growth or decline.

SUMMARY OF THE NATURE OF IMPACTS OF HUMAN ACTIVITIES

Research and Science

The magnitude and duration of effects described below are variable. In general, the effects of weak administrative systems are reversible in that improved administration systems can increase effective communication between Monument management and the scientific community. Without an adequate interpretive program, the public may underestimate benefits gained from its investment in Monument research and management. An inadequate administrative structure for protecting scientific values and research plots will result in natural processes and features being impeded substantially and irreversibly. This occurs where ecosystem succession and landscape development are altered. For example, inadvertent or intentional introduction and removal of organisms for research and recreational activities can affect community succession irreversibly. Such impacts would occur cumulatively with levels of development.

Recreation and Transportation

The unavoidable adverse effects of construction activities will be smoke, dust, noise, the sight of construction activity, and the presence of construction equipment on Monument roadways.

These impacts can only be partially mitigated by regulation.

Development of new roads, trails, and associated trailheads and parking areas will channel visitor use into selected areas of the Monument that have not previously been subjected to high levels of visitors.

This will change the Recreation Opportunity Spectrum by reducing the amount of area in the Primitive and Semi-primitive classes.

Construction of permanent interpretive, management, and maintenance facilities will in some cases establish man-made structures on lands that now are naturally vegetated and populated by native faunal species. Buildings and utilities will replace these biotic components of the environment and alter the natural scene.

Cultural Resources

Cultural resources are non-renewable. As such, impacts from implementing any of the alternatives represent a significant and permanent resource commitment. Cultural resources can be impacted directly by project activities, or impacts can be the indirect result of a project or of implementing an alternative. Indirect impacts could occur from increased visitor access to areas, such as caves or volcano sites, where "souvenir collecting" could occur. The collection of archaeological and historical items in the National Forest without a permit is illegal. Changes in the natural, historic, and archeological resources of the Monument that might occur as the result of implementing an alternative are classified as irreversible or irretrievable on the basis of possible future restoration of altered conditions.

Socioeconomic Conditions

Both direct and total visitor industry jobs (Tables 42, 43, 44, 46, and 47) are generated by visitor expenditures at private section, Monument-related enterprises whose development is stimulated by the operation of any given alternative. Thus, these jobs are generally both long term and cumulative. The jobs are cumulative because construction of any alternative occurs in phases (Appendix J). Construction jobs (Table 44) tend to be of short duration and are not cumulative since they end with the completion of each construction phase. As identified above, social effects accompany economic growth and are also long term and cumulative.

V. List of Preparers

V. LIST OF PREPARERS

Contributors to this plan are organized into three levels of responsibility. The management steering committee that continues to provide broad direction and review, the interdisciplinary team that has prepared the plan, and resource specialists that have contributed specialized input, review, and technical assistance.

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VI. List of Agencies, Organizations and Persons to whom Copies of Statement are sent.



Recipients of the Final Environmental Impact Statement for the Comprehensive Management Plan are listed below.

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Advisory Council on Historic Preservation	Duval Corporation
The American Alpine Club	Eastern Lewis Safety Council
American Forestry Association	Eastern Washington University
American West Magazine	Department of Geology
Andrew's Concession	Dr. Jeremy Anderson
Arizona State University	Dr. Robert Quinn
Audubon Society	Economic Development Council
Black Hills	Economic Research Associates
North Cascades	William Lee
Seattle	Ecosystems, Inc.
Tahoma	The Enterprise
Vancouver	Eugene Register Guard
Western Regional Office	Evans Products
Willapa Hills	Ft. Steilacoom Community College
B&B Logging, Inc.	Fort Vancouver Library
Backcountry Horsemen	Four Runners 4-Wheel Drive Club
Backcountry Horsemen of Washington	Friends of the Earth
Battle Ground Community Library	Friends of the Snohomish R. Delta
Broughton Lumber Company	Good Sam Club-Washington
Burlington Northern, Inc.	Grays Harbor Geo. & Gem. Soc.
George Raymond	Hazel Dell Community Library
Burlington Northern--Timberlands, Inc.	Hope Grange No. 155
Caffal Brothers Forest Products, Inc.	Industrial Forestry Assn.
Camas-Washougal Historical Society	International Paper Company
The Cascadians	Izaak Walton League of America
Castle Rock Public Library	K. C. Publications
Cathlamet Library	Kalama Public Library
Central Library - Portland	Kansas City, Linda Hall Library
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VII. Appendices

Table of Contents

<u>Appendix</u>	<u>Subject Description</u>	<u>Page</u>
A.	The Monument Act	211
B.	Biophysical Carrying Capacity	221
C.	Research Alternatives	239
D.	Alternatives by Management Concept Areas	243
E.	Interpretive Themes	289
F.	Alternative Access Proposals, Coldwater Lake and Johnston Ridge	293
G.	Recreation Opportunity Spectrum	295
H.	Air Traffic Restriction	309
I.	Description of Models Used	311
J.	Estimated Development Schedule and Costs for Alternative D	313
K.	Fire Management Strategy	325
L.	Expected Visitor Use Study	327
M.	Expected Visitation by Road Corridors	335
N.	Public Involvement and Comments	337
O.	References	435
P.	Glossary	441
Q.	Index	447

Appendix A

PUBLIC LAW 97-243—AUG. 26, 1982

96 STAT. 301

Public Law 97-243
97th Congress

An Act

To designate the Mount St. Helens National Volcanic Monument in the State of Washington, and for other purposes.

Aug. 26, 1982
[H.R. 6530]

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

ESTABLISHMENT OF NATIONAL VOLCANIC MONUMENT

SECTION 1. (a) In furtherance of the purposes of this Act, certain lands within and adjacent to the Gifford Pinchot National Forest in the State of Washington, which comprise approximately one hundred and ten thousand acres, as generally depicted on a map entitled "Mount St. Helens National Volcanic Monument, August 1982", are hereby designated as the Mount St. Helens National Volcanic Monument (hereafter in this Act referred to as the "Monument").

Mount St.
Helens National
Volcanic
Monument,
Wash.
Designation.
16 USC 431 note.

(b)(1) Not later than six months after the date of enactment of this Act, the Secretary of Agriculture (hereafter in this Act referred to as the "Secretary") shall file a map and a legal description of the Monument established under subsection (a) with the Committee on Energy and Natural Resources of the United States Senate and the Committees on Agriculture and on Interior and Insular Affairs of the United States House of Representatives. Such map and description shall have the same force and effect as if included in this Act. Such map and description shall be on file and available for public inspection in the office of the Forest Supervisor, Gifford Pinchot National Forest and in the office of the Chief of the Forest Service, Department of Agriculture.

Map and
description;
filing with
congressional
committees.

(2) The Secretary may correct clerical and typographical errors in the legal description referred to in paragraph (1), and the Secretary may, from time to time, make minor revisions of the boundary of the Monument. Such minor boundary revisions may be made by the Secretary only after publication of notice of the proposed revision in the Federal Register and after submission of notice thereof to the committees referred to in paragraph (1). Such notice shall be published and submitted at least 60 days before the revision is made. Notice of final action regarding such revision shall also be published in the Federal Register.

Minor boundary
revisions.

Notice:
publication
in Federal
Register.

EXTENSION OF NATIONAL FOREST BOUNDARY

SEC. 2. (a) The exterior boundary of the Gifford Pinchot National Forest is hereby extended to include all lands and waters within the boundaries of the Monument. Lands and interests therein acquired pursuant to section 3 shall become national forest system lands.

(b) For the purposes of section 7(a)(1) of the Land and Water Conservation Fund Act of 1965 (78 Stat. 897; 16 U.S.C. 4601-4 through 4601-11), the boundary of the Gifford Pinchot National

16 USC 4601-9.

Forest, as modified by this section, shall be treated as if it were the boundary of that forest on January 1, 1965.

ACQUISITION

SEC. 3. (a) The Secretary shall acquire all lands and interests in lands within the boundaries of the Monument by donation, exchange in accordance with this Act or other provisions of law, or purchase with donated or appropriated funds, except as provided in subsection (c) and except that the Secretary may acquire mineral and geothermal interests only by exchange. It is the sense of the Congress that in the case of mineral and geothermal interests such exchanges should be completed within one year after the date of enactment of this Act. Any lands owned by the State of Washington or any political subdivision thereof may be acquired only by exchange. Those mining claims in the Green River-Polar Star area shall not be acquired without the consent of the owner.

(b) In recognition of the rapidly deteriorating nature of much of the timber in the Monument, any timber acquired pursuant to this section shall be valued for purposes of any acquisition under subsection (a) at an amount not less than the fair market value of such timber on July 1, 1982.

(c)(1) Notwithstanding any other provision of law, the Secretary shall exchange lands and interests in lands referred to in paragraphs (2) and (3) in accordance with the provisions of this subsection. With respect to the lands and interests in lands referred to in paragraphs (2) and (3), the Secretary may exercise the authorities of subsection (a) only to the extent necessary to acquire any lands or interests in lands which are not acquired pursuant to the provisions of this subsection.

(2)(A) If Burlington Northern Incorporated offers to the United States the following described lands and interests therein, except mineral and geothermal interests, the Secretary shall accept such lands and interests therein (for the purposes of this Act, the term "Burlington Northern Incorporated" shall include any subsidiary of that corporation):

Township 7 North, Range 6 East:	
Section 1: Lots 1, 2, and 3, south half northeast quarter, and north half southeast quarter	Acres
Township 8 North, Range 5 East:	810.11
Section 21: All	640.00
Section 23: All	640.00
Section 25: All	640.00
Section 27: All	640.00
Section 29: All	640.00
Section 31: All fractional	623.52
Section 33: All	640.00
Section 35: All	640.00
Township 8 North, Range 6 East:	
Section 5: All fractional	480.44
Section 7: All fractional	637.58
Section 9: All	640.00
Section 15: West half	320.00
Section 17: All	640.00
Section 19: All fractional	631.76
Section 21: All	640.00
Section 27: West half	320.00
Section 29: All	640.00
Section 31: All fractional	630.44
Section 33: All	640.00

Mineral and
geothermal
interests,
completion
date.

Timber,
evaluation.

Burlington
Northern
Incorporated.

Township 9 North, Range 5 East:	Acres
Section 25: All	640.00
Township 9 North, Range 6 East:	
Section 5: Lot 1, southeast quarter northeast quarter, and southeast quarter	240.41
Section 9: All	640.00
Section 17: All	640.00
Section 21: All	640.00
Section 29: All	640.00
Section 31: All fractional	639.52
Section 33: All	640.00

(B) Upon acceptance of title by the United States to such lands and interests therein, the Secretary shall convey to Burlington Northern Incorporated all right, title, and interest of the United States to the following described national forest system lands and interests therein, except mineral and geothermal interests:

Township 7 North, Range 6 East:	Acres
Section 4: All fractional	680.88
Section 6: All fractional	670.04
Section 10: All	640.00
Section 22: All	640.00

(3XA) If the Weyerhaeuser Company offers to the United States the following described lands and interests in lands, except mineral and geothermal interests, the Secretary shall accept such lands and interests therein:

Weyerhaeuser
Company.

Township 9 North, Range 3 East:	Acres
Section 1: South half	320.00
Township 7 North, Range 4 East:	
Section 25: Northwest quarter northwest quarter	40.00
Township 8 North, Range 4 East:	
Section 2: All fractional	494.28
Township 9 North, Range 4 East:	
Section 1: All fractional	658.52
Section 3: South half northeast quarter, and south half	400.00
Section 4: Lots 2 and 3, south half north half, and south half	560.30
Section 5: South half northeast quarter, and south half	400.00
Section 6: Lot 7, southeast quarter southwest quarter, and south half southeast quarter	155.38
Section 7: All fractional	623.44
Section 8: All	640.00
Section 9: All	640.00
Section 11: All	640.00
Section 13: All	640.00
Section 15: East half east half	160.00
Section 16: North half northwest quarter	80.00
Section 17: North half northeast quarter	80.00
Section 22: A portion of east half and east half west half	271.±
Section 23: All	640.00
Section 24: All	640.00
Section 25: All	640.00
Section 26: North half, southeast quarter, and a portion of the southwest quarter	572.±
Section 27: A portion of the northeast quarter	66.±
Section 35: A portion of the northeast quarter	105.±
Township 10 North, Range 4 East:	
Section 25: Southeast quarter	160.00
Township 9 North, Range 5 East:	
Section 5: All fractional	640.32
Section 6: All fractional	679.52
Section 7: Lots 1 and 2, northeast quarter, and east half northwest quarter	340.57
Section 8: North half	320.00
Section 17: All	640.00
Section 19: All fractional	694.72

Township 10 North, Range 5 East:	
Section 5: A portion of the east half northeast quarter northwest quarter and east half	Acres 233.±
Section 17: Northeast quarter northeast quarter, and a portion of the northeast quarter and east half southeast quarter	145.±
Section 19: A portion of the south half southeast quarter	20.±
Section 20: A portion of the south half south half	60.±
Section 21: East half, east half northwest quarter, northwest quarter northwest quarter, northeast quarter southwest quarter, and a portion of the southwest quarter northwest quarter, northwest quarter southwest quarter	523.±
Section 29: All	640.00
Section 30: Northeast quarter, south half, and a portion of the east half northwest quarter	550.±
Section 31: All fractional	688.55
Section 32: All	640.00
Section 33: North half	320.00
Township 11 North, Range 5 East:	
Section 32: Lots 1 and 2	16.43

(B) Upon acceptance of title by the United States to such lands and interests therein, the Secretary shall convey to Weyerhaeuser Company all right, title, and interest of the United States to the following described national forest system lands and interests therein, except mineral and geothermal interests:

Township 10 North, Range 5 East:	
Section 6: Mineral survey	Acres 193.96
Section 7: Mineral survey	12.65
Township 11 North, Range 5 East:	
Section 28: Mineral survey	24.89
Section 29: Portion of mineral survey 837	5.20
Township 8 North, Range 4 East:	
Section 29: All	640.00
Section 30: All fractional	604.07
Section 32: All fractional	702.99
Township 13 North, Range 3 East:	
Section 6: All fractional	652.25
Township 4 North, Range 3 East:	
Section 10: All	640.00
Section 16: All	640.00
Section 20: All	640.00

(4) Except as provided in paragraph (7), the instruments of conveyance respecting the lands and interests exchanged under this subsection may contain such reservations as may be agreed upon by the Secretary and the Weyerhaeuser Company or the Secretary and Burlington Northern Incorporated, as the case may be.

Exchanges,
completion
date.

(5) It is the sense of the Congress that the exchanges authorized pursuant to this subsection should be completed within ninety days after the date of the enactment of this Act. The Secretary shall use the authorities of subsection (a) if the exchanges authorized by this subsection are not completed within a reasonable time after the expiration of such ninety day period.

Values of
lands or
interests,
reduction.

(5) The Secretary shall certify in writing that to his satisfaction, at the time of conveyance, there has been no reduction in the values of the lands or interests therein caused by a direct action on the part of the current landowner below that which formed the basis for the exchanges provided for in this section. If the Secretary finds that a reduction in the value of the lands or interests therein has occurred caused by direct action on the part of the current landowner, the Secretary shall not carry out the exchange for those lands or interests so affected under this subsection, and acquisition of those lands and interests shall be undertaken by the Secretary in accordance with the provisions of subsection (a).

(7) The provisions of this subsection (except for the provisions of paragraphs (5) and (6)) do not authorize the exercise by the Secretary of the power of eminent domain, and any exchange of the lands or interests in lands carried out under this subsection shall be pursuant to a voluntary agreement entered into between the Secretary and Burlington Northern Incorporated, or the Secretary and Weyerhaeuser Company, as the case may be, with the full consent of each of the parties to such agreement.

(d) Nothing in this Act shall affect any prior contractual obligation of Burlington Northern Incorporated or Weyerhaeuser Company regarding lands owned by them and included in an exchange pursuant to this Act nor shall such obligations be transferred pursuant to this legislation to the United States.

(e) Any terms, conditions, or obligations imposed by the Act of July 2, 1864 (13 Stat. 865), as amended, that apply to lands and interests in lands exchanged under this Act by Burlington Northern Incorporated shall apply in equivalent manner to lands and interests in lands obtained by Burlington Northern Incorporated under this Act.

(f) Notwithstanding any other provision of law, the Secretary shall only be required to prepare an environmental assessment of any exchange of mineral or geothermal interests authorized by this Act. In the course of preparing the assessment, the Secretary shall conduct at least one public hearing in the vicinity of the mineral or geothermal interests to be conveyed by the United States in such exchange. Any exchange of mineral or geothermal interests may be made by the Secretary only after providing the committees referred to in section 1 of this Act thirty days' notice of his intention to do so.

Environmental
assessment.

Hearing.

ADMINISTRATION

SEC. 4. (a) The Secretary acting through the Forest Service shall administer the Monument as a separate unit within the boundary of the Gifford Pinchot National Forest, in accordance with the appropriate laws pertaining to the national forest system, and in accordance with the provisions of this Act.

(b)(1) The Secretary shall manage the Monument to protect the geologic, ecologic, and cultural resources, in accordance with the provisions of this Act allowing geologic forces and ecological succession to continue substantially unimpeded.

(2) The Secretary may take action to control fire, insects, diseases, and other agents that might (A) endanger irreplaceable features within the Monument or (B) cause substantial damage to significant resources adjacent to the Monument.

(3) Nothing in this Act shall prohibit the Secretary from undertaking or permitting those measures within the Monument reasonably necessary to ensure public safety and prevent loss of life and property.

(c) The Secretary shall permit the full use of the Monument for scientific study and research, except that the Secretary may impose such restrictions as may be necessary to protect public health and safety and to prevent undue modification of the natural conditions of the Monument.

Scientific
study and
research.

(d) In order to protect the significant features of the Monument, reduce user conflicts, and ensure visitor safety, the Secretary is authorized to control times and means of access and use of the Monument or parts thereof: *Provided*, That nothing in this section

shall be construed as to prohibit the use of motorized vehicles, aircraft or motorboats for emergency and other essential administrative services, including those provided by State and local governments, or when necessary, for authorized scientific research.

Recreational
and interpretive
facilities.

(e)(1) The Secretary shall provide for recreational use of the Monument and shall provide recreational and interpretive facilities (including trails and campgrounds) for the use of the public which are compatible with the provisions of this Act, and may assist adjacent affected local governmental agencies in the development of related interpretive programs.

(2) Except for roads needed for recreational and interpretive purposes as may be recommended by the comprehensive management plan submitted in accordance with the provisions of subsection (i), roads or other developed facilities within the Monument should be located generally in areas which were developed prior to the 1980 eruption.

(f) Subject to valid existing rights, all Federal lands within the Monument are hereby withdrawn from all forms of entry or appropriation or disposal under the public land laws, and from location, entry, and patent under the United States mining laws, and from disposition under all laws pertaining to mineral and geothermal leasing and all amendments thereto. Any mining activity carried out pursuant to valid existing rights shall be conducted in accordance with applicable Federal and State law.

Timber
harvesting,
exceptions.

(g) Timber harvesting shall not be permitted on Federal lands within the Monument except (1) for timber salvage contracts awarded by the Forest Service before the date of enactment of this Act, and (2) to the minimum extent necessary to control fire, insects, diseases and other agents that would endanger irreplaceable features within the Monument, cause substantial damage to significant resources adjacent to the Monument, or endanger public safety. National forest system roads within the Monument may be used to the extent necessary for such timber harvesting activities. If the Secretary intends to carry out timber harvesting activities under clause (2), the Secretary shall advise the Committee on Energy and Natural Resources of the Senate and the Committees on Agriculture and Interior and Insular Affairs of the House of Representatives of the action the Secretary intends to take at least 30 days in advance of initiating action to contract for such sales, except that in emergency situations the Secretary shall submit a report to such Committees, describing the action taken within 30 days thereafter.

Notification
or report to
congressional
committees.

Hunting and
fishing zones,
designation.

(h) The Secretary shall permit hunting and fishing on lands and waters within the Monument in accordance with applicable Federal and State law, except that the Secretary may designate zones within the Monument where, and establish periods when, no hunting or fishing shall be permitted for reasons of public health and safety, the protection of resources, scientific research activities, or public use and enjoyment. Except in emergencies, any regulations issued by the Secretary under this subsection shall be put into effect only after consultation with the appropriate State agencies responsible for hunting and fishing activities. Nothing in this subsection shall be construed as affecting the jurisdiction or responsibilities of the State of Washington with respect to wildlife and fish within the Monument.

Management
plan, sub-
mittal to
congressional
committees.

(i) Within three years after the date of enactment of this Act, the Secretary shall submit to the committees referred to in section 1(b), a detailed and comprehensive management plan for the Monument.

The initial Monument management plan may be expressed as an amendment to the October 1981 Mount St. Helens Land Management Plan. Subsequent Monument plans shall be integrated with and periodically revised as a component of the Gifford Pinchot land management planning process. The plan shall include but not be limited to:

- (1) measures for the preservation of the natural geologic and ecologic processes and integrity of the resources;
- (2) indications of types, locations, and general intensities of development and access routes associated with the public understanding, use, and enjoyment of the area, including anticipated timetables and costs;
- (3) identification of, and implementation plans for, visitor carrying capacities of the area; and
- (4) indications of any potential modifications of the external boundaries of the area, and the reasons therefor.

MANAGEMENT OF ADJACENT FEDERAL LANDS

SEC. 6. Nothing in this Act shall be construed as authorizing or directing the establishment of protective perimeters or buffer zones around the Monument for the purpose of precluding activities outside the Monument boundary which would otherwise be permitted under applicable law. Nothing in this Act shall be construed as limiting the existing authority of the Secretary to take actions on Federal lands adjacent to the Monument necessary to protect public health and safety in emergencies involving volcanic activity.

SCIENTIFIC ADVISORY BOARD

SEC. 7. (a) There is hereby established the Mount St. Helens Scientific Advisory Board (hereinafter referred to as the "Board"). The Secretary shall consult with and seek the advice and recommendations of the Board with respect to—

- (1) the measures needed to protect and manage the natural and scientific values of the Monument; and
- (2) the administration of the Monument with respect to policies, programs, and activities which are specifically intended to retain the natural ecologic and geologic processes and integrity of the Monument.

The Board may make recommendations to the Secretary in regard to new research opportunities which may exist within the Monument designed to gain scientific information for future interpretation and enjoyment by visitors to the Monument. No recommendation by the Board shall be binding upon the Secretary.

(b) The Board shall be composed of nine members, who shall be individuals with recognized professional standing in appropriate scientific disciplines, as follows:

- (1) three members appointed by the Secretary (one of whom shall be a professional employee of the Forest Service);
- (2) two members appointed by the Secretary of the Interior (one of whom shall be a professional employee of the United States Geological Survey);
- (3) two members appointed by the Governor of the State of Washington from among professional employees of the State of Washington; and

Mount St.
Helens Scien-
tific Advisory
Board.
Establishment.

New research
opportunities,
recommendations.

Membership.

Terms of
office.

(4) two members appointed by the Chairman of the National Science Foundation.

(c) Each member shall be appointed to serve for a term of three years, except that one of the initial appointees of each appointing official shall serve an initial term of four years, one of the initial appointees of each appointing official shall serve an initial term of two years, and one of the initial appointees of the Secretary shall serve an initial term of one year.

(d) The members of the Board shall be appointed within ninety days of the date of enactment of this Act. The members of the Board shall, at their first meeting, elect a chairman.

(e) The Secretary, or a designee, shall from time to time, but at least annually, meet and consult with the Board on matters relating to the protection of the Monument and potential and ongoing research programs within the Monument.

(f) Members of the Board shall serve without compensation as such, but the Secretary is authorized to pay, upon vouchers signed by the Chairman, the expenses reasonably incurred by the Board and its members in carrying out their responsibilities under this Act.

(g) Any vacancy in the Board shall be filled in the same manner in which the original appointment was made.

Termination.

(h) The Board shall terminate ten years from the date of its first meeting.

EXPENDITURE OF CERTAIN REVENUES FROM GIFFORD PINCHOT NATIONAL FOREST BY SKAMANIA COUNTY, WASHINGTON

SEC. 8. (a) Notwithstanding the provisions of the last paragraph under the heading "Forest Service" of the Act of May 23, 1908 (16 U.S.C. 500), and of section 13 of the Act of March 1, 1911 (16 U.S.C. 500), of the amount which is paid under such provisions to the State of Washington with respect to Gifford Pinchot National Forest, to be expended for the benefit of Skamania County—

(1) not less than fifty percent shall be expended for the benefit of the public schools of Skamania County, as Skamania County may specify, and

(2) the remainder shall be expended for the benefit of public roads and other public purposes of Skamania County, as Skamania County may specify.

(b) Subsection (a) shall not apply to any amount paid by the Secretary of the Treasury under the provisions of law referred to in subsection (a) at the end of any fiscal year ending before the date of the enactment of this Act.

AUTHORIZATION OF APPROPRIATIONS

SEC. 9. There is hereby authorized to be appropriated to carry out the provisions of this Act, not to exceed \$12,000,000 for the fiscal year beginning October 1, 1982, and such sums as may be necessary for each fiscal year thereafter.

Approved August 26, 1982.

LEGISLATIVE HISTORY—H.R. 6530 (S. 2133):

HOUSE REPORTS: No. 97-836, Pt. I (Comm. on Interior and Insular Affairs), Pt. II (Comm. on Agriculture) and No. 97-748 (Comm. of Conference).

SENATE REPORTS: No. 97-481 accompanying S. 2133 (Comm. on Energy and Natural Resources) and No. 97-523 (Comm. of Conference).

CONGRESSIONAL RECORD, Vol. 128 (1982):

July 19, considered and passed House.

July 21, considered and passed Senate, amended.

Aug. 13, Senate agreed to conference report.

Aug. 17, House agreed to conference report.



Appendix B

BIOPHYSICAL CARRYING CAPACITY, SENSITIVITY, AND MAXIMUM DEVELOPMENT CATEGORIES

Mount St. Helens National Volcanic Monument was created by an Act that states, in part, "The Secretary (of Agriculture) shall manage the Monument to protect the geologic, ecologic, and cultural resources . . . allowing geologic forces and ecological succession to continue substantially unimpeded" (Section 4, b1). It states that uses of the Monument such as research and recreation must be compatible with the above provision. It also states that the Comprehensive Management Plan (CMP) shall include "measures for the preservation of the natural geologic and ecologic processes and integrity of the resources."

A team of resource specialists and researchers was convened to create a test for assuring compliance with the law. Called the Biophysical Team, it included Loren Herman, soils; Deigh Bates, hydrology; Tom Reilly, geology; Dale Brockway, ecology; Joseph Means, research; and Mary Walter, wildlife. Other specialists called upon for assistance were Becky Hutchins, engineering; Francisco Valenzuela and David Seesholtz, recreation; and Alice Purcell and Frank Roberts, wildlife.

Initially, this concept was agreed upon: Biophysical Carrying Capacity equals the maximum level of human impact possible while remaining within the intent of the Act for "preservation of the natural geologic and ecologic processes and integrity of the resources."

This process followed:

1. Biophysical Areas, which are subdivisions of major subcharacter landtypes, were established and mapped (Figure 5, Chapter II). They are generally homogeneous in terms of significant biological and physical features and processes.

2. In each Biophysical Area, significant physical and biological features and processes were identified and placed in a hierarchy based on sensitivity to human disturbance (Table 2); a 1 was rated very low in sensitivity, a 5 very high. The likelihood of a disturbance significantly impeding natural processes or impacting features was the determinant of sensitivity. Also taken into account were the size and uniqueness of a feature or process. Similar features and processes were rated equally whenever appropriate in all Biophysical Areas (Table 3). In addition to providing assurance that various approaches to managing the Monument are legal, this rating scale will also be useful to managers during implementation of the approved plan. It indicates the relative care which will be required in the design and

construction of development in sensitive portions of the Monument. Since the goal is to preserve natural features and processes in all of the Monument, the emphasis in this rating system is on relative sensitivity.

3. Nine potential levels of intensity were then established for development in the Monument. Called Development Categories (Table 4), they range from Closed to Most Uses (Category 1) to Open to All Uses, including rock pits (Category 9).

4. Each Biophysical Area was then assigned a Maximum Development Category (MDC) based on the biophysical sensitivity ratings of its features and natural processes. This step is documented in the rationale for assigning MDCs in Table 6. An area's Maximum Development Category, with adjustments described below, is its Biophysical Carrying Capacity.

The Biophysical Carrying Capacity seldom matches any Development Category exactly because of the large size and diversity of Biophysical Areas. For this reason, some MDCs were fine-tuned by specifying exceptions and conditions. For example, the bat caves located in the Cave Basalt Biophysical Area, qualify for and will be managed in accordance with Development Category 1 even though the overall Biophysical Area received an MDC rating of 4.

Modifications can also occur if effects on sensitive features and processes have already occurred or can be avoided or mitigated. If permanent long-term changes have already occurred on an area, such as some areas disrupted by the Corps of Engineers' activities, modifications to the assigned Management Development Category may occur. The Debris Avalanche Biophysical Area was assigned an MDC of 2, which does not permit the construction of new roads. The prohibition was based on the judgment that severe disruption of channel building processes and disruption of unique stratigraphy would result from road building. However, COE activities around the outflow of Coldwater Lake and the road constructed up South Coldwater Creek to access the Spirit Lake control tunnel disrupted those areas. For that reason, these localized areas may be managed at a higher MDC.

Biophysical Areas, features, and processes were defined at a general level of resolution. Portions of each area probably have higher or lower carrying capacities than that of the whole. Some are explicitly discussed in Table 5. Because of this, thorough ground checking by specialists will be required at

early stages of project planning. This will not only assure that the Biophysical Carrying Capacity of small areas are not exceeded, it will improve the location of developments by designating portions of an area where impacts will create the least disturbance.

Geological and ecological features and processes on the Monument are changing rapidly. As the first organisms begin to get a foothold on new substrates, for example, the sensitivity of that area may increase. Conversely, as easily-eroded deposits are removed from hillsides and vegetation blankets an area, sensitivity to disturbance will diminish. Because of this, the Biophysical Team recommended that the process described above be repeated within five years after the approval of this plan.

Off-Road Vehicle Biophysical Carrying Capacities

Off-Road Vehicle (ORV) Biophysical Carrying Capacities essentially eliminate non-snow ORV's throughout most of the Monument. Over-snow ORV's are acceptable outside deer and elk winter range when the Monument Manager determines that snow conditions will prevent resource damage. Non-snow ORVs are not acceptable in the devastated area (including blow-down and scorched forest areas) because of the sensitive

soils and tephra, steep slopes, sensitive plant and animal succession, and potential for animal harassment. For hillsides to recover, unopened roads should not be used. It would be difficult and expensive to regulate non-snow ORVs closely enough to be certain that they remained on designated trails or roads.

Interpretive Facilities

Since interpretive signs and displays will be located only where access has been provided for people, they will not produce significant additional disturbance. They do not exceed the Biophysical Carrying Capacity wherever trails, roads, or other developments are acceptable.

Introduction or Removal of Organisms

Introduction or removal of organisms can exceed the Biophysical Carrying Capacity of an area by altering ecological succession. Two examples are, introducing nonindigenous vegetation for erosion control; and secondly, researchers removing beavers to study their parasites, since this could result in altering habitats for terrestrial and aquatic organisms.

Table 1. Summary Biophysical Areas

<u>Subcharacter Land Type</u>	<u>Biophysical Area</u>
I. CAVES	A. Hills B. Cave Basalt C. Mudflow and pyroclastic flow deposits.
II. GOAT MARSH	A. Goat Marsh B. Mudflow and pyroclastic flow deposits C. Hills
III. LAHAR	A. Muddy/Pine flats B. Muddy Canyon C. Smith/Muddy
IV. APE CANYON	A. Ape Canyon
V. MOUNT ST. HELENS	A. Mount St. Helens
VI. CRATER	A. Crater
VII. DEBRIS AVALANCHE	A. New lakes B. Debris avalanche C. Uplands D. Pyroclastic flow deposits E. Mudflow F. South Coldwater
VIII. TEPHRA	A. Tephra
IX. SPIRIT LAKE	A. Spirit Lake B. Pyroclastic flow C. Uplands
X. UPPER GREEN RIVER	A. Upper Green B. Green Panhandle
XI. MT. MARGARET	A. Uplands B. Lakes and shorelines
XII. VANSON	A. Vanson
XIII. LOWER GREEN RIVER	A. Lower Green River

Table 2. Biophysical Sensitivity Rating Scale

Sensitivity Rating	Relative likelihood for potential levels of disturbance to significantly impede processes or significantly impact features.	Relative care needed during development and use to remain within the intent of the Act.	Rating Criteria (Reasons for Ratings)		
			Relative sensitivity to disturbance	Relative size of features or area	Relative uniqueness
1	Very unlikely	Very low	Very low	Very large	Very common
2	Unlikely	Low	Low	Large	Common
3	Moderate likelihood	Moderate	Moderate	Moderate	Medium
4	Likely	High	High	Small	Uncommon
5	Very likely	Very high	Very high	Very small	Very common or unique

Table 3. Sensitivity Ratings of Features and Processes.

	Rating
I. CAVES	
A. <u>Hills</u>	
1. Physical:	
- Low elevation, steep slopes	2
2. Biological:	
- Western hemlock dominated forest, intact ecosystems	2
- Spotted Owl Management Area	5
- Winter Range	4
3. Process:	
- Relative slow erosional processes	3
(increased erosion may significantly impact Cave Basalt Area below)	
B. <u>Cave Basalt</u>	
1. Physical:	
- Lava flow features including lava tubes, pressure ridges,	4
collapse pits--fragile flow structures within caves	
- Shallow, young, nutrient deficient soils	4
2. Biological:	
- Lodgepole/bearberry comm. with depauperate, lichen-moss understory,	4
sensitive ecosystem	
- Key winter range	5
- Cave ecosystems, unique animals	5
- Sensitive plant area, Sierra wood fern (<i>Thelypteris nevadensis</i>)	5
- Sensitive animal, Larch Mountain Salamander (<i>Plethodon larselli</i>)	5
3. Process:	
- Ground water movement (complex flow patterns)	5
- Infilling of some caves at north end	4
- Wind erosion	3
Note: activities upslope affect downslope features.	
C. <u>Mudflow and Pyroclastic Flow Deposits</u>	
1. Physical:	
- Primary and secondary (alluvially reworked) deposits 1980-present	4
(edges and fringes important)	
- Pre-1980 deposits	3
- Butte Camp (extrusive dome)	1
- Caves (several) in upper portion of Cave Basalt Flow	4
- Streams and springs	4
2. Biological:	
- Subalpine meadows	4
- Subalpine fir/beargrass community	3
- Ptarmigan (early successional stages associates)	5
- Deer and elk summer range	2
- Pika	3
3. Process:	
- Deposition, channel changes, alluvial reworking	4
- Treeline dynamics (perturbation and recovery)	4
- Understory recovery from burial	4
- Primary succession	3

Table 3. Continued

	Rating
II. GOAT MARSH	
A. <u>Goat Marsh (including much of RNA)</u>	
1. Physical: (area is very sensitive to hydrologic changes - Beaver pond, three lakes, streams, high water table, water-saturated organic soils)	5
2. Biological:	
- Marsh plants	4
- Calving area	4
- Lakes and marshes (including fish habitat)	4
- Nesting waterfowl	4
3. Process:	
- Lake development (eutrophication)	4
- Long term succession	4
B. <u>Mudflow and Pyroclastic Flow Deposits</u>	
1. Physical:	
- Old mudflow and pyroclastic flow deposits	1
- 1980-present primary and secondary mudflow deposits	2
2. Biological:	
- Lodgepole/bearberry forest	3
- Riparian zones (sitka alder, mesic herbs)	3
- Native fish in Kalama Springs and Kalama River	5
- Spring areas communities	4
3. Process:	
- Primary ecological succession on old pyroclastic flows	2
- Alluvial reworking of deposits	2
C. <u>Hills</u>	
1. Physical:	
- Goat Mountain	1
- Steep slopes	2
- Avalanche/debris tracks	1
2. Biological:	
- Upland deciduous forest (black cottonwood, some Douglas-fir, and red alder)	3
- Western hemlock, silver fir	1
- Noble fir	3
- Spotted owl, two Spotted Owl Management Areas	5
- Sensitive plant species, fringed pinesap (<u>Pleuricospora fimbriolata</u>)	5
3. Process:	
- Relatively low erosional rate	2
- Succession in older stands silver fir understory	1
- Tree-line dynamics	3
III. LAHAR	
A. <u>Muddy/Pine Flats</u>	
1. Physical:	
- Coarse mudflow deposits	4
- Air-flow/water-flow transition features	5

Table 3. Continued

	Rating
2. Biological:	
- Vegetation--huckleberry/beargrass/silver fir frost sensitive areas	3
- Ptarmigan (if present)	5
- Extensive subalpine meadows and plant communities (Plains of Abraham)	5
3. Process:	
- Fluvial reworking	4
- Slow, primary succession both terrestrial and aquatic	4
B. <u>Muddy Canyon</u>	
1. Physical:	
- Gorge scoured by mudflow	1
- Recently exposed columnar basalt flows	1
2. Biological:	
- Lowland forest (Western hemlock/Douglas-fir)	2
3. Process:	
- Very slow terrestrial and aquatic ecosystem recovery	3
C. <u>Smith/Muddy</u>	
1. Physical:	
- Mudflow deposits	4
- Coarse woody debris in and on deposits	4
2. Biological:	
- Western redcedar/western hemlock riparian with red alder	2
- Winter range	5
3. Process:	
- Channel migration	3
- Slow terrestrial and aquatic recovery due to lack of seed source availability	3
IV. APE CANYON	
1. Physical:	
- Steep, dissected slopes	4
- Mudflow down canyon	4
- North of Ape Canyon heavy tephra deposition	4
- South of Ape Canyon, 1-4" tephra deposit with timber intact	2
2. Biological:	
- Western hemlock series with Douglas-fir	2
- Some winter range (included in Marble Mt. Game Management Unit)	4
- Crane Lake (including wetland) with fish population	4
- Older forest, spotted owl habitat	4
- Class III streams	2
- Standing dead and down trees (canyon proper)	4
3. Process:	
- Unique dynamics of riparian and stream ecosystems (fluctuating)	5
- Early successional recovery north canyon (wide range of response)	4
- Early successional recovery south canyon	2
- Debris flows and landslides north of canyon	5
- Woody decomposition (concern over removal of roadway slash)	3

Table 3. Continued

V. MOUNT ST. HELENS	Rating
1. Physical:	
- Extensive mudflow and pyroclastic materials on slopes	3
- Steep slopes	3
- Glacial remnants	1
- Old lava domes on north and east flanks	1
- Ice caves	1
2. Biological:	
- Subalpine/alpine communities (high tephra deposition at north end)	5
- Severe environment for growth and sensitive to perturbation	
- Sensitive plant habitat, northern grape fern (<u>Botrychium boreale</u>) (if still present)	5
- Potential habitat high alpine wet areas.	5
- Meadows	4
- Scattered wetlands	4
- Summer range (Marble Mountain Game Management Unit)	2
- Ptarmigan	4
- Pikas	3
- Streams - Class III	3
3. Process:	
- Reworking of pyroclastic and mudflow deposits	3
- Glacial dynamics	1
- Vegetative succession	4
- Recolonization of area by fauna	4
VI. CRATER	
1. Physical:	
- Volcanic dome	1
- Pyroclastic flow deposits, rampart and breached crater	4
- Steep crater walls, talus and rockfall deposits	1
- Unique rock specimens ("bread crust" rock texture)	5
2. Biological:	
- Hydrothermal bacteria and algae	1
- Ballooning spiders	1
3. Process:	
- Rockfall	1
- Active volcanic processes: dome building eruption gas emissions	1
VII. DEBRIS AVALANCHE	
A. <u>New Lakes</u>	
1. Physical:	
- Coarse woody debris	3
- Debris dam--breaches (temporary drainage outlet)	4
2. Biological:	
- Bacterial communities--absence of intermediate trophic levels	2
3. Process:	
- Erosion along shores (waves)	4
- Sedimentation	4
- Succession of lake ecosystems (bacteria to autotrophs)	4

Table 3. Continued

	Rating
B. <u>Debris Avalanche</u>	
1. Physical:	
- Hummocky topography	5
- Ponds and "kettles"	5
- Loose, highly erosive soils	5
- New channels	5
- Marginal and central facies of deposit	5
2. Biological:	
- Few established seedlings and survivors, especially in marginal facies	4
- Potential winter range	3
- Potential riparian habitat	4
- Anadromous fisheries	3
3. Process:	
- Headward and lateral cutting of drainages	5
- Recolonization of area by flora and fauna	4
- Erosion (aeolian and fluvial)	3
- Soil formation	4
C. <u>Uplands</u>	
1. Physical:	
- Highly dissected steep slopes, first order channels	3
- Mass movement	4
2. Biological:	
- Variable shrub cover survival (15-18% cover)	5
- Blowdown forest	3
- Small areas of standing dead trees	4
- Residual mammals (gopher, mice) and occasional "visitor" deer and elk	5
3. Process:	
- Erosion (hillslope mass movement)	3
- Vegetative succession	4
- Woody decomposition	1
- Animals recolonizing area	3
D. <u>Pyroclastic Flow Deposits</u>	
1. Physical:	
- Hot springs and fumeroles	3
- Pyroclastic flow features, surface texture	5
- Sink holes and explosion pits	5
- Fluvial features (channels)	4
2. Biological:	
- Macro-invertebrates	3
- Potential riparian and stream habitat	4
- Thermophilic microbes	5
3. Process:	
- Dispersal of biota	4
- Primary plant succession	5
- Soil formation	4
- Erosion (aeolian and fluvial)	4
E. <u>Mudflow</u>	
1. Physical:	
- Steep slopes	4
- Mudflow deposits	4
- Sheep Canyon with a variety of mudflow features (scour)	4

Table 3. Continued

	Rating
2. Biological:	
- Standing green forest (some older forest)	1
- Scorched forest	4
- Blowdown forest	4
- Part of a Spotted Owl Management Unit	5
3. Process:	
- Erosion--fluvial reworking	4
- Woody decomposition	2
- Ecological succession with wide range of physical conditions	3
F. <u>South Coldwater</u> (channel)	
1. Physical:	
- Debris avalanche deposits	5
- Steep slopes	4
- Stream channel	4
- Hot deposits (pyroclastic flow, debris avalanche, blast deposits, hot springs)	5
2. Biological:	
- Hydrothermal bacteria	5
- Potential riparian	4
3. Process:	
- Erosion (surface and mass movement)	4
- Channel migration	4
- Plant and animal recolonization area	4
- Cooling of deposits	2
VIII. TEPHRA	
1. Physical:	
- Deep tephra deposits	4
- Steep slopes	5
2. Biological:	
- Blowdown	2
- Standing dead	4
- Trace understory	4
- Riparian potential	3
3. Process:	
- Erosion	5
- Woody decomposition	2
- Vegetative succession	4
- Recolonization of area	4
- Debris Flows	5
IX. SPIRIT LAKE BASIN	
A. <u>Spirit Lake</u>	
1. Physical:	
- Physical/chemical characteristics of water	5
- Floating woody debris	3
- Islands	4
2. Biological:	
- Lake organisms (anaerobic bacteria)	4
- Potential fish habitat	3

Table 3. Continued

	Rating
3. Process:	
- Lake level dynamics	5
- Erosion (wave action)	4
- Succession of lake ecosystem (recovery)	4
B. <u>Pyroclastic Flow Toe</u>	
1. Physical:	
- Pyroclastic flow deposits	4
- Sink holes	5
- Phreatic explosion pits	5
2. Biological:	
- Shrub/herb cover < 1%	4
- Potential littoral and riparian zone habitat	4
3. Process:	
- Succession	5
- Recolonization	4
- Erosion (wave action)	4
- Erosion (wind)	2
- Alluvial deposition	4
C. <u>Uplands</u>	
1. Physical:	
- Steep slopes	4
- Deep deposits from blast	4
- Soil removal areas (area washed by the wave caused by the landslide into Spirit Lake)	3
2. Biological:	
- Blowdown forest	3
- Understory cover variable (0-7%)	4
- Gophers	3
- Potential riparian and littoral zones	4
3. Process:	
- Fluvial erosion	4
- Repopulation by gophers and insects	3
- Soil formation, soil mixing, mycorrhizal inoculation	3
- Plant succession	4
X. UPPER GREEN RIVER	
A. <u>Upper Green</u>	
1. Physical:	
- Steep slopes	4
- Slope failures	3
- Moderate tephra deposition	4
- Large, relatively undisturbed watershed (few roads)	5
2. Biological:	
- Standing dead trees	4
- Standing green forests	3
- Some shrub and herb cover	4
- Elk	3
- Wetlands (Strawberry, Meta, N. of Meta)	4
- Meadows	4
- Riparian habitat and fish habitat	4
- Lakes (Ghost and Strawberry)	4

Table 3. Continued

	Rating
3. Process:	
- Fluvial erosion	4
- Woody decomposition	2
- Vegetative succession	4
- Animal dispersal	3
- Slope failures	4
B. <u>Green Panhandle</u>	
1. Physical:	
- Steep slopes	4
- Shallow, erosive soils	4
2. Biological:	
- Blowdown forest	3
- Standing dead trees	4
- Elk	3
- Small amounts of shrubs and herbs	4
3. Process:	
- Erosion	4
- Woody decomposition	2
- Vegetative succession	4
- Animal dispersal	3
- Slopes failures	4
XI. MT. MARGARET	
A. <u>Uplands</u>	
1. Physical:	
- Steep slopes	4
- Mass movement	4
- Substantial tephra cover	3
- Thin, pre-eruptive soils	4
2. Biological:	
- Standing dead trees	3
- Standing green forest (silver fir/Cascade azalea, subalpine fir/mountain hemlock)	2
- Blowdown forest	1
- Understory survival--shrub cover relatively high, herb cover relatively low	3
- Subalpine meadows	4
- Riparian habitat	3
3. Process:	
- Erosion	4
- Alluvial deposition	4
- Woody decomposition	2
- Vegetative succession	5
- Animal dispersal	3
B. <u>Lakes and Shoreline</u>	
1. Physical:	
- Variable physical/chemical characteristics of water (distance from volcano)	3
- Woody debris	2
2. Biological:	
- Fish habitat	3
- Littoral zone habitat (shallow basins)	5

Table 3. Continued

	Rating
3. Process:	
- Sedimentation	3
- Littoral succession	4
- Lake ecosystem development	4
- Woody decomposition	2
XII. VANSON	
1. Physical:	
- Steep, dissected slopes	3
- Shallow soils	3
- Lake	2
- Large, intact watershed	4
2. Biological:	
- Standing green (intact silver fir/mountain hemlock ecosystem)	2
- Spotted Owl Management Area in older forest	5
- Wetlands--riparian habitat	3
- Fisheries--Goat Creek	4
--Vanson Lake	2
- Small amount of winter range	4
- Calving areas (meadows)	4
3. Process:	
- Source of animal dispersal (migration)	3
- Erosion	3
- Plant succession	2
XIII. LOWER GREEN RIVER	
1. Physical:	
- Steep slopes	3
- Mass movement potential	3
- Stream channel and falls	2
2. Biological:	
- Mature forest (big trees)	4
- Standing dead	3
- Blowdown forest (Miner's Creek)	2
- Spotted Owl Management Area	5
- Winter range	5
- Anadromous fisheries	2
- Resident fisheries	3
- Riparian habitat	4
3. Process:	
- Reworking of channel	2
- Migration corridor for flora and fauna recolonization	3
- Plant succession	2
- Woody decomposition	1

Table 4. Development Categories

Development Category 1

The area is basically closed to most uses to provide long-term protection. Access is limited to scientific study that is non-manipulative. Development is limited to low standard trails for research or resource protection. Examples: cave closures, small research areas that are so sensitive that human entry could significantly disrupt the natural processes.

Development Category 2

Very low levels of dispersed use (off-trail is permitted). In higher use areas, travel is restricted to trails only or by permit. This is a day-use area only.

Development Category 3

This area includes lands where roads presently exist and/or areas that can withstand very minor roading, but no dispersed recreation activities. Controlled day-use only is allowed from a developed site adjacent to a road. Developments are limited to one mile of road per nine square miles of land and few pull-outs.

Development Category 4

This area includes lands where roads presently exist or areas where roads do not exist, and additional roading is undesirable. Some dispersed recreational activities are permitted. Access by trail is recommended in the roaded natural setting. Overnight camping may or may not be permitted.

Development Category 5

This area is similar to dispersed recreation areas in general forest lands. Restrictions are placed on facility development and trails. In roaded natural areas day use is permitted, while in semi-primitive non-motorized and primitive areas, trail use with controlled camping is allowed. Developments are limited to roads and trails with minor structures for research, safety, and resource protection. Roading is limited to less than one linear mile of road per three square miles.

Development Category 6

This area provides for dispersed roaded natural recreation. No facilities are provided. Day use only. Roading up to one linear mile per square mile is permitted.

Development Category 7

This area includes limited occupancy sites, i.e., picnic areas and developed campgrounds. Small structures like toilets, visitor stations may be provided.

Development Category 8

This area includes limited, intensive use sites, i.e. large developed campgrounds, drain fields, concessions, water front development, visitor centers.

Development Category 9

This area includes industrial sites, i.e., rock pits.

Table 5. Maximum Development Categories for Biophysical Areas

Exceptions for specific activities and developments, and rationale for the decisions made are also presented. General Biophysical Carrying Capacities for over-snow ORV's are discussed in the text.

<u>Biophysical Area</u>	<u>Maximum Development Category</u>	<u>Exceptions, Conditions and Rationale</u>
I. CAVES		
A. Hills	4	<p>Steep, dissected slopes, Spotted Owl Management Area, winter range</p> <p>No new roads: - loss of old growth forest habitat (incl. snags) - loss of winter range and harassment of animals.</p>
B. Cave Basalt	4	<p>Fragile soils and plant communities. Complex ground water flow patterns. Fragile cave entrances and subterranean habitats sensitive to disturbance.</p> <p>) trampling of very No dispersed camping) sensitive vegetation No horses) introduction of exotic) seeds, soil compaction</p> <p>New roads require a special survey to ensure that unmapped caves are not breached.</p> <p>Existing roads ok--reconstruction for mitigation permitted.</p> <p>New trails only if at least 1/4 mile from sensitive caves, trail must have destination: - Recommended no new trails until completion of the current ongoing cave study. A number of sensitive and/or unique habitats for vertebrate and invertebrate species.</p> <p>No flush toilets: - No drainfields because of complex ground water flow patterns in basalt flow.</p>
C. Mudflow & Pyroclastic Flow Deposits	5	<p>Shifting alluvial deposits. Fragile understory vegetation recovering from burial. Subalpine meadows sensitive to trampling.</p> <p>Manage dispersed camping to protect: - sensitive meadows, caves, springs</p> <p>Careful trail location and installation: - shifting alluvial deposits</p>
II. GOAT MARSH		
A. Marsh	2	<p>Wetlands and organic soils</p> <p>Use restricted to trails: - calving area, aquatic plants, sensitive plant Sierra wood fern (<i>Thelypteris nevadensis</i>)</p>
B. Mudflow & Pyroclastic Flow Deposit	5	<p>Same as area I.C.: --sensitive areas by spring and river</p> <p>No stocking in Kalama River: --native cutthroat trout</p> <p>Camping managed in area I.C.</p>

Table 5 (Continued)

<u>Biophysical Area</u>	<u>Maximum Development Category</u>	<u>Exceptions, Conditions and Rationale</u>
		Controlled use around Kalama Springs: --sensitive vegetation communities and habitat
C. Hills	5	Steep slopes, avalanche chutes, Spotted Owl Management Unit (SOMU's). Sensitive plants fringed pinesap (<u>Pleuricospora fimbriolata</u>). Dispersed camping ok except at sensitive plant sites
III. LAHAR A. Muddy/Pine Flat	4	Same as area I.C. only larger area. Alluvial deposits, subalpine area. No new roads: Same as area I.C., possible disruption of stratigraphy. No horses in the subalpine area, introduced seeds Gravel ok on current roads. Road stream crossings must not constrict highest conceivable flows: high flows are very important shapers of unique features. Recommend culverts and low road bed which can be easily overtopped, or long, high bridge (less desirable because is very expensive and may be destroyed.
B. Muddy Canyon Gorge Area	5	Very slow terrestrial and aquatic ecosystem recovery. No horses--new seed source, slow recovery of vegetation
C. Smith/Muddy Bottom	4	Channel migration and alluvial flows Camping ok No new roads, use only native material: channel migration, stream braiding, see 1990 memo (November 14, 1980). No horses: slow terrestrial and aquatic recovery. Seasonal closure of area to all vehicles for winter range protection.
IV. APE CANYON	4	<u>North</u> of canyon--active mass failures, debris avalanche, tephra layers, new vegetation. No roads north of canyon
	5	<u>South</u> of canyon Horses ok

Table 5 (Continued)

<u>Biophysical Area</u>	<u>Maximum Development Category</u>	<u>Exceptions, Conditions and Rationale</u>
V. MOUNT ST. HELENS	4	Alpine/subalpine communities (severe environment) with sensitive plants. Steep slopes, extensive mudflows, wetlands. No horses
VI. CRATER	4	Active dome growth, steep crater walls, unique pyroclastic flow and tephra deposits. No rock collecting: unique rock specimens
VII. DEBRIS AVALANCHE		
A. New Lakes (e.g. Coldwater, Castle)	4	Fragile lakeshore zones Electric motor only (to prevent bank damage and pollution) Docks and ramps ok (to harden fragile lakeshore in selected locations). No horses: -very sensitive soils and vegetation nutrient input into lakes
B. Debris Avalanche	2	Channel migration/formation, recolonization of area by flora and fauna No new roads: severe disruption of channel processes and unique stratigraphy Trails: in specified areas and/or raised trail ok No dispersed recreation, off trail use by permit only (day-use only): - fragile wetlands, establishment of new seedlings, fumaroles, hot springs, major springs, and stream courses
C. Uplands	5	Slope failures, highly dissected, steep slopes, fragile tephra deposits. Day use development above Cat. 5 may be acceptable on flat ridges on case-by-case bases. No horses: sensitive plant communities No ORVs: steep slopes, fragile soils
D. Pyroclastic Flow Deposits	2	Unique and/or fragile features, primary plant succession No dispersed recreation or strictly regulated by permit: fragile features (fumaroles, hot springs, eroding stream courses) Trails in specific areas only or raised board walk

Table 5 (Continued)

<u>Biophysical Area</u>	<u>Maximum Development Category</u>	<u>Exceptions, Conditions and Rationale</u>
E. Mudflow	4	<p>Steep slopes, mudflow features, part of a Spotted Owl Management Area</p> <p>Dispersed camping ok</p> <p>No horses: primary and secondary plant succession, lower area erodible</p> <p>No new roads: Spotted Owl Management Area, unique mudflow features, easily erodible soils</p>
F. South Coldwater Channel	2	<p>Unique deposits (spill over feature), steep slopes, active fluvial processes, debris avalanches (mass failures)</p> <p>No roads and no camping: hot springs, etc.</p> <p>Trails only on designated areas</p>
VIII. TEPHRA A. Tephra	4	<p>Steep slopes, active slope failures, deep tephra deposits, trace understory vegetation</p> <p>No opening of old roads (except Road 99): deep, loose soils, steep slopes, etc.</p> <p>Controlled, dispersed camping: primary and secondary plant succession, and above</p> <p>No horses: introduced seeds, see above</p> <p>No ORV's: see above</p>
B. Road 99	7	<p>Camping only where sanitary facilities are available. Two lanes maximum: see VIII. A.</p>
IX. SPIRIT LAKE BASIN A. Spirit Lake	2	<p>No motor boats: pollution (except for administration)</p> <p>Non-motorized boating or electric motors ok</p> <p>Fishing and hunting ok</p>
B. Pyroclastic Flow Toe	2	<p>Unique features (phreatic explosion pits), erosional (alluvial processes, primary succession)</p> <p>No dispersed recreation or strictly regulated by permit: unique features</p> <p>Trails to avoid unique features, stay on trails</p>
C. Uplands (includes littoral and riparian zones)	4	<p>Steep slopes, very erodible soils, no soil on lake wave runup areas (caused by debris avalanche displaced lake water), primary and secondary succession especially on shorelines.</p>

Table 5 (Continued)

<u>Biophysical Area</u>	<u>Maximum Development Category</u>	<u>Exceptions, Conditions and Rationale</u>
		Limited roading to provide access for maintenance of the lake level control devise.
		No horses: see above
		No overnight camping
X. UPPER GREEN RIVER		
A. Upper Green	4	Steep slopes, mass failures, highly erodible tephra and soils. Early plant succession.
		No horses: see above
		No new roads: concentrates runoff, see above
		Controlled, dispersed camping ok
B. Green Panhandle	4	Steep slopes, mass failures, highly erodible tephra and soils, early plant succession
		No horses: see above
		No roads: see above
XI. MT. MARGARET		
A. Uplands	4	Steep slopes, mass failures, highly erodible tephra and soils. Early plant succession.
		No horses: see above
		No new roads (old roads not to be opened)
		Controlled, dispersed camping ok
		No ORV's (non-snow) in the devastated portion: -animal harassment, sensitive plant/animal succession; sensitive soils, steep slopes
B. Lakes and Shorelines	2	Sensitive vegetation: moist, compactable soils
		No horses: lake pollution, exotic seed sources
		No roads: sensitive vegetation, animal habitat
		No camping within 200 ft. of lakeshore except at designated locations (lake pollution)
XII. VANSON		
General Forest	4	Steep, dissected slopes; shallow soils
		Controlled, dispersed camping ok
		No roads: steep slopes, animal harassment (calving areas, Spotted Owl Management Area), snag felling, loss of habitat
		No ORV's: Same as above
Meadows	2	Fragile vegetation and compactible soils
		No roads, camping, horses
XIII. LOWER GREEN	4	Steep slopes, mass movement potential, compactible ash soils
		Controlled camping
		No roads: steep slopes, Spotted Owl Management Area, animal harassment, loss of habitat, snag felling

Appendix C

RESEARCH ALTERNATIVES

Two types of research alternatives have been developed. One is administrative, addressing broad issues of communication within the scientific community, documentation, coordination of research, and other issues of general concern. The other deals with the protection of specific sites within the Monument.

ADMINISTRATION

Research activities underway in the Monument were appraised to identify problems and determine future requirements. An example of the findings is the need for a strategy to improve communication between Monument managers and researchers. Managers can better inform researchers about the requirements of Monument management and regulations. They can also provide information about relevant past and on-going research in specific areas. Researchers can help managers by keeping them acquainted with studies which may contribute to the Monument's interpretation program and assist other management activities (e.g., wildlife habitat protection).

After the goals for administering research in the Monument were established, a number of strategies for meeting them were developed.

These strategies were grouped into alternatives which were then meshed with the development alternatives being prepared by the Comprehensive Management Plan ID team. The assignment of a particular research alternative with a development alternative was influenced primarily by the level of access and facility construction called for by the latter. A description of how research administration objectives were incorporated into management alternatives follows.

Goal: Achieve effective communication between Monument staff managers and the scientific community.

--Alternative A

The Scientific Advisory Board continues to review Monument management as issues are called to its attention.

Scientists organize meetings with the Monument staff to maintain communication.

--Alternative B

An in-house science coordinator performs these functions: 1) interprets research activities for the public; 2) documents and coordinates research; 3) serves as liaison with Scientific Advisory Board and scientific community; 4) reviews proposed development which may affect research; 5) communicates research results to managers and research needs to scientists; and 6) helps prepare the "Annual Report on Protection of Scientific Values." This report would be assembled by the Monument staff to summarize the status of research documentation, coordination, communication,

collection and maintenance of records, facilities, and proposed developments. It would contain the results of monitoring the effects of research, recreation, development, and other activities on features, conditions, and natural processes. The report may also propose changes in protection procedures to the Scientific Advisory Board when the need is established.

--Alternatives C, D, D (Modified), E, F, & G

A panel of scientists active in Monument research provides a forum for transferring the collective advice of researchers to managers. This panel also assists the science coordinator perform tasks indicated in Alternative B and reviews the "Annual Report on Protection of Scientific Values." It also helps the science coordinator inform the scientific community about measures required to protect scientific values, and about the potentials and needs for research in the Monument. This information program will include a newsletter, notices in scientific society bulletins, poster sessions at scientific meetings, and communication by other appropriate means.

Goal: Document research sites and activities in the Monument to provide for coordination, planning, and protection of scientific values.

--Alternative A

Research sites are installed in the Forest Service Total Information System (TRI). New entries are added as scientists contact the Monument for permits into the restricted area and for other reasons.

--Alternative B

A cross-reference system of documentation is established containing study topics, scientists, and sites. It would be assembled as scientists contact the Monument for permits into the restricted area and for other reasons.

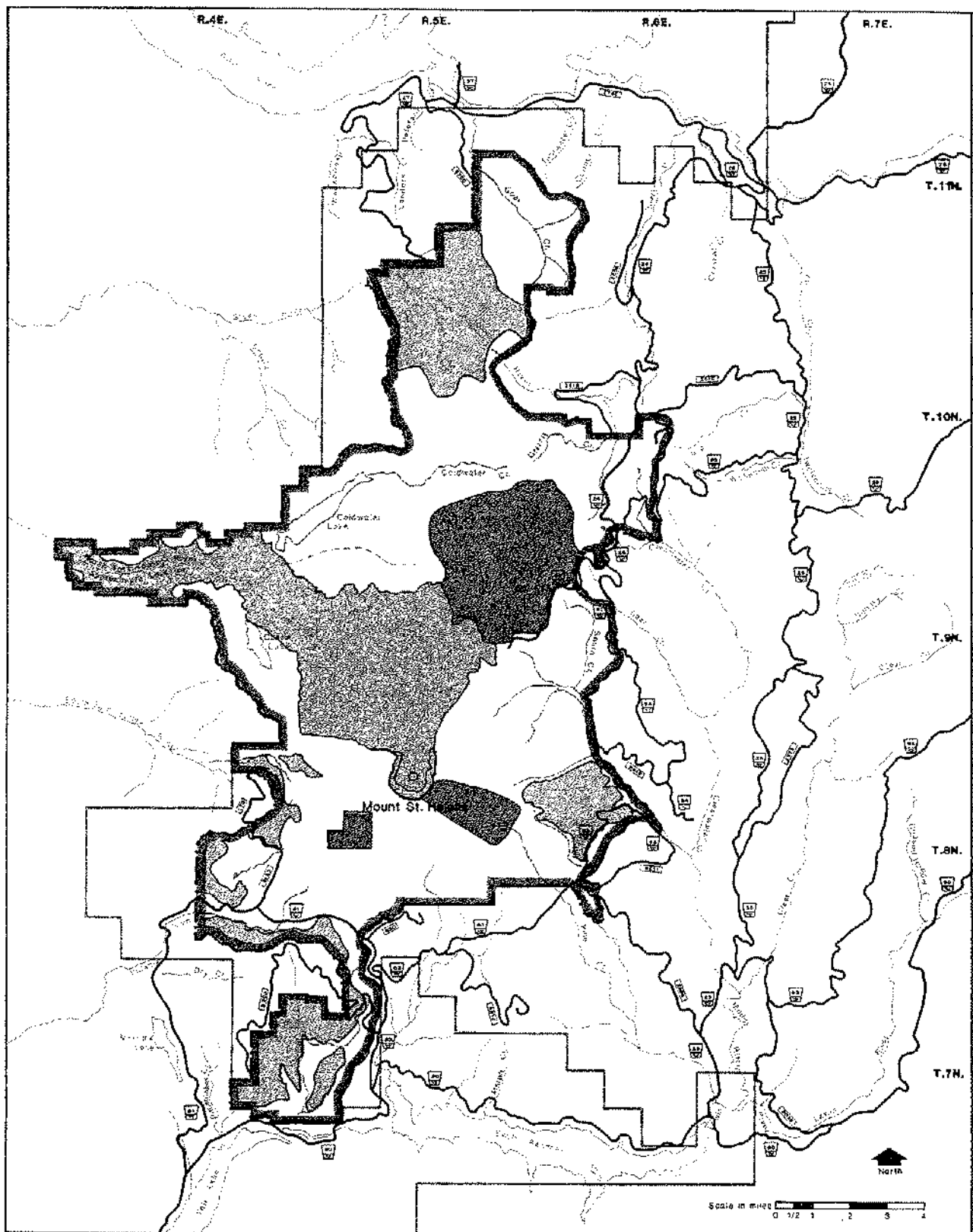
--Alternatives C, D, D (Modified), E, F, & G

Use of this cross-reference system is actively promoted. Research sites are adequately documented so that the Monument staff can locate them adequately for purposes of protection during construction and use of developments.

Goal: Coordinate research activities.

--Alternative A

Cooperate with efforts by local scientists to coordinate research by informing the scientific community of the range of active or planned research projects.



Legend

- National Monument Boundary
- National Forest Boundary
- Existing Roads
- Streams

Assignment of Protection Classes

Class	Alternatives							
	A	B	C	D	D Mod.	E	F	G
1								
2								
3								

Research Alternatives

Sensitivity to Disturbance of Scientific Values

- Very High
- High
- Medium
- Low

Figure C-1

--Alternative B

When it is mutually beneficial and proposed by the scientists involved, encourage the use of common study sites.

--Alternative C, D, D (Modified), E, F, & G

Actively communicate the advantages of using common research sites. Science coordinator is assisted by the local research panel and the SAB in identifying topic needing research.

Goal: Collect and maintain long term records of landscape, ecological, and other environmental conditions at the Monument.

--Alternative A

Permit Forest Service employees and other interested individuals to collect and maintain their own records, including repeat photographs, vegetation data, and other resource information. No central data storage or catalog system is provided.

--Alternative B

Establish a system for collecting and preserving Forest Service environmental conditions records. Results of the monitoring program prepared for the "Annual Report on Protection of Scientific Values" will be included.

--Alternatives C & E

The same as in B except that data sets collected by other organizations would be cataloged.

--Alternatives D, D (Modified), F, & G

The same as in C and E except that environmental data collection and monitoring activities discontinued by other organizations will be continued by the Forest Service if they are determined to be useful.

Goal: Provide access to remote research sites.

--Alternatives A, B, & C

Permit researchers to use the recreational trail system.

--Alternatives D, D (Modified), E, F, & G

Permit researchers to use the recreation trail system and construct administrative trails to key remote research sites. During the next ten years, up to 20 miles of trail will be constructed in steep terrain or in gentle, open terrain. Locations will be determined by identified needs.

SITE PROTECTION

Some areas within the Monument require a higher level of protection than others. To comply with direction in the Act, the Monument was divided into 17 ecological/landscape features that reflect scientific values (shown on Figure 29 in Chapter III). Each was given a rating based upon its uniqueness and sensitivity--a long history of research at a site provides a very

important record; it increases the value of future investigations and this was a factor in determining uniqueness. Three categories were created ranging from those needing the greatest protection (debris avalanche and pyroclastic flow areas) to those needing least (generally forests on steep slopes which were not greatly affected by the eruptive activity). The process which determined biophysical carrying capacity (Appendix B) was involved in creating this hierarchy (see Table B-2).

Three levels of protection were then established. The intent and requirements of each follow.

Protection Class 1

Goal: Provide maximum opportunity for natural processes and features to continue unimpeded in the most sensitive areas.

Prescriptions

--Strictly regulate the use of developed sites and trails. This will be done by means of access route location and education; in areas of extreme sensitivity, entry may be prohibited except by permit. Over-the-snow travel will be regulated by the Monument Manager.

--Strictly regulate introduction and removal of organisms. Fish and wildlife introductions and removals will be regulated under a cooperative Fish and Wildlife Management Plan developed jointly by the Washington State Department of Game, the Forest Service, and the Washington Department of Fisheries.

--Monitoring will include: 1) an extensive annual reconnaissance by the Monument staff of the entire trail system, road network, developments, and undeveloped sites that are being used; 2) four or more sampling transects extending outward from major developments with a set of repeatable photos and estimates of vegetation cover taken at points along the transects.

--Include this information in the "Annual Report on Protection of Scientific Values": 1) the results of monitoring program; 2) plans for future monitoring; 3) a summary of visitor use patterns in the area; 4) an assessment of the success of research plot protection measures; 5) an assessment of proposed developments and activities; 6) recommendations for additional or different measures if protection of scientific values is determined to be inadequate; and 7) an assessment of the status of research documentation, research communication and coordination, and the collection and maintenance of records.

--Submit the Annual Report to the panel of scientists active in Monument research except Alternatives A and B and the Scientific Advisory Board for review.

Protection Class 2

Goal: Allow natural processes and features to proceed substantially unimpeded, especially in local sites of highest sensitivity. Elsewhere in these areas, protection is afforded by inaccessibility and the less sensitive nature of features and processes.

Prescriptions

--Discourage or control public use of the most sensitive sites by the location of access and education.

--Regulate introduction and removal of organisms primarily by education, and by regulation when necessary.

--Monitoring will include: 1) an extensive annual reconnaissance by the Monument staff of half the trail and road system and developed sites; and 2) two sampling transects outward from developments using repeatable photo points.

--Include information described in Protection Class 1 in the "Annual Report on Protection of Scientific Values."

--Submit Annual Report to panel of scientists active in Monument research (does not apply in Alternatives A and B, which do not call for the panel).

Protection Class 3

Goal: Allow natural processes and features to proceed substantially unimpeded by relying on relative natural resiliency of the landscape.

Prescriptions

--Locate and design access routes to control use which occurs away from developed sites.

--Monitor protection of scientific values by documented reconnaissance of developments, trails, and roads. Each site will be inspected at least every other year.

--Include information described in Protection Class 1 in "Annual Report on Protection of Scientific Values."

--At a minimum, the in-house science coordinator will review the effects of past and proposed developments on scientific values.

Distribution of land in the three Protection Classes varies in the seven management alternatives. The primary influence, again, was the level of access and development. See Figure C-1 for Protection Class location by alternative.

Appendix D

ALTERNATIVES BY MANAGEMENT CONCEPT AREAS

In order to display the level of detail required in a development plan, the Monument was subdivided into Management Concept Areas (Figure No. 6). Each has a particular biophysical subcharacter and provides opportunities for similar or compatible recreation, interpretation, and research activities. A set of goals was developed for each Concept Area.

The alternative description which then follows begins with Coldwater/Johnston Ridge Concept Area and proceeds in a counter-clockwise direction around Mount St. Helens. In some instances, the boundaries of Concept Areas were adjusted to accommodate different approaches to access and development. This detailed description for the selected alternative (Alternative D, Modified) appears in Chapter II, rather than in this Appendix.

Supporting facilities were identified along road corridors outside the Monument boundary. Facilities outside the area included in the Mount St. Helens Land Management Plan will be evaluated further in the Forest Plan.

Specific Goals for Management Research, and Visitor Use by Management Concept Areas and Major Road Corridors

Specific goals were developed for each management concept area addressing the issues, concerns, and opportunities that could be provided by departing from Alternative A (No Change) for each portion of the Monument, based on the natural attributes of the area. These goals do not apply to Alternative A since present management is continued, and for the purpose of brevity and clarity, are displayed prior to the descriptions of the alternatives.

Summary of Goals

Coldwater/Johnston Ridge Area

Visitor Use

- Provide opportunities to view the mountain, crater, dome, and Spirit Lake.
- Interpret the 1980-1984 eruptions and the associated research.
- Provide essential support facilities for day users that travel approximately 3 hours round trip from I-5.
- Provide opportunities for observing scientists at work.
- Provide orientation information.
- Provide first aid facilities.
- Provide communications.
- Provide protection from the environment.
- Avoid personal injury and recurrent structural damage from geologic and flood hazards.
- Provide access to Coldwater Lake for boating.
- Allow the visitor to get involved with the environment while protecting it.
- Provide information that will encourage low impact use in the Mt. Margaret backcountry.

Management

- Provide communications system between field personnel and the Monument headquarters.
- Provide facilities for law enforcement.
- Provide support facilities for U.S. Geological Survey; e.g., communication, building space, access, that meet the architectural standards adopted for the Monument.
- Reduce visual impact of research and administrative facilities.

- Provide regulations, education, and enforcement necessary to protect the unique geologic features and natural processes.
- Minimize the impact of air traffic on the visitor experience.
- Improve air traffic safety situation.

Research

- Facilitate research on response of geomorphic processes and upland and aquatic ecosystems to the 1980 and subsequent volcanic and hydrologic events.
- Facilitate research on landforms and deposits resulting from the 1980 and earlier activity of Mount St. Helens.

Castle Lake/Sheep Canyon

Visitor Use

- Provide an opportunity to visit and learn about a new lake created by the debris avalanche.
- Provide an opportunity to view and learn about the seared standing dead timber, mudflows, and eyewitness accounts, all within an easy 3 hour drive from Interstate Highway 5.
- Provide support facilities for day use visitors.
- Provide boating opportunity.
- Provide access to good views of the crater and dome.
- Provide opportunity for semiprimitive recreation experience.
- Provide opportunities for environmental education.

Management

- Protect Monument visitors from the hazards.
- Reduce the potential for man-caused fire in the blowdown and fringe timber areas.
- Provide safe drinking water.
- Improve safety for air traffic

Research

- Facilitate research on the dynamic geologic, hydrologic, and ecologic features and processes associated with debris avalanche and pyroclastic flow deposits.
- Facilitate research on geologic, hydrological, and ecological features and processes of Castle Lake, its drainage basin, and hillslopes and streams draining northward onto the debris avalanche.

Cave Basalt/Goat Marsh Management Concept Area

Cave Basalt

- Provide opportunities to visit and learn about lava tubes, lava flows, and tree casts.
- Provide information that will result in improved behavior and less impact on the cave resource.
- Provide drinking water.
- Alleviate the traffic congestion associated with winter sports.
- Reduce the impact on the visitor experience caused by through vehicle traffic.
- Provide support facilities for day use visitors.
- Upgrade existing sanitation facilities.
- Reduce visual impacts caused by road side camping.
- Provide opportunities to learn about the unique noble fir stands and Goat Marsh.

General

- Provide opportunities to view and understand the alluvial flows.
- Provide access and facilities for mountain climbing.
- Provide access for cross-country skiing, ski mountaineering, and snowmobiling.

Management

- Protect the sensitive features and biota of the caves.
- Protect hibernating bat colonies.
- Protect the fragile vegetation on the lava flow.
- Provide facilities for research.
- Reduce vandalism in the Ape Cave.
- Protect sensitive geologic features, and structural improvement from alluvial flows.
- Avoid construction of improvements over parts of the lava tubes.
- Protect the visitor from natural hazards.
- Alleviate congestion and overflow parking during the winter.
- Reduce traffic conflicts between Monument recreation vehicles and industrial traffic.

Research

- Facilitate research on the ecological and geological aspects (including caves,

stratigraphy, plant succession) of pyroclastic flows, lava flows, and lahars on southwest side of Mount St. Helens.

- Facilitate research on geological, hydrological, and ecological features and processes on forested hillslopes receiving thin airfall tephra deposits in 1980.

Mudflow Management Concept Area

Visitor Use

- Provide an opportunity to view a unique waterfalls and canyon created by a 2,000 year old lava flow and exposed by the recent mudflow.
- Provide parking and access for hiking around the south side of the mountain.
- Provide the necessary support facilities for day-use visitors.
- Provide a roaded natural recreation experience.
- Provide for tradition winter recreation uses.

Management

- Protect the visitor from natural hazards.
- Improve access to the Muddy River Mudflow and Smith Creek area.
- Reduce traffic conflicts between Monument recreation vehicles and industrial traffic.
- Reduce road-maintenance cost in the mudflow area.
- Provide safe drinking water.
- Protect existing and potential research values of the Shoestring Glacier and Upper Muddy Fan area.
- Provide a quality big-game hunting opportunities.
- Reduce traffic congestion during winter recreation season.

Research

- Facilitate research on the geological, hydrological, and ecological aspects of mudflows/pyroclastic flows and their deposits.
- Facilitate research on geological, hydrological, and ecological aspects of zone of blasted down vegetation which also received heavy airfall tephra deposition.
- Facilitate research of geological, hydrological, and ecological aspects of steep, forested hillslopes receiving airfall tephra in the 1980 eruptions and numerous other times.

Road 99/Spirit Lake Management Concept Area

Visitor Use

- Provide access and support facilities to meet the present demand for viewing and learning about Spirit Lake, the debris avalanche, the mountain, crater, and the Corps of Engineers' project.
- Provide volcanologic and geologic interpretation.
- Provide orientation information.
- Provide protection from the harsh environment.
- Provide information that will encourage low impact use in the areas adjacent to access routes, developed sites, and the nearby backcountry area.

- Provide the essential support facilities for day users that have traveled an average of 4 hours from Interstate 5 to reach this area (picnicking, water, viewpoints, sanitation).
- Allow the visitor to interact with the newly created landscape.
- Interpret the May 18, 1980, cultural history of the area.
- Interpret the agency's response to the event (salvage program) in areas outside the Monument.
- Alleviate the traffic congestion on Road 99 while providing safe access to critical viewpoints.
- Disperse the use along the entire Road 99 route.
- Provide the opportunity for environmental education.

Winter Season

- Supplement traditional winter recreation experiences.

Management

- Provide safe drinking water.
- Provide facilities that can be reduced in size or phased out if and when west side access is developed.
- Protect the visitor from the threat of fire.
- Reduce the threat of fire to the Monument by improved prevention and detection techniques.

Research

- Facilitate research on response of geological, hydrological, and ecological aspects of Spirit Lake and its contributing watershed (excluding debris avalanche, pyroclastic flow, and Mount St. Helens).
- Facilitate research on geological, hydrological, and ecological features and processes of blast zone (both downed and seared vegetation areas) hillslope, small lake (e.g., Meta, Ghost, Strawberry), and whole watershed units (Upper Green River, Smith Creek, and tributaries).
- Provide opportunity for research on geological, hydrological, and ecological aspects of an aggraded mudflow-impacted channel (upper Smith Creek).

Mt. Margaret Management Concept Area

Visitor Use

- Provide an opportunity to interpret geologic and volcanic processes while enjoying a primitive or semiprimitive experience.
- Provide information that will encourage low impact use and fire prevention throughout the area.
- Provide access to the best views of the crater, dome, and Spirit Lake.
- Provide access between the lake's area and the Vanson Peak Backcountry.
- Provide opportunities to view and photograph some of the unique features.
- Provide opportunities for dispersed camping.

Management

- Protect the visitor from the threat of fire.
- Reduce the threat of fire to the standing/blown down dead timber.
- Provide for adequate sanitation.
- Provide access for research.
- Provide for good dispersion of the visitor use to reduce impacts on fragile vegetation and soils around the lakes and meadows.
- Provide a storage area and shelter for administrative use.
- Provide helicopter landing sites for administrative use.

Research

- Facilitate research on response on geological, hydrological, and ecological aspects of montane/subalpine lakes, streams, upland ecosystems, and whole watershed units (upper N. Coldwater, East Fork Miners Creek).

Backcountry Management Concept Area

Visitor Use

- Provide an opportunity to enjoy a semiprimitive recreation experience.
- Replace some of the traditional horse use eliminated from other areas of the Monument.
- Provide opportunities for dispersed camping.
- Provide access for fishing the Green River.
- Provide opportunities to view and photograph large old growth timber.
- Interpret the extent of the May 18, 1980, blast and its effect on man and geologic and volcanic processes.
- Interpret the agency's response (timber salvage) to the event.

Management

- Provide for adequate sanitation.
- Improve access into the area.
- Reconstruct trails to accommodate increased horse/hiker traffic.
- Provide adequate parking facilities for users.
- Provide for good dispersion of the visitor use to reduce impacts on fragile vegetation and soils around the lakes and meadows.
- Provide information that will encourage low impact use throughout the area.

Research

- Provide access into the Goat Creek drainage.
- Provide landscapes and ecosystems relatively undisturbed by development and the 1980 eruptive events of Mount St. Helens to serve as controls for studies of lakes, streams, and upland ecosystems elsewhere in the Monument.
- Provide a large watershed undisturbed by development and recent eruptive events to serve as a control for sediment yield studies elsewhere in the area greatly affected by 1980 activity of Mount St. Helens.

Mount St. Helens Management Concept Area

Visitor Use

- Interpretation of volcanologic and geologic processes.
- Provide opportunities for hiking and mountaineering.
- Provide a primitive to semiprimitive recreation opportunity.

Research

- Facilitate research on geological, hydrological, and ecological phenomena in crater and flank environments of an active volcano.
- Facilitate opportunity for intensive process-level geomorphology research on the Muddy Fan.
- Facilitate opportunity for intensive, integrated ecological research (Upper Pine Creek Fan and Butte Camp).

Management

- Protect the visitor from unpredicted volcanic hazards.
- Protect the fragile vegetation and soils above timberline.
- Improve air traffic situation from safety and recreation experience standpoint.
- Minimize impacts caused by long-term camping by researchers.
- Provide the visitor with information on volcanic and avalanche hazards.
- Provide information that will encourage low-impact use on the mountain slopes.

Road 25 Corridor (Additional Supporting Development)

Visitor Use

- Provide a safe travel route for recreation traffic from State Route 503 to U.S. Highway 12.
- Provide orientation information.
- Interpret the role that the Forest Service has in salvaging damage timber and speeding up the recovery of the area outside the Monument.
- Interpret the mudflows on the south and east side of the mountain.
- Provide trailhead facilities for the Boundary Trail.

- Provide clear directional signing.
- Redesign existing recreation facilities to meet the facility design guidelines for the Monument.

Winter Season

- Provide access and parking for winter recreation users.
- Supplement winter recreation opportunities.

Research

- Provide living and working facilities for researchers.
- Facilitate research on valley floor forest ecosystems including zones of 1980 mudflow impact.

Management

- Provide facilities for Skamania County law enforcement cooperators.
- Provide facilities for cooperative medical service.
- Minimize conflicts with industrial traffic.
- Replace temporary bridges on Pine Creek, Muddy River, and Eagle Cliff with permanent structures.

Lewis River Corridor (Additional Supporting Development)

Visitor Use

- Improve signing for visitors entering the Monument from State Route (SR) 14.
- Provide visitor orientation information for visitor entering from SR 14.
- Replace some of the traditional horse use lost in the Monument.
- Interpret agency's land management activities.

Management

- Provide suitable camping facilities for industrial users separate from the recreationists.
- Improve the safety around waterfalls' areas.
- Provide for greater dispersion of visitors to Mount St. Helens.
- Replace some of the camping capacity lost during the May 18, 1980, eruption.

Research

- Provide living facilities.

SPECIFIC ACTIONS BY MANAGEMENT CONCEPT AREA BY ALTERNATIVE

ALTERNATIVE A

Cave Basalt/Goat Marsh Area Management Concept Area

Ape Cave

- Maintain 20 car and 1 bus paved parking.
- Maintain a vault toilet.
- Maintain Trail No. 239 to upper end of Ape Cave.

Lava Cast

- Maintain the picnic area at 10 units and parking.
- Maintain pit toilets.

Kalama Springs

- Maintain the 5 unit picnic area.
- Maintain vault toilet.

Dispersed Area

- Maintain Trail No. 237 from Road 8123 to Goat Marsh Lake.
- Maintain road to Rock Pit at trailhead, and allow dispersed camping.
- Road 8123 from near Blue Lake remains closed because of damage by alluvial flows.
- Operate damaged portion of Road 81 using native material surfacing.
- Maintain Trail No. 238 from near Blue Lake to Sheep Canyon.
- Maintain parking for 4 cars at Trail No. 238, trailhead at Red Rock Pass.

South Portal

- Continue to operate the temporary portal at the PP&L's Yale recreation site.
- Phase out the temporary facility in 1987.

Mudflow Management Concept Area

Lava Canyon

- Maintain 10 car parking area using native material surfacing.
- Maintain trail to viewpoint.
- Maintain interpretive sign.

Dispersed Area

- Manage Road 83 from east of the mudflow as a one-way loop road.
- Maintain portions of Roads 83, 2588, and 92 across the mudflows with native material surfacing.
- Continue to restrict public access over Road 92 to Smith Butte.
- Maintain Trail No. 234 and Jackpine Shelter.
- Replace temporary bridge on Road 83 crossing of Pine Creek.

Road 99/Spirit Lake Management Concept Area

Bear Meadow Viewpoint

- Retain existing parking for 15 cars.
- Maintain vault toilet.
- Maintain 5 picnic units and an interpretive sign.

Miner's Car

- Retain existing parking for 10 cars.
- Maintain protective fence and interpretive sign.

Meta Lake

- Maintain a barrier free trail to the lake, and the interpretive sign.

Cascade Peaks Viewpoint

- Retain parking for 15 cars.
- Maintain interpretive sign.

Independence Pass

- Maintain trail to viewpoint.
- Maintain interpretive signs.

Windy Ridge Viewpoint

- Retain parking for 110 cars.

Norway Pass Trailhead

- Retain parking for 30 cars.

Strawberry Mountain

- Maintain Road 2516 to viewpoint.

Dispersed Use

- Maintain Trail No. 1 from Bear Meadow to Norway Pass.
- Maintain Trail No. 220 from Bear Meadow to Strawberry Mountain.

Mt. Margaret Management Concept Area

- Trail access is provided from Road 26 to Norway Pass, all other use is cross country.

Backcountry Management Concept Area

- Maintains all existing trails in the present locations. Reconstructs damaged portions of the Green River Trail No. 213 to connect to Road 2612 and a private road on the west side of the Monument. Retains the pullout parking and interpretive sign at Ryan Lake, Quartz Creek Big Tree Area, and at the blast edge along Road 26.

Mount St. Helens Management Concept Area

- Continues to restrict access as coordinated with the Washington State Department of Emergency Services and U.S. Geological Survey.

Facilities Outside the Monument Along Major Access Corridors

Iron Creek Information Station

- Retain the existing temporary portal building at Iron Creek campground and phase out in 1987.

Iron Creek Campground

- Retain 92 unit campground.

Clearwater Overlook

- Operate and maintain existing graveled parking for 6 cars.
- Retain 3 interpretive signs.

Muddy River Mudflow

- Retain paved parking for 10 cars. Retain interpretive signing.

Cedar Flats Research Natural Area

- Retain parking for 5 cars, and maintain loop trail.

Pine Creek Information Station

- Operate the former Ranger Station as a visitor information station.

Lower Falls

- Retain existing 16 unit campground.
- Maintain protective fence at falls.

Big Creek Falls

- Retain paved parking area for 8 cars, vault toilet, and trail to the waterfalls.

Curly Creek Falls Viewpoint

- Retain gravel parking area for 10 cars, vault toilet, trail to waterfalls, and waterfall viewing platform.

Curly Creek Campground

- Retain as dispersed camping opportunity for recreation.

Outlaw Ridge Viewpoint

- Retain as viewpoint, picnic area with paved parking for 16 cars and 2 buses, vault toilet, interpretive sign, and 8 picnic tables.

Management

- Manage Road 25 as double lane paved road with the exception of the portion between Road 2573 and Elk Pass. Manage the portion between the junction with Road 2573 and 2560 as a one way system with north bound on Road 2573 and south bound traffic on Road 2560.
- Manage the segment between Road 2560 and Elk Pass as single lane paved road with turnouts.

ALTERNATIVE B

Coldwater/Johnston Ridge Management Concept Area

Coldwater Lake

- Construct an information kiosk.

- Construct 10 unit picnic area.
- Construct vault toilets.
- Construct a viewpoint with 100 seat amphitheater.
- Install three interpretive signs.
- Provide paved parking for 80 cars and 2 buses at viewpoint.
- Provide paved parking for 20 cars at boat ramp.
- Provide water.
- Acquire public rights for existing private roads into Coldwater Lake, and reconstruct to a double lane dust free standard.
- No action proposed to control management activities between this road and the Monument boundary.
- Provide information bulletin board with pack-it-out and low impact backcountry use message.
- Close the lake to all motorized use including float planes.

Johnston Ridge

- Construct 3-sided rock shelter.
- Install interpretive signs at two viewpoints.
- Construct compost toilets, 2 each.

Harrys Ridge

- Construct 3-sided rock shelter.
- Construct compost toilet.
- Reconstruct U.S. Geological Survey antenna/building.

Minnie Peak

- Construct combination viewpoint/trailhead with parking for 10 cars. Install interpretive signs and bulletin board with pack-it-out message.
- Acquire public access agreement for existing private road to Minnie Peak. Reconstruct to a single lane graveled standard.
- No action proposed to control management activities between this road and the Monument boundary.

Dispersed Area

- Construct trail to Johnston Ridge and Harrys Ridge.
- Construct trail to damaged logging equipment on Coldwater Ridge/install interpretive sign.
- Construct 2 viewpoints with interpretive signs on access roads with paved parking for 10 cars at each location.

Air Traffic

- Request F.A.A. to chart the area and restrict air traffic to 2,000 feet above the terrain.

Research

- Manage area under standards of Protection Class 3, as shown on Figure 1, in Appendix C.

Castle Lake/Sheep Canyon Management Concept AreaCastle Lake

- Construct parking for 5 autos (gravel), and interpretive sign.
- Acquire public access agreement along private Road 3000, and maintain as single lane gravel access to Castle Lake.
- Issue a special use permit for a concessionaire to operate a bus shuttle from State Route 504 near Camp Baker to Castle Lake.

Sheep Canyon Complex

- Maintain Road 8123 as single lane gravel access to Sheep Canyon.
- Construct parking for viewpoint/trailhead for 5 autos, 3 picnic units, 2 interpretive signs, and vault toilet.

Dispersed Area

- No open fires.

Air traffic

- Request F.A.A. to chart the area and restrict air traffic to 2,000 feet above the terrain.

Research

- Manage area to standards of Protection Class 2 and Class 3 as shown on Figure 1, in Appendix C.

Cave Basalt/Goat Marsh Management Concept AreaApe Cave

- Retain parking for 20 cars and 1 bus.
- Construct a vault toilet.
- Rewrite the Ape Cave brochure as a self-guided trail.
- Retain Trail No. 239 to upper end of the Ape Cave.
- Construct an information/interpretive kiosk.
- Construct a cedar fence around the skylight near the upper end of Ape Cave.
- Relocate Road 8303 to eliminate traffic by the cave entrance.
- Retain an information bulletin board at the cave entrance with cave conservation messages.

Lava Cast

- Retain the picnic area at 10 units.
- Construct a .3 mile loop barrier free interpretive trail through the Lava Cast area.
- Retain parking for 15 cars.
- Provide water.
- Construct a vault toilet.

Kalama Springs

- Install interpretive sign at the springs.
- Remove present picnic area.
- Reconstruct 5 car parking area near springs.
- Maintain Road 8100610 to Kalama Springs.

Dispersed Area

- Remove Trail No. 237 from Road 8123 to Goat Marsh Lake.
- Close Road 8300030.
- Close Road 8123070.
- Close Road 8100600.
- Close Roads 8123171 and 8123173.
- Sign the boundary of the Goat Marsh RNA.
- Road 8123, Trail No. 238, construct trailhead parking for 10 cars.
- Butte Camp, install compost toilet.
- Reconstruct Trail No. 238A to Butte Camp.
- Maintain Trail No. 238 to Sheep Canyon.
- Close and obliterate road between Roads 8100730 and 8100830 (presently washed out).
- Restrict access to all caves that are known to have hibernating bats.
- Install hazard warning signs inside caves that are likely to receive visits from the general public.
- No camping within sight of Road 8303 from junction with Road 83 and Ape Cave.
- Close the damaged portion of Road 8123 from Blue Lake to the end.
- Maintain Road 8123 to Sheep Canyon.

South Information Station

- Replace the existing temporary building with an information kiosk at the PP&L recreation site.

Air Traffic

- Request F.A.A. to chart the portion of the area within the Monument and restrict air traffic to 2,000 feet above the terrain.

Research

- Manage under Protection Class 3, as shown on Figure 1, in Appendix C.

Mudflow Management Concept AreaLava Canyon Complex

- Construct graveled parking area for 20 autos.
- Construct and locate two interpretive signs.
- Construct a vault toilet.
- Construct hiker-only trail to falls on the Muddy River.
- Construct a hiker-only trail along the edge of the mudflow north to Windy Pass, Trail No. 234, and trailhead on Road 83 for 8 cars.
- Construct a single lane road with turnouts to a viewpoint overlooking the mudflow.

Dispersed Area

- Manage Road 83 east of Muddy River mudflow as a one-way loop road.
- Continue to maintain Road 83 and Road 2588 by using only native material surfacing through the mudflow.
- Maintain existing Trail No. 216C to Jackpine Shelter.
- Construct Trail No. 216B to June Lake, plus a 3-car parking area on Road 83.
- Remove all traces of Road 92 from along Smith Creek north of the junction with Road 83.
- Utilize abandoned Roads 8315 and 8315130 as portions of Trail 216B, provide scarification and water control on unused portions. Eliminate Road 8300100.
- Limit Lava Canyon to day use.
- Close Road 9418 at junction of Road 94 to all traffic except by permit.
- Construct a viewpoint on Marble Mountain (interpretive sign). Parking for 4 autos.

Air Traffic

- Request the F.A.A. to chart the portion of the area within the Monument and restrict air traffic to 2,000 feet above the terrain.

Research

- Manage under standards of Protection Class 3, as shown on Figure 1, in Appendix C.

Road 99/Spirit Lake Management Concept AreaBear Meadow

- Develop parking (paved) for 5 vehicles with trailers on the north side of Road 99 to accommodate hiking/horse use on Trail No. 1.
- Install site sign on a rock base.
- Install rock wall with 3 interpretive signs.
- Construct vault toilet at trailhead.
- Install horse tie rack.
- Install curbing and sidewalk on the existing 15 auto parking area.
- Provide water.
- Maintain 5 existing picnic units.
- Retain existing parking, 15 cars, and vault toilet.

East Entrance

- Construct entrance sign with rockbase.
- Construct rock wall complete with curbing and sidewalk and 1 interpretive sign.
- Retain the existing paved parking for 7 autos, and entrance sign.

Miner's Car

- Separate parking from traffic by realigning the road, and expand to accommodate 10 autos.
- Construct a hiker trail from the car to the Meta Lake trailhead to eliminate walking on the road.
- Remove cyclone fence and replace with wrought iron fence on a rock base. Weld removable parts to the car.

Meta Lake

- Retain barrier free trail to the lake.
- Construct a cedar fence to serve as a physical barrier and deter hiking on the lake shore.
- Build new interpretive sign into the fence.
- Install site sign on a rock base.
- Improve parking for 6 autos by paving.

Cascade Peaks Viewpoint (Rd 94/99 junction)

- Retain parking for 15 autos.
- Replace interpretive sign and base.

Independence Pass

- Improve parking to accommodate 5 autos.
- Maintain existing trail 1/4 mile to the viewpoint, and replace interpretive sign and base.

Cedar Creek

- Improve parking for 6 autos.
- Install interpretive sign on rock podium base.

Donneybrook

- Widen road to provide parallel parking for 5 autos for viewing Spirit Lake.

Windy Ridge Viewpoint

- Retain 110 car paved parking and improve with curbing, rock wall, and sidewalk.
- Construct 3-sided rock shelter open toward Spirit Lake with 200 seat amphitheater.
- Construct trail to viewpoint on the ridge.
- Provide water.

Norway Pass Trailhead

- Retain the 30 car parking area at Trail No. 1 on Road 26.
- Provide water.
- Construct vault toilet.

Grizzly Panorama

- Construct parking for 4 cars.
- Install Monument entrance sign and 1 interpretive sign on rock base.

Strawberry Mtn

- Close Road 2516 where it enters the Monument. Construct parking for 4 cars.
- Construct a trail to the peak.

Dispersed Area

- Reconstruct Road 99 to a double lane dust free standard from Road 25 to Windy Ridge.
- Reconstruct Trail No. 220 and Trail No. 1 east of Bear Meadow to accommodate horse/hiker use.
- Close the area to open fires.
- Prevention patrols for fire on Roads 99 and 26 during fire season.
- Trail and camping closures during high fire danger.
- Limit use in Spirit Lake Basin to day use only.

Air Traffic

- Request F.A.A. to chart the area and restrict air traffic to 2,000 feet above the terrain.

Research

- Manage areas to standards of Protection Class 2 and 3 as shown on Figure 1, in Appendix C.

Mt. Margaret Management Concept Area

- Construct the following trails:
Trail No. 1 across Mt. Margaret Ridge to Harrys Ridge.
Trail No. 211 from Minnie Peak to Boot Lake.
Trail No. 212 across Black Mountain and down Miners Creek to Trail No. 213.
Primitive trail to the south end of Boot Lake.
Trail No. 214 across Whittier Ridge from Trail No. 1 to Trail No. 211.
Primitive trail to Snow Lake.
- Construct compost toilets at the following designated camping areas: Panhandle, Boot, Snow, and Obscurity Lakes.
- Close the entire area to open campfires.
- Provide backcountry ranger to make available low impact/fire prevention messages to users.
- Close the area to all entry during periods of high fire danger.
- Limit trail use to hiker only.
- St. Helens Lake Basin, Grizzly Lake Basin, and Norway Pass area will be day use only.

Research

- Manage to standard of Protection Class 3, as shown on Figure 1, in Appendix C.

Air traffic

- Request the F.A.A. to chart the area and restrict air traffic to 2,000 feet above the terrain, and limit landings to by permit only.

Backcountry Management Concept AreaRyan Lake

- Construct the following:
Parking for 5 autos.
Interpretive sign and site sign on rockbase.
Vault toilet.

Quartz Big Tree

- Construct parking for 4 autos.
- Construct site sign and interpretative sign.
- Reconstruct nature trail.

Dispersed Area

- Reconstruct Trail No. 213 to provide access to Roads 2612 and Weyerhaeuser's Road 2500.
- Reconstruct existing Trails No. 213, 217, 218, and 220 to standards needed to accommodate horse/hiker use.
- Relocated the east end of Trail No. 217 to a good trailhead site on Road 2612.
- Construct the following trailheads: (To accommodate horse use.)

Road	Trail	Toilet	No. of Cars
Weyerhaeuser 2500	#213	Vault	10
2612	#213	Vault	10
2612	#217		6
2600	#220		3
2750	#217		5
2750	#217C		5

- Construct compost toilets and designate camping areas: Vanson and Deadmans Lake.
- Acquire public access agreements on the following private roads:
Road 27 to Vanson Peak area.
Road 2612 (Sections 13 and 18).
Private road from Minnie Peak to Green River.
- Construct approximately 1/2 mile of single lane gravel road from the end of Green River road to the Monument boundary.
- Provide low impact camping and pack it out information at all trailheads.
- Provide backcountry ranger annually to make available low impact use/fire prevention message.
- No action proposed to control management activities along private land in Section 13, T. 10 N., R. 5 E., and Section 18, T. 10 N., R. 6 E.

Research

- Manage to standards of Protection Class 3, as shown on Figure 1, in Appendix C.

Air Traffic

- Request F.A.A. to chart the area inside the Monument and restrict air traffic to 2,000 feet above the terrain.

Mount St. Helens Management Concept AreaVisitor Use

- Provide a mountain climbing brochure with the main emphasis on informing the visitor about volcanic, geologic, and avalanche hazards and information on low impact use. Brochure would provide historic interpretive information.
- Sign trails leading to the mountain slopes informing climbers of registration system and reminding returning climbers to check out after completing a climb.

Management

- Close the crater to all entry except by permit for scientific study.
- Operate a voluntary registration system for mountain climbing.
- Close the area to all entry during periods when U.S. Geological Survey advises of potential eruptive activity.
- Require all research and monitoring facilities to conform to the architectural standards for the Monument.
- Participate in the avalanche forecasting program.

Research

- Manage shaded areas to standards of Protection Class 2 and 3 as shown on Figure 1, in Appendix C.

Air Traffic

- Request the F.A.A. to chart the area and restrict air traffic to 2,000 feet above the terrain and limit landings to by permit only.

Other Facilities Outside the Monument Along Major Access CorridorsIron Creek Information Station

- Provide a kiosk for dispensing information.
- Retain the vault toilet.

Iron Creek Campground

- Operate and maintain the existing 92 units.

Boundary Trailhead

- Construct paved parking at Elk Pass for 5 cars.
- Provide horse ties.
- Provide vault toilet.

Clearwater Overlook

- Improve existing parking by paving for 6 cars.
- Construct a rock wall with sidewalk and curb.
- Install 3 interpretive signs on the wall.

Muddy River Overlook

- Construct paved parking for 5 cars.
- Construct trail to viewpoint.
- Construct a rock wall with 3 interpretive signs at the viewpoint.

Muddy River Mudflow

- Maintain existing 10 car parking and interpretive signing.

Cedar Flats Research Natural Area

- Maintain existing 5 car parking and 1 mile loop interpretive trail.
- Provide a self-guided trail brochure and trailhead sign.

Pine Creek Viewpoint

- Improve parking for 5 cars.
- Provide 2 interpretive signs.
- Provide a rock wall.

Pine Creek Information Station

- Retain and improve the former Ranger Station office as an information station.
- Provide comfort station.
- Provide kiosk for dispensing information during unstaffed periods.
- Improve landscaping and displays/exhibits.

Lower Falls

- Convert existing campground to day use viewpoint and camping area.
- Construct 5 picnic units.
- Construct graveled parking for 5 cars for day use.
- Replace toilets with new vault toilet design.
- Provide water.
- Extend protective fencing at key viewpoints and along river.
- Install interpretive sign at viewpoint.
- Improve 12 camping units.

Big Creek Falls

- Maintain the existing paved parking area for 8 cars, vault toilet, and trail to the waterfalls.

Curly Creek Viewpoint

- Retain gravel parking for 10 cars, vault toilets, viewing platform, and fences.

Curly Creek Campground

- Use as dispersed camping opportunity.

Outlaw Ridge

- Retain as viewpoint picnic area with paved parking for 16 cars and 2 buses, vault toilet, 8 picnic tables, and interpretive signs.
- Construct an information kiosk to display visitor orientation information.

Research

- Construct 6 trailer camping units behind the office for research users.
- Designate campsites at Curly Creek for research users.

Management

- Provide trailer space for the Skamania County deputy at Pine Creek.
- Provide signs for State Route 14 and Forest Service Roads 51 and 30.

Roads

- Upgrade the remaining portions of Road 25 to a double lane standard. (Separate analysis needed on portion between 2573 junctions and 2560.)

ALTERNATIVE C

Coldwater/Johnston Ridge Management Concept Area

Coldwater Lake Complex

- Construct a bus tram sales office/loading area building.
- Construct a visitor information station/first aid building with a gift shop/snack bar.
- Provide paved parking for 600 cars and 12 buses, with designed-in expansion for 400 cars near the bus tram office.
- Provide paved parking for 40 cars at the boat launch.
- Provide paved parking for 20 cars at Trail No. 221.
- Construct a comfort station at bus tram.
- Construct a comfort station at boat launch.
- Construct a 200 seat outdoor amphitheater.
- Construct 20 unit picnic area with covered tables near amphitheater.
- Construct boat launch ramp and dock.
- Provide water.
- Construct a bus maintenance shop and fuel storage.
- Construct 4 interpretive signs.
- Request Washington State Department of Transportation to construct State Route 504 from near Camp Baker to Coldwater Lake, to a double lane paved standard.
- Install underground power/telephone cable from Camp Baker to Coldwater Lake.
- Provide space in the visitor contact station for law enforcement cooperators.
- Install 2-way radio remote in visitor contact station.
- Acquire a scenic easement on the private land between State Route 504 and the Monument boundary, and the S 1/2, SE 1/4 of Section 35, T. 10 N., R. 4 E. to retain visual quality.
- Close Coldwater Lake to all motorized boats (including electric motors) and float planes.
- Issue a special use permit to operate a shuttle bus concession from Coldwater Lake to Johnston Ridge.

Johnston Ridge

- Construct an observation post/visitor center building with viewing deck.
- Construct a 200 seat outdoor amphitheater.
- Construct a comfort station.
- Construct 4 interpretive signs.
- Provide water.
- Install underground power/telephone cable from Coldwater to Johnston Ridge observation post.
- Construct a single lane dust free road from Coldwater Lake to the observation post.
- Install a 2-way radio remote.
- Construct paved parking for 5 administrative vehicles at the observation posts, and construct a heliport nearby for U.S. Geological Survey and administrative use.

Harrys Ridge

- Construct a 3-sided rock shelter for day use only.
- Install a compost toilet.
- Provide one interpretive sign.
- Reconstruct U.S. Geological Survey building/antenna.
- Provide information board with pack-it-out and low impact backcountry use information.

Dispersed Area

- Construct Trail No. 230 along the north shoreline of the lake.
- Construct Trail No. 221 across the debris avalanche as a loop interpretive trail.
- Construct trail to damaged logging equipment, and install interpretive sign.
- Construct Trail No. 1 to Harrys Ridge.
- Construct 2 viewpoints along State Route 504 and install one interpretive sign at each viewpoint.
- Provide paved parking for 11 cars.

Air Traffic

- Request the F.A.A. to chart the area and restrict air traffic to 2,000 feet above the terrain, except by permit.

Research

- Manage area under standards of Protection Class 3, as shown on Figure 1, in Appendix C.

Castle Lake/Sheep Canyon Management Concept Area

Castle Lake Complex

- Purchase public rights in private Road 3000 and maintain as single lane gravel access to Castle Lake.
- Close the lake to all motorized boating and float planes.
- Construct: parking for 10 autos (gravel), vault toilet, and interpretive sign.
- Provide water.
- Construct Trail No. 221 as an interpretive loop trail.

Sheep Canyon Complex

- Maintain Road 8123 as single lane gravel access to Sheep Canyon.
- Construct: parking for viewpoint/trailhead for 10 autos, 3 picnic units, 2 interpretive signs, and a vault toilet.

Dispersed Area

- Construct Trail No. 216.1 between Castle Lake and Sheep Canyon.
- Limit visitor use to trails in the debris avalanche high value research area.
- No open fires.
- No overnight use permitted.

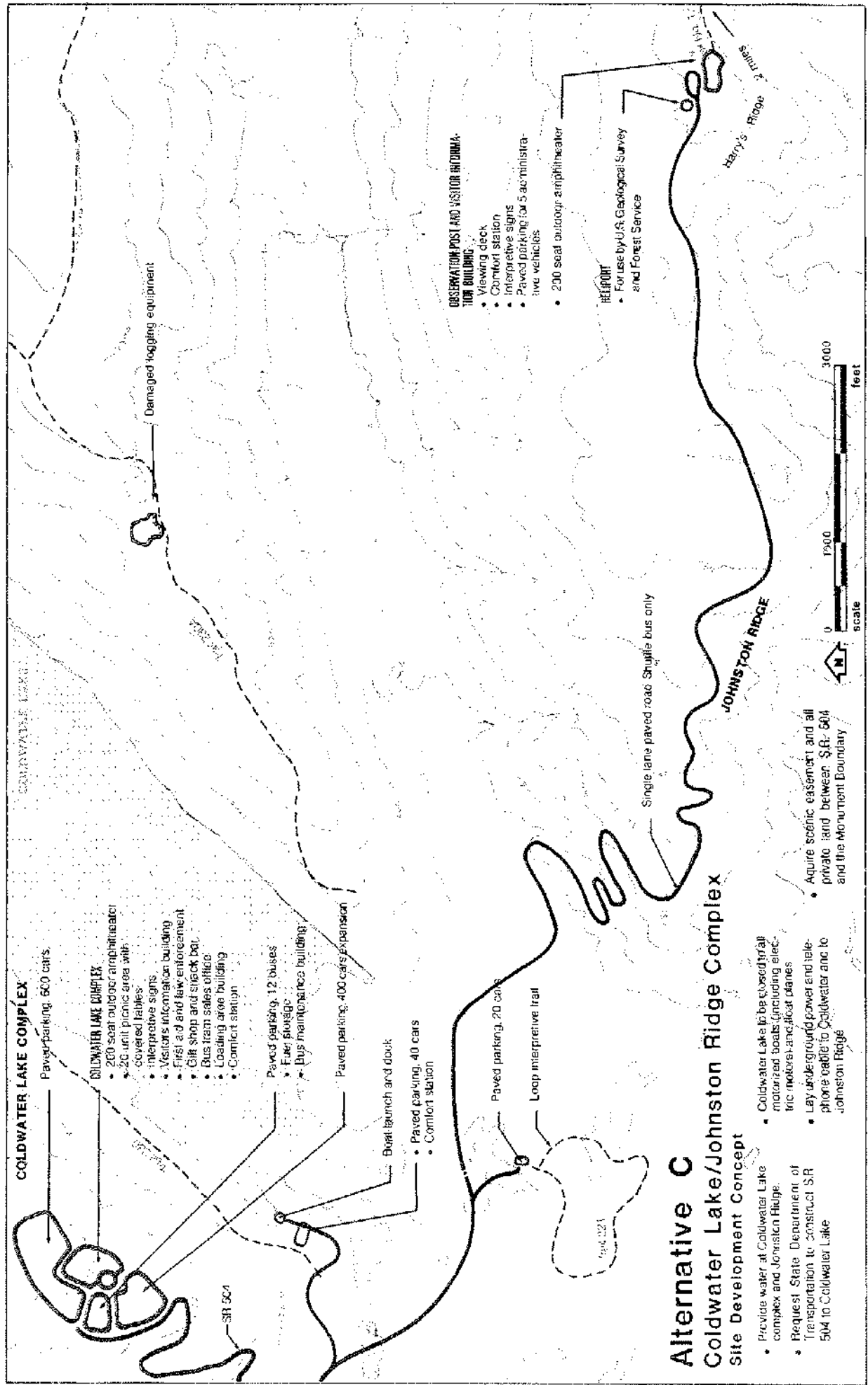


Figure D-1

Research

- Manage shaded areas to standards of Protection Class 1 and 3 as shown on Figure 1, in Appendix C.

Air Traffic

- Request the F.A.A. to chart the area and restrict air traffic to 2,000 feet above the terrain.

Cave Basalt/Goat Marsh Management Concept AreaApe Cave

- Relocate parking further away from the cave entrance and expand to paved parking for 30 cars and 1 bus.
- Construct a vault toilet.
- Rewrite the Ape Cave brochure as a self-guided trail.
- Retain Trail No. 239 to upper end of Ape Cave.
- Construct an information/interpretive kiosk.
- Construct a cedar fence around the skylight near the upper end of Ape Cave.
- Relocate Road 8303 to eliminate traffic by the cave entrance.
- Retain an information bulletin board at the cave entrance with cave conservation messages.

Lava Cast

- Retain the picnic area at 10 units.
- Construct a .3 mile loop barrier free interpretive trail through the Lava Cast area.
- Retain parking for 15 cars.
- Provide water.
- Construct a vault toilet.

Kalama Springs

- Install interpretive sign at the springs.
- Reconstruct as an interpretive site for day use only, with gravel parking for 4 cars.
- Gravel Road 8100610 to Kalama Springs.

Goat Marsh

- Retain Trail No. 237 from Road 8123 to Goat Marsh Lake.
- Close Road 8123070 and use as a part of Trail No. 237.
- Close Roads 8123171 and 8123173.
- Sign the boundary of the RNA.
- Sign trailhead with information encouraging low impact use.

Trailheads

- Road 8123, construct parking for 10 cars (Blue Lake) end of Trail No. 238.
- Road 8100830, construct parking for 5 cars.
- Road 81, Red Rock Pass, Trail No. 238, reconstruct parking for 4 cars.

Dispersed Area

- Acquire commercial hauling rights in private road from Road 8303 to Road 81 to allow industrial traffic to flow west and avoid mixing with Ape Cave and Lava Cast traffic.
- Close Road 8300030 to reduce dispersed use of sensitive caves.
- Construct compost toilet and camp units for 10 users at Trail No. 238/238C junction.
- Butte Camp, install compost toilet.
- Reconstruct Trail No. 238A to Butte Camp.
- Construct Trail No. 216 near timberline.
- Maintain Trail No. 238 to Sheep Canyon.
- Reopen Road 81 to single lane gravel surface, form a loop drive.
- Sign with information on registration system at all dispersed camps.
- Campers must register at portals, Monument headquarters, or visitor center.
- No camping within sight of Road 83 and 8303 to Ape Cave.
- Close the damaged portion of Road 8123 from Blue Lake to the end.
- Reconstruct damaged portion of Road 81 to the preerruption standard.
- Retain Road 8123 to Sheep Canyon as a single lane gravel surface road.

Winter Season

- Request State cooperative funds to groom existing roads as shown on the map.
- Mark and maintain ski trails as shown on the map.

Yale Information Station

- Reconstruct as a visitor information station in the present location at Yale recreation site.
- Provide paved parking for 15 cars.
- Install power and telephone.
- Operate short range broadcasting system to present updated information during periods the contact station is closed.
- Enter cooperative agreement with PP&L to use their land and have them provide a building which the Monument would staff and maintain.
- Visitors would use the sanitation facilities presently on site and maintained by PP&L.
- Request Cowlitz County Department of Transportation to construct deceleration lane at entrance.

Research

- Manage under Protection Class 3, as shown on Figure 1, in Appendix C.

Mudflow Management Concept AreaLava Canyon Complex

- Upgrade parking for the trail and viewpoint signing at present location for 10 cars.

- Establish trailhead/interpretive complex near Moss Springs that will serve Trail No. 234 to the mountain and Trail No. 184 to Lava Canyon. Graveled parking for 20 cars.
- Provide water.
- Construct vault toilet.

Dispersed Area

- Construct Trail No. 216C as hiker only access to a timberline trail with trailhead on Road 83 for 5 cars.
- Manage Road 83 from the mudflow northeast as a one-way loop road.
- Upgrade portion of Road 83 and 2588 through the mudflow by applying gravel surface rock and culverts.
- Relocate approximately 0.8 miles of Road 9418 to eliminate steep grade.
- Close portion of Trail No. 216C outside the Monument to ORV's.
- Construct Trail No. 216 at approximately timberline on the south and east side of the mountain.
- Reconstruct Road 92 above the mudflow along Smith Creek to Ape Canyon.
- Construct a permanent bridge across Smith Creek in the general vicinity of existing temporary bridge.
- Manage traffic in a one-way direction south on Road 94 and Road 9418.
- Limit use in Lava Canyon to day use.
- Construct viewpoint on Marble Mountain with gravel parking for 4 cars and install an interpretive sign.
- Acquire a scenic easement on Section 4, T. 7 N., R. 5 E., from the State of Washington.

Winter Season

- Construct Sno-park facility near the junction of Roads 83 and 8312 with the following: Paved parking area for 50 vehicles with trailers, and vault toilets.
- Request State cooperative funds to snowgroom Roads 83 and 8312.
- Mark, construct, and maintain cross-country ski trail to June Lake 3.5 miles in approximate location of abandoned Roads 8315 and 8315130.
- Request State Sno-park funds for snow removal

Research

- Manage under standards of Protection Class 3, as shown on Figure 1, in Appendix C.

Road 99/Spirit Lake Management Concept Area

Bear Meadow

- Develop parking (paved) for 5 vehicles with trailers on the north side of Road 99 to accommodate hiking/horse use on Trail No. 1.
- Install site sign on a rock base.
- Install of rock wall with 3 interpretive signs.
- Construct vault toilet at trailhead.

- Install horse tie rack.
- Install curbing and sidewalk on the existing 15 auto parking area.
- Provide water.
- Maintain 5 picnic units.

East Entrance

- Construct entrance sign with rockbase.
- Construct rock wall complete with curbing and sidewalk and 1 interpretive sign.
- Retain the existing paved parking for 7 autos.

Miner's Car

- Separate parking from traffic by realigning the road, signing and striping, and expand to accommodate 10 autos.
- Construct a hiker trail from the car to the Meta Lake trailhead to eliminate walking on the road.
- Remove cyclone fence and replace with a wrought iron fence on rock base. Weld removable parts to the car.

Meta Lake

- Retain the barrier free trail to the lake.
- Construct a cedar fence at the trail's end to serve as a physical barrier and deter hiking on the lake shore.
- Mount new interpretive sign on a rock base.
- Install site sign on a rock base.
- Improve parking for 6 autos by paving.

Cascade Peaks Viewpoint (Rd 94/99 junction)

- Retain parking for 15 autos, stripes.
- Replace interpretive sign and base.

Independence Pass

- Improve parking to accommodate 5 autos.
- Extend trail north for 1 mile to a viewpoint.
- Replace interpretive sign and base.

Harmony Creek

- Construct parking for 10 vehicles.
- Install site sign and interpretive sign on a rock base.

Cedar Creek

- Improve parking for 10 autos.
- Install interpretive sign on rock base.

Donneybrook

- Widen road to provide parallel parking for 10 autos for viewing Spirit Lake.
- Install interpretive sign on rock base.

Smith Creek View

- Construct parking for 20 cars.
- Construct rock wall complete with curbing and walkways with interpretive sign on wall.
- Install site sign on rock base.

Windy Ridge Viewpoint

- Retain 110 car paved parking and improve with curbing, rock wall, and sidewalk.

- Construct 3-sided rock shelter open toward Spirit Lake with 200 seat amphitheater.
- Construct trail to viewpoint on the ridge.
- Provide water.

Norway Pass Trailhead

- Retain the 30 car parking area at Trail No. 1 on Road 26.
- Provide water.
- Construct vault toilet.

Grizzly Panorama

- Construct parking for 4 cars.
- Install Monument entrance sign and 1 interpretive sign on rock base.

Smith Ridge

- Install an interpretive sign on a rock base and provide parking for 5 cars.

Strawberry Mtn Lookout

- Construct a lookout tower to serve both fire detection and visitor interpretation.
- After the lookout is constructed, close Road 2516 where it enters the Monument, develop parking for 7 cars, install a vault toilet, and eliminate the closed portion of the road.
- Construct a trail to the lookout.

Dispersed Area

- Reconstruct Trail No. 220 and Trail No. 1 east of Bear Meadow to accommodate horse/hiker use.
- Construct a boat dock and boat launch to maintain access to the lake control device, if needed. Maintain native surface access road to Spirit Lake from Windy Ridge for administrative use only.
- Close the area to open fires.
- Restrict access to developed sites and trails in the Spirit Lake Basin as shaded on the map. (Research Protection Class I.)
- Prevention patrols for fire on Roads 99 and 26 during fire season.
- Trail and camping closures during high fire danger.
- Delay construction of Trail 1D until after 1990 when it is estimated that fire hazard will decrease.

Research

- Manage shaded areas to standards of Protection Class 2 and 3 as shown on Figure 1, Appendix C.

Air Traffic

- Request F.A.A. to chart the portion of the area in the Monument and restrict traffic to 2,000 feet above the terrain.

Mt. Margaret Management Concept Area

- Construct the following trails:
Trail No. 1 across Mt. Margaret Ridge to Harrys Ridge.

Trail No. 211 from Trail No. 1 to Trail No. 212 (from near Coldwater Peak to Snow Lake).
Trail No. 212 across Mt. Venus to Deep Lake and down Falls Creek to Trail No. 213.
Primitive trail to the south end of Boot Lake.
Trail No. 214 across Whittier Ridge from Trail No. 1 to Trail No. 211 (on ridge between Boot and Panhandle Lakes).
Trail 211F from Road 2612 to Trail No. 211 near Panhandle Lake.
Primitive trail to Snow Lake.
Trail No. 209 from Trail No. 1 to St. Helens Lake.

- Construct compost toilets at the following designated camping areas: Panhandle, Boot, Snow, Shovel, and Obscurity Lakes
- Close the entire area to open campfires.
- Require overnight visitors to register.
- Provide backcountry ranger to make available low impact/fire prevention messages to users.
- Close the area to all entry during periods of high fire danger.
- Limit trail use during this planning period to hiker only.
- Delay construction of trails in high fire hazard areas until 1990.

Research

- Manage to standards of Protection Class 3, as shown on Figure 1, in Appendix C.
- Require camper to be located at least 200 feet from water, unless in a designated campsite.

Air Traffic

- Restrict air traffic to 2,000 feet above the terrain, and limit landings to by permit only.

Backcountry Management Concept Area

Ryan Lake

- Construct the following: Parking for 5 autos, interpretive sign and site sign on rockbase, and vault toilet.

Quartz Big Tree

- Construct parking for 5 autos and 1 bus.
- Construct vault toilet.
- Construct site sign and interpretative sign.
- Reconstruct nature trail.

North Fringe

- Construct interpretive sign on rock base.
- Construct parking for 3 autos.
- Traffic barriers.

Polar Star Mine

- Install interpretive sign. Construct parking for 10 cars.
- Provide water. Construct 6 picnic units. Construct vault toilet.

Dispersed Area

- Reconstruct Trail No. 213 to provide access to Roads 2612 and Weyerhaeuser Road 2500.
- Reconstruct existing Trails No. 213, 217, 218, and 220 to standards needed to accommodate horse/hiker use.
- Relocate portion of Trail No. 217 presently on private land to inside the Monument.
- Relocate the east end of Trail No. 217 to a good trailhead site on Road 2600118.
- Construct the following trailheads: (To accommodate horse use.)

<u>Road</u>	<u>Trail</u>	<u>Toilet</u>	<u>No. of Cars</u>
Weyerhaeuser 2500	#213	Vault	10
2612	#213		5
2600	#220		3
2750	#217		3
2600118	#217		5

- Construct compost toilets and designate camping areas at Vanson and Deadmans Lakes.
- Acquire public access agreements on the following private roads: Weyerhaeuser 2500 (State Route 504 to end), Road 27 to Vanson Peak, and Road 2612 (Sections 13 and 18).
- Provide low impact camping and pack-it-out information at all trailheads.
- Provide backcountry ranger to make available low impact use/fire prevention message.
- Acquire scenic easement along Road 2612 through private lands in Section 13, T. 10 N., R. 5 E., and Section 18, T. 10 N., R. 6 E.

Research

- Manage to standards of Protection Class 3, as shown on Figure 1, in Appendix C.
- Construct Trail No. 205 from Road 2750 along Goat Creek to Trail No. 217. Close trail to horse use.

Air Traffic

- Request F.A.A. to chart the area inside the Monument and restrict air traffic to 2,000 feet above the terrain.

Mount St. Helens Management Concept Area

- Provide a mountain climbing brochure with the main emphasis on informing the visitor about volcanic, geologic, and avalanche hazards, and information on low impact use.
- Operate a registration system for mountain climbing.
- Sign trails leading to the mountain slopes informing climbers of registration system and reminding returning climbers to check out after completing a climb.

- Close the crater to all entry except by permit for scientific study.
- Close the area to all entry during periods when U.S. Geological Survey advises of potential eruptive activity.
- Require all research and monitoring facilities to conform to the architectural standards for the Monument.
- Participate in the avalanche forecasting program.

Air Traffic

- Request the F.A.A. to chart the area and restrict air traffic to 2,000 feet above the terrain and limit landings to by permit only.

Research

- Manage to standards of Protection Class 2 and 3 as shown on Figure 1, Appendix C.

Other Facilities Outside the Monument Along Major Access CorridorsIron Creek Information Station

- Provide parking for 5 cars (at Iron Creek Campground).
- Construct as a drive-up building with service windows on both sides.
- Provide a kiosk for dispensing information during unstaffed periods.
- Provide vault toilet.

Iron Creek Campground

- Retain existing 92 camp units.

Boundary Trailhead

- Construct paved parking at Elk Pass for 5 cars.
- Provide horse ties.
- Provide vault toilet.

Clearwater Overlook

- Improve existing parking by paving for 6 cars.
- Construct rock wall with sidewalk and curb.
- Install 3 interpretive signs on or in the wall.

Muddy River Overlook

- Construct paved parking for 5 cars.
- Construct trail to viewpoint.
- Construct rock wall with 3 interpretive signs at the viewpoint.

Muddy River Mudflow

- Maintain existing 10 car parking and interpretive signing.

Cedar Flats Research Natural Area

- Maintain existing 5 car parking and 1 mile loop interpretive trail.
- Provide a self-guided trail brochure and trailhead sign.

Pine Creek Viewpoint

- Improve parking for 5 cars.
- Provide 2 interpretive signs.
- Provide a rock wall.

Pine Creek Information Station

- Retain and improve the former ranger station office as an information station.
- Provide comfort station.
- Provide kiosk for dispensing information during unstaffed periods.
- Improve landscaping and displays/exhibits.

Cispus

- Retain and continue to operate as an Environmental Learning Center under a special use permit.

Lower Falls

- Convert existing campground to day use viewpoint and picnic area.
- Construct graveled parking for 15 cars.
- Replace toilets with new vault toilet design.
- Provide water.
- Extend protective fencing at key viewpoints and along river.
- Install interpretive sign at viewpoint.
- Construct 10 picnic units.

Big Creek Falls

- Maintain the existing paved parking area for 8 cars, vault toilet, and trail to the waterfall.

Lewis River Campground

- Construct a 50 unit campground near the Lewis River.

Curly Creek Viewpoint

- Retain gravel parking for 10 cars, vault toilets, viewing platform, fences.
- Construct vault toilet and improve camping units.
- Use for recreation and research camping.

Outlaw Ridge

- Retain as viewpoint picnic area with paved parking for 16 cars and 2 buses, vault toilet, 8 picnic tables, and interpretive signs.
- Construct an information kiosk to display visitor orientation information.

Research

- Provide a building at Pine Creek as a research laboratory.
- Construct 6 trailer camping units for research users.
- Designate campsites at Curly Creek for research users.

Management

- Provide office space for the Skamania County law enforcement cooperators in the Pine Creek information station.
- Provide housing for the Skamania County deputy at Pine Creek.

- Provide housing for 3 to 4 rescue personnel and a covered garage space for their ambulance.
- Provide signs for State Route 14 and Forest Service Roads 51 and 30.

Roads

- Replace temporary bridges at Pine Creek, Muddy River, and Eagle Cliff.
- Upgrade the remaining portions of Road 25 to a double lane dust free standard. (Separate analysis needed on portion between 2573 junctions and 2560.)

ALTERNATIVE D (Preferred in DEIS)

Alternative D (Modified), as changed by public comment on the DEIS, is presented in detail in Chapter II.

Coldwater/Johnston Ridge Management Concept Area

Coldwater Lake Complex

- Construct an aerial tramway sales office/loading area building.
- Construct a visitor information station/first aid building.
- Construct a restaurant/gift shop/snack bar and provide paved parking for 600 cars and 5 buses, with designed-in expansion for 400 cars near the aerial tram.
- Provide paved parking for 50 cars at the boat launch.
- Provide paved parking for 20 cars at Trail No. 221.
- Construct a comfort station at aerial tram.
- Construct a comfort station at boat launch.
- Construct a 200 seat outdoor amphitheater.
- Construct 20 unit picnic area with covered tables near amphitheater.
- Construct boat launch ramp and dock.
- Provide water.
- Provide a boat dock at east end of lake with access to Trail No. 230.
- Construct a bus maintenance shop and fuel storage.
- Issue a special use permit to operate a aerial tram concession from Coldwater Lake to Johnston Ridge.
- Construct 6,200 feet of aerial tramway to Johnston Ridge (concessionaire).
- Construct 4 interpretive signs.
- Construct Trail No. 221 as a loop interpretive trail. Elevate trail in sensitive areas.
- Construct a 10 unit picnic area near Coldwater Lake.
- Request Washington State Department of Transportation to reconstruct State Route 504 from near Camp Baker to Coldwater Lake, to a double lane paved standard.
- Install underground power/telephone cable from Camp Baker to Coldwater Lake.
- Provide space in the visitor information station for law enforcement cooperators.
- Install 2-way radio remote.

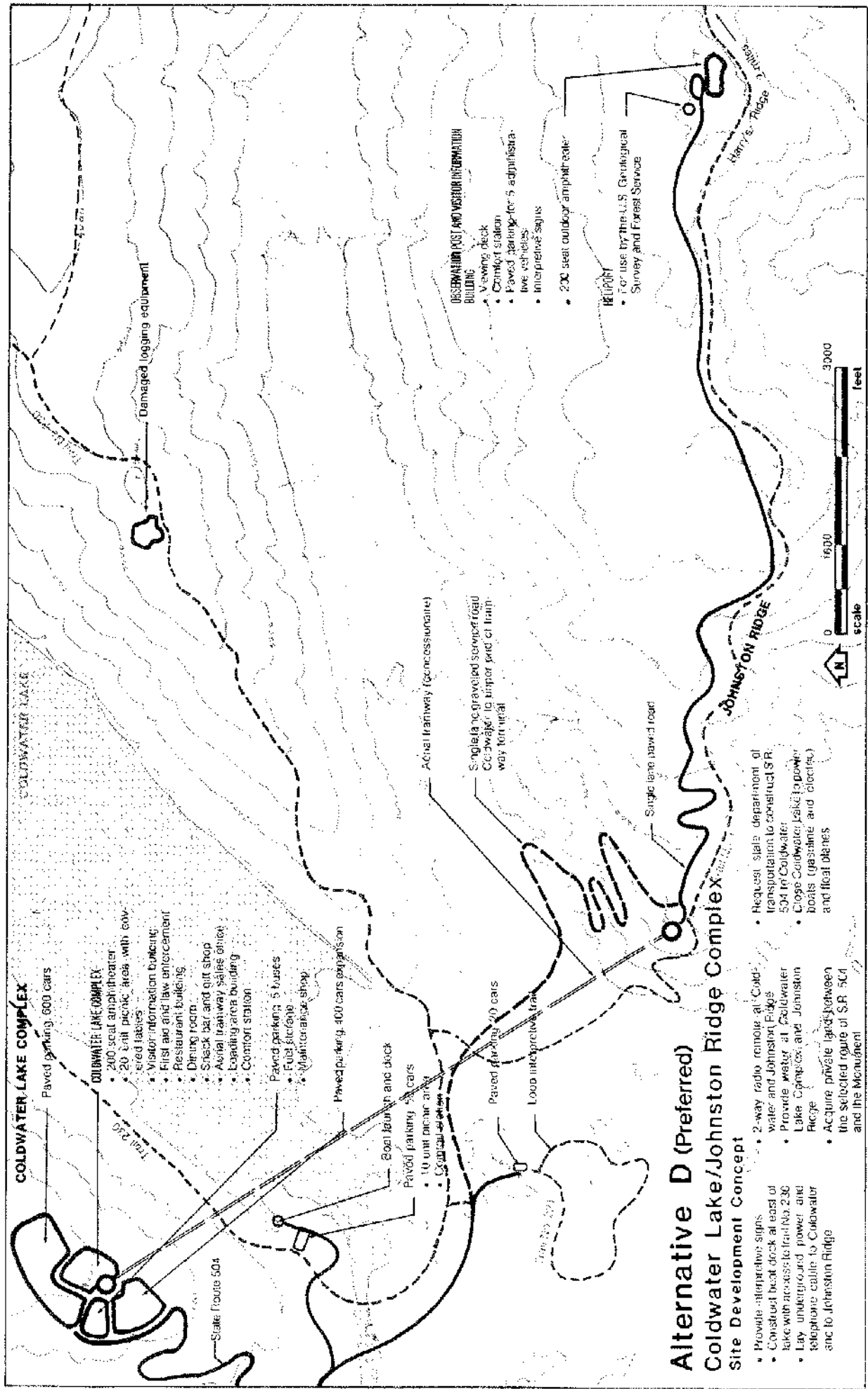


Figure D-2

- Close the lake to gasoline powered motor boats and float planes.
- Acquire private land between the selected route for State Route 504 and the Monument, and the S1/2 of SE1/4 of Section 35, T. 10 N., R. 4 E. north of the Coldwater Lake complex.
- Encourage the County to designate State Route 504 as a scenic highway.

Johnston Ridge

- Construct an observation post/visitor center building with viewing deck.
- Construct a 200 seat outdoor amphitheater.
- Construct a comfort station.
- Construct 4 interpretive signs.
- Provide water.
- Construct a trail from the observation post to Coldwater Lake.
- Lay underground power/telephone cable from Coldwater to Johnston Ridge observation post.
- Construct 2.5 miles of single lane graveled service road from Coldwater Lake for access to upper end of the terminal for operation, maintenance, and administration.
- Construct a single lane road from the upper end of the tram to the observation post for bus shuttle transportation.
- Install a 2-way radio remote.
- Construct paved parking for 5 administrative vehicles.
- Construct a heliport near the observation post.

Note: Based on the best information available at the time of this plan, the access from Coldwater Lake to Johnston Ridge is displayed as a combination aerial tram/bus shuttle system. As more intensive field surveys and market analysis are completed, it may be technically and economically feasible to have the aerial tram extend all the way to the observation post. Since this would reduce environmental disturbance and improve convenience to the user, no further environmental analysis would be necessary to implement the change.

Harrys Ridge

- Construct a 3-sided rock shelter.
- Install a compost toilet.
- Provide one interpretive sign.
- Reconstruct U.S. Geological Survey building/antenna.
- Provide information board with pack-it-out and low impact backcountry use information.

Winter Season

- Aerial tram operates all winter.
- Allow cross country ski rental at aerial tram sales office.
- Close area around Johnston Ridge to motorized over-the-snow use to avoid user conflict.
- Request the Washington State Department of Transportation to plow State Route 504 to Coldwater Lake.

- Request cooperative funds to keep 200 parking spaces open at the aerial tram.

Dispersed Area

- Construct 3 viewpoints along State Route 504 and install one interpretive sign at each viewpoint. (Provide paved parking for 31 cars).
- Construct Trail No. 1 from Coldwater Lake parking to the observation post.
- Construct Trail No. 230 along the north shoreline of Coldwater Lake.
- Construct Trail No. 1 to Harrys Ridge.
- Construct Trail No. 230A to damaged logging equipment on Coldwater Ridge and along Coldwater Creek to Trail No. 230.

Air Traffic

- Request the F.A.A. to chart the area and restrict air traffic to 1,000 feet above the terrain, except by permit.

Research

- Manage area under standards of Protection Class 2, as shown on Figure 1, Appendix C.

Castle Lake/Sheep Canyon Management Concept Area

Castle Lake Complex

- Acquire public access agreement in private Road 3000, and maintain as single lane gravel access to Castle Lake.
- Close the lake to all motorized boating and float planes.
- Construct: parking for 20 autos (gravel), vault toilet, rock picnic shelter containing 10 picnic tables, interpretive Trail No. 221.1 on debris avalanche, Trail No. 221.2 to Sheep Canyon Complex, and interpretive sign.
- Provide water.
- Designate 10 acres as an environmental study area on the debris flow near Castle Lake and provide additional parking for two buses.

Sheep Canyon Complex

- Maintain Road 8123 as single lane gravel access to Sheep Canyon.
- Construct: parking for viewpoint/trailhead for 15 autos, parking for viewpoint for 5 autos, 3 picnic units, 2 interpretive signs, short trail and viewpoint, and vault toilet.
- Provide water.

Dispersed Area

- Construct Trail No. 216G and Trail No. 216.8 across the South Fork of the Toutle River and the debris avalanche.
- Maintain approximately 4 miles of single lane gravel road southwest of Castle Lake from private Road 3000 to Trail No. 216G trailhead.
- Limit visitor use to trails in the debris avalanche high value research area.

- No open fires.
- No overnight use permitted.
- Construct trailhead parking, for Trail No. 216G, for 10 autos.

Air Traffic

- Request F.A.A. to chart the area and restrict air traffic to 1,000 feet above the terrain.

Research

- Manage shaded areas to standards of Protection Class 1 and 2 as shown on Figure 1, in Appendix C.

Cave Basalt/Goat Marsh Management Concept Area

Ape Cave

- Relocate parking further away from the cave entrance and expand to paved parking for 40 cars and 1 bus.
- Construct a 20 ft. x 20 ft. building for interpretive displays, lamp and equipment rental, and guided tours of the cave.
- Construct vault toilet.
- Rewrite the Ape Cave brochure as a self-guided trail.
- Retain Trail No. 239 to upper end of the Ape Cave.
- Construct a cedar fence around the skylight near the upper end of Ape Cave.
- Relocate Road 8303 to eliminate traffic by the cave entrance.
- Retain an information bulletin board at the cave entrance with cave conservation messages.
- Reconstruct Road 8303 to double lane dust free standard.

Lava Cast

- Retain the picnic area at 10 units.
- Construct a .3 mile barrier free loop interpretive trail through the Lava Cast area.
- Expand parking for 15 cars.
- Provide water.
- Construct vault toilet.

Dispersed Area

- Close Road 8300030 at the junction with Road 90.
- Acquire industrial use rights in private road from Road 8303 to Road 81 to allow industrial traffic to flow west and avoid mixing with Ape Cave and Lava Cast traffic.

Kalama Springs

- Construct 6 unit picnic area.
- Install interpretive sign at the springs.
- Install vault toilet.
- Reconstruct Road 8100610 to Kalama Springs as a graveled road.

Goat Marsh

- Retain Trail No. 237 from Road 8123 to Goat Marsh Lake.
- Install interpretive sign at viewpoint on Road 8123173.
- Retain trailhead in Rock Pit at the end of Road 8123070 with parking for 5 cars.
- Close Roads 8123171 and 8123173.
- Sign the boundary of the RNA.
- Sign trailhead with information encouraging low impact use.

Trailheads

- Road 8123, construct parking for 10 cars, and add horse tie facilities.
- Retain parking for 4 cars at Red Rock Pass for Trail No. 238.

Dispersed Area

- Junction of Trail Nos. 238 and 238C, construct compost toilet and camp units for 20 users.
- Butte Camp, install compost toilet.
- Reopen Road 81 to single lane dust free surfaced standard to provide a loop drive.
- Reconstruct Trail No. 238A to Butte Camp.
- Construct Trail No. 216 near timberline.
- Allow horse use on Trails 238C, 238D, and portion of 216 to form a loop opportunity.
- Construct Trail No. 238C to Blue Lake Noble Fir stand from the Blue Lake Trail No. 238 trailhead, and install interpretive sign.
- Sign with information on registration system at all dispersed camps.
- Gate Road 8300030 to the powerline.
- No camping within sight of major roads. (Road 83, Road 8303, to Ape Cave, Road 81.)
- Close the damaged portion of Road 8123 from Blue Lake to the end.
- Reconstruct Road 8123 to Sheep Canyon as a single lane graveled road.
- Restrict access to all caves that are known to have hibernating bats.
- Install hazard warning signs inside caves that are likely to receive visits from general users.
- Restrict access to all caves known to have archeological cultural resources that could be damaged by cave use.

Winter Season

- Request State cooperative funds to groom roads for snow trails for snow trails as shown on the map.
- Mark and maintain ski trails as shown on the map.

South Information Station

- Construct new building on PP&L lands along county highway to Cougar, near the junction with Road 81.
- Install power and telephone.
- Provide paved parking for 5 cars.
- Provide double lane access to drive-up windows on both sides of the building.
- Construct comfort station.
- Provide water.

- Enter cooperative agreement with PP&L for use of land.
- Provide latest information on volcano and road conditions on 24 hour broadcast over low frequency radio.

Air Traffic

- Request F.A.A. to chart the portion of this area in the Monument and restrict air traffic to 1,000 feet above the terrain.

Research

- Manage shaded areas to standards of Protection Class 2 and 3 as shown on Figure 1, in Appendix C.

Mudflow Management Concept Area

Lava Canyon Complex

- Construct trailhead/interpretive complex near Moss Springs, parking for 35 autos.
- Construct Trail No. 234 to the Round-the-Mountain trail.
- Construct Trail No. 184 across the Muddy River and down stream to Road 83.
- Construct Trail No. 184A to form a loop opportunity.
- Provide water.
- Construct vault toilet.
- Install 6 tables for picnicking.
- Construct and install 3 interpretive signs.
- Construct Trail No. 234 parking, 8 autos.
- Construct Trail No. 225 parking, 20 autos.
- Construct Road 83 parking at the lower terminus of Trail No. 184, 5 autos.
- Improve viewpoint parking, 10 autos.

Dispersed Area

- Construct Trail No. 216B from Road 83 to June Lake. Construct trailhead parking for 4 autos.
- Construct Trail No. 216 at timberline on the south and east sides of the mountain.
- Construct Trail No. 225 from Road 83 up Smith Creek (to Road 99).
- Reconstruct portions of Road 83 and operate as a one-way loop system from the Muddy River mudflow to Smith Creek.
- Limit Lava Canyon to day use.
- Upgrade portion of Road 83 and 2588 through the mudflow by applying gravel and installing culverts.
- Remove all trace of Road 92 from Smith Creek north of the junction with Road 83.
- Close portion of Trail No. 216B outside the Monument to ORV's.
- Designate 10 acres as an environmental study area on the mudflow.
- Construct a viewpoint on the road to Marble Mountain with an interpretive sign and parking for 4 autos.
- Pave Road 83 from junction of Road 81 to junction of Road 8312.
- Construct a trailhead on Road 8100070 for 10 cars, and construct Trail No. 216A to Trail No. 216.

- Designate 20 camping units for mountain climbing near the trailhead for Trail No. 216A.

Winter Season

- Construct Sno-park facility near the junction of Roads 83 and 8312 with the following:
 - Paved parking area for 60 autos with trailers.
 - Vault toilet and shelter with picnic tables.
- Request State Sno-park funds for snow removal.
- Request State cooperative funds to snowgroom 13.5 miles of Roads 83 and 8312.
- Construct cross country ski trails.

Air Traffic

- Request F.A.A. to chart the portion of this area within the Monument and restrict air traffic to 1,000 feet above the terrain.

Research

- Manage shaded areas to standards of Protection Class 2 and 3 as shown on Figure 1. in Appendix C.

Road 99/Spirit Lake Management Concept Area

Bear Meadow

- Develop parking (paved) for 5 vehicles with trailer on the north side of Road 99 to accommodate hiking/horse use on Trail No. 1.
- Install site sign on a rock base.
- Install rock wall with 3 interpretive signs.
- Construct vault toilet at trailhead.
- Install horse tie rack.
- Install curbing and sidewalk on the existing 15 auto parking area.
- Provide water.
- Retain the existing 5 picnic units.

East Entrance

- Construct entrance sign with rockbase.
- Construct rock wall complete with curbing and sidewalk and 1 interpretive sign.
- Retain the existing paved parking for 7 autos.

Miner's Car

- Separate parking from traffic by realigning the road, and expand to accommodate 10 autos.
- Construct a hiker trail from the car to the Meta Lake trailhead to eliminate walking on the road.
- Remove cyclone fence and replace with a rock wall. Weld removable parts to the car.

Meta Lake

- Maintain the barrier free trail to the lake.
- Construct rock wall at the trail's end to serve as as a physical barrier and deter hiking on the lake shore.
- Mount new interpretive sign on the wall.

- Install site sign on a rock base.
- Improve parking on Road 99 for 6 autos by paving.

Cascade Peaks Viewpoint (Rd 94/99 junction)

- Retain parking for 15 autos.
- Replace interpretive sign and base.

Independence Pass

- Improve parking to accommodate 10 autos
- Extend trail north to Trail No. 1.
- Replace interpretive sign and base.

Harmony Creek

- Construct parking for 10 vehicles.
- Construct trail to Spirit Lake.
- Install site sign and interpretive sign on a rock base.

Cedar Creek

- Improve parking for 10 autos.
- Install interpretive sign on rock base.

Donneybrook

- Widen road to provide parallel parking for 15 autos for viewing Spirit Lake.
- Install trailhead sign on rock base.

Upper Smith Creek Trailhead

- Construct parking for 5 cars.

Smith Creek View

- Construct parking for 30 cars and use in conjunction with Windy Ridge viewpoint to provide parking for a bus shuttle to Spirit Lake.
- Install a vault toilet.
- Construct rock wall complete with curbing and walkways with interpretive sign on wall.
- Install site sign on rock base.
- Install 5 picnic tables.

Windy Ridge Viewpoint

- Retain 110-car paved parking and improve with curbing, rock wall, and sidewalk.
- Construct 3-sided rock shelter open toward Spirit Lake with 200 seat amphitheater.
- Construct trail to viewpoint on the ridge.
- Provide water.

Spirit Lake Viewpoint

- Construct parking and turnaround for 3 buses.
- Install 2 interpretive signs and a loop trail.
- Issue special use permit to allow bus concessionaire to conduct tightly controlled tours to the lake shore with interpretive talks enroute only after westside access is completed and volcano hazard is reduced.
- Construct open-sided shelter for waiting area for buses.
- Construct trail to Harrys Ridge.
- Construct vault toilet.
- Construct a boat dock and boat launch to maintain access to the lake control devise.

Norway Pass Trailhead

- Retain the 30 car parking area at Trail No. 1 on Road 26.
- Provide water.
- Construct vault toilet.

Grizzly Panorama

- Construct parking for 4 cars.
- Install monument entrance sign and 1 interpretive sign on rock base.

Smith Ridge

- Install an interpretive sign on a rock base and provide parking for 5 cars.

Strawberry Mtn Lookout

- Construct a lookout tower to serve both fire detection and visitor interpretation.
- After the lookout is constructed, close Road 2516 where it enters the Monument, develop parking for 7 cars, install a vault toilet, and eliminate the closed portion of the road.
- Construct a trail to the lookout.

Dispersed Area

- Reconstruct Road 99 to a double lane dust free standard from Road 25 to Windy Ridge viewpoint.
- Designate 10 acres near St. Charles Lake as an environmental education area; construct parking along the road for 5 cars and 1 bus; construct hiker trail to the area.
- Reconstruct Trail No. 220 and Trail No. 1 east of Bear Meadow to accommodate horse/hiker/bike use.
- Improve Road 99 between Windy Ridge viewpoint and Spirit Lake to single lane gravel surface, and allow bus concession to Spirit Lake.
- Close the area to open fires.
- Restrict access to developed sites and trails in the Spirit Lake Basin as shaded on the map.
- Prevention patrols for fire on Roads 99 and 26 during fire season.
- Trail and camping closures during high fire danger.
- Day use only in Spirit Lake Basin.
- Delay construction of Trail No. 1D until fire hazard decreases.

Winter Season

- State cooperative funds used to snowgroom Road 99 as a snow trail to Windy Ridge Viewpoint.

Research

- Manage shaded areas to standards of Protection Class 1 and 2 as shown on Figure 1, in Appendix C.

Air Traffic

- Request F.A.A. to chart the portion of the area in the Monument and restrict air traffic to 1,000 feet above the terrain.

Mt. Margaret Management Concept AreaDispersed Area

- Construct the following trails:
 - Trail No. 1 across Mt. Margaret Ridge to Harrys Ridge.
 - Trail No. 211 from Trail No. 1 to the Coldwater Lake Complex.
 - Trail No. 212 across Mt. Venus to Deep Lake and down Falls Creek to Trail No. 213.
 - Primitive trail to the south end of Boot Lake.
 - Primitive trail to Holmstedt Lake.
 - Primitive trail to Venus Lake.
 - Primitive trail to Coldwater Peak.
 - Trail No. 214 across Whittier Ridge from Trail No. 1 to Trail No. 211.
- Primitive trail to Snow Lake.
- Construct compost toilets at the following designated camping areas: Panhandle Lake, Boot, Snow, Venus, Shovel, and Obscurity Lakes.
- Close the entire area to open campfires.
- Require a permit for overnight camping and limit to designated areas.
- Provide backcountry ranger to make available low impact/fire prevention messages to users.
- Provide 3-sided rock camping shelter for the backcountry guard near Panhandle Lake.
- Close the area to all entry during periods of high fire danger.
- Limit trail use to hiker only.
- Restrict trail access to fire hazard areas until 1990.

Air Traffic

- Request F.A.A. to chart the area and to restrict air traffic to 1,000 feet above the terrain, and limit landings to by permit only.

Research

- Manage to standards of Protection Class 2, as shown on Figure 1, Appendix C.

Backcountry Management Concept AreaRyan Lake

- Construct parking for 5 autos.
- Install interpretive sign and site sign on rock base.
- Construct vault toilet.

Quartz Big Tree

- Construct parking for 5 autos and 1 bus.
- Construct vault toilet.
- Construct site sign and interpretative sign.
- Reconstruct nature trail.
- Prepare a visitor's guide to the area with emphasis on school groups.

North Fringe

- Construct interpretive sign on rock base.
- Construct parking for 3 autos.

Dispersed Area

- Reconstruct Trail No. 213 to provide access to Road 2612 and Weyerhaeuser Road 2500.
- Acquire right-of-way for Trail No. 213 in Section 31, T. 11 N., R. 5 E. to tie private Road 2500.
- Reconstruct existing Trail Nos. 213, 217, 218, and 220 to standards needed to accommodate horse/hiker use.
- Extend Trail No. 218 into Goat Creek to Road 2750.
- Construct Trail No. 205 to Trail No. 217 near Vanson Peak.
- Relocate portion of Trail No. 217 presently on private land to inside the Monument.
- Relocate the east end of Trail No. 217 to a good trailhead site on Road 2612.
- Construct the following trailheads: (To accommodate horse use.)

Road	Trail No.	Toilet	No. of Cars
2612	213	Vault	10
2612	217		6
2600	220		3
2750	218	Vault	10
2750	217C		5

- Construct compost toilets and designate camping areas at Vanson Lake and Deadmans Lake.
- Acquire public access agreements on Roads 2700, 2742, and 2150, and improve to public travel standard.
- Provide low impact camping and pack-it-out information at all trailheads.
- Provide backcountry ranger to make available low impact use/fire prevention message.
- Acquire ownership of private lands in Section 13, T. 10 N., R. 5 E., and Section 18, T. 10 N., R. 6 E.

Research

- Manage shaded area to standards of Protection Class 2 and 3 as shown on Figure 1 in Appendix C.
- Construct Trail No. 205 from Trail 218 along Goat Creek to Trail No. 217.

Air Traffic

- Request F.A.A. to chart the area inside the Monument and restrict air traffic to 1,000 feet above the terrain.

Mount St. Helens Management Concept Area

- Provide a mountain climbing brochure with the main emphasis on informing the visitor about volcanic, geologic, and avalanche hazards and information on low impact use.

- Sign trails leading to the mountain slopes informing climbers of permit system and reminding returning climbers to check out after completing a climb.

Research

- Manage shaded areas to standards of Protection Class 1 and 2 as shown on Figure 1, in Appendix C.

Air Traffic

- Request the F.A.A. to chart the area and restrict air traffic to 1,000 feet above the terrain and limit landings to by permit only.

Management

- Close the crater to all entry except by permit for scientific study.
- Operate a permit system for mountain climbing.
- Require a permit to camp.
- Close the area to all entry during periods when U.S. Geological Survey advises of potential eruptive activity.
- Require all research and monitoring facilities to conform to the architectural standards for the Monument.
- Participate in the avalanche forecasting program.

Other Facilities Outside the Monument Along Major Access Corridors

North Information Station

- Relocate on the north side of Road 25 in Section 7, T. 11 N., R. 7 E. (north of Road 25/26 junction).
- Provide parking for 5 cars.
- Construct as a drive-up building with service windows on both sides.
- Provide a kiosk for dispensing information during unstaffed periods.
- Provide vault toilet.

Iron Creek Campground

- Retain the existing 92 camp units.

Iron Creek Picnic Area

- Convert the existing portal site to a picnic area with 5 picnic sites and a picnic shelter containing 8 tables.
- Maintain the existing vault toilet.
- Provide water.

Boundary Trailhead

- Construct paved parking at Elk Pass for 5 cars.
- Provide horse ties.
- Provide vault toilet.

Clearwater Overlook

- Improve existing parking by paving for 6 cars.

- Construct a rock wall with sidewalk and curb.
- Install 3 interpretive signs on the wall.

Muddy River Overlook

- Construct paved parking for 5 cars.
- Construct trail to viewpoint.
- Construct a rock wall with 3 interpretive signs at the viewpoint.

Muddy River Mudflow

- Maintain existing 10 car parking and interpretive signing.

Cedar Flats Research Natural Area

- Maintain existing 5 car parking and 1 mile loop interpretive trail.
- Provide a self-guided trail brochure and trailhead sign.

Pine Creek Viewpoint

- Improve parking for 5 cars.
- Provide interpretive signs.
- Provide a rock wall.

Pine Creek Information Station

- Retain and improve the former ranger station office as an information station.
- Provide comfort station.
- Provide kiosk for dispensing information during unstaffed periods.
- Improve landscaping and displays/exhibits.

Cispus Environmental Learning Center

- Retain the buildings, and continue to operate under special use permit as an Environmental Learning Center.
- Upgrade the Mount St. Helens displays and library.
- Prepare a special brochure to inform research community of special facilities available to them at the center and include the environmental study areas in the Monument. (Cooperative effort between the agency and the permittee.)

Lower Falls

- Convert existing campground to day use viewpoint and picnic area.
- Construct paved parking for 15 cars.
- Replace toilets with new vault toilet design.
- Provide water.
- Extend protective fencing at key viewpoints and along river.
- Install interpretive sign at viewpoint.
- Construct 10 picnic units.

Big Creek Falls

- Maintain the existing paved parking area for 8 cars, vault toilet, and trail to the waterfalls.
- Extend trail down Big Creek to viewpoints for other falls and down the Lewis River to the proposed campground.

Lewis River Campground

- Construct a 60 unit campground near the Lewis River.
- Construct trail bridge across the Lewis River to access existing Trail No. 31.

Curly Creek Viewpoint

- Retain gravel parking for 10 cars, vault toilets, viewing platform, and fences.

Curly Creek Campground

- Construct vault toilet and improve camping units.
- Use for recreation and research camping.

Outlaw Ridge

- Retain as viewpoint picnic area with paved parking for 16 cars and 2 buses, vault toilet, 8 picnic tables, and interpretive signs.
- Construct an information kiosk to display visitor orientation information.

Winter Season

- Construct paved parking for 20 cars with trailers near the junction of Roads 25/99.
- Provide vault toilet.
- Request State cooperative funds to snowgroom Road 99 as snow trail to Windy Ridge Viewpoint and Road 25 to Elk Pass.

Management

- Provide office space for the Skamania County law enforcement cooperator in the Pine Creek information building.
- Provide housing for the Skamania County deputy at Pine Creek.
- Provide housing for 3 to 4 rescue personnel and a covered garage space for their ambulance.

Roads

- Upgrade the remaining portions of Road 25 to a double lane dust free standard. (Separate analysis needed on portion between 2573 junctions and 2560.)

Research

- Provide building space at Pine Creek for a research laboratory.
- Construct 8 trailer camping units for use by visiting scientists.
- Utilize the Cispus Environmental Learning Center for overnight accommodations and laboratory space to support projects on the north side of the Monument.
- Designate campsites at Curly Creek for research users.

Management

- Provide signs for State Route and County Roads 51 and 30.

ALTERNATIVE E

Coldwater/Johnston Ridge Management Concept Area

- Construct Trail No. 221 from Castle Lake and along the north shore of Coldwater Lake.
- Install interpretive sign at Coldwater Lake.
- Construct helicopter landing area and allow concession helicopters to land on Johnston Ridge with a permit.
- Close Coldwater Lake to boats with motors and float planes.

Harrys Ridge

- Construct a 3-sided rock shelter.
- Install compost toilet.
- Install interpretive sign at helicopter landing site.
- Reconstruct U.S. Geological Survey building/antenna at Harrys Ridge.

Air Traffic

- Request F.A.A. to chart the area and limit air traffic to 1,000 feet above terrain.

Castle Lake/Sheep Canyon Management Concept AreaCastle Lake Complex

- Acquire public rights in private Road 3000, and maintain as single lane gravel access to Castle Lake and Trail No. 216G trailhead.
- Provide bus concession from the end of the State Route 504 at Camp Baker to move approximately 200 people per hour to Castle Lake.
- Allow only concession bus access to Castle Lake during the peak visitor hours and season. (June 1 to September 5 and 10:00 a.m. to 5:00 p.m.)
- Construct parking for 5 buses and 10 autos (gravel).
- Construct vault toilet.
- Construct rock picnic shelter with 8 picnic tables.
- Construct a loop interpretive Trail No. 221.1 on debris avalanche, Trail No. 221.2 to Sheep Canyon complex, and interpretive signs.
- Provide water.

Sheep Canyon Complex

- Maintain Road 8123 as single lane gravel access to Sheep Canyon.
- Construct parking for viewpoint/trailhead for 15 autos, and parking for viewpoint for 5 autos.
- Construct 3 picnic units, a vault toilet, 2 interpretive signs, and a short trail to a viewpoint.
- Provide water.

Dispersed Area

- Maintain approximately 4 miles of single lane gravel road southwest of Castle Lake from private Road 3000 to Trail No. 216G trailhead.
- Construct Trail No. 216G and Trail No. 216.8 across the South Fork of the Toutle River and the debris avalanche.
- Construct trailhead parking, Trail No. 216G, for 10 autos.
- Limit visitor use to trails in the debris avalanche high value research area.
- No open fires.
- No overnight camping.

Air Traffic

- Request F.A.A. to chart the area and restrict air traffic to 1,000 feet above the terrain.

Research

- Manage shaded areas to standards of Protection Class 1 and 2 as shown on Figure 1, in Appendix C.

Cave Basalt/Goat Marsh Management Concept AreaApe Cave

- Relocate paved parking for 20 cars and 1 bus further away from the cave entrance.
- Construct a vault toilet.
- Rewrite the Ape Cave brochure as a self-guided trail.
- Retain Trail No. 239 to upper end of the Ape Cave.
- Construct an interpretive/information kiosk.
- Construct a cedar fence around the skylight near the upper end of Ape Cave.
- Relocate Road 8303 to eliminate traffic by the cave entrance.
- Retain an information bulletin board at the cave entrance with cave conservation messages.

Lava Cast

- Retain the picnic area at 10 units.
- Construct a .3 mile barrier free loop interpretive trail through the Lava Cast area.
- Retain existing parking.
- Provide water.
- Construct vault toilet.

Ole's Cave

- Construct a 12 unit campground.
- Install underground power cable.
- Provide water.
- Construct Trail No. 236 to lower end of Ole's Cave.
- Construct an information kiosk at the junction of Roads 90 and 83.
- Construct a visitor information/lamp rental/cave tour concession building.
- Construct day use parking for 40 cars.
- Construct vault toilet.
- Close Road 8300030 to the powerline.

McBride Lake

- Construct 12 unit campground on west side of Road 8100600.
- Provide water.
- Install vault toilet.
- Construct trail to Kalama Springs.
- Pave Road 8100600 and use for campground entrance.

Kalama Springs

- Expand picnic area to 6 units.
- Install interpretive sign at the springs.
- Retain Road 8100610 to Kalama Springs.

Goat Marsh

- Retain Trail No. 237 from Road 8123 to Goat Marsh Lake.
- Install interpretive sign at viewpoint on Road 8123170.
- Retain trailhead in Rock Pit at the end of Road 8123070 with parking for 5 cars.
- Retain Road 8123070 to trailhead.
- Close Roads 8123171 and 8123173.
- Sign the boundary of the RNA.
- Sign trailhead with information encouraging low impact use.

Trailheads

- Road 8123, construct parking for 10 cars near Blue Lake.
- Retain parking for 4 cars at Red Rock Pass for Trail No. 238.

Dispersed Area

- At junction of Trail Nos. 238 and 238C, construct compost toilet and camp units for 20 users.
- Butte Camp, install compost toilet.
- Sign with information on permit system at all dispersed camps.
- Restrict access to caves during bat hibernation.
- Acquire industrial hauling rights in private road from Road 8303 to Road 81 to allow industrial traffic to flow west and avoid mixing with Ape Cave and Lava Cast traffic.
- Require permits for overnight use.

Management

- Reopen Road 81 to preerruption standard to form a loop drive.
- Reconstruct Trail No. 238A to Butte Camp.
- Construct Trail No. 216 near timberline.
- Allow horse use on trails as shown on the map.
- Close Road 8123 from Blue Lake to the end.
- Reconstruct damaged portion of Road 81 to single lane gravel standard from 8100600 to McBride Lake campground.
- Reconstruct Roads 8123 and 8123 to Sheep Canyon as a single lane gravel road.
- Acquire private land in Section 20, T. 7 N., R. 5 E, for Ole's development.

Winter Season

- Request State cooperative funds to groom roads as shown on the map.
- Mark and maintain ski trails.

South Information Station

- Construct new portal building on PP&L lands along county highway to Cougar, near the junction with Road 81.
- Install power and telephone.
- Provide paved parking for 5 cars.
- Provide double lane, dust free access to drive-up windows on both sides of the building.
- Construct comfort station.
- Provide water.
- Enter cooperative agreement with PP&L for use of land.
- Provide latest information on volcano and road conditions on 24-hour broadcast over low frequency radio.

Research

- Manage shaded areas to standards of Protection Class 2 and 3 as shown on Figure 1, in Appendix C.

Mudflow Management Concept AreaLava Canyon Complex

- Construct trailhead/interpretive complex near Moss Springs, parking for 35 autos.
- Construct Trail No. 234 to the Round-the-Mountain trail.
- Construct Trail No. 184 across the Muddy River and down stream to Road 83.
- Construct Trail No. 184A to form a loop opportunity.
- Provide water.
- Construct vault toilet.
- Install 4 tables.
- Construct and install 3 interpretive signs.
- Construct Trail No. 234 parking, 5 autos.
- Construct Trail No. 184 parking, 20 autos.
- Construct Road 83 parking at the lower terminus of Trail No. 184, 5 autos.
- Construct viewpoint parking, 10 autos.
- Acquire scenic easement on Section 4, T. 7 N., R. 5 E., from the State of Washington.

Marble Mountain

- Construct a viewpoint on Marble Mountain with an interpretive sign and parking for 4 autos.
- Protect the U.S. Geological Survey antenna on Marble Mountain by fencing and signing.

Dispersed Area

- Construct Trail No. 216B from Road 83 to June Lake. Construct trailhead parking for 4 autos.
- Construct Trail No. 225 from Road 92 to Road 99.
- Construct trailhead on Road 92 for 5 autos, for Trail No. 225.

- Upgrade portion of Road 83 through the mudflow by applying gravel and installing culverts.
- Reconstruct portion of Road 83 and operate as a one-way loop system from the mudflow to Smith Creek.
- Manage traffic in a one-way direction south on Road 94 and Road 9418.
- Tie Road 94 through to Road 9210 to provide an alternate haul route for industrial traffic. Construct a bridge across the Muddy River to tie into Road 92 and 9211 system.
- Reconstruct Road 92 as gravel road along the edge of the Smith Creek mudflow.
- Close portion of Trail No. 216B outside the Monument to ORV's.
- Day use only in Lava Canyon.
- Relocate approximately 0.8 miles of Road 9418 to eliminate excess grade.
- Construct Trail No. 216A from Road 8100830 to Trail No. 216.
- Construct trailhead on Road 8100830 with parking for 6 cars.
- Pave Road 83 from junction with Road 81 to junction with Road 8312.

Winter Season

- Construct Sno-park facility near the junction of Roads 8300 and 8312 with paved parking area for 60 autos with trailers.
- Construct vault toilet.
- Construct 3-sided picnic shelter with tables.
- Request State cooperative funds to snowgroom 13.5 miles of Roads 83 and 8312.
- Request State Sno-park funds for snow removal on Road 83.
- Construct cross country ski trails on Road 8100830 to Road 83 (Sec. 34), and Trail No. 216B.

Research

- Manage shaded areas to standards of Protection Class 2 and 3 as shown on Figure 1, in Appendix C.

Road 99/Spirit Lake Management Concept AreaBear Meadow

- Develop parking (paved) for 5 vehicles with trailer on the north side of Road 99 to accommodate hiking/horse use on Trail No. 1.
- Install site sign on a rock base.
- Install of rock wall with 3 interpretive signs.
- Construct 2 seat vault toilet at trailhead.
- Install horse tie rack.
- Install curbing and sidewalk on the existing 15 auto parking area.
- Provide water.
- Maintain 5 picnic units.

East Entrance

- Construct entrance sign with rockbase.
- Construct rock wall complete with curbing and sidewalk and interpretive sign.
- Retain the existing paved parking for 7 autos.

Miner's Car

- Separate parking from traffic by realigning the road, and expand to accommodate 10 autos.
- Construct a hiker trail from the car to the Meta Lake trailhead to eliminate walking on the road.
- Remove cyclone fence and replace with a wrought iron fence on top of a low rock wall. Weld removable parts to the car.

Meta Lake

- Retain barrier free trail to the lake.
- Construct a rock wall at the trail's end to serve as a physical barrier and deter hiking on the lake shore.
- Mount new interpretive sign on the wall.
- Install site sign on a rock base.
- Improve parking for 6 autos by paving.

Cascade Peaks Viewpoint (Rd 94/99 junction)

- Retain parking for 15 autos, stripe.
- Replace interpretive sign and base.

Independence Pass

- Improve parking to accommodate 10 autos.
- Extend trail north to Trail No. 1.
- Replace interpretive sign and base.

Harmony Creek

- Construct parking for 10 vehicles.
- Install site sign and interpretive sign on a rock base.

Cedar Creek

- Improve parking for 10 autos.
- Install interpretive sign on rock base.

Donneybrook

- Widen road to provide parallel parking for 15 autos for viewing Spirit Lake and using the Smith Creek trail.
- Install trailhead sign on rock base.

Smith Creek View

- Construct parking for 30 cars.
- Construct rock wall complete with curbing and walkways with interpretive sign on wall.
- Install site sign on rock base.

Windy Ridge Viewpoint

- Retain 110 car paved parking and improve with curbing, rock wall, and sidewalk.
- Construct 3-sided rock shelter open toward Spirit Lake with 200 seat amphitheater.
- Construct trail to viewpoint on the ridge.
- Provide water.

Spirit Lake Viewpoint

- Construct parking for 200 cars, and expansion for 50 cars.
- Install interpretive signs and a loop trail.
- Construct two, 20 feet x 40 feet, open-sided shelter with 20 picnic tables.
- Construct trail to Harrys Ridge.
- Construct vault toilet.
- Construct 100 seat amphitheater.
- Construct a boat dock and boat launch to maintain access to the lake control device.

Norway Pass Trailhead

- Retain the 30 car parking area at Trail No. 1 on Road 26.
- Provide water.
- Construct vault toilet.

Grizzly Panorama

- Construct parking for 4 cars.
- Install Monument entrance sign and interpretive sign on rock base.

Smith Ridge

- Install an interpretive sign on a rock base and provide parking for 5 cars.

Strawberry Mtn Lookout

- Construct a lookout tower to serve both fire detection and visitor interpretation.
- After the lookout is constructed, close Road 2516 where it enters the Monument, develop parking for 7 cars, install a vault toilet, and eliminate the closed portion of the road.
- Construct a trail to the lookout.

Dispersed Area

- Reconstruct Road 99 to a double lane paved standard from Road 25 to Windy Ridge viewpoint.
- Reconstruct Trail No. 220 and Trail No. 1 east of Bear Meadow to accommodate horse/hiker/bike use.
- Reconstruct Road 99 between Windy Ridge viewpoint and Spirit Lake to a double lane gravel standard.
- Permits required for overnight use.
- Close the area to open fires.
- Restrict access to developed sites and trails in the Spirit Lake Basin as shaded on the map.
- Prevention patrols for fire on Roads 99 and 26 during fire season.
- Trail and camping closures during high fire danger.
- Day use only in Spirit Lake Basin.
- Delay construction on Trail No. 1D until fire hazard decreases.

Winter Season

- State cooperative funds used to snowgroom Road 99 for snow trail to Windy Ridge Viewpoint.

Air Traffic

- Request F.A.A. to chart the portion of the area in the Monument and restrict traffic to 1,000 feet above the terrain.

Research

- Manage shaded areas to standards of Protection Class 1 and 2 as shown on Figure 1, in Appendix C.

Mt. Margaret Management Concept AreaVisitor Use

- Construct the following trails:
 - Trail No. 1 across Mt. Margaret Ridge to Harrys Ridge.
 - Trail No. 211 from Trail No. 1 to Castle Lake.
 - Trail No. 212 across Mt. Venus to Deep Lake and down Falls Creek to Trail No. 213.
 - Primitive trail to the south end of Boot Lake.
 - Primitive trail to Holmstedt Lake.
 - Primitive trail to Venus Lake.
 - Trail No. 214 across Whittier Ridge from Trail No. 1 to Trail No. 211.
 - Primitive trail to Snow Lake.
- Construct compost toilets at the following designated camping areas: Panhandle Lake, Boot, Snow, Venus, Shovel, and Obscurity.
- Close the entire area to open campfires.
- Require a permit for overnight camping and limit to designated areas.
- Provide backcountry ranger to make available low impact/fire prevention messages to users.
- Provide 3-sided rock camping shelter for the backcountry guard near Panhandle Lake.
- Close the area to all entry during periods of high fire danger.
- Limit trail use during this planning period to hiker only.
- Delay trail access to high fire hazard areas until after 1990.

Research

- Manage to standards of Protection Class 3 as shown on Figure 1, in Appendix C.

Air Traffic

- Request F.A.A. to chart the area to restrict air traffic to 1,000 feet above the terrain, and limit landings to by permit only.

Backcountry Management Concept AreaRyan Lake

- Construct parking for 5 autos.
- Install interpretive sign and site sign on rock base.
- Construct vault toilet.

Quartz Big Tree

- Construct parking for 5 autos and 1 bus.
- Construct vault toilet.
- Construct site sign and interpretative sign.
- Reconstruct nature trail.

North Fringe

- Construct interpretive sign on rockbase.
- Construct parking for 3 autos.

Dispersed Area

- Reconstruct Trail No. 213 to provide access to Roads 2612 and Weyerhaeuser 2500.
- Reconstruct existing Trail Nos. 213, 217, 218, and 220 to standards needed to accommodate horse/hiker use.
- Extend Trail No. 218 north to Road 2742019.
- Relocate portion of Trail No. 217 presently on private land to inside the Monument.
- Relocate the east end of Trail No. 217 to a good trailhead site on Road 2612.
- Construct the following trailheads: (To accommodate horse use.)

<u>Road</u>	<u>Trail No.</u>	<u>Toilet Vault</u>	<u>No. of Cars</u>
2612	213		10
2612	217		6
2600	220		3
2742019	218		4
2750	217		5

- Construct compost toilets and designate camping areas at Vanson and Deadmans Lake.
- Acquire public access agreement on the following private roads and improve to public travel standards:
 - Weyerhaeuser 2500 (Monument boundary to State Route 504).
 - Road 27 to Vanson Peak area.
 - Roads 2742 and 2742019.
 - Road 2612 (Sections 13 & 18).
- Manage Road 26 as one way (north) from Ryan Lake to junction of Road 25 during times of heavy visitor use.
- Provide low impact camping and pack-it-out information at all trailheads.
- Provide backcountry ranger to make available low impact use/fire prevention messages.
- Acquire scenic easement on private lands in Section 13, T. 10 N., R. 5 E., and Section 18, T. 10 N., R. 6 E.

Research

- Manage shaded areas to standards of Protection Class 2 and 3 as shown on Figure 1, in Appendix C.

Mount St. Helens Management Concept Area

- Provide a mountain climbing brochure with the main emphasis on informing the visitor about volcanic, geologic, and avalanche hazards and information on low impact use.

- Sign trails leading to the mountain slopes informing climbers of permit system and reminding returning climbers to check out after completing a climb.

Research

- Manage shaded areas to standards of Protection Class 1 and 2 as shown on Figure 1, in Appendix C.

Management

- Close the crater to all entry except by permit for scientific study.
- Request the F.A.A. to chart the area and restrict air traffic to 1,000 feet above the terrain and limit landings to by permit only.
- Operate a permit system for mountain climbing.
- Require a permit to camp.
- Close the area to all entry during periods when U.S. Geological Survey advises of potential eruptive activity.
- Require all research and monitoring facilities to conform to the architectural standards for the Monument.
- Participate in the avalanche forecasting program.

Other Facilities Outside the Monument Along Major Access Corridors

North Information Station

- Relocate on the north side of Road 25 in Section 7, T. 11 N., R. 7 E. (north of Road 25/26 junction).
- Provide parking for 5 cars.
- Construct as a drive-up building with service windows on both sides.
- Provide a kiosk for dispensing information during unstaff periods.
- Provide a vault toilet.

Iron Creek Campground

- Retain existing 92 camp units.

Iron Creek Picnic Area

- Convert the existing portal site to a picnic area with 5 picnic sites and a picnic shelter containing 8 tables.
- Maintain the existing vault toilet.
- Provide water from campground system.

Boundary Trailhead

- Construct paved parking at Elk Pass for 5 cars.
- Provide horse ties.
- Provide vault toilet.

Clearwater Overlook

- Improve existing parking by paving for 6 cars.
- Construct a rock wall with sidewalk and curb.
- Install interpretive signs on the wall.

Muddy River Overlook

- Construct paved parking for 5 cars.
- Construct trail to viewpoint.
- Construct a rock wall with interpretive signs at the viewpoint.

Muddy River Mudflow

- Maintain existing 10 car parking and interpretive signing.

Cedar Flats Research Natural Area

- Maintain existing 5 car parking and 1 mile loop interpretive trail.
- Provide a self-guided trail brochure and trailhead sign.

Pine Creek Viewpoint

- Improve parking for 5 cars.
- Provide interpretive signs.
- Provide a rock wall.

Pine Creek Information Station

- Retain and improve the former ranger station office as an information station.
- Provide comfort station.
- Provide kiosk for dispensing information during unstaffed periods.
- Improve landscaping and displays/exhibits.

Lower Falls

- Convert existing campground to day use viewpoint and picnic area.
- Construct paved parking for 15 cars.
- Replace toilets with new vault toilet design.
- Provide water.
- Extend protective fencing at key viewpoints and along river.
- Install interpretive sign at viewpoint.
- Construct 10 picnic units.

Big Creek Falls

- Maintain the existing paved parking area for 8 cars, vault toilet, and trail to the waterfalls.
- Extend trail down Big Creek to viewpoints for other falls and down the Lewis River to the proposed campground.

Lewis River Campground

- Construct a 60 unit campground near the Lewis River.
- Construct trail bridge across the Lewis River to access existing Trail No. 31.

Curly Creek Viewpoint

- Retain gravel parking for 10 cars, vault toilets, viewing platform, and fences.

Curly Creek Campground

- Construct vault toilet and improve camping units.
- Use for recreation and research camping.

Outlaw Ridge

- Retain as viewpoint picnic area with paved parking for 16 cars and 2 buses, vault toilet, 8 picnic tables, and interpretive signs.
- Construct an information kiosk to display visitor orientation information.

Cispus Environmental Learning Center

- Retain the buildings, and continue to operate under special-use permit as an Environmental Learning Center.
- Upgrade the Mount St. Helens displays and library.
- Prepare a special brochure to inform research community of special facilities available to them at the center and include the environmental study areas in the Monument. (Cooperative effort between the agency and the permittee)

Winter Season

- Construct paved parking for 20 cars with trailers near the junction of Roads 25/99.
- Provide vault toilet.
- State cooperative funds used to snowgroom Road 99 as snow trail to Spirit Lake and Road 25 to Elk Pass.

Research

- Provide building space at Pine Creek for a research laboratory.
- Construct 8 trailer camping units for use by scientists.
- Utilize the Cispus Environmental Learning Center for overnight accommodations and laboratory space to support projects on the north side of the Monument.
- Designate campsites at Curly Creek for research users.

Management

- Provide office space for the Skamania County law enforcement cooperator in the Pine Creek information building.
- Provide housing for the Skamania County deputy at Pine Creek.
- Provide housing for 3 to 4 rescue personnel and a covered garage space for their ambulance.
- Provide signs for State Route 14 and Forest Service Roads 51 and 30.

Roads

- Upgrade the remaining portions of Road 25 to a double lane standard. (Separate analysis needed on portion between 2573 junctions and 2560.)

ALTERNATIVE F

Coldwater/Johnston Ridge Management Concept Area

Coldwater Lake

- Construct a visitor information/first aid building.
- Construct a restaurant/gift shop/snack bar.
- Provide paved parking for 120 cars and 5 buses.
- Provide paved parking for 50 cars at the boat launch.
- Provide paved parking for 20 cars at Trail No. 221.
- Construct a comfort station near visitor information station.
- Construct a comfort station at boat launch.
- Construct a 20 unit picnic area with covered tables.
- Construct a boat launch ramp, dock, and marina.
- Provide water.
- Provide a boat dock at the east end of lake with access to Trail No. 230.
- Construct interpretive signs.
- Construct a 10 unit picnic area near Coldwater Lake.
- Request Washington State Department of Transportation to construct State Route 504 from near Camp Baker to Johnston Ridge, to a double lane paved standard.
- Install underground power/telephone cable from Camp Baker to Coldwater Lake.
- Provide space in the visitor information station for law enforcement cooperators.
- Install 2-way radio remote in visitor contact station.
- Construct a snowmobile/snocat storage building at Coldwater Lake.
- Close the lake to float planes and limit boat speed to 10 mph.

Johnston Ridge

- Construct an observation post/visitor center building with viewing deck.
- Construct a 200 seat outdoor amphitheater.
- Construct comfort station at parking area.
- Construct comfort station at trailhead.
- Provide water.
- Construct parking for 200 cars and 5 buses at the observation post.
- Construct parking for 10 cars and 2 buses at logging equipment.
- Construct parking for 50 cars at Trail No. 1 trailhead.
- Install underground power/telephone cable from Coldwater to Johnston Ridge.
- Install a 2-way radio remote in observatory.
- Construct paved parking for 5 administrative vehicles.
- Construct a heliport near the observation post for U.S. Geological Survey and Forest Service administrative use.

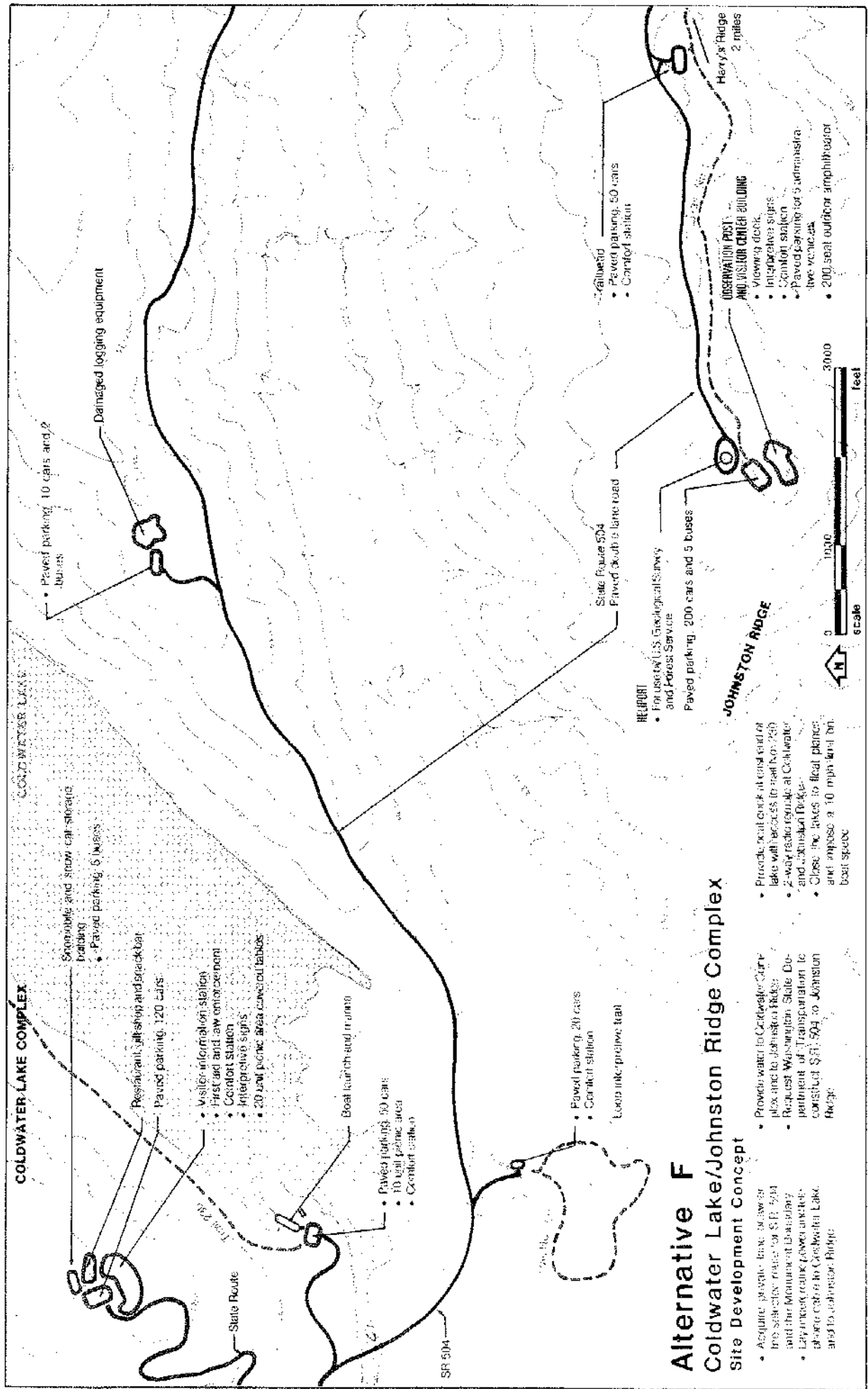


Figure D-3

Harrys Ridge

- Provide information board with pack-it-out and low impact backcountry use information at trailhead.
- Construct a 3-sided rock shelter.
- Install a compost toilet.
- Provide interpretive sign.
- Construct Trail No. 1 to Harrys Ridge.
- Reconstruct U.S. Geological Survey building/antenna.

Minnie Peak

- Construct viewpoint near Elk Prairie with graveled parking for 20 cars.
- Install interpretive sign.
- Construct trailhead for Trail No. 211 with graveled parking for 20 cars.
- Acquire public access rights on private road to Minnie Peak and improve to single lane gravel standard.
- Install information bulletin board with message on pack-it-out and low impact camping.

Dispersed Area

- Construct 3 viewpoints along State Route 504 and install an interpretive sign at each viewpoint. Provide paved parking for 38 cars.
- Construct Trail No. 230 along the north shoreline of the lake.
- Construct Trail No. 221 across the debris avalanche to Castle Lake. Elevate trail in sensitive areas. Use first 1/4 mile to provide a loop interpretive trail.
- Construct paved double lane road to cultural resource on Coldwater Ridge.

Winter Season

- Allow snowmobile/ski rental and snocat tour concession at the Coldwater Lake complex.
- Request the State Department of Transportation to plow State Route 504 to Coldwater Lake.
- Request cooperative Sno-park funds to keep 200 parking spaces open.
- Request cooperative funds from the State to groom the roads to Johnston Ridge/Minnie Peak.

Air Traffic

- Request the F.A.A. to chart the area and restrict air traffic to 1,000 feet above the terrain.

Research

- Manage area under standards of Protection Class 2 as shown on Figure 1, in Appendix C.

Castle Lake/Sheep Canyon Management Concept AreaCastle Lake Complex

- Purchase public rights in private Road 3000, and improve to paved single lane access to Castle Lake.

- Close the lake to all motorized boating and float planes.
- Construct parking for 25 autos (paved).
- Construct vault toilet.
- Construct rock picnic shelter with 8 picnic tables.
- Construct interpretive Trail No. 221.1 on debris avalanche, and Trail No. 221.2 to the ridge east of Castle Lake.
- Install interpretive signs.
- Provide water.

Sheep Canyon Complex

- Maintain Road 8123 as single lane paved access to Sheep Canyon.
- Construct parking for viewpoint/trailhead for 20 autos.
- Construct parking for viewpoint for 5 autos.
- Construct 5 picnic units.
- Install interpretive signs.
- Construct short trail to viewpoint.
- Construct vault toilet.
- Provide water.

Dispersed Area

- Construct Trail No. 216G and Trail No. 216.8 across the South Fork of the Toutle River and the debris avalanche.
- Construct tie through road from Weyerhaeuser Road 3000 across the South Fork of the Toutle River to Road 8123. (Pave for public comfort and safety).
- Limit visitor use to trails in the debris avalanche high value research area.
- No open fires.
- No overnight camping.
- Purchase rights on existing roads and raw land for rights of way for the tie through road across the South Fork of the Toutle River.
- Construct trailhead parking/viewpoint, Trail No. 216G, for 20 autos with vault toilet.
- Upgrade approximately 4 miles of road to single lane dust free standard along ridge from Road 3000 to trailhead.
- Maintain approximately 3 miles of single lane gravel road along ridge southeast and east of Castle Lake.

Research

- Manage shaded areas to standards of Protection Class 1 and 2 as shown on Figure 1, in Appendix C.

Cave Basalt/Goat Marsh Management Concept AreaApe Cave

- Relocate parking further away from the cave entrance and expand to paved parking for 50 cars and 1 bus.
- Construct a 20 ft. x 20 ft. building for interpretive displays, lamp and equipment rental, and guided tours of the cave by a concessionaire.
- Construct vault toilet.

- Provide water.
- Rewrite the Ape Cave brochure as a self-guided trail.
- Retain Trail No. 239 to upper end of the Ape Cave.
- Construct a cedar fence around the skylight near the upper end of Ape Cave.
- Relocate Road 8303 to eliminate traffic by the cave entrance.
- Retain an information bulletin board at the cave entrance with cave conservation messages.
- Reconstruct Road 8303 to double lane paved standard.

Lava Cast

- Expand the picnic area to 20 units.
- Construct a .3 mile barrier free loop interpretive trail through the Lava Cast area.
- Expand parking for 30 cars.
- Provide water.
- Construct vault toilet.
- Construct Trail No. 232A to Trail No. 232 as a hiker only trail.

Ole's Cave

- Construct a 25 unit campground/comfort stations.
- Install underground power cable.
- Provide water.
- Construct Trail No. 236 to lower end of Ole's Cave and to Trail No. 232.
- Construct an information kiosk at the junction of Roads 90 and 83.
- Extend and pave Road 8300030 to Ole's Campground.
- Acquire private land in Section 20.

McBride Lake

- Construct 12 unit campground on west side of Road 8100600.
- Provide water.
- Install vault toilet.
- Construct trail to Kalama Springs.
- Pave Road 8100600 and use for campground entrance.

Kalama Springs

- Construct 8 unit picnic area.
- Install interpretive sign at the springs.
- Install vault toilet.
- Pave Road 8100610 to Kalama Springs.

Kalama River Horse Camp and Trails

- Construct a 12 unit campground for horse users.
- Construct the following trails for horse/hiker use:
 - Trail No. 237 from the campground to McBride Lake.
 - Trail No. 232 from Road 8122 along the south boundary of the Monument across Long Mountain on the Kipuka and to Road 90.
 - Trail No. 232B to Cinnamon Peak.
 - Trail Nos. 237A and 238 from McBride Lake to Sheep Canyon and Butte Camp.
 - Trail No. 238C and the portion of Trail No. 216 east to Butte Camp to provide a loop trail to the mountain.

- Construct trailhead at Road 90 with horse ties and parking 5 cars.
- Restrict horse use to trails, trailheads and campground.
- Require feed to be brought in and to be other than hay.
- Operate Kalama Horse Camp by reservation only.
- Provide water.

Goat Marsh

- Retain Trail No. 237 from Road 8123 to Goat Marsh Lake and extend along the west side of the marsh to the top of Goat Mountain (hiker only).
- Install interpretive sign at viewpoint on Road 8123.
- Close Road 8123070 and use as a part of Trail No. 237.
- Improve Roads 8123171 and 8123173.
- Sign the boundary of the Research Natural Area.
- Sign trailhead with information encouraging low impact use.

Trailheads

- Road 8123, construct parking for 10 cars.
- Road 8100830, construct parking for 10 cars.
- Road 81, Kalama River, construct parking for 10 cars, plus vault toilet and tie rack for horses.
- Road 8123 and Road 8123070 junction, construct paved parking for 5 cars.

Dispersed Area

- Reconstruct the portion of Road 8123 that was damaged by alluvial flows to a single lane standard.
- Road 8123, construct compost toilet and 8 camp units with tent pads and fire rings, and provide water.
- South climbing camp (Section 20), construct compost toilet.
- Butte Camp, install compost toilet.
- Acquire rights in private road from Road 8303 to Road 81 to allow industrial traffic to flow west and avoid mixing with Ape Cave and Lava Cast traffic.
- Permits required for overnight use.
- Sign with information on permit system at all dispersed camps.
- No camping along major roads. (Roads 83, 81, 8303, 8123, and 8123170.)
- Restrict access to caves during bat hibernation.
- Reconstruct damaged portion of Road 81 to provide a paved loop drive.
- Pave Road 8123 to Sheep Canyon.

Blue Lake Noble Fir Grove

- Construct parking for 5 cars.
- Construct interpretive trail.
- Reopen Road 81 to form a paved loop drive.

Winter Season

- Request Sno-park funds from Washington State to open parking near the Forest boundary on Road 81 at the old pumice pit, parking for 15 cars for snowmobiling, and at the former Kalama Work Center, parking for 15 cars for cross-country skiing.
- Request State cooperative funds to groom roads as shown on the map.
- Mark and maintain ski trails as shown on the map.

South Information Station

- Construct new building on PP&L lands along the county highway to Cougar, near the junction with Road 81.
- Install power and telephone.
- Provide paved parking for 5 cars.
- Provide double lane access to drive-up windows on both sides of the building.
- Construct comfort station.
- Provide water.
- Enter cooperative agreement with PP&L for use of land.
- Provide latest information on volcano and road conditions on 24 hour broadcast over low frequency radio.

Research

- Manage shaded areas to standards of Protection Class 2 and 3 as shown on Figure 1, Appendix C.

Mudflow Management Concept AreaLava Canyon Complex

- Construct paved access road to a new trailhead/viewpoint/interpretive sites on the south side of the Muddy River Canyon: (1/2 mile)
- Construct paved parking for 45 autos.
- Provide water.
- Construct vault toilet.
- Construct and install 4 tables.
- Construct and install 3 interpretive signs.
- Construct Trail No. 184 from the viewpoint to Road 83.
- Construct Trail No. 234 from Trail No. 184 to timberline.
- Construct Trail No. 184B to Shoestring Glacier viewpoint.
- Construct trailhead at the lower terminus of Trail No. 184 on Road 83 for 5 autos.

Marble Mountain

- Construct interpretive viewpoint at Marble Mountain with parking for 4 autos.
- Protect the U.S. Geological Survey antenna at Marble Mountain with fence and sign.

Dispersed Area

- Construct Trail Nos. 216C and 216B to provide hiker access to the mountain.
- Construct Trail No. 216 at timberline on south and east side of the mountain.

- Construct Trail No. 225 from Road 83 to Road 99.
- Upgrade Road 83 by paving surface from Road 81 to Lava Canyon.
- Construct a road tie through from Road 94 to Road 9210 to provide an alternate haul route for industrial traffic.
- Construct tie through road between Roads 9211130 and 2586 to provide an alternate haul route for industrial traffic.
- Construct a road tie from Road 83 to Road 9418 to eliminate the road on the Smith Creek mudflow.
- Upgrade Roads 9400 and 9418 to accommodate two-way traffic.
- Replace temporary bridge on Road 83 across Pine Creek with permanent structure.
- Remove all trace of Road 92 from Smith Creek north of the junction with Road 83.
- Close portions of Trail Nos. 216B and 216C outside the Monument to ORV's.
- Day use only in Lava Canyon.
- Relocate approximately 0.8 mile of Road 9418 to eliminate excess grade.

Trailheads

- Construct trailhead parking as follows:

Road	Trail No.	Toilet	No. of Cars
83	216C		5
83	225	vault toilet	10
83	234		8

Winter Season

- Construct Sno-park facility near the junction of Roads 83 and 8312.
- Construct paved parking for 80 vehicles with trailers.
- Construct vault toilets.
- Provide a shelter with 4 picnic tables.
- Provide water.
- Sno-park funds used to open roads and parking.
- Request State cooperative funds to snowgroom Roads 83 and 8312, 13.5 miles, and tie through from Road 83 to 8100830 - 2.0 miles.
- Mark, construct, and maintain cross country ski trails as follows: Trail No. 216B, Road 8315, and Road 8315150.
- Request State Sno-park funds to plow road and parking area.

Research

- Manage shaded areas to standards of Protection Class 2 and 3 as shown on Figure 1, in Appendix C.

Road 99/Spirit Lake Management Concept AreaBear Meadow

- Develop parking (paved) for 5 vehicles with trailers on the north side of Road 99 to accommodate hiking/horse/bike use on Trail No. 1.

- Install site sign on a rock base.
- Install of rock wall with interpretive signs.
- Construct vault toilet at trailhead.
- Install horse tie rack.
- Install curbing and sidewalk on the existing 15 auto parking area.
- Provide water.
- Maintain 5 picnic units.

East Entrance

- Construct entrance sign with rockbase.
- Construct rock wall complete with curbing and sidewalk and interpretive sign.
- Retain the existing paved parking for 7 autos.

Miner's Car

- Separate parking from traffic by realigning the road, and expand to accommodate 10 autos.
- Construct a hiker trail from the car to the Meta Lake trailhead to eliminate walking on the road.
- Remove cyclone fence and replace with a rock wall 100 feet long. Weld removable parts to the car.

Meta Lake

- Retain barrier free trail to the lake.
- Construct a rock wall at the trail's end to serve as a physical barrier and deter hiking on the lake shore.
- Mount new interpretive sign on the wall.
- Install site sign on a rock base.
- Expand parking along Road 99 to 10 autos during paving.

Cascade Peaks Viewpoint (Road 94/99 junction)

- Retain parking for 15 autos, stripe.
- Replace interpretive sign and base.

Independence Pass

- Improve parking to accommodate 10 autos.
- Extend trail north to Trail No. 1.
- Replace interpretive sign and base.

Harmony Creek

- Construct parking for 10 vehicles.
- Construct trail to Spirit Lake.
- Install site sign and interpretive sign on a rock base.

Cedar Creek

- Improve parking for 10 autos.
- Install interpretive sign on rock base.

Donneybrook

- Widen road to provide parallel parking for 15 autos for viewing Spirit Lake and using the Smith Creek trail.
- Install trailhead sign on rock base.

Smith Creek View

- Construct parking for 20 cars.
- Construct rock wall complete with curbing and walkways with interpretive sign on wall.
- Install site sign on rock base.

Windy Ridge Viewpoint

- Retain 110 car paved parking and improve with curbing, rock wall, and sidewalk.
- Construct 3-sided rock shelter open toward Spirit Lake with 200 seat amphitheater.
- Construct trail to viewpoint on the ridge.
- Provide water.

Spirit Lake Complex

- Construct parking for 80 cars.
- Install 2 interpretive signs and a loop trail.
- Construct 20 feet x 40 foot open-sided shelter with 10 picnic tables
- Construct 100 seat amphitheater.
- Construct trail to Harrys Ridge.
- Construct vault toilet.
- Construct a boat dock and boat launch to maintain access to the lake control device, if needed.

Norway Pass Trailhead

- Retain the 30 car parking area at Trail No. 1 on Road 26.
- Provide water.
- Construct vault toilet.

Grizzly Panorama

- Install Monument entrance sign and interpretive sign on rock base and provide parking for 5 cars.

Smith Ridge

- Install an interpretive sign on a rock base and provide parking for 5 cars.

Strawberry Mtn.

- Close Road 2516 where it enters the Monument, develop parking for 7 cars, install vault toilet, and eliminate the closed portion of road.
- Construct a trail to the viewpoint.

Dispersed Area

- Reconstruct Road 99 to a double lane dust free standard from Road 25 to Spirit Lake.
- Designate 10 acres near St. Charles Lake as an Environmental Education area; construct parking along the road for 5 cars and 1 bus; construct hiker trail to the area.
- Reconstruct Trail No. 220 and Trail No. 1 east of Bear Meadow to accommodate horse/hiker/bike use.
- Close the area to open fires.
- Restrict access to developed sites and trails in the Spirit Lake Basin as shaded on the map.
- Permits required for overnight use.
- Prevention patrols for fire on Roads 99 and 26 during fire season.
- Trail and camping closures during high fire danger.
- Day use only Spirit Lake Basin.
- Delay access into high fire hazard areas until 1990.

Winter Season

- State cooperative funds used to snowgroom Road 99 as a snow trail to Windy Ridge Viewpoint.
- Sno-park funds used for snow removal on Roads 25 and 99 to Bear Meadow, and to provide parking space for 20 cars.

Research

- Manage shaded areas to standards of Protection Class 1 and 2 as shown on Figure 1, in Appendix C.

Mt. Margaret Management Concept Area

- Construct the following trails:
Trail No. 1 across Mt. Margaret Ridge to Harrys Ridge.
Trail No. 211 from Trail No. 1 to Minnie Peak.
Trail No. 212 across Mt. Venus to Deep Lake and down Falls Creek to Trail No. 213.
Primitive trail to the south end of Boot Lake.
Trail No. 211F to Venus, Island, and O'Conner Lakes, and to Trail No. 212 near Deep Lake.
Trail No. 209 to St. Helens Lake from Trail No. 1.
Trail No. 214 across Whittier Ridge from Trail No. 1 to Trail No. 211.
Primitive trail to Snow Lake.
Trail No. 230 from Trail No. 211 to Coldwater Lake Complex.
Primitive Trail No. 210 to Coldwater Peak.
- Construct compost toilets at the following designated camping areas: Panhandle, Boot, Snow, Shovel, and Obscurity Lakes.
- Close the entire area to open campfires.
- Require a permit for overnight camping and limit to designated areas.
- Provide backcountry ranger to make available low impact/fire prevention messages to users.
- Provide 3-sided rock camping shelter for the backcountry guard near Panhandle Lake.
- Close the area to all entry during periods of high fire danger.
- Limit trail use during this planning period to hiker only.
- Delay access to high fire hazard areas until 1990.

Research

- Manage to standards of Protection Class 2 as shown on Figure 1, in Appendix C.

Backcountry Management Concept AreaRyan Lake

- Construct parking for 5 autos.
- Install interpretive sign and site sign on rock base.
- Construct vault toilet.

Quartz Big Tree

- Construct parking for 5 autos and 1 bus.
- Construct vault toilet.
- Construct site sign and interpretative sign.
- Reconstruct nature trail.

North Fringe

- Construct interpretive sign on rockbase.
- Construct parking for 3 autos.

Polar Star

- Construct parking for 10 cars. Construct 6 picnic units.
- Install interpretive sign.
- Provide water.

Dispersed Area

- Reconstruct Trail No. 213 to provide access to Roads 2612 and Weyerhaeuser's Road 2500.
- Reconstruct existing Trail Nos. 213, 217, 218, and 20 to standards needed to accommodate horse/hiker use.
- Construct Trail No. 240 up Red Springs Creek to Trail No. 218.
- Extend Trail No. 218 north to Road 2742019.
- Construct Trail No. 202A between Trail Nos. 217A and 202.
- Relocate portion of Trail No. 217 presently on private land to inside the Monument.
- Construct Trail No. 202 from the Green River to Deadmans Lake.
- Relocate the east end of Trail No. 217 to a good trailhead site on Road 2612.
- Construct Trail No. 205 from Road 2750 to Vanson Peak.
- Construct compost toilets and designate camping areas at Vanson and Deadmans Lake.
- Construct the following trailheads: (To accommodate horse use.)

Road	Trail No.	Toilet	No. of Cars
Weyerhaeuser 2500	213	Vault	10
2516	220		5
2612	213	Vault	10
2612	217		6
2600	220		4
2742019	218		6
2750	217		5
2750	205		5
2750	217.1		5
2608016	240		3

- Acquire public access rights on Road 2612 and improve. Acquire public access agreement for Roads 27, 2742 and 2742019. Weyerhaeuser Road - Minnie Peak to Green River.
- Provide low impact camping and pack-it-out information at all trailheads.
- Provide backcountry ranger to provide low impact use/fire prevention message.
- Construct approximately 1/2 mile of single lane gravel road from the end of the Green River Road to the Monument boundary.
- Manage Road 26 as a one way road (north) from Ryan Lake to the junction of Road 25 during times of heavy visitor use.

Research

- Manage shaded areas to standards of Protection Class 2 and 3 as shown on Figure 1, in Appendix C.

Mount St. Helens Management Concept Area

- Provide a mountain climbing brochure with the main emphasis on informing the visitor about volcanic, geologic, and avalanche hazards and information on low impact use.
- Sign trails leading to the mountain slopes informing climbers of permit system and reminding returning climbers to check out after completing a climb.
- Close the crater to all entry except by permit for scientific study.
- Operate a permit system for mountain climbing.
- Require a permit to camp.
- Close the area to all entry during periods when U.S. Geological Survey advises of potential eruptive activity.
- Require all research and monitoring facilities to conform to the architectural standards for the Monument.
- Participate in the avalanche forecasting program.

Research

- Manage shaded areas to standards of Protection Class 1 and 2 as shown on Figure 1, in Appendix C.

Other Facilities Outside the Monument Along Major Access Corridors

North Information Station

- Relocate on the north side of Road 25 in Section 7, T. 11 N, R. 7 E. (north of Road 25/26 junction).
- Provide parking for 5 cars.
- Construct as a drive-up building with service windows on both sides.
- Provide a kiosk for dispensing information during unstaff periods.
- Provide vault toilet.

Iron Creek Campground

- Retain existing 92 camp units.

Iron Creek Picnic Area

- Convert the existing portal site to a picnic area with 5 picnic sites and a 20 ft. x 40 ft. picnic shelter containing 8 tables.
- Maintain existing vault toilet.
- Provide water.

Boundary Trailhead

- Construct paved parking at Elk Pass for 5 cars.
- Provide horse ties.
- Provide vault toilet.

Clearwater Overlook

- Improve existing parking by paving for 6 cars.
- Construct a rock wall with sidewalk and curb.
- Install interpretive signs on the wall.

Muddy River Overlook

- Construct paved parking for 5 cars.
- Construct trail to viewpoint.
- Construct a rock wall with interpretive signs at the viewpoint.

Muddy River Mudflow

- Maintain existing 10 car parking and interpretive signing.

Cedar Flats Research Natural Area

- Maintain existing 5 car parking and 1 mile loop interpretive trail.
- Provide a self-guided trail brochure and trailhead sign.

Pine Creek Viewpoint

- Improve parking for 5 cars.
- Provide interpretive signs.
- Provide a rock wall.

Pine Creek Information Station

- Retain and improve the former ranger station office as an information portal.
- Provide comfort station (4 seats).
- Provide kiosk for dispensing information during unstaffed periods.
- Improve landscaping and displays/exhibits.

Cispus

- Retain and continue to operate as an Environmental Learning Center by special use permit.
- Upgrade the Mount St. Helens display and library.

Lower Falls

- Convert existing campground to day use viewpoint and picnic area.
- Construct paved parking for 25 cars.
- Replace toilets with new vault toilet design.
- Provide water.
- Extend protective fencing at key viewpoints and along river.
- Install interpretive sign at viewpoint.
- Construct 15 picnic units.

Big Creek Falls

- Maintain the existing paved parking area for 8 cars, vault toilet, and trail to the waterfall.
- Extend waterfall trail down Big Creek to viewpoints for other falls and down the Lewis River to the proposed campground.

Lewis River Campground

- Construct a 100 unit campground near the Lewis River.
- Construct trail bridge across the Lewis River to access existing Trail No. 31.

Curly Creek Viewpoint

- Retain gravel parking for 10 cars, vault toilets, viewing platform, fences.

Curly Creek Campground

- Construct vault toilet and improve camping units.
- Use for industrial camping.

Outlaw Ridge

- Retain as viewpoint picnic area with paved parking for 16 cars and 2 buses, vault toilet, 8 picnic tables, and interpretive signs.
- Construct an information kiosk to display visitor orientation information.

Management

- Provide office space for the Skamania County law enforcement cooperation in the Pine Creek information building.
- Provide housing for the Skamania County deputy at Pine Creek.
- Provide housing for 3 to 4 rescue personnel and a covered garage space for their ambulance.

Roads

- Upgrade the remaining portions of Road 25 to a double lane standard. (Separate analysis needed on portion between Roads 2573 and 2560 junctions.)
- Provide signs for State Route 14 and County Roads 51 and 30.

Research

- Provide building space at Pine Creek for a research laboratory.
- Construct 8 trailer camping units for scientists.
- Provide overnight accommodations for researchers at Cispus Environmental Learning Center.
- Designate campsites at Curly Creek for research users.

ALTERNATIVE G

Coldwater/Johnston Ridge Management Concept AreaColdwater Lake

- Construct a visitor information station/first aid/maintenance building.
- Construct a restaurant/gift shop/snack bar.
- Provide paved parking for 80 cars and 2 buses, with interim parking for 200 cars until the highway is extended to Spirit Lake.
- Provide paved parking for 20 cars at the boat launch.
- Provide paved parking for 10 cars at Trail No. 221.

- Construct a comfort station near the visitor information building.
- Construct a comfort station at boat launch.
- Construct boat launch ramp, dock, and marina.
- Provide water.
- Provide a boat dock at east end of lake with access to trail.
- Construct interpretive signs.
- Provide paved parking for 10 cars at Trail No. 230.
- Request Washington State Department of Transportation to construct State Route 504 from near Camp Baker to Coldwater Lake and extend as a double lane dust free Forest Service road to Spirit Lake and tie into Road 99 when volcanic/geologic hazards subside.
- Install underground power/telephone cable from Camp Baker to Coldwater Lake.
- Provide space in the visitor information station for law enforcement cooperators.
- Install 2-way radio remote.
- No restrictions on boating.

Harrys Ridge

- Construct a 3-sided rock shelter.
- Install compost toilet.
- Provide interpretive sign.
- Reconstruct U.S. Geological Survey building/antenna.
- Provide information board with pack-it-out and low impact backcountry use information.

Minnie Peak

- Construct combination viewpoint/trailhead with parking for 30 cars.
- Install interpretive sign and bulletin board with pack-it-out/low impact backcountry use message.
- Construct vault toilet.
- Acquire public access rights on private road to Minnie Peak, and improve to a single lane gravel standard.

Dispersed Area

- Construct Trail No. 1 to viewpoint on Johnston Ridge.
- Construct Trail No. 230A to damaged logging equipment on Coldwater Ridge and along Coldwater Creek.
- Construct 3 viewpoints along State Route 504 and install interpretive sign at each viewpoint, provide paved parking for 38 cars.
- Construct Trail No. 230 along the north shoreline of the lake.
- Construct Trail No. 221 across the debris avalanche to Castle Lake. Elevate trail in sensitive areas. Use first 1/4 mile to provide a loop interpretive trail.

Winter Season

- Request the State Department of Transportation to plow State Route 504 to Spirit Lake, and open 100 parking spaces.

- Request cooperative Sno-park funds to keep 80 parking spaces open at Coldwater Lake.

Research

- Manage area under standards of Protection Class 2 as shown on Figure 1, in Appendix C.

Castle Lake/Sheep Canyon Management Concept Area

Castle Lake Complex

- Purchase public rights in private Road 3000, improve to paved single lane access to Castle Lake.
- Close the lake to all motorized boating and float planes.
- Construct parking for 25 autos (paved).
- Construct vault toilet.
- Construct rock picnic shelter with 8 picnic tables.
- Construct interpretive Trail No. 221.1 on debris avalanche, and Trail No. 221.2 to the ridge east of Castle Lake.
- Install interpretive signs.
- Provide water.

Sheep Canyon Complex

- Maintain Road 8123 as single lane dust free access to Sheep Canyon.
- Construct parking for viewpoint/trailhead for 20 autos and for viewpoint for 5 autos.
- Construct 5 picnic units.
- Install interpretive signs and a short trail to a viewpoint.
- Construct vault toilet.
- Provide water.

Dispersed Area

- Construct Trail Nos. 216G and 216.8 across the South Fork of the Toutle River and the debris avalanche.
- Limit visitor use to trails in the debris avalanche high value research area.
- No open fires.
- No overnight camping.
- Upgrade approximately 4 miles of single lane road to pavement along ridge from Road 3000 to trailhead for Trail No. 216G.
- Maintain approximately 3 miles of single lane gravel road along ridges southeast and east of Castle Lake.
- Construct trailhead parking/viewpoint, Trail No. 216G, for 20 autos, with vault toilet.

Research

- Manage shaded areas to standards of Protection Class 1 and 2 as shown on Figure 1, in Appendix C.

Cave Basalt/Goat Marsh Management Concept Area

Ape Cave

- Provide paved parking for 20 cars and 1 bus.
- Construct vault toilet.
- Rewrite the Ape Cave brochure as a self-guided trail.

- Retain Trail No. 239 to upper end of the Ape Cave.
- Construct a cedar fence around the skylight near the upper end of Ape Cave.
- Relocate Road 8303 to eliminate traffic by the cave entrance.
- Retain an information bulletin board at the cave entrance with cave conservation messages.
- Construct a gate on the entrance road.

Lava Cast

- Retain the picnic area of 10 units.
- Construct a .3 mile barrier free loop interpretive trail through the Lava Cast area.
- Expand parking for 20 cars.
- Provide water.
- Construct vault toilet.
- Construct Trail No. 232A to Trail No. 232 for hikers only.

Ole's Cave

- Construct a 25 unit campground.
- Install underground power cable.
- Provide water.
- Construct Trail No. 236 to lower end of Ole's Cave and to Trail No. 232.
- Construct an information kiosk at the junction of Roads 90 and 83.
- Construct day use parking for 40 cars.
- Construct visitor information, lamp and equipment rental, and cave tours concession building.
- Abandon Road 8300030.
- Acquire private land in Section 20.

McBride Lake

- Construct 25 unit campground on west side of Road 8100600.
- Provide water.
- Install vault toilet.
- Construct trail to Kalama Springs.
- Pave Road 8100600 and use for campground entrance.

Kalama Springs

- Construct 8 unit picnic area.
- Install interpretive sign at the springs.
- Pave Road 8100610 to Kalama Springs.
- Construct vault toilet.

Kalama River Horse Camp and Trails

- Construct a 12 unit campground for horse users.
- Construct the following trails for horse/hiker use:
 - Trail No. 237 from the campground to McBride Lake,
 - Trail No. 232 from Road 8122 along the south boundary of the Monument across Long Mountain on the Kipuka and to Road 90,
 - Trail No. 232B to Cinnamon Peak,
 - Trail Nos. 237A and 238 from McBride Lake to Sheep Canyon and Butte Camp,
 - Trail No. 238C and the portion of Trail No. 216 east to Butte Camp to provide a loop trail to the mountain.

- Construct trailhead at Road 90 with horse ties, parking 5 cars.
- Restrict horse use to trails, trailheads and campground.
- Require feed other than hay to be brought in.
- Operate Kalama Horse Camp by reservation only.
- Provide water.

Goat Marsh

- Retain Trail No. 237 from Road 8123 to Goat Marsh Lake and extend along the west side of the marsh to the top of Goat Mountain (hiker only).
- Install interpretive sign at viewpoint on Road 8123.
- Close Road 8123070 and use as a part of Trail No. 237.
- Improve Roads 8123171 and 8123173.
- Sign the boundary of the RNA.
- Sign trailhead with information encouraging low impact use.

Trailheads

- Road 8123, retain parking for 10 cars.
- Road 8100830, construct parking for 10 cars.
- Road 81, Kalama River, construct parking for 10 cars, plus vault toilet and tie rack for horses.

Dispersed Area

- Road 8123, construct compost toilet and 8 camp units with tent pads and fire rings, and provide water.
- South climbing camping (Section 20), construct compost toilet.
- Butte Camp, install compost toilet.
- Reopen Road 81 to form a paved loop drive.
- Require permits for overnight use.
- Sign with information on permit system at all dispersed camps.
- Restricts access to caves during bat hibernation.
- Acquire commercial hauling rights in private road from Road 8303 to Road 81 to allow industrial traffic to flow west and avoid mixing with Ape Cave and Lava Cast traffic.

Blue Lake Noble Fir Grove

- Construct parking for 5 cars.
- Install interpretive sign.
- Reconstruct the damage portion of former Road 8123 from Blue Lake to the end as a single lane gravel standard.
- Pave Roads 8123 to Sheep Canyon.

Winter Season

- Request Sno-park funds from Washington State to open parking near Forest boundary on Road 81 at former Kalama work center, parking for 15 cars.
- Request state cooperative funds to groom roads as shown on the map.

- Mark and maintain ski trails as shown on the map.

South Portal

- Construct new portal building on PP&L lands along county highway to Cougar, near the junction with Road 81.
- Install power and telephone.
- Provide paved parking for 5 cars.
- Provide double lane access to drive-up windows on both sides of the building.
- Construct comfort station.
- Provide water.
- Enter cooperative agreement with PP&L for use of land.
- Provide latest information on volcano and road conditions on 24 hour broadcast over low frequency radio.

Research

- Manage shaded areas to standards of Protection Class 2 and 3 as shown on Figure 1, in Appendix C.

Mudflow Management Concept Area

Lava Canyon Complex

- Construct paved access road to a new trailhead/viewpoint/interpretive site on the south side of the Muddy River Canyon. (1/2 mile)
- Construct paved parking for 45 autos.
- Provide water.
- Construct vault toilet.
- Construct and install 4 tables.
- Construct and install interpretive signs.
- Construct Trail No. 184 from the viewpoint to Road 83.
- Construct Trail No. 234 from Trail No. 184 to timberline.
- Construct Trail No. 184B to Lahar viewpoint.
- Construct trailhead on Road 83 for 5 autos.

Dispersed Area

- Construct Trail Nos. 216C and 216B to provide hiker access to the mountain.
- Construct Trail No. 216 near timberline on south and east sides of mountain.
- Construct Trail No. 225 from Road 83 to Road 99.
- Upgrade Road 83 by paving surface from Road 81 to Lava Canyon including across the mudflow.
- Construct a road tie through from Road 94 to Road 9210 to provide an alternate haul route for industrial traffic.
- Construct tie through road between Roads 9211130 and 2586 to provide an alternate haul route for industrial traffic.
- Construct a road tie from Road 83 to Road 9418 to eliminate the road on the Smith Creek mudflow.
- Upgrade Road 94 to 9418 to accommodate two-way traffic.
- Day use only in Lava Canyon.

- Relocate approximately 0.8 mile of Road 9418 to eliminate excess grades.
- Construct trailhead parking as follows:

Road	Trail No.	No. of Cars
83	216c	5
83	225	10
83	234	8

- Construct interpretive viewpoint at Marble Mountain with parking for 4 autos.
- Protect the U.S. Geological Survey antenna at Marble Mountain with fence and sign.

Winter Season

- Construct Sno-park facility near the junction of Roads 83 and 8312.
- Construct paved parking for 80 vehicles with trailers.
- Construct vault toilets.
- Construct warming hut, with picnic tables.
- Provide water.
- Request State cooperative funds to snowgroom Roads 83 and 8312 and tie through from Road 83 to Road 8100830.
- Mark, construct, and maintain cross country ski trails as follows:

Trail 216B	-	1.5 miles
Road 8315	-	1.0 miles
Road 8315150	-	.5 miles

Research

- Manage shaded areas to standards of Protection Class 2 and 3 as shown on Figure 1, Appendix C.

Road 99/Spirit Lake Management Concept Area

Bear Meadow

- Develop parking (paved) for 5 vehicles with trailer on the north side of Road 99 to accommodate hiking/horse use on Trail No. 1.
- Install site sign on a rock base/install audio interpretive device in the rock wall.
- Install rock wall with interpretive signs.
- Construct vault toilet at trailhead.
- Install horse tie rack.
- Install curbing and sidewalk on the existing 15 auto parking area.
- Provide water.
- Install information kiosk.
- Maintain 5 picnic units.

East Entrance

- Construct entrance sign with rock base.
- Construct rock wall complete with curbing and sidewalk and interpretive sign.
- Retain the existing paved parking for 7 autos.

Miner's Car

- Separate parking from traffic by realigning the road, and expand to accommodate 10 autos.

- Construct a hiker trail from the car to the Meta Lake trailhead to eliminate walking on the road.
- Remove cyclone fence and replace with a rock wall 100 feet long. Weld removable parts to the car.

Meta Lake

- Retain barrier free trail to the lake.
- Construct a rock wall at the trail's end to serve as a physical barrier and deter hiking on the lake shore.
- Mount new interpretive sign on the wall.
- Install site sign on a rock base.
- Improve parking along Road 99 for 6 autos by paving.

Cascade Peaks Viewpoint (Road 94/99 junction)

- Retain parking for 15 autos, stripe.
- Replace interpretive sign and base.

Independence Pass

- Improve parking to accommodate 10 autos.
- Extend trail north to Trail No. 1.
- Replace interpretive sign and base.

Harmony Creek

- Construct parking for 10 vehicles.
- Construct trail to Spirit Lake.
- Install site sign and interpretive sign on a rock base.

Cedar Creek

- Improve parking for 10 autos.
- Install interpretive sign on rock base.

Donneybrook

- Widen road to provide parallel parking for 15 autos for viewing Spirit Lake and using the Smith Creek trail.
- Install trailhead sign on rock base.

Smith Creek View

- Construct parking for 10 cars.
- Construct rock wall complete with curbing and walkways with interpretive sign on wall.
- Install site sign on rock base.

Windy Ridge Viewpoint

- Reconstruct paved parking and reduce capacity to 40 cars.
- Construct 3-sided rock shelter open toward Spirit Lake.
- Construct trail to viewpoint on the ridge.
- Provide water.
- Construct vault toilet.

Spirit Lake Viewpoint

- Construct parking for 380 cars.
- Install interpretive signs and a loop trail.
- Construct two open-sided shelters for picnicking with 12 tables, each.
- Construct 200 seat amphitheater.
- Construct trail to Harrys Ridge.
- Construct vault toilet.

Norway Pass Trailhead

- Retain the 30 car parking area at Trail No. 1 on Road 26.
- Provide water.
- Construct vault toilet.

Grizzly Panorama

- Construct parking for 4 cars.
- Install Monument entrance sign and interpretive sign on rock base.

Smith Ridge

- Install an interpretive sign on a rock base and provide parking for 5 cars.

Strawberry Mtn

- Close Road 2516 where it enters the Monument, develop parking for 7 cars, install a vault toilet, and put the road surface to bed.
- Construct a trail to the viewpoint.

Dispersed Area

- Reconstruct Road 99 to a double lane paved standard from Road 25 to the Spirit Lake Basin.
- Reconstruct Trail No. 220 and Trail No. 1 east of Bear Meadow to accommodate horse/hiker/bike use.
- Construct a boat dock and boat launch to maintain access to the lake control device, if needed.
- Close the area to open fires.
- Restrict access to developed sites and trails in the Spirit Lake Basin as shaded on the map.
- Preventing patrols for fire on Roads 99 and 26 during fire season.
- Trail and camping closures during high fire danger.
- Day use only Spirit Lake Basin.
- Permits required for overnight use.

Winter Season

- State cooperative funds request to snowgroom Road 99 as a snow trail to the Spirit Lake Basin.

Research

- Manage shaded areas to standards of Protection Class 1 and 2 as shown on Figure 1, in Appendix C.

Mt. Margaret Management Concept Area

- Construct the following trails:
Trail No. 1 across Mt. Margaret Ridge to Harrys Ridge.
Trail No. 211 from Trail No. 1 to Weyerhaeuser Road at Minnie Peak.
Trail No. 212 across Mt. Venus to Deep Lake and down Falls Creek to Trail No. 213.
Primitive trail to the south end of Boot Lake.
Primitive trail to Holmstedt Lake and to Trail No. 214.

Primitive trail to Venus Lake.

Trail No. 214 across Whittier Ridge from Trail No. 1 to Trail No. 211.

Primitive trail to Snow Lake.

Trail No. 209 to St. Helens Lake from Trail Nos. 1 and 207.

Trail No. 230A to logging equipment on Coldwater Ridge.

Trail No. 211F from Road 2612 up Grizzly Creek to Trail No. 211.

- Construct compost toilets at the following designated camping areas: Panhandle, Boot, Snow, Venus, Shovel, and Obscurity Lakes.
- Close the entire area to open campfires.
- Require a permit for overnight camping and limit to designated areas.
- Provide backcountry ranger to make available low impact/fire prevention messages to users.
- Provide 3-sided rock camping shelter for the backcountry guard near Panhandle Lake.
- Close the area to all entry during periods of high fire danger.
- Limit trail use during this planning period to hiker only.
- Delay trail access to high fire hazard areas until 1990.

Research

- Manage to standards of Protection Class 2 as shown on Figure 1, in Appendix C.

Backcountry Management Concept AreaRyan Lake

- Parking for 5 autos.
- Interpretive sign and site sign on rockbase.

Quartz Creek Big Tree

- Construct parking for 5 autos and 1 bus.
- Construct vault toilet.
- Construct site sign and interpretative sign.
- Reconstruct nature trail.

North Fringe

- Construct interpretive sign on rock base.
- Construct parking for three autos.

Polar Star Mine/Road 2612

- Construct 7 picnic units.
- Construct vault toilet.
- Construct parking, 12 cars.
- Construct interpretive sign.
- Provide water.

Dispersed Area

- Reconstruct Trail No. 213 to provide access to Roads 2612 and Weyerhaeuser Road 25.
- Reconstruct existing Trail Nos. 213, 217, 218, and 220 to standards needed to accommodate horse/hiker use.
- Construct Trail No. 202A from Road 2750 to Trail No. 202.
- Extend Trail No. 218 north to Road 2742019.

- Construct Trail No. 202 from the Green River to Deadmans Lake.
- Relocate portion of Trail No. 217 presently on private land to inside the Monument.
- Construct Trail No. 205A from Road 2750 to Vanson Peak.
- Construct primitive access Trail No. 240 from Road 2608016 to Trail No. 217.
- Relocated the east end of Trail No. 217 to a good trailhead site on Road 2612.
- Construct the following trailheads: (To accommodate horse use.)

Road	Trail No.	Toilet	No. of Cars
Weyerhaeuser 2500	213	Vault	10
2612	213	Vault	10
2612	217		6
2600	220		4
2742019	218		6
2750	217		5
2750	202A		5
2750	205		5
2516	220		5

- Construct compost toilets and designate camping areas at Vanson and Deadmans Lake.
- Acquire public access agreement on the following private roads and improve to travel standard:

Weyerhaeuser 2500 (State Route 504 to end).

Road 27 to Vanson Peak.

Roads 2742 and 2742019.

- Provide low impact camping and pack-it-out information at all trailheads.
- Provide backcountry ranger to provide low impact use/fire prevention message.
- Acquire ownership of private lands in Section 13, T. 10 N., R. 5 E., and Section 18, T. 10 N., R. 6 E.

Research

- Manage shaded areas to standards of Protection Class 2 and 3 as shown on Figure 1, in Appendix C.
- Construct Trail No. 205 from Road 2750 to Trail No. 217 in the Goat Creek Basin.

Mount St. Helens Management Concept Area

- Provide a mountain climbing brochure with the main emphasis on informing the visitor about volcanic, geologic, and avalanche hazards and information on low impact use.
- Sign trails leading to the mountain slopes informing climbers of permit system and reminding returning climbers to check out after completion of a climb.
- Close the crater to all entry except by permit for scientific study.
- Operate a permit system for mountain climbing.
- Require a permit to camp.

- Close the area to all entry during periods when U.S. Geological Survey advises of potential eruptive activity.
- Require all research and monitoring facilities to conform to the architectural standards for the Monument.
- Participate in the avalanche forecasting program.

Research

- Manage shaded areas to standards of Protection Class 1 and 2 as shown on Figure 1, in Appendix C.

Other Facilities Outside the Monument Along Major Access Corridors

North Information Station

- Relocate on the north side of Road 25 in Section 7, T. 11 N., R. 7 E. (north of Road 25/26 junction).
- Provide parking for 5 cars.
- Construct as a drive-up building with service windows on both sides.
- Provide a kiosk for dispensing information during unstaffed periods.
- Provide a toilet.
- Provide power/telephone cable.

Iron Creek Campground

- Retain existing 92 camp units.

Iron Creek Picnic Area

- Convert the existing portal site to a picnic area with 5 picnic sites and a 20 ft. x 40 ft. picnic shelter containing 8 tables.
- Maintain the existing vault toilet.
- Provide water.

Boundary Trailhead

- Construct paved parking at Elk Pass for 5 cars.
- Provide horse ties.
- Provide vault toilet.

Clearwater Overlook

- Improve existing parking by paving for 6 cars.
- Construct a rock wall with sidewalk and curb.
- Install interpretive signs on the wall.

Muddy River Overlook

- Construct paved parking for 5 cars.
- Construct trail to viewpoint.
- Construct a rock wall with interpretive signs at the viewpoint.

Muddy River Mudflow

- Maintain existing 10 car parking and interpretive signing.

Cedar Flats Research Natural Area

- Maintain existing 5 car parking and 1 mile loop interpretive trail.

- Provide a self-guided trail brochure and trailhead sign.

Pine Creek Viewpoint

- Improve parking for 5 cars.
- Provide 2 interpretive signs.
- Provide a 60 ft. rock wall.

Pine Creek Information Station

- Retain and improve the former ranger station office as an information portal.
- Provide comfort station.
- Provide kiosk for dispensing information during unstaffed periods.
- Improve landscaping and displays/exhibits.
- Remodel east end of building for display area.

Cispus

- Continues to operate as an Environmental Learning Center by special use permit.

Lower Falls

- Convert existing campground to day use viewpoint and picnic area.
- Construct paved parking for 25 cars.
- Install new design vault toilet.
- Provide water.
- Extend protective fencing at key viewpoints and along river.
- Install interpretive sign at viewpoint.
- Construct 15 picnic sites with tables.

Big Creek Falls

- Maintain the existing paved parking area for 8 cars, vault toilet, and trail to the waterfalls.
- Extend trail down Big Creek to viewpoints for other falls and down the Lewis River to the proposed campground.

Lewis River Campground

- Construct a 100 unit campground near the Lewis River.
- Construct trail bridge across the Lewis River to access existing Trail No. 31.

Curly Creek Viewpoint

- Retain gravel parking for 10 cars, vault toilets, viewing platform, fences.

Curly Creek Campground

- Construct vault toilet and improve camping units.
- Use for industrial camping.
- Provide water.

Outlaw Ridge

- Retain as viewpoint picnic area with paved parking for 16 cars and 2 buses, vault toilet, 8 picnic tables, and interpretive signs.
- Construct an information kiosk to display visitor orientation information.

Winter Season

- Construct parking for 20 cars with trailers near the junction of Roads 25/99.
- Provide vault toilet.
- State cooperative funds requested to snowgroom Road 99 as snow trail to Spirit Lake and to plow Road 25 to Elk Pass and parking for an additional 20 cars.
- Mark Boundary Trail for cross country skiing.

Management

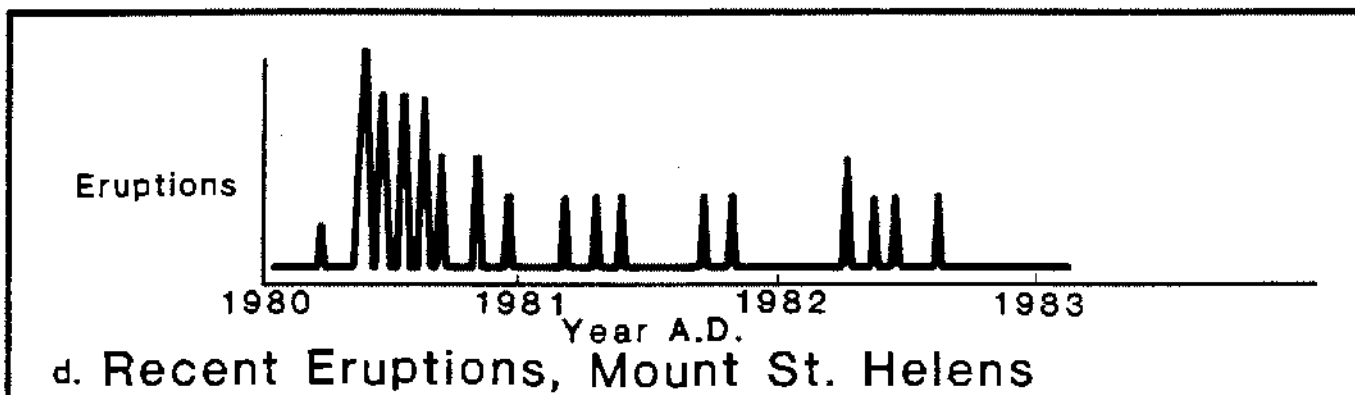
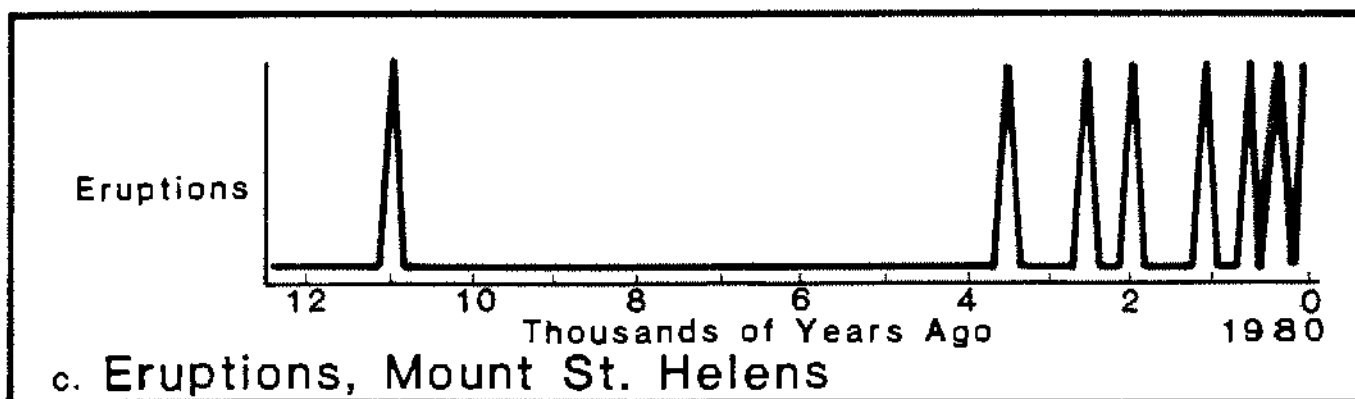
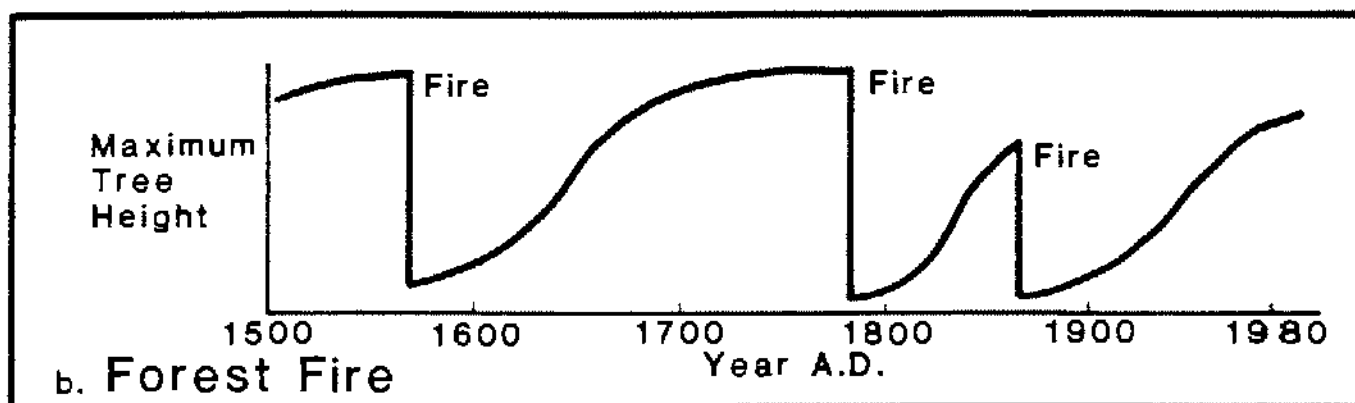
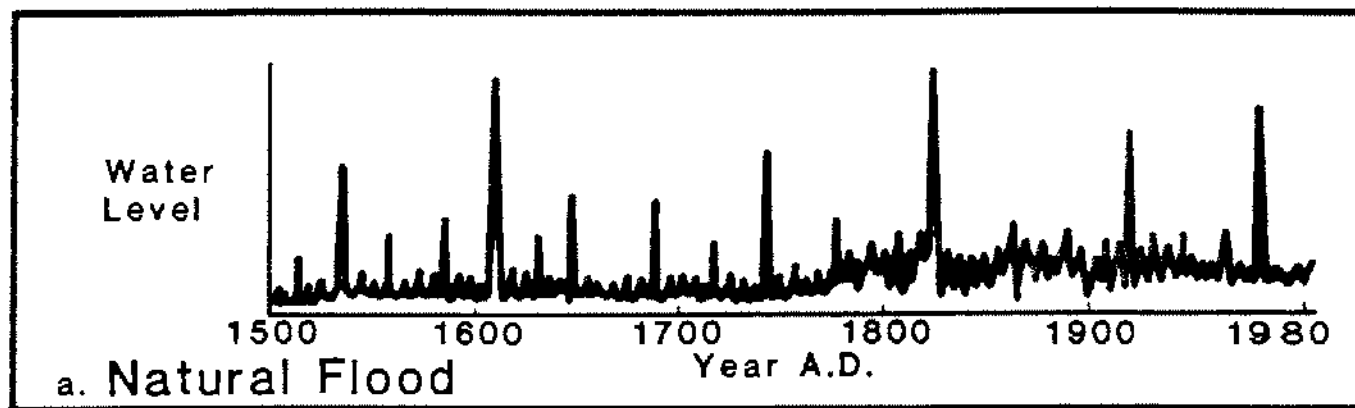
- Provide office space and housing for the Skamania County law enforcement cooperation in the area between the Pine Creek Information Station and school.
- Provide housing for 3 to 4 rescue personnel and a covered garage space for their ambulance.

Roads

- Upgrade the remaining portions of Road 25 to a double lane standard. (Separate analysis needed on portion between 2573 junctions and 2560.)
- Provide signs for State Route 14 and Forest Service Roads 5100 and 30.

Research

- Provide building space at Pine Creek for to a research laboratory.
- Construct 8 trailer camping units for scientists.
- Designate campsites at Curly Creek for research users.



Rapid Change Punctuating "Normal" Events

Figure E-1

Appendix F

ALTERNATIVE ACCESS PROPOSALS

COLDWATER LAKE TO JOHNSTON RIDGE

In order to meet the visitors' desire to see the crater and dome (ref. Chapter II), public access to Johnston Ridge is an important part of several alternatives.

Roaded access to Johnston Ridge from the west was determined to be technically very difficult. Side slopes are steep (slopes in excess of 50%), and roads previously constructed in this area have experienced recurring failures.

Aerial Tram/Gondola Proposal

An alternative was proposed to use an aerial tram or gondola system between the west side of Coldwater Lake and the west end of Johnston Ridge. Before including this proposal in any alternative, a field investigation and cost estimate were made. Engineering representatives from the Regional Office Structures Group and the Gifford Pinchot NF and a recreation specialist visited the site in May, 1983. In order to reach the best viewpoint on Johnston Ridge, a tram system would need to be approximately 3.3 miles in length and include one turn (40°). The eastern 2.1 miles follows the relatively flat ridge and would need towers spaced close together. This section could be replaced with a bus shuttle along a single-lane road. The western 1.2 miles could be accomplished with a single-span system (towers at each end).

The gondola cable car appears to be the best choice for several reasons:

- Is lower in cost than large carriers.
- Has less sophisticated machinery than large carriers.
- Has higher capacity (persons/hour) than other alternatives.
- Each passenger has a good view in all directions.
- Is an enclosed carrier.

In addition to the capital investment cost, annual maintenance costs of \$150,000 and annual operation costs of \$200,000 were estimated for the gondola.

Estimates were made for costs of providing shuttle bus transportation from the gondola terminal to the observation post. Two types of 50-passenger buses were considered: open air shuttle and city type buses. Assuming a six-minute ride and a six-minute dwell (load/unload) at each end, each bus could make 2-1/2 round trips/hour. Six buses could carry 750 passengers per hour in each direction.

	City-type	Open Air
Capital Investment		
6 buses	\$900,000	\$300,000
Van	\$ 25,000	\$ 25,000
Annual O & M	\$363,000	\$214,000

Table F-1. Comparison of Various Tram Systems

Type of System	Persons Per Carrier	Persons Per Hour	Cost/mile (\$ MM)	Project* Length	Total Project (\$ MM)	Comments
Sky Tram	80-120	600-1000	\$3±	6500'	\$3.5	too expensive
Gondola Cable Car	6-8	2400	\$2+	6500'	\$2.5	best choice
Gondola Chairlift	4	600-1200	\$2-	6500'	\$2.4	above is better (more people/hr)
Chairlift, Open (Detachable)	3-4	2160-2600	\$2-	6300'	\$2.3	open carrier, not desirable
Chairlift, open (Fixed)	2-3	1200-1600	\$0.5-0.8	6300'	\$0.9	open carrier, and too slow
Funicular Rail	40	800	\$3±	6500'	\$3.7	not good for the site
Cog Rail Train	40	720 (2 carriers) (3 units)	\$4±	8000'	\$6.0	not practical

*Western 1.2 miles only

(A capture rate of 30% yields 254,000 riders/season)

Next, the payoff for capital investment was calculated using a 10% compounding rate. A 5-year payoff was considered necessary to attract interest from the business community.

	Gondola w/city type bus	Gondola w/open air bus
Gondola Capital Investment	\$2,500,000	\$2,500,000
Bus Capital Investment	<u>925,000</u>	<u>325,000</u>
Total Capital Investment	\$3,425,000	\$2,825,000
Convert Cap. Inv. to 5 years @ 10%	\$ 904,000	\$ 745,000
Gondola Operation	200,000	200,000
Gondola Maintenance	150,000	150,000
Bus O & M	363,000	214,000
TOTAL	\$1,617,000	\$1,309,000

	Thousands of Users/Year		
FARE	250	300	350
\$5	\$1,125,000	\$1,350,000	\$1,575,000
\$6	\$1,350,000	\$1,620,000	\$1,890,000
\$7	\$1,575,000	\$1,890,000	\$2,205,000

Fares of \$5 - \$6 would be adequate to meet 5-year payoff (comparable facilities charge \$5.00 to \$7.50).

Another alternative was proposed to use a shuttle bus system from Coldwater Lake to Johnston Ridge (without an aerial tram or gondola).

Assume 10 buses @ 1 round trip/hour =
430 people/hour each way.

Capital Investment		
10 buses @ \$150,000		\$1,500,000
2 vans @ \$ 25,000		50,000

It is apparent that the investment would be less for this system than the gondola/bus alternative, but demand (recreation visitors) would not be met during peak season.

Either system (bus shuttle or gondola/bus) appears to be economically feasible. Each has been included in the alternative.

Appendix G

RECREATION OPPORTUNITY SPECTRUM (ROS)

This recreation planning system provides a framework for stratifying and defining classes of recreation opportunities, based on the surrounding settings, or varying conditions, ranging from modern and developed, to primitive and undeveloped. These recreation opportunity settings can be defined as the combination of physical, biological, social, and managerial conditions that give value to a place. Thus, an opportunity includes qualities provided by nature (vegetation, landscape, topography, scenery, qualities associated with recreation use (levels and types of use), and conditions provided by management (developments, roads, regulations). By combining variations of these qualities and conditions, management can provide a variety of opportunities for recreationists.

Recreation opportunity settings imply a choice for recreationists; people must be aware of the opportunities, and the opportunities must be comprised of conditions desired by recreationists. Thus, opportunities are a function of user preference and a product of management actions designed to provide desired settings and to make people aware of their existence.

For ease of use, the possible mixes or combinations of activities, settings, and probable experience opportunities have been arranged along a spectrum, or continuum, consisting of six settings from primitive to urban (Figure 1). This matrix provides visual and contextual examples of the components that make up each ROS class and the probable experiences that occur in each class within the Monument. The ROS compatibility matrix also provides general direction for the management of each ROS class regardless of alternative. Further detailed information about compatible recreation facilities by ROS class can be found in the Mount St. Helena National Monument Facility Design Guide (April 1983). For further information about the use of the ROS system in land management planning and its conceptual foundations, refer to ROS Users Guide (1982).

The ROS classes were delineated using the criteria defined in the matrix for each alternative. The mapped ROS classes are displayed by alternative following the ROS matrixes (Figures G1-8).

Recreation Opportunity Spectrum Mount St. Helens National Volcanic Monument

P Primitive	SPNM Semi-Primitive Nonmotorized	SPM Semi-Primitive Motorized
<ul style="list-style-type: none"> Interaction between users is very low and evidence of other users is minimal. Setting is a newly created volcanic landscape unmodified by humans. Access is primarily cross country with only a few primitive trails. Mode of travel is by foot only. Winter travel may be by cross country skis or snow shoes. No on site interpretative facilities. No designated viewpoints. 	<ul style="list-style-type: none"> Interaction between users is low but there is often evidence of other users. Setting is predominantly one of a newly created volcanic landscape with some unaffected areas in a natural state. Access is primarily by trail. Mode of travel is by foot or horseback. Winter travel may be by cross country skis or snow shoes. No on site interpretative facilities. Viewpoints may be designated but undeveloped. 	<ul style="list-style-type: none"> Concentration of users is low but there is often evidence of other users. Setting may be predominantly one of newly created volcanic landscape or unaffected high points outside. Access is primarily by primitive road or trail. Mode of travel in the winter may be by snowmobile. No on site interpretative facilities. Viewpoints may be designated but undeveloped.

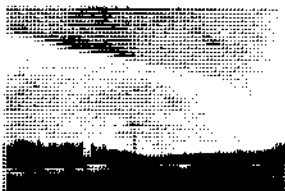
Map Code



Social Encounters			
Physical Setting			
Access			
Mode of Travel			
Winter travel			
Interpretation			
Viewpoint			

RN Roaded Natural <ul style="list-style-type: none"> • Interaction between users may be low to moderate but evidence of other users is prevalent. • Setting contains newly created volcanic landscape defined by or framed by natural appearing unaffected vegetation. • Access is by road varying from dirt to paved. Mode of travel is by auto, RV, or buses. • Winter travel is by auto or tour buses. • Wayside interpretative exhibits are made of natural appearing materials. • Viewpoints are designated with minimal development. 	R Rural <ul style="list-style-type: none"> • Interaction between users is moderate to high. • Setting is primarily one of pastoral scenes or small communities. • Access is by road primarily double lined paved. • Mode of travel is by auto, RV, or bus. Aerial trams are also possible. • Interpretative facilities may be complex wayside exhibits of natural appearing materials. • Viewpoints are designated with moderate development. 	U Urban <ul style="list-style-type: none"> • Sights and sounds of humans on site are predominant; large numbers of users can be expected. • Setting is an urbanized environment with vegetation sometimes exotic and manicured outside the monument. • Access is usually by multi-laned paved highways. • Mode of travel is by auto, RV, bus, surface trams, or airplane. • Interpretative facilities are sophisticated and located in an interpretative center. • Viewpoints are highly developed.

Map Code



Social Encounters

Physical Setting

Access

Mode of Travel

Winter travel

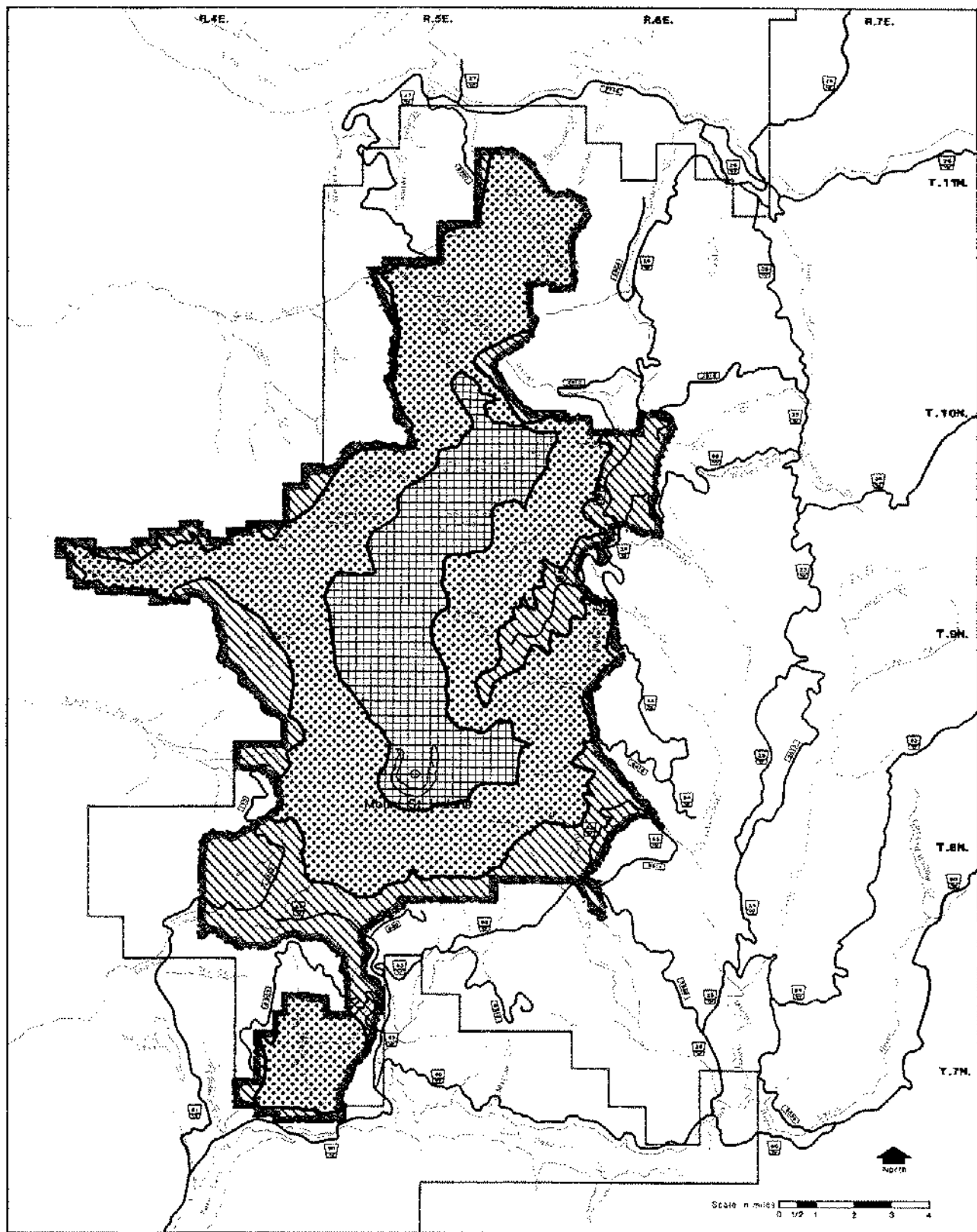
Interpretation

Viewpoint

Compatibility Matrix of R.O.S.

	P Primitive	SPNM Semi-Primitive Non-Motorized	SPM Semi-Primitive Motorized
Experiences	<ul style="list-style-type: none"> Observing scientific studies Very high discovery feeling Moderate learning feeling, self-interpretation. No information or orientation Very high perceived feeling of risk or danger Nostalgic feeling for where things were—Harmony Falls, etc. Very strong feeling of size, magnitude, and idiosyncrasies of event and relationships to natural process and human events over time Escape from people and physical pressures (sights and sounds) Extreme challenge in access and climbing activity Exercise high—climatic stress high with visitor discomfort Visitor wants to experience solitude 	<ul style="list-style-type: none"> Observing scientific studies High discovery feeling Moderate learning feeling, with self-interpretation—little orientation High perceived feeling of risk or danger Nostalgic feeling of where things were, Harmony Falls, etc. Strong feeling of size, magnitude and idiosyncrasies of event of relationship to natural process and human events over time Moderate to high feeling of escape from sights and sounds of humans Difficult challenge in access Exercise moderate—climatic stress moderate with visitor discomfort Visitor wants to escape all but occasional small group social experience 	<ul style="list-style-type: none"> Climatic stress high with visitor discomfort High discovery feeling Visitor's equipment is important Moderate feeling of learning—little orientation High perceived feeling of risk or danger Nostalgic feelings of where things were Strong feeling of size and magnitude and idiosyncrasies of events and relationship to natural process and human events over time Moderate feeling of escape from sights and sounds of humans Moderate to high vehicle oriented challenge in access Equipment and leadership may be important Visitor wants to escape all but occasional small group social experience
Social Encounters	<ul style="list-style-type: none"> 0 to 6 encounters per day No conflicting types of users 	<ul style="list-style-type: none"> 6 to 15 encounters per day Little conflict in types of users 	<ul style="list-style-type: none"> 6 to 15 encounters per day Some conflict between motorized from motorized users
Managerial Control	<ul style="list-style-type: none"> No on-site controls Restrict numbers of visitors during the day Restrict air traffic to give non-motorized experience Some areas may have very restricted use 	<ul style="list-style-type: none"> On-site controls present but subtle Restrict numbers of visitors during day to meet above criteria Restrict air traffic to give non-motorized experience 	<ul style="list-style-type: none"> On-site controls present but subtle Restrict numbers of visitors to meet above criteria Restrict air traffic to give semi-primitive motorized experience
Physical Setting	<ul style="list-style-type: none"> Unmodified natural environment Approximately 5,000 acres + 3 miles from nearest road with motorized use May have high levels of subjective hazards 	<ul style="list-style-type: none"> Subtle modifications in natural environment would go unnoticed to observer on trails Approximately 2,500 acres in size 1/2 to 1/4 mile from nearest road with motorized use May have moderate levels of subjective hazards 	<ul style="list-style-type: none"> Subtle modifications in natural environment—may be noticed but do not draw attention of motorized observer Approximately 2,500 acres in size 1/2 to 1/4 mile from nearest road better than primitive with motorized use
Trail Access	<ul style="list-style-type: none"> Primarily trailless area. May have rough "most difficult" trails (12" ungraded tread with 20%—sustained grades 30—4% max pitch) 	<ul style="list-style-type: none"> Trails difficult to moderately difficult (max sustained grades of 20% with 20% max pitches 12-18" tread) dirt and rock tread surface 	<ul style="list-style-type: none"> Motorized trails difficult to moderately difficult with some groomed winter trails
Road Access	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> Primitive roads may exist but closed to motorized use Primitive roads may be restored to natural contour 	<ul style="list-style-type: none"> Over snow travel only
Mode of Travel	<ul style="list-style-type: none"> Foot traffic only Cross country skis and snow shoes during winter 	<ul style="list-style-type: none"> Foot and equestrian traffic may be separated Cross country ski and snow shoes during winter Non-motorized boats 	<ul style="list-style-type: none"> Some foot and equestrian trails Snow mobiles during winter season Motorized boats
Interpretation	<ul style="list-style-type: none"> No on-site facilities No designated viewpoints The use of technical guide books 	<ul style="list-style-type: none"> No on-site facilities Use of maps, brochures and guide books to locate viewpoints and other interpretive opportunities as well as present message Utilize green vegetation wherever possible to enframe blast and flow area views 	<ul style="list-style-type: none"> No on-site facilities Use of brochures and guide books Utilize green vegetation wherever possible to enframe blast and flow area views and provide human scale
Structures	<ul style="list-style-type: none"> No structures other than small isolated research monitoring equipment 	<ul style="list-style-type: none"> Structures rare and isolated Blend in with surroundings so they are unnoticed 	<ul style="list-style-type: none"> Structures rare and isolated Blend in with surroundings so they do not draw attention
Activities	<ul style="list-style-type: none"> Mt. climbing Hiking Taking photographs View scenery Cross-country skiing Self-study of volcano Self-interpretation Exploration off trails Risk taking 	<ul style="list-style-type: none"> Mountain climbing Hiking Taking photographs Viewing scenery Picnicking (non impact area) Cross-country skiing Self-interpretation Swimming Fishing Camping (backpacker) Snow play Hunting Horseback riding Boating (non motor) 	<ul style="list-style-type: none"> Hiking Taking photographs View scenery Snowmobiling Self-study of volcano Self-interpretation Swimming Fishing Camping Snowplay Hunting Horseback riding Driving for pleasure with difficulty Boating (limited motorized) Organization camping

RN Roaded Natural	R Rural	U Urban	
<ul style="list-style-type: none"> Moderate feeling of discovery High feeling of learning—some orientation Moderate perceived feeling of risk or danger Nostalgic feeling of where things were, Harmony Falls, etc. High to moderate feeling of size, magnitude and idiosyncrasies of event and relationship to natural process and human events over time Moderate feeling of affiliation with other people Low to moderate challenge in access Climatic stress moderate inside flow zone with visitor discomfort but low in vegetated area outside. Vegetated area outside provides relief from stress in blast area Visitor expects a moderately social experience Visitor receives on-site interpretation Consumer activities are very minor 	<ul style="list-style-type: none"> High feeling of learning, information and orientation are important Moderate feeling of discovery Nostalgic feeling of process and event exists but somewhat remote Affiliation with moderate sized groups of people very probable and important Observing new people important Risk and challenge relatively unimportant Visitor is comfortable Visitor expects a social experience Consumer activities are minor 	<ul style="list-style-type: none"> Very high feeling of learning information and orientation Low feeling of discovery Affiliation with large masses of people very probable and important Observing new people very important Remote feeling of event and natural process over time Risk and challenge unimportant, safe feeling Visitor is comfortable Observing remote scientific studies Visitor expects a highly social experience Consumer activities are common 	Experiences
<ul style="list-style-type: none"> Moderate to high encounters on roads. Low to high encounters on trails and away from roads 	<ul style="list-style-type: none"> Moderate to high encounters in developed sites and on roads and trails. Moderate encounters away from developed sites 	<ul style="list-style-type: none"> Large numbers of users on site and in nearby areas 	Social Encounters
<ul style="list-style-type: none"> On site regimentation and controls are noticeable but harmonize with natural environment 	<ul style="list-style-type: none"> Regimentation and controls are obvious and numerous and largely in harmony with natural and man-made environment 	<ul style="list-style-type: none"> Regimentation of controls obvious and numerous but in harmony with man made environment 	Managerial Control
<ul style="list-style-type: none"> Modifications may be dominant to observe off sensitive roads and trails but remain unnoticed or visually subordinate to those on sensitive roads and trails Strong contrasts between natural appearing (unmodified areas) and areas altered by volcanic to provide good feel for size and shape of blast area 	<ul style="list-style-type: none"> Culturally modified natural environment yet attractive Pastoral farm lands and small communities Human created planting but appear natural Provides much of visitors' experiences between visitor center and volcano 	<ul style="list-style-type: none"> Man-created environment yet attractive Human created plantings which harmonize with natural elements Convenience of user of primary importance 	Physical Setting
<ul style="list-style-type: none"> Easy access with up to 10% sustained grades +20% max pitch. Tread width 18-24". Surface ranges from dirt to spot gravel Paved trails useable by handicapped 	<ul style="list-style-type: none"> Very easy access with 0-5% sustained grades 10% max pitch 18-48" tread Paved asphalt trails useable by handicapped 	<ul style="list-style-type: none"> Very easy access useable by handicapped 35-72" inroads wider is necessary to handle masses of people Concrete paving or other hard surfaces 	Trail Access
<ul style="list-style-type: none"> Single lane dirt maintenance Level III Single lane with turnout graveled or paved Double lane graveled or paved 	<ul style="list-style-type: none"> Double lane graveled or paved Single lane graveled or paved when developed for one way traffic 	<ul style="list-style-type: none"> Multilaned paved 	Road Access
<ul style="list-style-type: none"> Automobiles and RVs Buses Aerial tram May have cross-country skiing and snow mobiles separated during winter Motorized boats 	<ul style="list-style-type: none"> Automobiles and RVs Buses Aerial tram Helicopter 	<ul style="list-style-type: none"> Automobiles and RVs Buses Aerial tram Surface tram Helicopter 	Mode of Travel
<ul style="list-style-type: none"> Simple way side exhibits at or near road's edge. Facilities should be located and designed so that sights and sounds do not encroach upon adjacent semi-primitive areas Use of outdoor listening stations Interpretive trails located up to 1/2 mile from parking areas and roads On-site interpretive talks, walks and campfire programs Utilize green vegetation wherever possible to enframe views and provide human scale 	<ul style="list-style-type: none"> Interpretive site, i.e., complex wayside exhibit with base of native materials Interpretive stations such as kiosk manned part time Interpretive trails at or near development Major interpretive centers 	<ul style="list-style-type: none"> Dominant structure complex Large parking lots Interpretive trails at or near development 	Interpretation
<ul style="list-style-type: none"> Structures scattered Harmonize with natural environment to the point that they remain subordinate 	<ul style="list-style-type: none"> Structures range from scattered to small dominant clusters Harmonize with natural environment 	<ul style="list-style-type: none"> Structures are dominant but attractive May be man-made materials which harmonize with site 	Structures
<ul style="list-style-type: none"> Hiking and walking Taking photographs View scenery Picnicking Snowmobiling Study of volcano Interpretation Swimming Fishing Camping (car) Snowplay Hunting Horseback riding Driving for pleasure Boating (motorized) Organization camping 	<ul style="list-style-type: none"> Walking Taking photographs Viewing scenery Snowmobiling Picnicking Interpretation and information Driving for pleasure Horseback riding Organized camping Environmental study center activities 	<ul style="list-style-type: none"> Walking Taking photographs Limited viewing of scenery Picnicking Interpretation, information, and orientation Buying food and souvenirs 	Activities



Legend

- National Monument Boundary
- National Forest Boundary
- Existing Roads
- Streams
- Roaded Natural
- Semi-Primitive Nonmotorized
- Primitive

Recreation Opportunity Spectrum Alternative A

Figure G-1

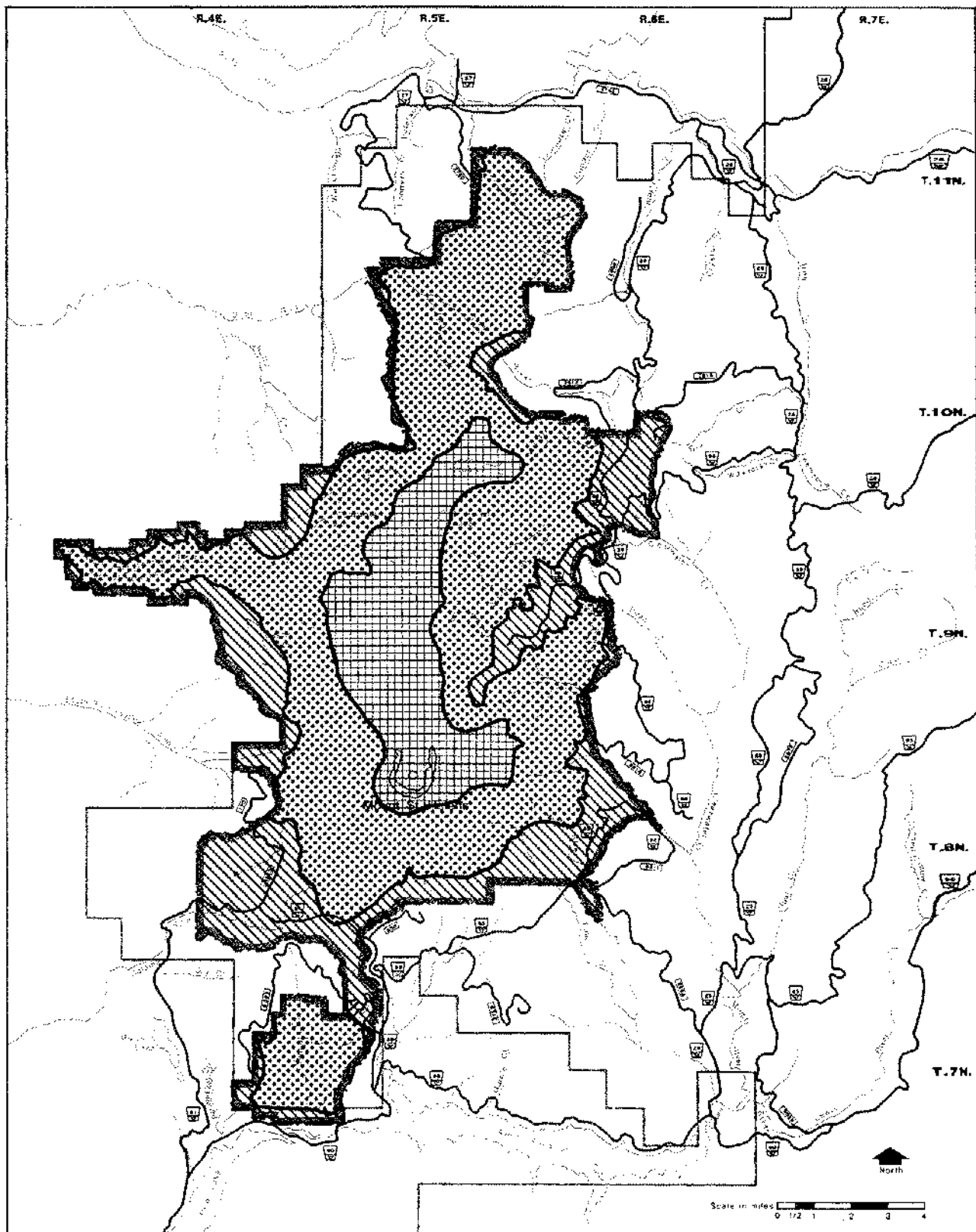
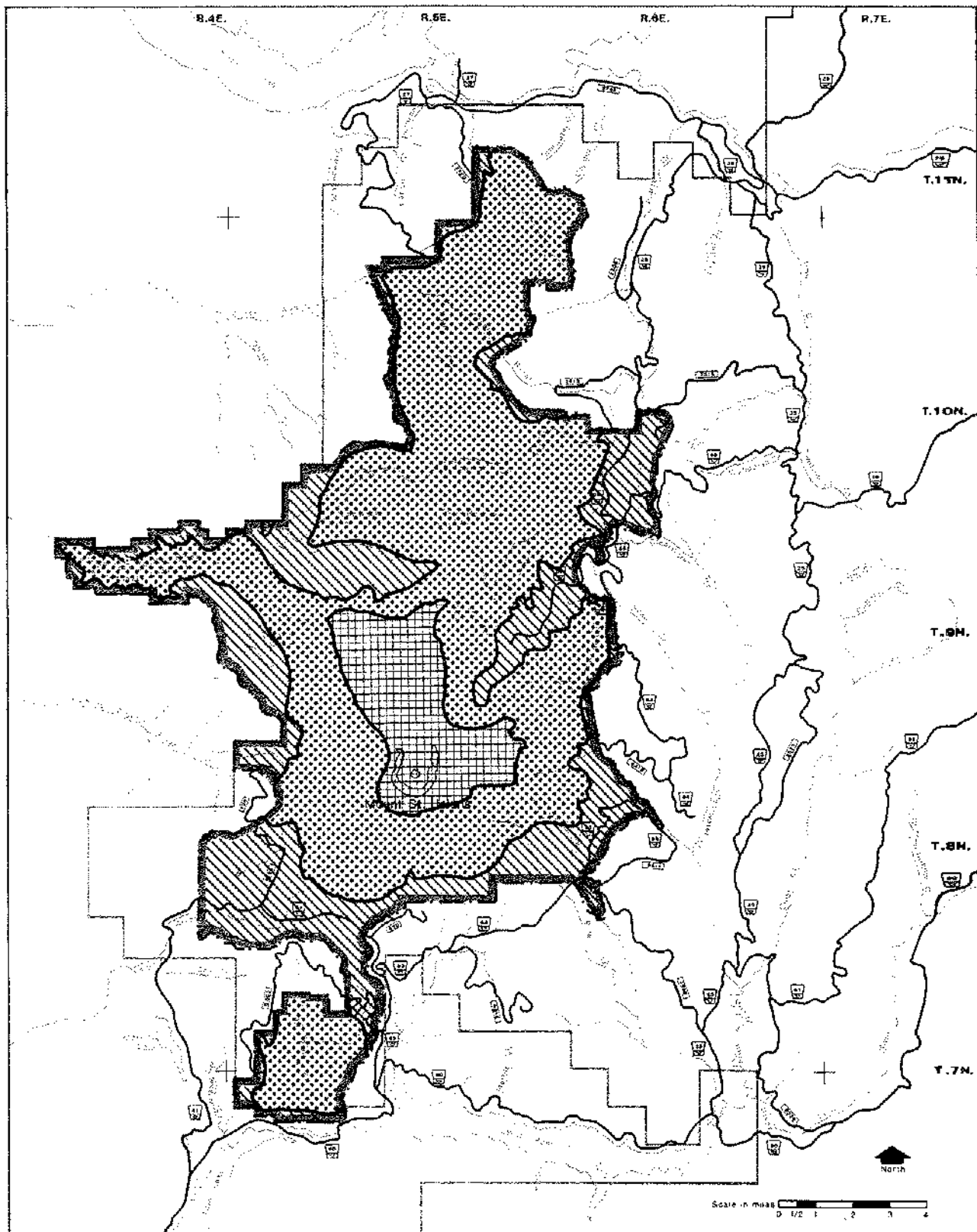


Figure G--2

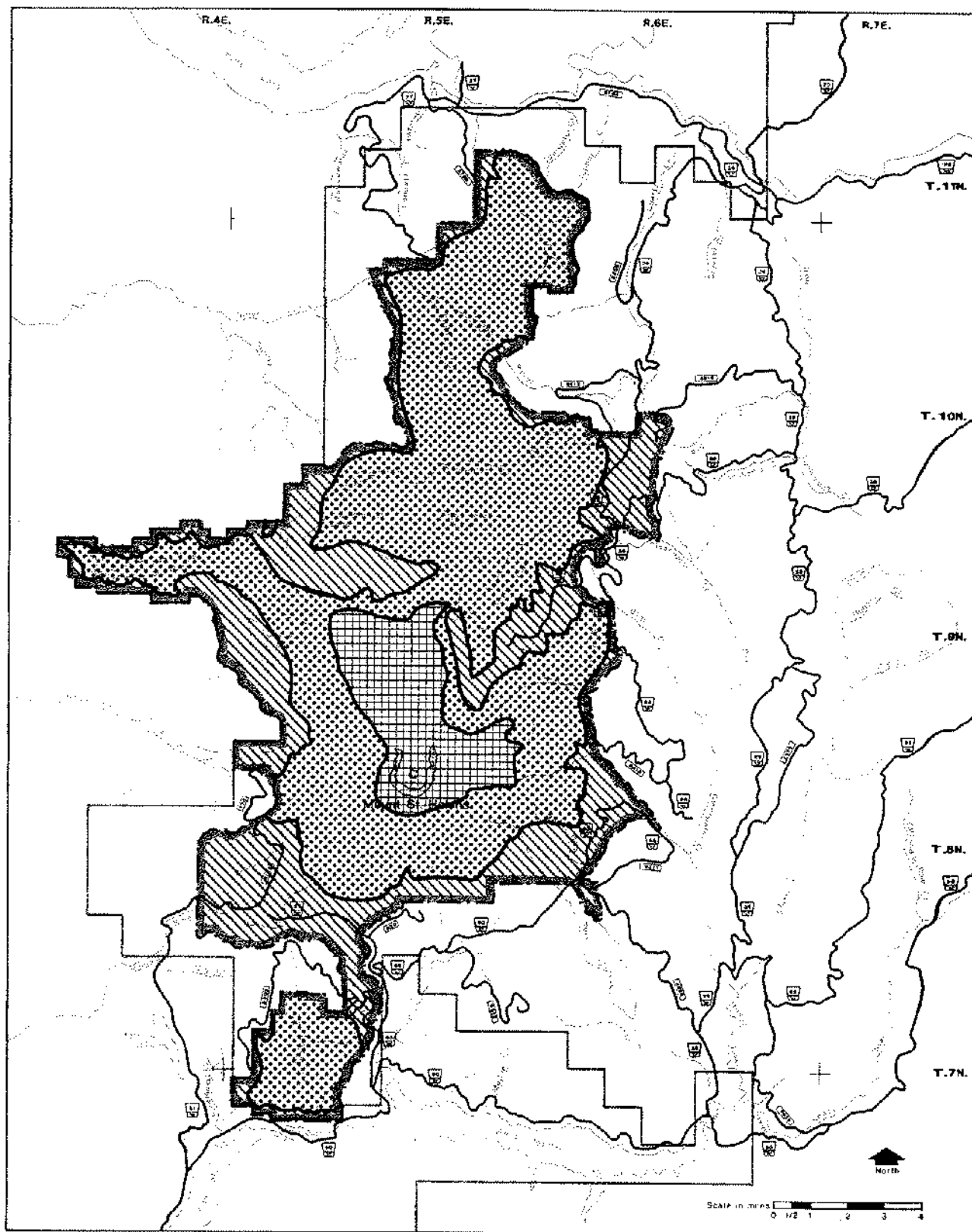


Legend

- National Monument Boundary
- National Forest Boundary
- Existing Roads
- Streams
- Rural
- Roaded Natural
- Semi-Primitive Nonmotorized
- Primitive

Recreation Opportunity Spectrum Alternative C

Figure G-3

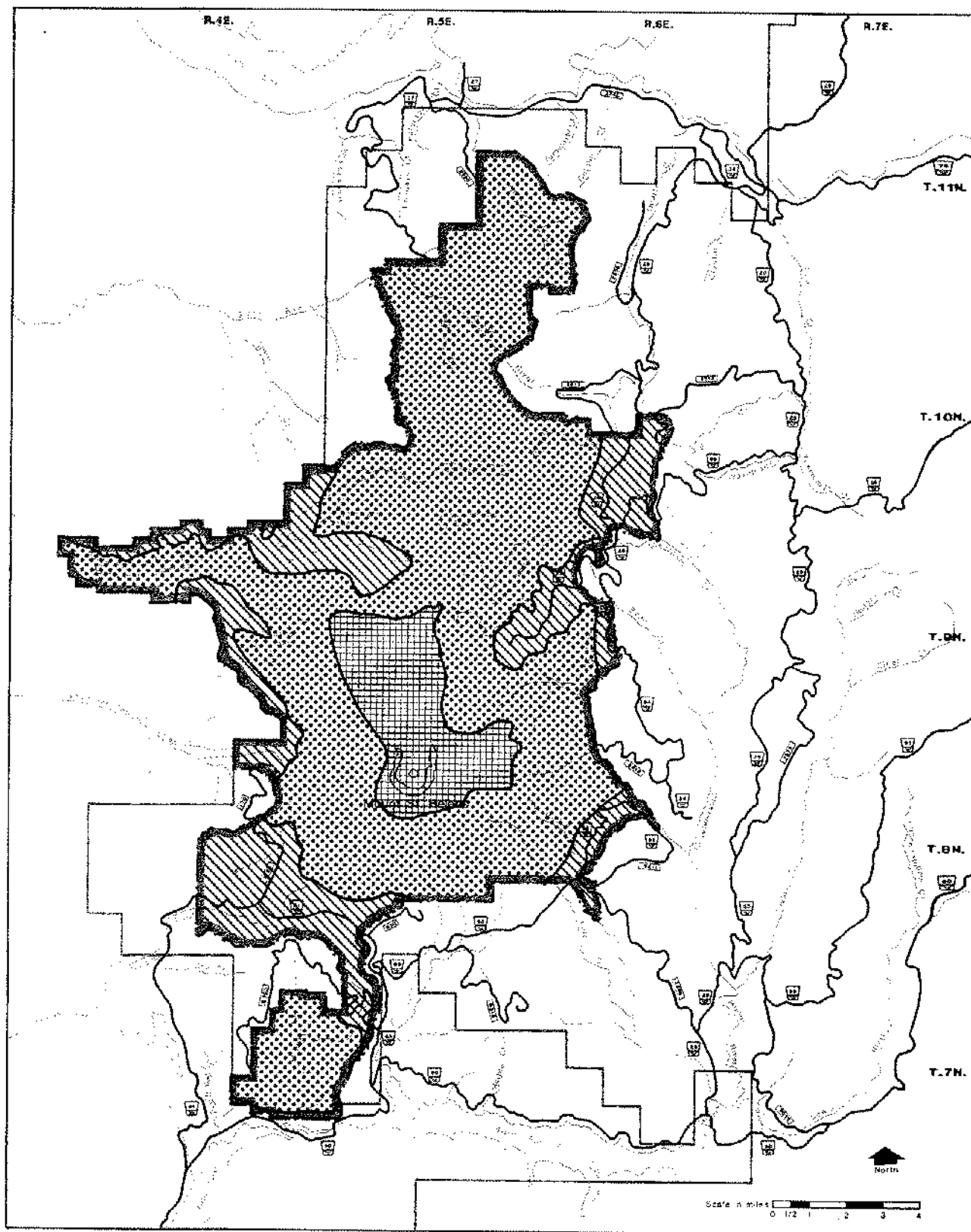


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



- National Monument Boundary
- National Forest Boundary
- Existing Roads
- Streams
- Rural
- Roaded Natural
- Semi-Primitive Nonmotorized
- Primitive

Recreation Opportunity Spectrum Alternative D

Figure G-4

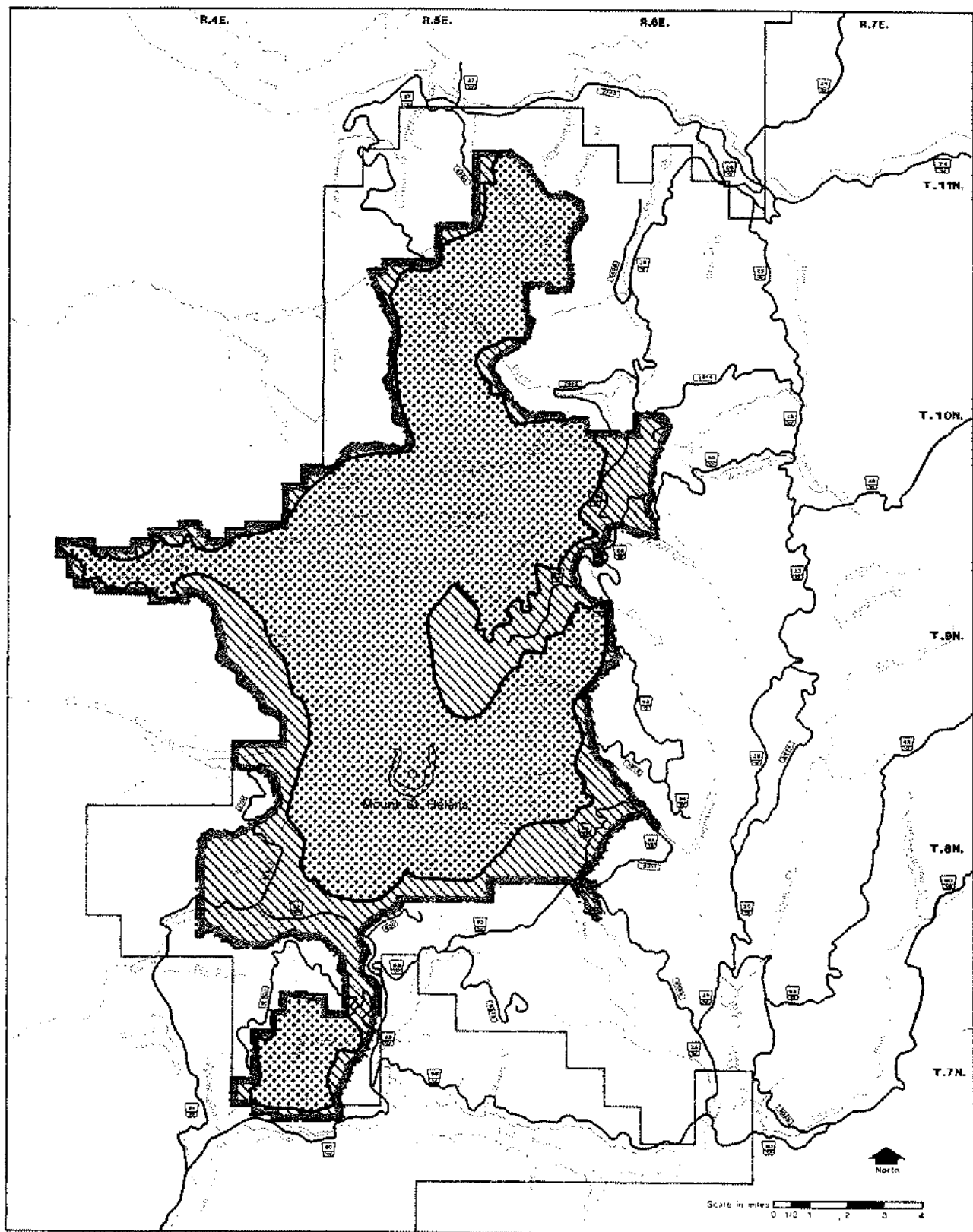


Legend

-  National Monument Boundary
-  National Forest Boundary
-  Existing Roads
-  Streams
-  Rural
-  Roaded Natural
-  Semi-Primitive Nonmotorized
-  Primitive

Recreation Opportunity Spectrum Alternative D (Modified, Selected)

Figure G-5

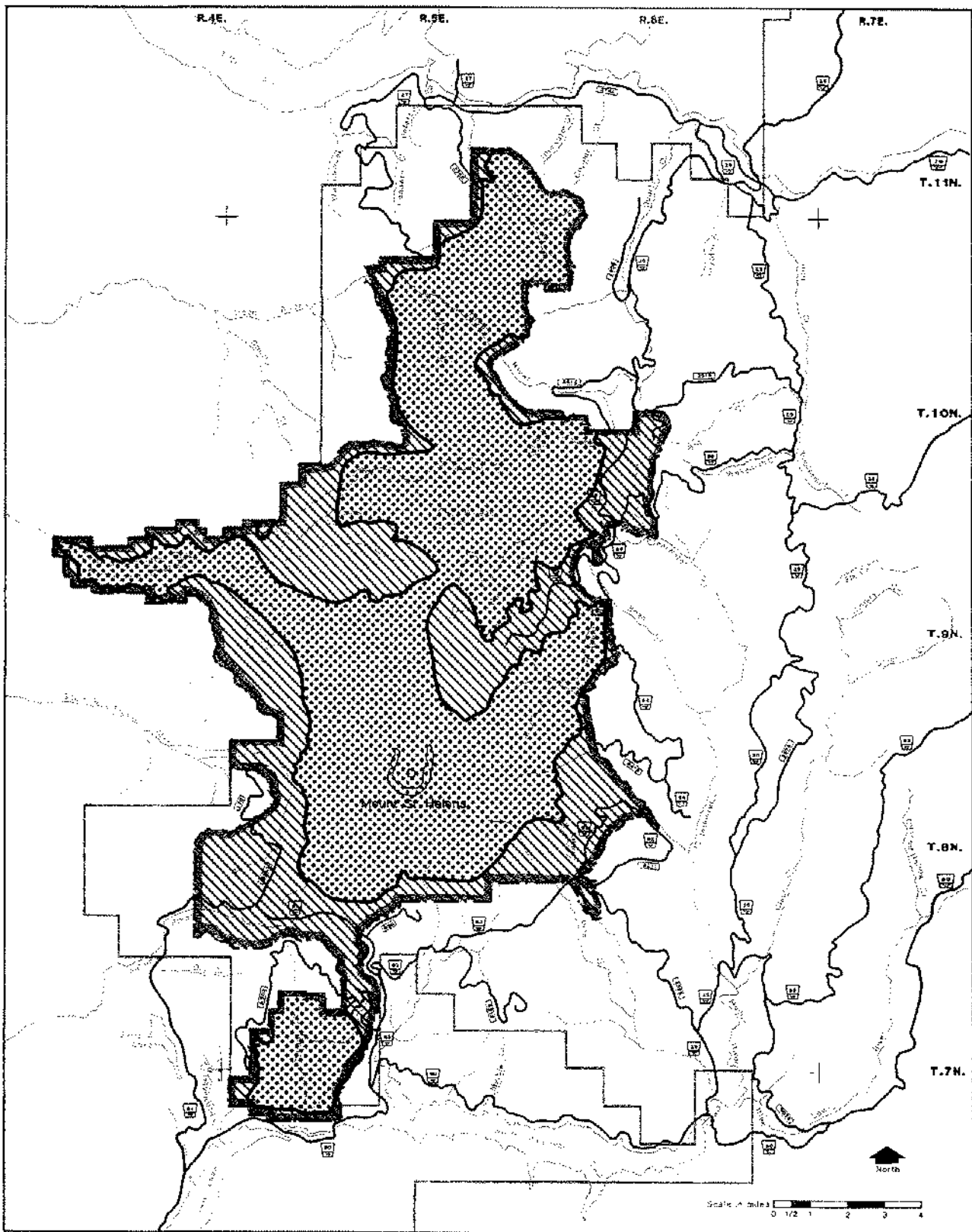


Legend

- National Monument Boundary
- National Forest Boundary
- Existing Roads
- Streams
- Roaded Natural
- Semi-Primitive Nonmotorized

Recreation Opportunity Spectrum Alternative E

Figure G-6

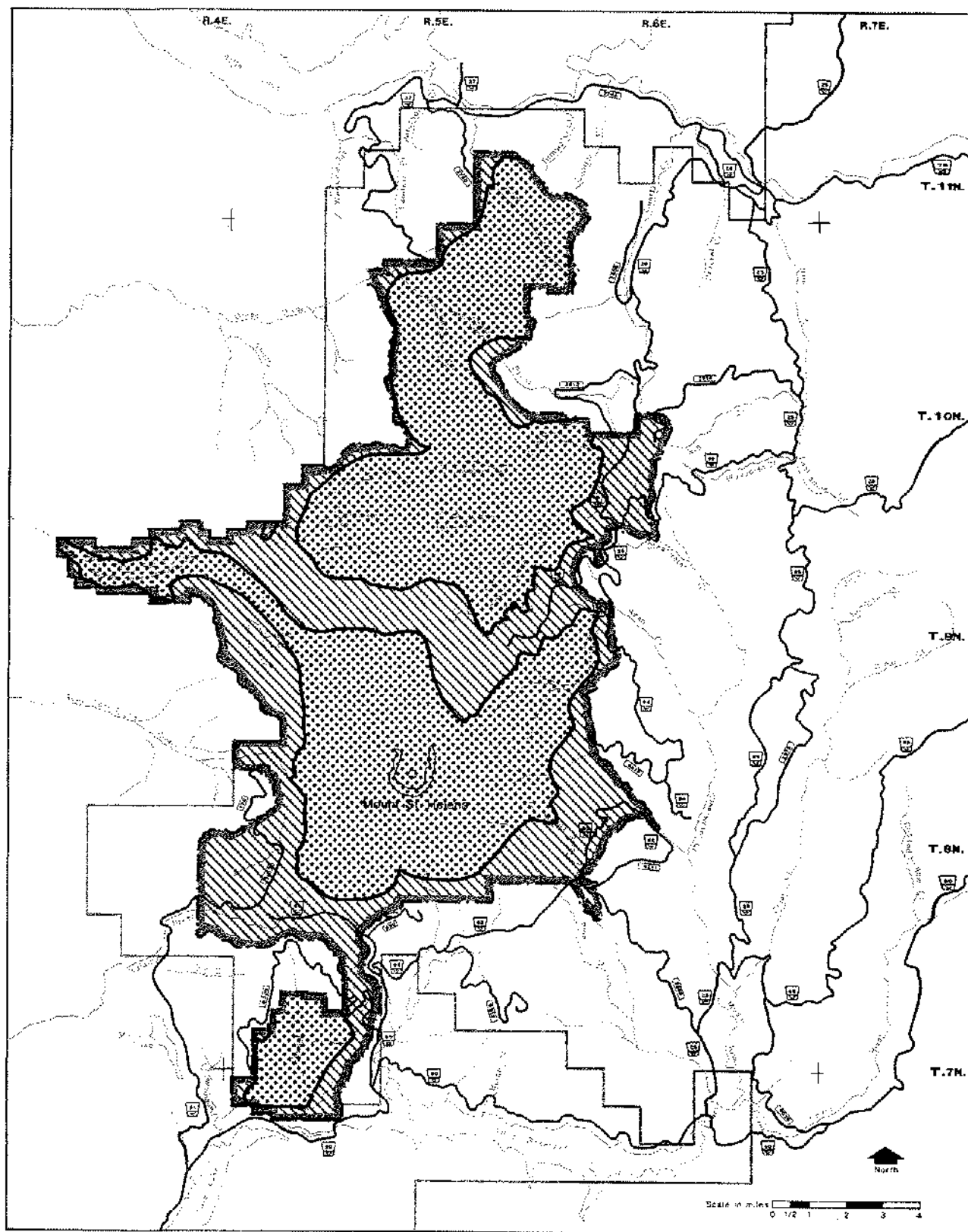


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




- National Monument Boundary
- National Forest Boundary
- Existing Roads
- Streams
- Rural
- Roaded Natural
- Semi-Primitive Nonmotorized

Recreation Opportunity Spectrum Alternative F

Figure G-7



Legend

-  National Monument Boundary
-  National Forest Boundary
-  Existing Roads
-  Streams
-  Rural
-  Roaded Natural
-  Semi-Primitive Nonmotorized

Recreation Opportunity Spectrum Alternative G

Figure G-8

Appendix H

SELECTED ALTERNATIVE

AIR TRAFFIC MANAGEMENT

The guidelines, policies, and procedures contained in the Gifford Pinchot National Forest's Aviation Plan will be used to manage air traffic.

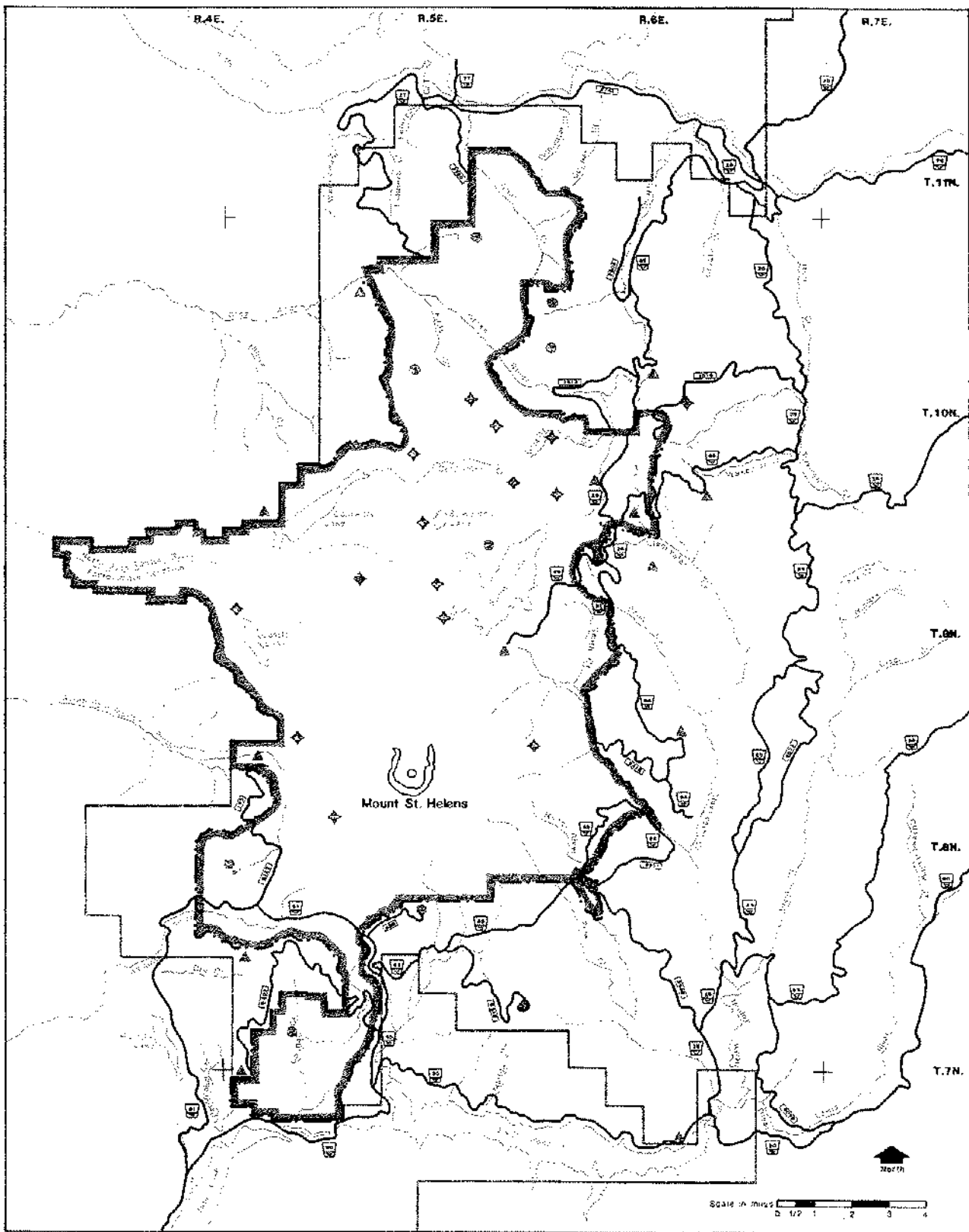
Upon approval of the Final Environmental Analysis Statement, the Federal Aviation Administration will be requested to chart the entire Monument and implement these restrictions.

The landing of aircraft is prohibited on lands and waters administered by the Forest Service without authorization. Exceptions include: (1) when forced to land due to an emergency beyond the control of the operator, (2) at officially designated landing sites, or (3) on approved official business of the Federal, State, and County governments.

All aircraft, except those on official monitoring flights, are requested to maintain a minimum altitude of 1,000 feet above the terrain, and monitor an assigned radio frequency when over the charted area.

The airdropping of persons, cargo, or objects by parachute or other means from aircraft on these charted lands is prohibited without authorization from the Forest Service. Exceptions include: (1) emergencies involving the safety of human life, or (2) threat of serious property loss.

Figure H-1 shows the location of approved helicopter landing sites.



Legend

— National Monument Boundary

— National Forest Boundary

— Existing Roads

— Streams

△ Heliports (Maintained* heliports with road access)
Note: traffic control is necessary at some heliports.

◆ Primary heliports (maintained*)

⊙ Secondary heliports (adequate for emergency use,
capable of rapid improvement)

* Maintenance of heliports inside the NVM is limited to
minimal brushing of touchdown areas and retention of
established approach/departure paths.

Helicopter Access

(U.S.F.S. Approved Landing Sites)

Figure H-1

Appendix I

MODELS USED TO ESTIMATE EFFECTS

The following computerized models were used to aid in identifying effects by alternative (Chapter IV, Environmental Consequences):

Erosion/Sedimentation Model:

To estimate increased erosion and subsequent sedimentation from proposed road construction or reconstruction within the Monument, a computer model entitled ONEROS3, developed by the Watershed Systems Development Group at the USDA's Fort Collins Computer Center, was used. ONEROS3 is an erosion model which will account for onsite, gully, and road erosion. By use of delivery coefficients, the eroded material is delivered to but not through a channel system. While the outputs are quantitative in nature, they should be used primarily for comparative purposes. It is not valid, and was never intended to be so, to interpret the numbers shown in the following table to be actual values, although the relative amounts with respect to each other are correct. The road erosion portion of the computer model is based upon information regarding normal roadbed width and cut and fill slope angles. The general form of the road erosion equation is:

$$E(R) = F \cdot M(R) \cdot V(R) / \text{Area}$$

Where:

E(R) = Road Erosion
F = Conversion Factor for Units Desired
M(R) = Mile of Road
Area = Hydrologic Response Unit Area (Acres)
V(R) = Volume - Rate of Erosion

Where:

V(R) = $RS \cdot 5280 \cdot ER(R) / (12 \cdot 4560)$
RS = Relative Road Surface in Feet
ER(R) = Erosion Rate for a Particular Road State of Condition (in/yr)

Road Erosion is then determined by considering the sediment delivery coefficient:

$$E(R) = E(R) \cdot T$$

Where:

E(R) = As Above
T = Sediment delivery coefficient between the road and channel

The Relative Road Surface (RS) in feet, takes into account the watershed slope, road width, and cut and fill slopes. These were adjusted for road type; i.e., primitive vs. paved double lane. The paved portion of a road width was deleted from calculations. Road segments were then measured and sorted by watershed and by road type. Basic Erosion Rate (BER) was estimated for devastated and vegetated portions of the Monument at 0.15 in/yr and 0.12 in/yr respectively. Road cut and fill slope angles were changed, as were road widths, to correspond to road type. Three types of roads were modeled: primitive, gravel surface, and paved surface. Outputs were calculated on a per-acre basis and then multiplied by the number of acres per mile by road type. The following table shows the outputs by watershed for each alternative.

Table I-1: Estimated Delivered Sediment by Alternative
(Relative Tons of Sediment Per Watershed Per Year;
Generated from Roads Within the Monument)

Watershed	Alternative							
	A Existing Condition	B	C	D	D (Modified)	E	F	G
1. Green River	16.19	16.19	16.19	16.19	16.19	16.19	16.19	16.19
2. Coldwater/ North Toutle	21.47	21.47	40.13	31.75	51.75	21.47	70.95	62.27
3. Clearwater/Bean	15.77	15.77	15.77	15.77	15.77	15.77	15.77	15.77
4. Smith/Muddy Pine	24.34	24.35	24.35	24.35	22.34	24.35	24.37	24.35
5. South Toutle	13.05	13.05	13.05	13.05	13.05	13.05	13.59	13.59
6. Kalama River	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30
7. Basalt Flows	31.46	31.48	32.86	32.86	32.86	32.86	32.86	32.86

Model for Fire Frequency and Size Projections By Alternative

Fire frequency, size, and statistical cause data for the St. Helens R.D. (1970-1979) was projected using the following adjustments and assumptions:

- 1) It was assumed that lightning occurrence rates (number of strikes) will be similar to pre-eruption rates, but that there will be an increase in the number of firestarts in blowdown and fringe areas. Ignition probability and fire frequency for blowdown and fringe areas was projected using a ratio of N.F.D.R.S. ignition probability (at the 97th percentile) for Fuel Model I (slash) against Fuel Model G (general Forest). Size distribution for lightning fires was assumed to be the same as the pre-eruption distribution.
- 2) Man-caused fire occurrence was adjusted as follows:
 - a) Escape slash was omitted as a statistical cause.
 - b) All data was adjusted by RVD's per 1,000 acre and by acres of fuel type.

- c) Fire frequency for blowdown and fringe fuels was projected the same as for lightning fire frequency (a ratio of ignition probability of Model I/G).
- d) Size distribution for blowdown fuels was projected at the same rate as for general forest fuels.
- e) Size distribution for fringe fuels was projected using a ratio of N.F.D.R.S. spread component (at the 97th percentile) of Model I/G.

Regional Economic Forecasting Model

The Mount St. Helens Regional forecasting Model is an econometric model designed for economic forecasting and analysis. For this study, the model provides the means for estimating the economic impact of tourism development in the four counties of the region: Clark, Cowlitz, Lewis, and Skamania. The regional model is linked to an interindustry econometric model of Washington State, the Washington Projection and Simulation Model (Bourque, Conqay, and Howard, 1977; Conway, 1979; and Conway, 1981.) The economic and demographic variables projected for the Mount St. Helens Region include jobs and earnings by sector, total jobs, total labor and proprietors' income, personal income, and population.

Appendix J

APPENDIX J: TIMETABLE AND COSTS, ALTERNATIVE D (MODIFIED, SELECTED)

What follows is an estimated development schedule (with associated costs) showing sequential implementation of Alternative D (Modified, Selected). Future construction scheduling will be adjusted based upon future volcanic activity, resource recovery, and funding availability. Each phase is intended to represent a two year period of time. Should funding be constrained, then the duration of each phase can be extended. This is not intended to be a specific annual budget, and is only for indicating the relative priority of each project.

SCHEDULING OF CAPITAL INVESTMENT, ALTERNATIVE D (MODIFIED, SELECTED)

RECREATION FACILITIES

Table J-1

P = Planning

S = Survey

D = Design

C = Construction

FRT = Federal Road and Trail Funds
FLM = Forest Land Management Funds

(Phase ± 2 years) Facilities planned by Management & Concept Areas	Phase I \$ thousands		Phase II \$ thousands		Phase III \$ thousands		Phase IV \$ thousands		\$ Thous. Total by Project
	FRT	FLM	FRT	FLM	FRT	FLM	FRT	FLM	
<u>Coldwater/Johnston Ridge</u>									
Coldwater Complex			PSD 50	PSD 240	C 484	C 2,150			2,924
Johnston Ridge Complex			PSD 5	PSD 130	C 50	C 1,220			1,405
Harrys Ridge				PSD 12		C 81			93
SR 504 Viewpoints (3 ea.)	P	4	C 60	C 10					78
Power and Telephone				PSD 160		C 800			960
Subtotal for Area	4	4	115	552	534	4,251			5,460
<u>Castle Lake/Sheep Canyon</u>									
Spud Mtn. Trailhead	PSDC 10								10
Sheep Canyon	PSD 2	PSD 6	C 12	C 37					57
Subtotal for Area	12	6	12	37					67

SCHEDULING OF CAPITAL INVESTMENT, ALTERNATIVE D (MODIFIED, SELECTED)
(Continued)

RECREATION FACILITIES

Table J-1

Facilities planned by Management & Concept Areas	Phase I \$ thousands		Phase II \$ thousands		Phase III \$ thousands		Phase IV \$ thousands		\$ Thous. Total by Project
	FRT	FLM	FRT	FLM	FRT	FLM	FRT	FLM	
<u>Cave Basalt/Coat Marsh</u>									
Ape Cave	PSDC 63	PSDC 66							129
Yale Portal	PSDC 28	PSDC 71							99
Lava Cast		PSDC 29				PSDC 8			37
Kalama Springs			PSDC 12			PSDC 19			31
Dispersed Camps						PSDC 9			18
Trailheads	PSD 1		C 5					C 8	6
Blue Lake Noble Fir						PSDC 4			4
Subtotal for Area	92	166	17			40		8	324
<u>Mud Flow Area</u>									
Lava Canyon Complex	PS 4	PS 8	DC 26			DC 52			90
Trailheads	P 2	P 1	SDC 24			SDC 15			42
Marble Mtn. Winter Rec.	PSDC 84	PSDC 53							137
Dispersed Camp		P 2				C 10			12
Subtotal for Area	90	64	50			77			281
<u>Road 99/Spirit Lake</u>									
Bear Meadow	PSDC 12	PSDC 33							45
Miner's Car	PSDC 42	PSDC 22							64
Heta Lake	PSDC 53	PSDC 29							82
Cascade Peak View	PSDC 92	C 2							94
Independence Pass	PSDC 30					PSDC 4			34

Appendix E

INTERPRETIVE THEMES

The following themes were presented in the Forest Service document, February 1983, titled The Interim Interpretive and Development Program for Mount St. Helens National Volcanic Monument and will be used as guidelines for developing themes for the interpretive plan required in all alternatives.

Central Theme:

The main theme for the Monument is "How and why Mount St. Helens after a repose of a century and a quarter suddenly erupted with astonishing power." The spectacular effects of the May 18, 1980, eruption are the principal educational and recreational resources of the area and the main reason why the Mount St. Helens National Volcanic Monument exists.

Unifying Concept:

Catastrophic events punctuate the normal, generally quiet periods in our lives. Most rivers have many 'normal' years when runoff may be a little higher or lower than average, but it fluctuates within a predictable range. On rare occasions, an exceptional storm or unusually rapid snowmelt results in a very large flood, which may cause enormous damage and perhaps loss of life. Such a flood may occur only once every 20, 100, or 500 years (Fig. 1A). Coastal areas are similarly affected year after year by various storms and tides that have generally predictable effects. But then once in 50 or 200 years comes the devastating storm that washes away beaches, undercuts headlands, levels dune fields, closes inlets, sinks vessels, and so on. Effects of the unusual large flood or coastal storm may survive several decades of 'ordinary' events, until a new high-energy event once again changes the area. In the short span of human lifetime, the 1938 hurricane is a standard for coastal damage in New England, while 1894 is the standard for flood damage on the Columbia River. Effects of such large events may exceed those of all the intervening 'quiet' years combined.

Earthquakes have rocked certain areas of the Mediterranean, inland China, the Pacific rim, and elsewhere, occasionally leveling villages or a city, triggering destructive landslides, causing tens of millions of dollars in damage, and perhaps claiming hundreds of victims. Between such natural destructive events, people live ordinary lives with small regard for the unthinkable. San Francisco may never quite forget 1906, or Anchorage 1964, but the memory soon fades. These cities will pursue their normal existences--until the next destructive quake unknown years, decades, or centuries in the future.

Some forests show analogous biologic examples of episodic catastrophic change (Fig. 1B). A tract of mature, old-growth forest is consumed by fire, such as the great 1902 'Yacolt burn' south of Mount St. Helens. Effects of such an unusual event are visible for decades, or in severe climates for centuries, during which new trees slowly mature. Then once again the area may be swept by a catastrophic fire that swiftly eliminates the trees. The process of gradual revegetation and forest succession then once again resumes.

Major eruptions from explosive volcanoes like Mount St. Helens are episodic and commonly catastrophic. The period between major events at a single volcano is usually far longer than a human lifetime, and may be longer than the span of a civilization. Following a violent episode of eruptions that alters the area forever, Mount St. Helens may remain quiet for hundreds or even thousands of years. Then rather suddenly it spurts to violent life with ashflows, mudflows, pumice falls, lava flows, and dome-building, before fading into another long period of quiet repose (Fig. 1C). Even during an eruptive episode, such as the current one, there are relatively long periods (weeks or months) between eruptions that last only a few hours or days (Fig. 1D).

Various types of catastrophic events are thus separated by relatively long periods of 'ordinary' quiet time. The rare, large event has a major, even dominating impact on land and on living things, including people. During the quiet times between episodes of volcanism or fire, the area recovers from the effects of the catastrophe. Geologic events like volcanic eruptions or major earthquakes take place intermittently over such long periods of time that one person cannot observe more than a trifle of the entire succession of changes. Only rarely do we witness such awesome power as by the May 18, 1980, eruption of Mount St. Helens. This particularly well-recorded event allows us to better comprehend such events, to improve our ability at predicting them, to initiate appropriate human responses, and to better understand the recovery of ecosystems and humans after the event. The awesome May 18 eruption, while it considerably affected human lives and land near the mountain, was not unusual when viewed in the long spread of geologic history of this or other volcanoes.

The 1980-82 eruptions of Mount St. Helens allows an unparalleled opportunity to examine processes of volcanism and to contrast natural volcanic changes with other natural and cultural changes after eruptions. At Mount St. Helens National Volcanic Monument, the USDA Forest Service interpretive

program, cooperating with the U.S. Geological Survey, attempts to explain changes that have taken place as a result of the current episode of eruption, to relate these events to our more common experiences, and to educate visitors on safety from future eruptions from this and other volcanoes.

Secondary Themes:

Sudden Volcanic Changes; Gradual Ecologic Change.

-- Mount St. Helens erupted in but an instant in geologic and human time. The power of an eruption is difficult to comprehend except for the astonishing evidence strewn over scores of square miles. Trees are ripped from their stumps, logging equipment and automobiles are smashed, scorched, or blown off ridges, millions of trees are laid over like so many jackstraws. While these amazing events occurred within only minutes, it will take decades for the forest and dependent wildlife to return to their preeruptive conditions.

This contest between catastrophic and gradual changes is a major interpretive theme for Mount St. Helens, and telling this story will employ several media. It is important to emphasize the term 'change' rather than to evoke values as do the terms 'destruction,' 'devastation,' and 'recovery.' From the point of view of the forester or Spirit Lake cabin-owner, the May 18, 1980, eruption was clearly destructive; but viewed by the student of landforms and earth materials, volcanic processes are constructive. After all, Spirit Lake, Coldwater Lake, Ape Caves and the beautiful cone of Mount St. Helens itself have all been formed by one or another volcanic episodes.

The Usual and Unusual: How is Mount St. Helens Different? This theme will explore similarities and differences between Mount St. Helens and other volcanoes around the Pacific rim, Hawaii, Mediterranean, Caribbean, Iceland, and elsewhere in the world. It will show proximity to plate boundaries, types of eruptions, types of eruptive

material, and relative change to the land, ecosystems and humans. Certainly a comparison should be made with the eruptions of Lassen Peak in 1914-1921. Multiple media will be required to show similarities and differences between Mount St. Helens and other volcanoes. Simulated time-lapse techniques could be used to show effects of Cascade volcanic eruptions over the millennia.

Response to Disaster. -- Ecosystems and human society respond to disasters differently. This theme will contrast the response to ecosystems and society to disaster. Discussion of ecosystems should include topics like new landforms, new drainage patterns, erosion, plant succession, return of animals to the area, species diversity, and eventual equilibrium of the ecosystem. The eventual equilibrium may or may not be similar to that which was lost.

Social response to disaster should cover such topics as individual experiences during the May 18, 1980, eruption, rescue operation, teamwork involved in accomplishing rescue and cleanup, cleanup activities and rebuilding a life after personal disaster. In addition there should be discussion of lingering problems--such as Spirit Lake and the Toutle valley, where the Corps of Engineers has continuing projects. It will be impossible to entirely separate natural ecosystems from human response to the eruption, for both are parts of the natural system. But it will be possible to compare and contrast these two subsystems.

Search for Predictability. -- This theme will explore the need to know why and how things happen. It will explore research related to Mount St. Helens before, during, and after the eruptions. It will present results of geologic, volcanologic, biologic, ecologic, and social research related to volcanic eruptions, especially of Mount St. Helens.

SCHEDULING OF CAPITAL INVESTMENT, ALTERNATIVE D (MODIFIED, SELECTED)
(Continued)

RECREATION FACILITIES

Table J-1

Facilities planned by Management & Concept Areas	Phase I \$ thousands		Phase II \$ thousands		Phase III \$ thousands		Phase IV \$ thousands		\$ Thous. Total by Project
	FRT	FLM	FRT	FLM	FRT	FLM	FRT	FLM	
Harmony Creek	PSDC 25	PSDC 5							30
Cedar Brook	PSDC 25	PSDC 25							50
Donneybrook	PSDC 10	PSDC 25							35
Smith Creek Viewpoint	PSDC 30	PSDC 34							64
Windy Ridge Viewpoint		C 115							115
Upper Smith Cr. Trailhead	PSD 3	PSD 2	C 17	C 6					28
Strawberry Mtn.	PSDC 6	PSD 10	C 15	C 60					91
Environmental Ed.	PSD 2		C 10	C 2					14
Subtotal for Area	330	302	42	72					746
<u>Mt. Margaret</u>									
Compost toilets						C 45		C 45	90
Rock shelter						PSD 4		C 30	34
Reconstruct U.S.G.S. Antenna Building		PSD 1		C 10					11
Subtotal for Area		1		10		49		75	135
<u>Backcountry Area</u>									
Trailheads (5 each)									60
Ryan Lake	PSDC 8	PSDC 18	PSDC 26	PSDC 22		PSDC 8	PSDC 4		26
Quartz Cr. Big Trees			PSDC 15	PSDC 20					35
Compost toilets				C 20					20
Subtotal for Area	8	18	41	62	8	4			141

SCHEDULING OF CAPITAL INVESTMENT, ALTERNATIVE D (MODIFIED, SELECTED)
(Continued)

RECREATION FACILITIES

Table J-1

Facilities planned by Management & Concept Areas	Phase I \$ thousands		Phase II \$ thousands		Phase III \$ thousands		Phase IV \$ thousands		\$ Thous. Total by Project
	FRT	FLM	FRT	FLM	FRT	FLM	FRT	FLM	
<u>Mount St. Helens</u>									
U.S.G.S. Equipment			C	20					20
<u>Road 25 Corridor</u>									
Iron Creek Information Station	PSDC	28	PSDC	71					99
Iron Creek Picnic Ground	PSD	3	PSD	6	C	38			68
Boundary Trailhead					PSD	1	C	7	18
Clearwater Overlook	PSD	3	PSD	5	C	24			42
Muddy River Overlook	PSDC	3	PSDC	4	C	10			26
Pine Creek Viewpoint					PSDC	25			25
Pine Creek Information Station									54
Sno-park 25/99					PSDC	12			31
Subtotal for 25 Corridor	37	140	59	109	1	1	7	9	363
<u>Lewis River Corridor</u>									
Lower Falls					PSD	6	C	38	105
Lewis River Campground					PSD	38	C	240	692
Subtotal for Lewis River					44	62	278	413	797
TOTAL	573	701	336	979	567	4,368	285	505	8,334

ROAD AND BRIDGE CONSTRUCTION/RECONSTRUCTION

Table J-2

Specifications	
P = Planning	D = Double lane
S = Survey	S = Single lane
D = Design	P = Asphalt paved
C = Construction	G = Gravel

FRT = Federal Road and Trail Funds

Road No.	Location	Specifications			Phase I		Phase II		Phase III		Total \$ thousands
		Lanes	Surf.	Speed	Maint Class	Miles	\$ thousands	Miles	\$ thousands	Miles	
25	Jet 2573 Dist Bdy	D	P	30	5	12	PSD 720	12	4,800		5,520
2516	Jet 25 - NYM Bdy	S	G	25	4			6.8	C 55 PSD 8.3		63.3
Mining Rd.	2612 - trailhead	S	G	20	3	1.7	C 50 PSD 7.50				57.5
2700	Co.Rd.- Jet 2750	D	G		3			4.9	C 140 PSD 21		161
81	8100730-8100830	S	G	20	4	1.1	C 60 PSD 9				69
8100600	8100-Kalama R end	S	G	20	3					C 10 PSD 1.5	11.5
8100610	8100-end K.Spring	S	G	20	4		PSD 2.3	0.7	C 15		17.3
8100730	8100-end (T.H.)	S	G	20	3	0.1	C 2 PSD .3				2.3
8100830	8100-end (T.H.)	S	G	10-20	3		PS 5	2.6	C 50 D 2.5		57.5
8123070	8123-end	S	G	20	3			0.2	C 4 PSD .6		4.6
8123170	NYM Bdy-end ShCan	S	G	20	3	1.0	C 22 PSD 3.3				25.3
83	Jet 81 - Jet 8312	S	P		4		PS 22	2.9	D 11 C 220		253
83	NYM Bdy- Jet 2588	S	G		4			3.4	C 15 PSD 1.5		16.5

SCHEDULING OF CAPITAL INVESTMENT, ALTERNATIVE D (MODIFIED, SELECTED)
(Continued)

ROAD AND BRIDGE CONSTRUCTION/RECONSTRUCTION

Table J-2

P = Planning
S = Survey
D = Design
C = Construction

FRT = Federal Road and Trail Funds

Road No.	Location	Specifications			Phase I		Phase II		Phase III		Total \$ thousands
		Lanes	Surf.	Speed	Maint Class	Miles	\$ thousands	Miles	\$ thousands	Miles	\$ thousands
8303	Jct 83 - Ape Cave	S	P	20	4	1.0	PSD 22.5 C 150				172.5
8303	Ape Cave-NYN Bdy	S	P	20	4	0.2	C 40 PSD 6				46
8312	83 - viewpoint	S	D	20	3		PS 1.8	2.1	C 18 D .9		20.7
99	Jct 25-Windy Rdg	D	P	25	5	16.5	PSD 997.5 C 6,650				7,647.5
Johnston Ridge	Bus Shuttle	S	P	20	4				PS 80	7.2	C 1370 D 50 1,500
	Road Subtotals	-	-	-	-	33.6	8,771.2	35.6	5,442.8	7.7	1,431.5 15,645.5

BRIDGES		Phase I	Phase II	Phase III	Total
25	Lower Pine	PSDC 750			750
25	Muddy River		PS 90	DC 1,110	1,200
83	Upper Pine	PSDC 880			880
90	Lewis River (Eagle Cliff)		PS 84	DC 756	840
	Coldwater Lake exit channel		PS 15	C 275 D 10	300
Bridge Subtotals		1,630	189	2,151	3,970
TOTAL Roads and Bridges		10,401.2	5,631.3	3,582.5	19,615.5

SCHEDULING OF CAPITAL INVESTMENT, ALTERNATIVE D (MODIFIED, SELECTED)
(Continued)

STATE ROUTE 504 RECONSTRUCTION, (SPIRIT LAKE MEMORIAL HIGHWAY)

EMERGENCY RELIEF FUNDS

P = Planning
S = Survey
D = Design
C = Construction

Specifications
D = Double lane
P = Asphalt paved

Table J-3

Road No.	Location	Specifications		Phase I \$ thousands	Phase II \$ thousands	Phase III \$ thousands	Phase IV \$ thousands	Total \$ thousands
		Lanes	Surface					
SR 504 (reconstruction)								
	St. Helens to Bear Creek	D	P	PSD 1,150	C 21,850			23,000
	Bear Creek to Elk Rock	D	P	PSD 550	PSD 250 C 7,600	C 7,600		16,000
	Elk Rock to Coldwater Lake	D	P	PSD 625	PSD 625	C 23,750		25,000
	Subtotal SR 504	-	-	2,325	30,325	31,350	-	64,000

**SCHEDULING OF CAPITAL INVESTMENT, ALTERNATIVE D (MODIFIED, SELECTED)
TRAIL CONSTRUCTION/RECONSTRUCTION**

Table J-4

Definitions for Abbreviations:

Design Objectives

- (I) = Interpretive
(P) = Pack and Saddle
(H) = Hiker only
(X) = Cross Country Ski
(S) = All Purpose Snow
(E) = Easy
(D) = Difficult
(H) = Most Difficult

Developed Sites

- P = Planning
S = Survey
D = Design
C = Construction
R = Reconstruction

FRT = Federal Roads and Trail Funds

Trail No.	Segment	Design Objective	Phase I Miles	Phase I FRT \$ thousands	Phase II Miles	Phase II FRT \$ thousands	Phase III Miles	Phase III FRT \$ thousands	Phase IV Miles	Phase IV FRT \$ thousands	Total by Trail \$ thousands
233	Lava Cast Nature	(I) Interpretive	0.3	PSDC 18							18
238.1	8123 to 8123	(P) Pack & Saddle (E)	4.3	PSDC 50							50
238.2	Rd. 8123 to Rd. 81	(P) (E)		PSD 3	2.7	R 22					25
238.3	Rd. 81 to Rd. 81	(P) (E)			5.0	PSDC 70					70
238D	Tr. 238 to Noble Fir	(I)			1.5	PSDC 15					15
238A	Rd. 8100 to Butte Camp	(P) (D) Difficult	2.9	PSDR 30							30
238C	Tr. 238 to Tr. 216	(H) (D)		PSD 1	0.6	C 7					8
216.1	Tr. 238 to Tr. 216G	(H) (D)	2.7	PSDC 59							59
216G	Tr. 216.1 to Pet Road	(H) (D)	1.9	PSDC 32							32
216.2	Tr. 238D to Tr. 238A	(H) (D)				PSD 9	4.0	C 60			69
216.3	Tr. 238A to Tr. 216A	(H) (D)	1.9	PSDC 34							34
216.4	Tr. 216A to Tr. 216B	(H) (D)		PSD 5	2.5	C 38					43
216.5	Tr. 216B to Tr. 234	(H) (D)		PSD 6	3.7	C 55					61
216.6	Tr. 234 to Tr. 216D	(H) (D)	2.0	C 40							40
216.7	Tr. 216D to Tr. 216E	(H) (D)						PSD 4	1.7	C 34	38
216.8	Tr. 216E to Tr. 216G	(H) (D)						PSD 15	6.4	C 127	142
216A	Rd. 8100830 to Tr. 216	(H) (D)		PSD 1	1.2	C 13					14
216B	Rd. 8300 to Tr. 216	(H) (D)		PSD 2	1.4	C 16					18
216D	Tr. 216 to Rd. 99	(H) (D)	1.6	C 30							30

SCHEDULING OF CAPITAL INVESTMENT, ALTERNATIVE D (MODIFIED, SELECTED)
TRAIL CONSTRUCTION/RECONSTRUCTION
(Continued)

Table J-4

Trail No.	Segment	Design Objective	Phase I		Phase II		Phase III		Phase IV		Total by Trail
			Miles	FRT \$ thousands	Miles	FRT \$ thousands	Miles	FRT \$ thousands	Miles	FRT \$ thousands	\$ thousands
234	Rd. B300 to Tr. 216	(H) (E)	4.5	C 45							45
221	Castle Lk to Tr. 216	(H) (E)			PSD	4	3.1	C 26			30
221A	Coldwater Lake Loop	(I)			PSD	1	0.5	C 7			8
230	Tr. 211 to Trail 1	(H) (D)			PSD	10	5.0	C 70			80
230A	Tr. 230 to S.Coldwater Cr	(H) (D)							3.0	C 60	73
230B	Tr. 230 to Coldwater Pk.	(H) (H) Difficult	0.5	PSDC 12							12
1-2	Norway Pass to Tr. 214	(H) (E)	1.9	PSDC 37							37
1-3	Tr. 214 to Tr. 230	(H) (E)	3.3	PSDC 7							71
1-4	Tr. 230 to Tr. 1E	(H) (E)			1.7	PSDC 37					37
1-5	Tr. 1E to Observatory	(H) (E)			PSD	5	2.7	C 52			57
1-6	Observatory to Coldwater	(H) (E)							5.8	C 80	88
207	Rd. 99 to Trail No. 1	(H) (E)		PSD 1	1.0	C 12			4.4	C 66	87
1E	Tr. 1 to Harrys Ridge	(H) (E)			PSD	1	0.6	C 12			13
1D	Tr. 1 to Ghost Lake	(H) (H)							0.4	C 5	6
214	Tr. 1 to Tr. 211	(H) (D)							2.0	C 37	40
211.1	Tr. 1 to Tr. 211A	(H) (D)							3.0	C 53	58
211.2	Tr. 211A to Tr. 214	(H) (D)							1.5	C 17	19
211.3	Tr. 214 to Tr. 212								1.0	C 10	11
211.4	Tr. 212 to Coldwater	(H) (E)							7.7	C 140	150
211A	Boot Lake	(H) (H)							0.5	C 9	10
211B	Shorel Lake	(H) (H)							0.5	C 9	10
211C	Tr. 211 to Snow Lake	(H) (H)							0.2	4	5
212	Tr. 211 to Tr. 213	(P) (D)			PSD	10	5.4	C 100			110
213	Rd. 2612 to Weyoo Rd 2500	(P) (E)	2.0	PSDC 26							26

SCHEDULING OF CAPITAL INVESTMENT, ALTERNATIVE D (MODIFIED, SELECTED)
TRAIL CONSTRUCTION/RECONSTRUCTION
(Continued)

Table J-4

Trail No.	Segment	Design Objective	Phase I		Phase II		Phase III		Phase IV		Total by Trail \$ thousands
			Miles	FRT \$ thousands	Miles	FRT \$ thousands	Miles	FRT \$ thousands	Miles	FRT \$ thousands	
217	Rd. 2612 to Private Rd.	(P) (E)	9.0	PSDR 76							76
213A	Tr. 213 to Tr. 217	(P) (E)		PSD 4	2.5	C 14					38
217A	Tr. 217 to Tr. 217	(P) (D)	1.0	PSDR 10							10
205	Pvt Road 2750 to Tr. 217	(P) (D)		P 1			2.7	C 40			45
218	Tr. 217 to Rd 2750	(P) (D)		PSD 8	5.0	R 40	3.7	C 55			103
220.1	Rd. 2612 to Strawberry LO	(P) (D)	7.5	PSDR 112							112
220.2	Rd. 99 to Strawberry LO	(P) (D)	2.0	PSDR 11							11
219	Rd. 2516 to Strawberry LO	(H) (D)		PSD 1	1.0	C 10					11
	Quartz Creek	(I) (E)		PSD 1	0.3	R 10					11
227	Independence Pass to Tr. 1	(H) (E)	3.1	PSDC 40							40
224	Rd. 99 to Spirit Lake	(H) (E)					1.0	C 15			17
225	Rd. 83 to Rd. 99	(H) (D)		PSD 10	8.0	C 123					133
184	Rd. 83 to Rd. 9211	(H) (E)		PSD 4	2.4	C 23					27
184A	Tr. 184 to Tr. 184	(H) (D)		PSD 3	2.7	C 27					30
216E	Rd. 99 to Tr. 216	(H) (E)		PSD 2	1.0	C 15					17
A	Rd. 83 to Road 83	(X) Cross Country Ski	1.5	PSDC 5							5
B	Rd. 8315 to Rd. 8300100	(X)	2.6	PSDC 9							9
216B	Sno-park to Rd. 83	(S) All purpose snow.	0.3	PSDC 2							2
C	Trail 8 to Trail 216(X)			PSD 2	2.0	C 4					6
D	Trail 8 to Trail C (X)			PSD 1	1.0	C 2					3
E	Road 83 to Trail 216 (X)					PSD 6.0	4.0	C 24			30
F	Sno-park to Rd. 830830(S)			PSD 2	3.0	C12					14
	TOTAL (Trails)		57.0	807	42.9	646	32.7	534	38.1	651	2,629

SCHEDULING OF CAPITAL INVESTMENT, ALTERNATIVE D (MODIFIED, SELECTED)
(Continued)

MISCELLANEOUS ONE-TIME COSTS

Table J-5

P = Planning
S = Survey
D = Design
C = Construction

FRT = Federal Road and Trail Funds
FLM = Forest Land Management Funds

	Phase I \$ thousands		Phase II \$ thousands		Phase III \$ thousands		Phase IV \$ thousands		\$ Thous. Total by Project
	FRT	FLM	FRT	FLM	FRT	FLM	FRT	FLM	
<u>Plans:</u>									
Interpretive Prospectus		40							80
Fire Management		20							20
Backcountry Management						20			20
Cave Management		20							20
Fish & Wildlife				40					40
Road Abandonment				30		28			58
Acquisition of additional acreage				608		608			1,216
Remote weather station		11							11
TOTAL ONE-TIME COSTS		91		678		656			1,425

SCHEDULING OF CAPITAL INVESTMENT, ALTERNATIVE D (MODIFIED, SELECTED)
(Continued)

ADMINISTRATIVE HEADQUARTERS AND SEASONAL WORK CENTERS

Table J-6

P = Planning
S = Survey
D = Design
C = Construction

FAO = Fire, Administrative, & Other
FRT = Federal Road and Trail Funds

Facility	Location	Phase I \$ thousands	Phase II \$ thousands	Phase III \$ thousands	Phase IV \$ thousands	Total \$ thousands
Mount St. Helens National Volcanic Headquarters Seasonal Work Quarters	Chelatchie Prairie/ Amboy, Washington	D 100	PD 95 C 1,500	C 700		2,395
	Toutle River/Coldwater Lake			PSD 17 C 175		192
	Bear Meadows			PSD 20 C 210		230
	Pine Creek		PSD 18	C 179		197
	Subtotal	100	1,613	1,301		3,014

Appendix K

FIRE MANAGEMENT STRATEGIES

The Monument Act authorizes wildfire control measures within the Monument to "protect irreplaceable features," or to prevent "substantial damage to significant resources adjacent to the Monument." (Sections 4b2 and 3; and 4g2.) However, tree removal during fire control must be kept to "the minimum extent necessary" (Section 4g2). Therefore, all alternatives consider all blowdown and fringe areas within the Monument as "irreplaceable features," so fires must be controlled. "Protective perimeters or buffer zones" around the Monument are prohibited (Section 6 of the Act), so fire control strategies adjacent to the Monument must be defined by existing plans, policies, and laws related to National Forest Management (such as the upcoming Forest Plan). Thus, fires originating within the Monument must be controlled when adjacent private lands are threatened. The role of allowing fires to burn naturally is not discussed directly in the Act, but heavy emphasis is placed on preserving natural processes within the Monument (Section 4i1). Therefore, natural fires may be allowed to burn within the Monument and to cross the boundary only onto adjacent National Forest land, and then only if other approved existing plans allow natural fires.

The Monument has been divided into three fire management zones based on the natural features and processes that present varying fire fuel hazards (Figure 38 in Chapter III). The following fire management strategies apply to all of the alternatives, including the selected Alternative D (Modified). These strategies have been developed based on the direction provided by the Act, and by the public in their review comments on the DEIS.

In Zone I, a "confine" strategy applies to any fires occurring in the Mount St. Helens timberline or Spirit Lake Basin--fires will be confined within the boundaries of this zone. Fuel loading is light to nonexistent in these areas and public access is limited, so fire occurrence is anticipated to be infrequent and isolated.

A "control" strategy applies in Zone II, requiring the quickest reasonable control of all fires, using "modified suppression" techniques wherever possible. "Modified suppression" means that crew sizes, techniques, and control strategies may be adjusted to minimize environmental disturbances caused by suppression

actions. Some examples: firelines constructed only where necessary, minimal heavy equipment use, the use of clear or fugitive-dye (rapidly decomposing) retardants, and snags left standing that do not pose safety hazards. This zone includes potential high fire hazard areas, so boundaries include buffers to aid in control.

In Zone III, a "contain" strategy allows naturally occurring fires to continue burning under specific environmental conditions and fire-intensity levels, with minimal control lines established--these are called "prescribed natural fires." In this zone, "modified suppression" techniques will be used at all times. The decision to allow a fire to burn or be suppressed rests with the Monument Manager, in consultation with the Forest Supervisor. The primary objective in allowing prescribed natural fire in the Monument is to permit some low intensity fires to play a natural role in the ecological succession of the area. These natural fires occur at infrequent intervals in the general forest area (Zone III), and are called "gap-phased" (meaning infrequent) fires. Fifty years of available data report only 18 lightning fires, and the limits identified on allowing them to continue burning naturally will further reduce the number of candidate fires.

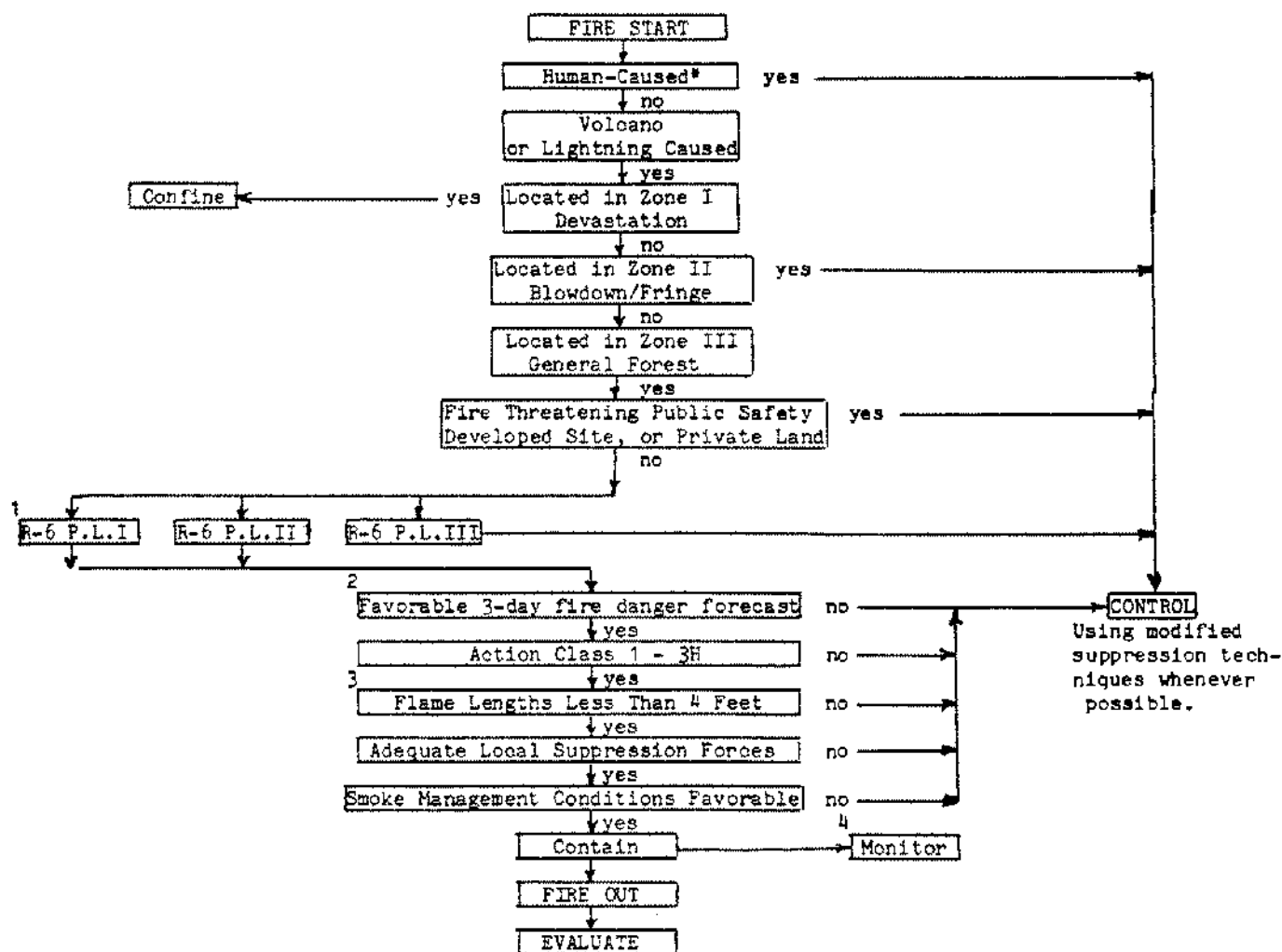
"Scheduled prescribed fires" are also recommended in Alternatives C through G, including the selected Alternative D (Modified). These are fires ignited by fire managers at a predetermined time in a specific area under specific favorable environmental conditions. The primary objective of these fires is to reduce extreme fire hazards. The limited use of these fires under favorable conditions could recreate the effects of natural fires, in areas where waiting for natural wildfires would be hazardous or impractical. Current policy requires that all scheduled prescribed fires be preceded by a separate environmental analysis that is approved by the Regional Forester, so this plan does not allow them in itself. This discussion is included in this plan to indicate their potential usefulness as mitigation in areas of high fire hazards.

Figure K-1 presents a "decision tree" used to select appropriate management strategies after a fire starts, based on the cause, current environmental conditions, and natural characteristics within each zone in the Monument.

Figure K-1

DECISION TREE FOR FIRE MANAGEMENT STRATEGY IN THE NATIONAL VOLCANIC MONUMENT

Specific constraints, guidelines, and objectives would be described in a Monument Fire Management Implementation Plan. The purpose of this diagram is to illustrate typical strategy.



Appendix L

SUMMARY OF THE DEMAND ANALYSIS FOR THE MOUNT ST. HELENS CMP

I. Purpose

Recreation demand is a crucial consideration in the process of recreation planning. The demand analysis provides direction for the best level of development and the best location for that development to occur. The demand analysis helps provide solutions to the allocation of the limited recreational resources in the Monument.

II. Definitions

The "demand" as applied to this analysis is the expected total recreational use of the Mount St. Helens National Volcanic Monument and adjacent areas throughout the planning horizon under assumed conditions and for appropriate outdoor recreation opportunities. This analysis did not establish a schedule of volume in relation to a price. The measures used are Recreation Visitor Days (RVDS) by recreation activity and Recreation Opportunity Class, and by recreation visits. The projections of expected future of visitor use in the Monument and adjacent areas were made at five-year intervals throughout the planning horizon (to the year 2000).

III. Projection Difficulties

Projecting recreation use was difficult due to the following: the lack of accurate long-term use data, the constantly changing access pattern due to road reconstruction, the level and type of volcanic activity, and predicting changing perceptions by the public.

IV. Projection Assumptions and their Rationale

1. There are two kinds of users which can be stratified and treated differently in estimating the future use of the area. These two types of users are:

- A. Traditional Users. These users existed prior to 1980. Typical recreational activities include the "traditional" activities such as camping, hiking, snowmobiling, etc. They recreate within the full Recreation Opportunity Spectrum. These visitors are considered to be similar to other users in the National Forest System.
- B. Mount St. Helens Recreation/Resource Based Users. These users began coming to the area in 1980 with the desire to view and learn about the area. The great majority of this use occurs within the Roaded Natural Recreational Opportunity Class. These visitors are

considered to be similar to other users of major National Parks.

Rationale: Prior to the 1980 eruptions, visitors to the area were, for the most part, local (figure 30, Chapter III). These visitors were observed to take part in traditional recreation activities. These recreationists are considered to be the traditional users. Following the 1980 eruptions, the origin of the visitors to the area changed (figure 31, Chapter III). The majority of these new visitors take part in sightseeing and interpretive activities. When the new origin of visitors is compared to the origin of visitors to other National Parks (figure 31, Chapter III) and the types of activities that are common in the National Parks, strong similarities become evident.

2. A certain high priority demand exists. This high priority demand is defined as:

Roaded Natural opportunities to view the key interpretive features and learn about those features in a basically reflective manner within a short, four-hour or less time frame.

Rationale: The Act creating the Monument states this as one of the purposes of the Monument. Visitor activity characterization in similar major National Parks shows that most visitors are taking part in a mostly visual experience in a Roaded Natural setting. The benefits of the experience occur from the effect of the landscape and setting on the individual. The purpose is to allow visitors to experience the area in an absorbed way, given the individual opportunities for choice and independent experience. These goals have strong historical foundations (Sax, Joseph L., "Mountains without Handrails, Reflections on the National Parks"). The short time frame of the visit is characteristic of the modern "park" experience in a fast paced world.

3. The Mount St. Helens National Volcanic Monument's dominant characteristic is its outstanding physical resources. This physical resource has almost no opportunities for alternative substitutes.

Rationale: The response of visitors to the area attests to its innate nature. No area in the continental United States is similar in nature.

4. Use projections assume easy access from I-5 and that roads and facilities do not limit the key or high priority use (demand).

Rationale: This assumption removes the need to consider the effects of the lack of supply or high prices on expected use. The area is large enough to provide for high levels of use.

5. Facilities within the Monument will not of themselves generate significant amounts of demand.

Rationale: The appropriate recreational experience that the area should supply is based on the natural resource. Demand generated beyond that high priority demand is not as critical and should be confined to the facility itself.

6. That the Mount St. Helens Visitor Center is a significant visitor attraction separate of the Monument.

Rationale: The facility is being planned as a major interpretive center at this time.

7. If easy westside access from I-5 is not provided, visitation to the Monument will be 40-60% less.

Rationale: Increased cost to the visitor in both time and money will reduce the total expected visitation. Past use patterns in 1982 and 1983 have provided some measure of the visitation that has been unable or unwilling to reach the Monument.

8. Volcanic activity will continue in an intermittent fashion, as it has since 1981.

Rationale: This is the outlook as provided by the U.S. Geologic Survey. The volcanic activity will have a strong effect on use. Most likely, the volcanic activity will be in intermittent low levels over the planning horizon.

V. Methodology And Projections

The methods used to estimate the future recreation of the area begin with the separation of the two types of visitors to the area. Each of these two types of recreation demand are then analyzed separately, and future projections are made for each. The main reference for methodology was Economics of Outdoor Recreation (Clawson & Knetch, 1971).

1. Traditional Demand

Four basic methods were used to project the future traditional recreation use of the area. The first method was to apply a simple trend extension for each past recreation activity that occurred in the area. This method provided an estimate that assumes that the future will be like the past. This, of course, is not the case for this area. However, this projection does provide a comparison against other methods.

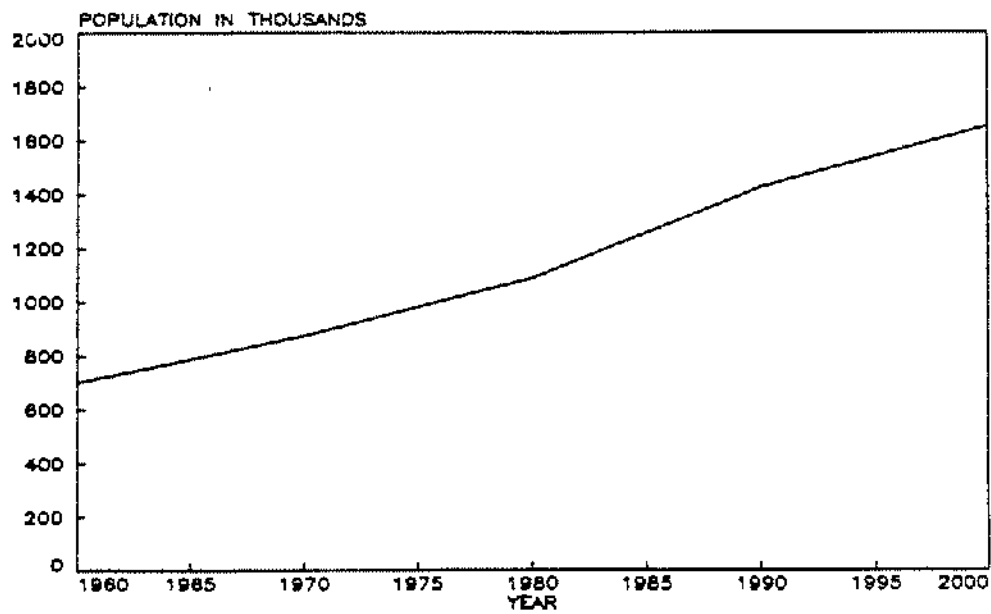
The second method is based on the knowledge that the market area is local, and that there has been a close relationship between recreation use and the local population growth. By extending this basic causal force underlying past demand and converting this trend into estimates of future recreation use, a potentially accurate predictive measure emerges. The local area is fast growing (Figure L-1); and it is expected that as population grows, the demand for these opportunities will continue to grow proportionally. However, this method fails to consider the loss of the old Spirit Lake Basin. That area had a very special attractiveness for recreationists. That attractiveness no longer being present will reduce the demand for traditional recreation in the area.

The third method used was to compare national traditional recreation growth rates localized for the Gifford Pinchot National Forest. These forecasts of future use (Figure L-2) proved to be a useful comparison but not specific enough for the unusual situation at the Monument.

The fourth method relies on professional judgment. The above four methods are compared and other factors are taken into consideration but not in a simple or easily defined way. The other factors considered include attractiveness, substitutability, potential supply, recovery rates, reliability of past data, and estimated initial response to the reopening of the area. This method takes into account the variable that the above methods fail to consider. This final method is the one used to estimate the expected future traditional recreational use in the Mount St. Helens National Monument. Figure L-2 compares the four projections.

Figure L-1

POPULATION CHANGES IN THE G.P. INFLUENCE AREA



TRADITIONAL RECREATION DEMAND

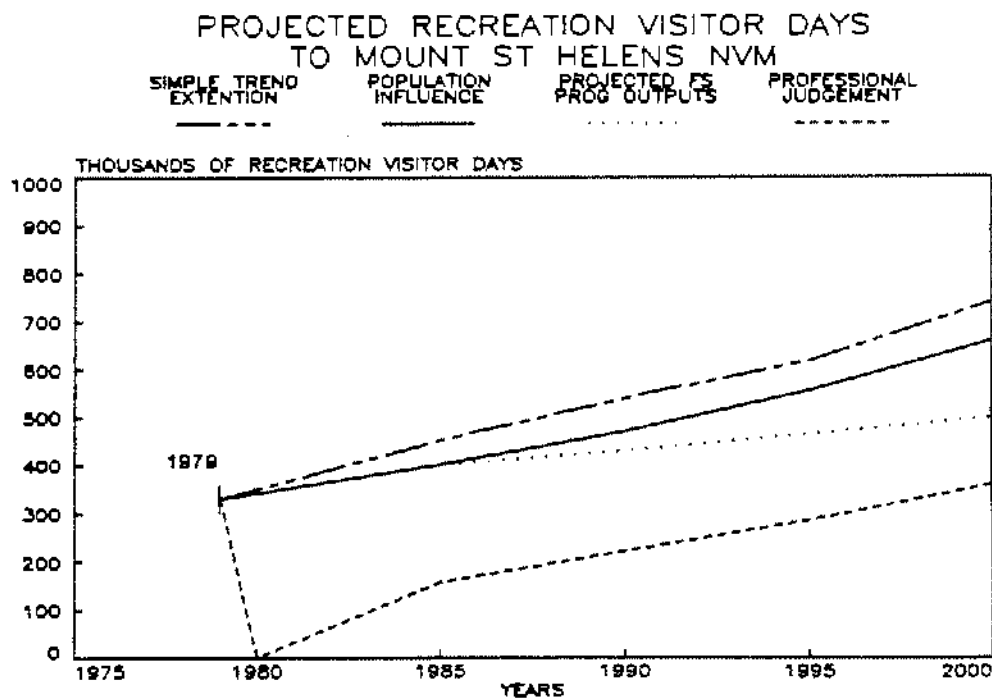


Figure L-2

The following table shows the projected Recreation Visitor Days (RVD's) for the Traditional Recreation Activities.

A comparative study was done of other areas similar to the Mount St. Helens National Monument (Mount St. Helens Interpretation and

Table L-1. Expected Traditional Recreation Use

Recreation Activity	Thousands of RVD's				
	1979	1985	1990	1995	2000
Snowmobiling*	3.3	.9	3.8	4.1	5.9
Boating	10.1	2.0	2.2	2.6	3.0
Hiking, Walking	33.1	16.0	32.0	41.6	49.9
Swimming	9.8	0.2	0.5	1.5	2.0
Fishing	11.0	4.0	5.6	7.8	10.9
Camping	117.2	58.6	70.3	91.4	109.6
Organizational Camping	20.0	10.0	10.4	12.4	14.8
Picnicking	8.5	6.5	9.1	10.9	13.1
Skiing*	3.1	.6	3.1	3.7	4.4
Snow Play*	7.1	.7	3.4	4.0	4.8
Hunting	45.1	30.0	39.0	50.7	65.9
Mountain Climbing	7.8	7.8	12.4	16.2	19.4
Gathering Forest Product	9.0	4.5	5.8	7.6	9.8
Dispersed Camping	13.0	10.6	12.8	16.6	20.0
Caving	7.7	9.6	12.0	14.4	16.0
Horse Use	1.6	.8	.9	1.1	1.3
Other	1.5	.7	.9	1.1	1.3
TOTAL	308.9	163.5	224.2	285.1	352.1

Source: U.S.F.S., Recreation Management System
*Adjusted 1979 use figures estimating actual use.

2. Mount St. Helens Recreation Demand

In forecasting recreation use for the Mount St. Helens recreation, different methods were used. Because no discernible stable past trend existed and the recreation use has been restricted, it is not possible to do a simple trend extension. The first step in the process of forming the projection was to find a measure of the level of interest in visiting the area. This level of potential past visitors to the area was estimated by studying the level of interest as demonstrated by volcano visitors to the Visitor Centers, the Monument area, and along State Route 504. This provided a base level of use. Table L-2, after being adjusted for double counting, provides an estimate of the total use.

Table L-2. Total Demonstrated Use in Visits

YEAR	VISITS
1982	1,160,000
1983	1,166,000

Recreation Plan, David M. Dornbush, 1981).

Their trends and levels of use were studied and then applied to the situation at the Monument. Figures L-3 and L-4 show the past recreation use trends at similar areas. Similar areas all exhibit comparatively slow levels of growth in recreation use.

A study of the visitor industry entitled, Mount St. Helens Regional Visitor Industry Development Program (Harrison Price Company, Malcolm D. McPhee & Associates, 1982), estimated visitation to the Visitor Center at one million visits by 1985 with a 12.5% increase by 1990.

Because the market area is national and international, the national and international population growth trends, a basic causal force of demand, was studied. Population average annual growth rates in developed countries visiting the area including the United States is less than 1%.

After considering the above information, it was determined that this demand is slower growing and greatly affected by national trends. The growth rate of this demand will most likely approximate the state's tourism growth rate (Figure L-5).

Figure L-3
RECREATION VISITS TO GRAND CANYON N.P.

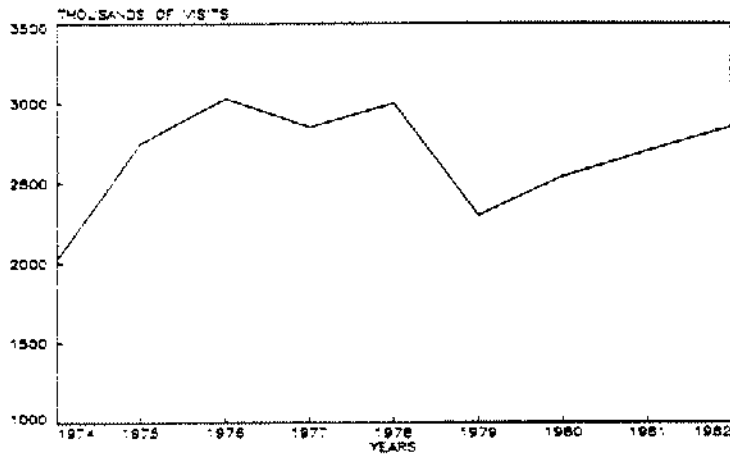


Figure L-4
RECREATION VISITS TO MOUNT RAINIER N.P.

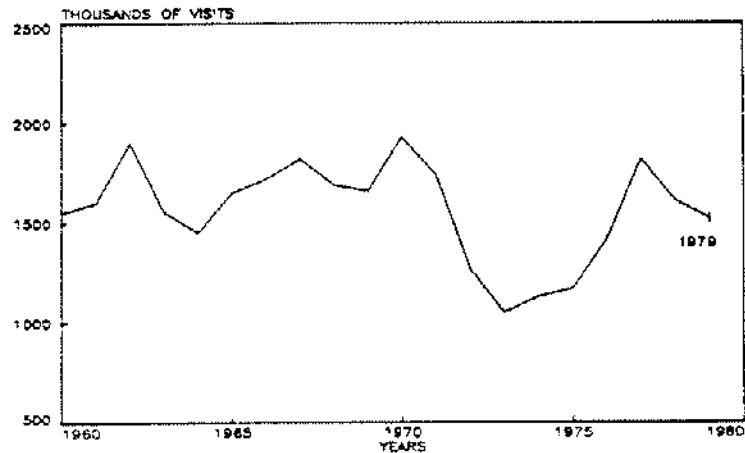
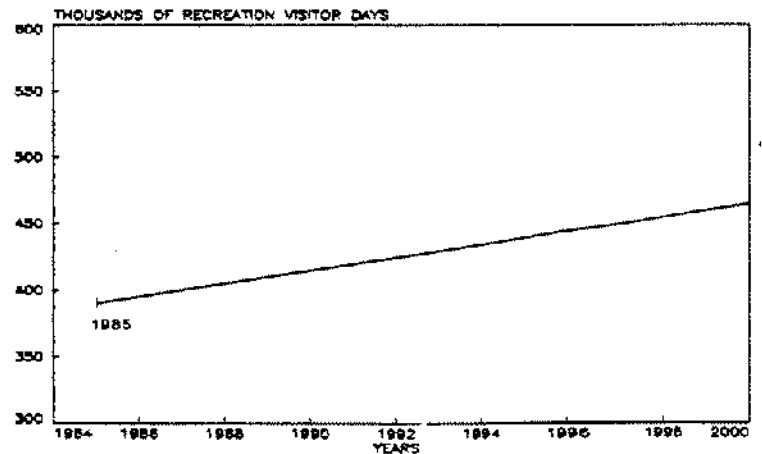


Figure L-5
RVD'S TO MOUNT ST HELENS NVM
BASED ON PROJECTED STATE TOURISM

**MOUNT ST. HELENS
RECREATION DEMAND**



The following table shows the projected Recreation Visitor Days (RVD's) for the Mount St. Helens Recreation Activities.

Table L-3. Expected Mount St. Helens Recreation Use

Recreation Activity	Thousands of RVD's				
	1979	1985	1990	1995	2000
Viewing Scenery	110.2	148.4	156.8	166.2	176.2
Driving for Pleasure	130.6	135.0	143.1	151.7	160.8
Nature Study	11.3	23.0	24.3	25.7	27.2
Interpretation, on site*	10.9	19.3	20.5	21.7	23.3
Visitor Center Use	N.A	62.5	66.2	70.2	74.4
TOTAL	263.0	388.2	410.9	435.5	461.9

Source: U.S.F.S., Recreation Management System
*Adjusted 1979 use figures estimate actual use.

3. Recreation Opportunity Spectrum Demand

The demand for recreation opportunities was also analyzed from the perspective of the two types of recreation demands (Tradition and Mount St. Helens). The forest planning effort presently indicates that the forest will not be able to meet the demand for primitive and semi-primitive recreation opportunities. The Monument presently contains about 25% of the primitive opportunities in the forest and about 20% of the Forest's semi-primitive recreation opportunities. Even though the Monument was not created to provide these types of opportunities in particular, there will be a significant demand for these kinds of opportunities within the Monument.

The recreational activities were assigned probabilities of occurring in different ROS classes and then projected with considerations for the special nature of the area. The ROS projections were made for the two recreation types by the same methods for each as explained above.

The following tables display the projected Recreation Visitor Days by the traditional and Mount St. Helens activities by ROS classes.

Table L-4. Expected Traditional Use by ROS Classes

Thousands of RVD's

ROS Classes	1979	1985	1990	1995	2000
Primitive	6.6	5.3	7.1	9.1	11.6
Semi-primitive, Non-motorized	48.7	27.0	36.8	47.6	60.9
Semi-primitive, Motorized	23.2	10.5	14.2	18.2	23.2
Roaded Natural	198.4	104.2	143.5	280.8	218.7
Rural	32.0	16.5	22.6	29.4	37.7
TOTAL	308.90	163.5	224.2	285.1	352.1

Table L-5. Expected Mount St. Helens Use by ROS Classes

ROS Classes	Thousands of RVD's				
	1979	1985	1990	1995	2000
Primitive	N/A				
Semi-primitive, Non-motorized	N/A				
Semi-primitive, Motorized	N/A				
Roaded Natural	263.0	325.7	344.7	365.3	387.5
Rural	N/A	62.5	66.2	70.2	74.4
TOTAL	263.0	388.2	410.9	435.5	461.9

Note: This does not mean that there is no demand for the Mount St. Helens experience in the other ROS classes. It is assumed using the methodology in this report that the demand for the more primitive interactions with the unique resource will be expressed in the "traditional" demand figures.

Table L-6. Summary of RVD's by ROS Classes

ROS Classes	Thousands of RVD's				
	1979	1985	1990	1995	2000
Primitive	6.6	5.3	7.1	9.1	11.6
Semi-primitive, Non-motorized	48.7	27.0	36.8	47.6	60.9
Semi-primitive, Motorized	23.2	10.5	14.2	18.2	23.2
Roaded Natural	461.4	429.9	488.2	646.1	606.2
Rural	32.0	79.0	88.8	99.6	112.1
TOTAL	572.9	551.7	635.1	820.6	814.0

4. Projection of Recreation Visits

The above projections were based on RVD's which are 12-hour periods of recreation. Since the Mount St. Helens activities are mostly experienced in short visits, it is also necessary to display the projected visits to the area.

Table L-7. Summary of Projected Visits

ROS Classes	Thousands of Visits				
	1979	1985	1990	1995	2000
Traditional Recreation	592.2	279.9	384.2	411.1	603.5
Mount St. Helens Recreation					
On Site	630.8	873.3	924.8	979.9	1039.1
Visitor Center	N/A	1000.0	1064.0	1123.2	1190.4
TOTAL	1160.0	2153.2	2373.0	2514.2	2833.0

Appendix M

PROJECTED VISITATION BY ACCESS CORRIDORS

For the purpose of Comparison of the Alternatives the projected visits to the area in the year 2000 were distributed to the major access corridors (Table M-1). Visits along each road corridor were developed by: a. first determining pre-eruption use patterns; b. then adding estimated projected visits stimulated by the distribution of recreation facilities planned by alternative, after subtracting those visitors who will stop only at the visitor center. In other words, the projected distribution of recreational facilities planned by alternative as related to major road corridors was assumed to be an approximate proxy for projected demand. This assumption is considered valid because total demand versus supply (as shown in Appendix L) were within 10 percent of each other. Additional assumptions were used in making these projections:

1. The actual visitation will be limited by demand.
2. The expected demand will decrease by 65 percent in Alternate E, due to the lack of convenient westside access.
3. Visits were distributed rather than visitors days since this measurement will indicate more about the socioeconomic impacts.
4. The visitor center use will be a constant for the lower SR 504 corridor (the Spirit Lake Memorial Highway).
5. Visitor distribution for both the original preferred Alternative D (in DEIS) and the selected Alternative D (Modified), because facility development related to each road corridor remains virtually identical.

Table M-1: Visits by Access Corridors in the Year 2000
Compared to Visits Experienced in Year 1983

Alter- natives	Total Visits to Area	North, US 12,		West, SR 504		Southwest, SR 503		South, Cty. Rd. 51		West, SR 504	
		Percent of Visits	Visits by Corridor	Percent of Visits	Visits by Corridor	Percent of Visits	Visits by Corridor	Percent of Visits	Visits by Corridor	Percent of Visits	Visits by Corridor
	Thousands	%	Thousands	%	Thousands	%	Thousands	%	Thousands	%	Thousands
A	714	58	414	0	--	38	271	4	29	1	1,190
B	1,179	35	412	35	412	26	306	4	47	1	1,190
C	1,735	17	295	70	1,215	9	156	4	69	1	1,190
D ¹	1,735	17	295	70	1,215	9	156	4	69	1	1,190
E	1,127	52	586	10	113	34	383	4	45	1	1,190
F	1,735	17	295	60	1,041	19	330	4	69	1	1,190
G	1,735	29	503	50	868	17	295	4	69	1	1,190
Present (1983)	375	--	218	--	(260) ²	--	142	--	15	--	374

¹ Both for the preferred Alternative D (in DEIS) and the selected Alternative D (Modified).

² Related Mount St. Helens use on SR 504 to Hoffstadt viewpoint at the end of the highway.

Appendix N

PUBLIC INVOLVEMENT AND COMMENTS

This appendix is divided into the following sections: I. Introduction; II. Public and Scientific Advisory Board Involvement Process; III. Nature and Extent of Comments; IV. Substantive Comments and Responses; and V. List of Respondents to DEIS.

I. INTRODUCTION

The Forest Service is directed to respond to public comments by the Council on Environmental Quality Regulations (Section 1503.4) for implementing the provisions of the National Environmental Policy Act.

The ways for the Forest Service to respond are:

- A. Modify alternatives, including the proposed action.
- B. Develop and evaluate alternatives not previously given serious consideration by the agency.
- C. Supplement, improve, or modify its analyses.
- D. Make factual corrections.
- E. Explain why comments do not warrant further agency response.

II. PUBLIC AND SCIENTIFIC ADVISORY BOARD INVOLVEMENT PROCESS

A. PUBLIC INVOLVEMENT PROCESS

The Mount St. Helens Comprehensive Management Plan (DEIS) was released for a 60-day review period from October 7 to December 5, 1984. Five open house meetings were held during October 1984 to provide information or answer questions about the draft Comprehensive Management Plan. The meetings were held in Longview, Stevenson, Vancouver, Tacoma, and Randle, with a total attendance of about 200 individuals. After the open house meetings, 19 presentations were made on request to groups interested in the draft plan, involving over 600 individuals.

B. SCIENTIFIC ADVISORY BOARD INVOLVEMENT PROCESS

The DEIS was also released to the Scientific Advisory Board (SAB) on September 25, 1984. The SAB was created by the Monument Act and consists of nine members with recognized professional standing in appropriate scientific disciplines. The SAB provides advice and recommendations with respect to Sec. 7 of the Monument Act:

(1) The measures needed to protect and manage the natural and scientific values of the Monument; and

(2) The administration of the Monument with respect to policies, programs, and activities which are specifically intended to retain the natural ecologic and geologic processes and integrity of the Monument.

The SAB met again on October 24 to discuss their review of the DEIS. Then on December 11, 1984, the Board made their recommendations on the DEIS. These recommendations (along with Forest Service responses to them) are presented at the end of the next section.

III. NATURE AND EXTENT OF COMMENTS

A. PUBLIC RESPONSES

A total of 382 comments were received, representing 450 signatures. The greatest number of comments, 299 (78.3%), came from individuals and represented the highest number of signatures. The second largest category came from organizations, including special interest groups such as the Mount St. Helens Protective Association and Randle, Unincorporated.

Table 1 shows the distribution of comments by residence of the respondents.

TABLE 1 - Residence of Respondents

	<u>Comments</u>	<u>Signatures</u>
Eastern Lewis County	164	180
Longview/Kelso	22	26
Vancouver/Portland	31	35
Puget Basin	72	83
Other SW Washington	56	83
Other State of Washington	6	6
Out of State	<u>31</u>	<u>37</u>
Total	382	450

Residents in the Eastern Lewis County area accounted for 42.9% of the total comments and 40.0% of all signatures. The second largest number of comments came from the Puget Basin, at 18.8% of all comments and 18.4% of total signatures.

Over half (57.3%) of all comments were received as personal letters, which includes response forms provided at the open house meetings. A form letter circulated by Randle, Unincorporated, represented 42.4% of all comments, or 40.9% of total signatures. Letters from federal, state, and local agencies are attached at the end of the next section. Table 2 ranks the order in which comments were received on various subjects.

A more detailed analysis of the nature and extent of public response is available in the publication, "Analysis of Public Comment to Mount St. Helens Comprehensive Management Plan" (March 1985). This publication, along with individual letters received in response to the DEIS, is available at the Gifford Pinchot National Forest Supervisor's Office in Vancouver, Washington.

TABLE 2 - Comment Subjects

<u>Rank</u>	<u>Comment Subject</u>	<u>Number of Comments</u>	<u>% Total Comments</u>	<u>Number of Signatures</u>	<u>% Total Signatures</u>
1	Access	311	21.1	400	21.9
2	Costs	179	12.2	201	11.0
3	Coldwater/Johnston Ridge Complex	140	9.5	161	8.8
4	Winter Recreation	114	7.7	139	7.6
5	Castle Lake Proposal	66	4.5	72	3.9
6	Spirit Lake Proposal	55	3.7	63	3.4
7	Mt. Margaret Area	50	3.4	64	3.5
8	Development	49	3.3	81	4.4
9	Research	41	2.8	43	2.4
10	Horse Use	35	2.4	38	2.1
11	Land Acquisition & Boundary Adjustments	30	2.0	33	1.8
12	Visitor Center	29	2.0	33	1.8
13	Safety, Law Enforcement, & Emergency Medical	28	1.9	46	2.5
14	Hunting & Fishing Opportunities	27	1.8	42	2.3
15	Muddy River Lahar	27	1.8	32	1.8
16	Strawberry Mountain Area	26	1.8	29	1.6
17	Trails	25	1.7	29	1.6
18	Mountain Climbing	24	1.6	24	1.3
19	Caves Area	22	1.5	25	1.4
20	Air Traffic	19	1.3	30	1.7
21	Information Stations	18	1.2	25	1.4
22	Common Management Practices	15	1.0	25	1.4
23	Kalama Springs	15	1.0	17	0.9
24	Green River/Vanson/Goat Creek Backcountry	14	1.0	19	1.0
25	Planning Process	14	1.0	17	0.9
26	Socioeconomics	14	1.0	24	1.3
27	Fire, Insects, & Disease	14	1.0	22	1.2
28	Dispersed Recreation	10	0.7	13	0.7
29	Boating	9	0.6	15	0.8
30	Entrance Fees & Other Fees	7	0.5	16	0.9
31	Recreation Experience	7	0.5	7	0.4
32	Biophysical	7	0.5	8	0.4
33	Visitor Use	5	0.3	5	0.3
34	Off Road Vehicles	5	0.3	5	0.3
35	Army Corps Project	4	0.3	5	0.3
36	Cultural Resources	4	0.3	4	0.2
37	Mining	3	0.2	3	0.2
38	Staffing	3	0.2	4	0.2
39	Mitigation	3	0.2	3	0.2
40	Air Quality	2	0.1	2	0.1
41	Scheduling	2	0.1	2	0.1
42	Maps	1	0.1	1	0.1
Total Comments, by Subject		1,473		1,827	

B. SCIENTIFIC ADVISORY BOARD COMMENTS

1. The Scientific Advisory Board strongly recommends adoption of Alternative D as the Comprehensive Management Plan for the Monument. This alternative maximizes the scientific, interpretive, and Mount St. Helens related recreational benefits, while providing, with some exceptions, an acceptable degree of protection for the unique natural features and processes of the Monument.

2. Two of the alternatives presented, Alternative F and Alternative G call for significant road construction and maintenance through the debris avalanche and pyroclastic deposits between Coldwater Lake and Windy Ridge, and would cause unacceptable and irreversible damage to some of the most significant and most sensitive geological and biological features of the Monument. The Board recommends that these alternatives not be adopted (see paragraph 8a).

3. The Board endorses the plan for administration and coordination of scientific research called for in Alternative D. This plan calls for a Research Protection Class 1 for features of special scientific importance and sensitivity, for a professional research coordinator on the Monument staff, full tracking and documentation of research in the Monument, an annual Report on Protection of Scientific Values, and the use of an advisory panel of scientists who are actively engaged in research in the Monument. We recommend that this plan, in full, be a part of whichever development alternative may be adopted.

4. Recognizing that scientific research and interpretation of science to the public are central to the charter of the National Volcanic Monument, the Board recommends that a person of excellent scientific qualifications be a high ranking member of the Monument Manager's team. The research coordinator mentioned in the plan should not be merely a manager and coordinator of ongoing research activities within the Monument, but a person whose scientific training and experience will help create an environment in which science will truly flourish. Desirable qualities include: (1) an advanced degree (preferable Ph.D) in a pertinent field (e.g., ecology, geology, etc.); (2) research experience, publications, and sufficient stature as a scientist to

FOREST SERVICE RESPONSES

1. Numerous changes have been made to Alternative D, based on public and agency review of the draft plan, including: shuttle bus access to Johnston Ridge in place of a tram, dropping road access to Castle Lake, dropping the Spirit Lake bus shuttle, allowing horse use in the "green fringe," closing sensitive portions of the Muddy River Lahar to camping, dropping picnicking at Kalama Springs, and ending ORV use one mile east of Bear Meadow. In the selected alternative, overall levels of development have been reduced from the preferred alternative presented in the DEIS with the substitution of many parts from Alternative C.

2. Agrees with the comparison of impacts shown in the plan.

3. Agrees with the selected alternative.

4. The selected alternative includes provision for a science coordinator; your input will be considered in preparing the position description, detailing the specific duties, and qualifications of the Monument Science Coordinator.

SCIENTIFIC ADVISORY BOARD COMMENTS

be an asset in dealing with other scientists, agency officials, and funding sources; and (3) interests that span the main range of research activities in the Monument. This person should have the title of Monument Scientist with rank, salary, and influence at least comparable to that of the Chief Naturalist in a large National Park. Research coordination would be among the duties of the Monument Scientist, but equally important would be the charge to discern exceptional research opportunities and to help launch appropriate new projects. The Monument Scientist would be a principal advisor to the Monument Manager, would supervise the activities of the science advisory panel, and would advise in planning displays and programs to interpret science at Mount St. Helens to the public. The Monument Scientist should also remain active in research.

5. The Board notes the absence of a plan for fish and wildlife management (as opposed to habitat protection) in the Draft Comprehensive Management Plan. We recommend that the staff of the Gifford Pinchot National Forest begin discussions immediately with the Washington State Departments of Fisheries and Game aimed at preparation of a joint Wildlife Management Plan consistent with all the provisions of the Monument Act. This Wildlife Management Plan should provide for continuing consultation among these and other agencies, and should be completed within the same two-year time frame as other detailed management plans for the Monument.

6. Although the Board believes that Alternative D, as presented, provides the most nearly acceptable basis for management of the Monument, we believe that some improvements to this alternative should be made. We offer the following recommendations:

a) Effects of the proposed management schemes have been evaluated with mitigation measures implemented. Full implementation of appropriate mitigation should be required for any selected level of development to proceed. Shutdown or fallback levels of operation should be identified should mitigation be inadequately funded.

b) The Board endorses the concept of an aerial tramway from Coldwater Lake to Johnston Ridge. This is an imaginative solution that provides a dramatic interpretative experience for the visitor with minimum impact on the sensitive debris avalanche deposits. If at all possible, the tramway should

FOREST SERVICE RESPONSES

5. The U.S. Forest Service and the Washington Departments of Game and Fisheries are jointly developing a Wildlife Management Plan.

6. a. Mitigation identified in Chapter II are part of the selected alternative, so the scheduling of development will ultimately depend on fund availability, including funds for mitigation. This has been clarified in the FEIS.

b. The selected alternative no longer includes a tramway to Johnston Ridge, and a shuttle bus has been substituted, based on public/agency comments on the DEIS. Running the tram directly to the observation post was analyzed and was not economically feasible since it would cost \$8 million to build.

SCIENTIFIC ADVISORY BOARD COMMENTS

provide access directly to the Observation Post without recourse to a bus shuttle.

- c) The proposed extension of State Route 504 to Coldwater Lake should follow the high ground as shown on the Preferred Alternative D colored map. It should not, in any case, be constructed on the debris avalanche or on the immediate north slopes of North Fork Toutle River.
- d) The road from Windy Ridge to Spirit Lake should be left essentially at its present level of development for the duration of the plan with traffic carefully controlled and limited to a low level. The status of the road should be reviewed after 10 years of use. However, bus transportation of visitors to the area should proceed only after careful evaluation of public safety questions and of potential impacts on sensitive geological and biological features and on the natural processes of erosion and biological recovery.
- a) Opening of the Castle Lake Road is a desirable development for the future, but its implementation should be deferred pending further assessment of the stability of the debris dam.
- f) The Board is concerned about the possible impact of visitors on the sensitive elk calving area at Goat Marsh. We recommend that Trail 237 be closed to motorized vehicles, and that Road 8123 be closed to snowmobiles and not be snow-groomed.
- g) The Board recommends the use of administrative closure of trails as a tool to accomplish the goals of the Wildlife Management Plan (as developed according to paragraph 5 above) including restricted access to lakes of special research interest. The Board will provide a list of such lakes in a later recommendation for use by the Monument staff.

FOREST SERVICE RESPONSES

- c. The upper corridor for SR 504 is part of the selected alternative.
- d. The selected alternative includes phasing out the existing access road to Spirit Lake. The phase-out is intended to allow the completion of ongoing research projects in the vicinity.
- e. Road access to Castle Lake has been dropped from the selected alternative, except for research and administration.
- f. Snowgrooming on Road 8123 is no longer included in the selected alternative; Goat Marsh will be closed to snowmobiles; and other ORV's will continue to be prohibited within the Monument.
- g. Trail access to the Mt. Margaret area has been reduced from the preferred Alternative D shown in the DEIS. Trail access to Holmstedt Lake has been eliminated in the selected alternative, and in some specific locations, such as Shovel, Grizzly, and Snow Lakes, trails have been relocated higher on slopes with primitive trails to these lakes. This will reduce traffic to these lakes and thus protect the recovering shorelines. Trails throughout the backcountry will be routed as much as possible to avoid sensitive areas. The Backcountry Management Plan will include a provision for monitoring user impacts, and restrictions will be used when unacceptable levels of impacts are found. The plan will also provide criteria to determine times of trail construction relative to lakeshore recovery and fire hazards.

FOREST SERVICE RESPONSES

- h. Horse use under the selected alternative is restricted to green-timber areas within the Monument.

- i. The USGS facility at Harrys Ridge is retained as part of the selected alternative.

- j. The selected alternative includes recommending to the FAA that an assigned radio frequency apply to the airspace over the Monument.

- k. The FEIS includes these revisions showing the effects of alternatives on recreational uses of wildlife.

7. The selected alternative includes the development of a Cave Management Plan. Unregulated research in the caves is not encouraged under the selected alternative since many of the caves are highly sensitive. Access to Ape Cave is unrestricted, but use of Lake Cave is discouraged since this cave is sensitive to disturbance.

SCIENTIFIC ADVISORY BOARD COMMENTS

- h) Horse use of the Monument should be restricted to areas where vegetation and land surface were not significantly impacted by the eruption. Horse use can begin in eruption-impacted areas only after the vegetation and land surface has developed the resiliency to accept such use.

- i) The U.S. Geological Survey facility at Harrys Ridge is essential for monitoring and telemetering data on volcanic eruptions and must be retained in all alternatives.

- j) Steps should be taken as soon as possible to establish a permanent dedicated radio frequency for the control and warning of aircraft within and near the Monument.

- k) The Comprehensive Management Plan should be revised to show more clearly the effects of the various alternatives on the recreational use of wildlife, both consumptive and non-consumptive.

7. The Cave Management Plan should ensure that adequate protection is provided for potentially rare or endangered faunal species, particularly the Thompson's Big-Eared Bat and the Larch Mountain Salamander. The preferred method of protection is to keep the high-sensitivity caves remote by avoiding the construction of new roads, trails, and public facilities in their vicinity. The actual closure of critical caves should only be done on a case-by-case basis.

The Cave Management Plan should encourage and facilitate scientific research on the caves and their faunas, and should provide for entry (on a tightly controlled basis) into highly sensitive caves. The plan should also accommodate scientific and educational groups to the greatest extent possible, consistent with protection of the cave's features.

The general public should have unrestricted access only to Ape Cave and Lake Cave. These two caves are already well known and heavily used and they are best suited to absorb heavy visitation. Facilities that aid and encourage visitation should be limited to the one area near the main entrance to Ape Cave and the Lava Cast area.

8. The preceding paragraphs of the Recommendation all represent a consensus of the Scientific Advisory Board. In addition, individual members of the Board have prepared statements on the following issues:

- a) Should there be a cross-Monument highway?

The Scientific Advisory Board addressed the issue of a cross-Monument highway during the meetings on the DEIS/CMP. The cross-Monument highway concept strongly effects the balance between maximizing public enjoyment and preserving natural processes with their associated research opportunities.

Arguments in favor of the highway had the following focus: the visitor facilities on the west side of the NVM would be connected with the Randle-Cougar road along the east side; increased travel options through and around the NVM; maximum visitor enjoyment of the Monument provided in one day rather than two or more; improved evacuation options for emergencies; and avoidance of dead-end visits on SR 504 and Forest Service Road 99. Another point is that the public could reach the best volcano view sites from their own vehicles if the highway was built rather than using concessionaire transportation.

Those not in favor of a cross-Monument highway felt that a route through the Spirit Lake Basin (the most probable one) would severely disturb the avalanche-debris deposit, a unique geologic feature. In addition, a highway on the avalanche-debris deposit would be extremely expensive to build and to maintain because of the unconsolidated nature of the deposit. Erosion, seismicity and possible pyroclastic flows from the volcano orator still threaten the basin and could periodically disrupt a highway across the area. Open public access to this area is also questionable from a safety standpoint.

Though divided on this issue, the Board felt most strongly that a cross-Monument highway should not be considered in the near term. The idea of reopening the issue in 10 to 15 years was not objectionable to any Board member or representative.

- 8a. The selected alternative will end SR 504 at Coldwater Lake. The depth and unconsolidated nature of the debris avalanche deposits between Coldwater Lake and Spirit Lake make road building in the area extremely difficult and expensive, if not impossible, at this time. The continual erosive nature of this material, which often results in deep gullies occurring overnight, makes keeping a passable road prohibitively expensive. The North Fork of the Toutle River is constantly changing location, and would require major modification of the landscape and great expense to provide a suitable crossing. In the event of volcanic activity, any investment in a road on the debris avalanche would have a high probability of being covered over or washed away. This decision does not preclude reevaluating the extension of SR 504 during future planning.

SCIENTIFIC ADVISORY BOARD COMMENTS

b) Access versus protection for research sites.

Research opportunities within the National Volcanic Monument are enhanced by two conditions: (1) a reasonable degree of protection from human impact and (2) accessibility to research sites. These two requirements are commonly in conflict and a reasonable balance must be achieved. Zeal to protect critical areas should not leave them so isolated that research is impeded. Many critical areas of great geologic interest are in remote and/or heavily vegetated parts of the Monument, reached only with great difficulty without trails. In general, a well developed trail system throughout the Monument will be a positive asset to most field research projects and the timely development of such a trail system is encouraged. Certain biologically sensitive areas, however, may be adversely affected to a high degree by human entry even on foot. Such areas must be identified on an individual basis and left remote. In general, however, the DEIS tends to over-emphasize the fragility of natural systems within the Monument, particularly the geologic/volcanic features. Expert appraisal on a case-by-case basis is needed. The science advisory panel could be called upon to assist in deciding which areas be left remote and for how long.

FOREST SERVICE RESPONSES

- 8b. As described in Appendix B, alternative access proposals were evaluated to minimize disturbances both on natural features, and also on natural processes. For example, in instances where construction presented minimal physical alterations, a process such as surface drainage was felt to be altered, so the proposal was avoided. Each alternative was evaluated not only in terms of disturbances to physical features, but also on processes. After public comment, this ultimately led to the selected alternative.

IV. SUBSTANTIVE COMMENTS AND RESPONSES

A substantive public comment is "a comment which provides factual information, professional opinion, or informed judgment which is pertinent to the decision being considered." Substantive comments indicate whether the analysis is incomplete or otherwise incorrect.

For public comments received for the Mount St. Helens Comprehensive Management Plan (DEIS), comments were considered substantive if they met any of the following criteria:

- A. Respondent criticized methodology and indicated why it was weak.
- B. Respondent stated DEIS was inadequate and was specific and had supporting rationale.
- C. Respondent specifically questioned the alternatives, or did not understand the meaning of an alternative.
- D. Respondent requested specific additional information, not contained or referenced in the DEIS, to adequately understand and be able to respond.
- E. A federal, state, or local agency with jurisdiction by law disagreed with the proposal because of environmental impacts and specified mitigation measures necessary to implement or suggested another alternative.
- F. Respondent identified specific mitigation measures.

Based on the above criteria, virtually all of the comments were considered substantive. Many comments received were worded similarly, so in these situations the comments were combined under one comment statement. Substantive comments follow by subject, with the Forest Service's response to each comment.

SUMMARY OF PUBLIC COMMENTS

Letter Number	Comment No.	Comments	Responses
Access (311C, 400S)			
279*, 352, 220*, 309, 185, 362, 210, 240, 261, 273*, 154, 178, 214, 216*, 274*, 297, 303, 304, 324, 325, 328, 341, 348, 363	1.	Request that Road 99 and SR 504 be tied together to provide a loop opportunity. (24C, 42S)	1. The selected alternative will and SR 504 at Coldwater Lake. The depth and unconsolidated nature of the debris avalanche deposits between Coldwater Lake and Spirit Lake make road building in the area extremely difficult and expensive, if not impossible, at this time. The continual erosive nature of this material, which often results in 50-foot deep gullies occurring overnight, makes keeping a passable road prohibitively expensive. The North Fork of the Toutle River is constantly changing location, and would require major modification of the landscape and great expense to provide a suitable crossing. In the event of volcanic activity, any investment in a road on the debris avalanche would have a high probability of being covered over or washed away.
252, 275, 349, 357, 266, 268, 4, 78, 118, 199, 202, 246, 254, 263, 361	2.	The road should not be extended to Spirit Lake from either the east to west. (15C, 17S)	2. Comment agrees with the preferred DEIS Alternative "D".
218, 23, 224, 226, 289, 9, 120, 247, 286, 294, 223, 353, 288, 307, 308, 11, 77, 144, 178, 211, 220*, 274*, 291	3.	Improve Roads 25 and 99 as soon as possible for safety. (23C, 36S)	3. Increases in public travel over Roads 25 and 99 have required early reconstruction efforts to enhance public safety along these two routes, and road design criteria have already been completed for Road 99.
261, 198	4.	Manage Road 26 for two-way traffic without improvement. (2C, 5S)	4. Road 26 will be operated for two-way traffic; except for possible short periods of one-way traffic during reconstruction of Roads 99 and 25.
125, 288	5.	Support the closure of Road 8123. (2C, 3S)	5. Comment agrees with the preferred DEIS Alternative "D".
220*, 222*, 261, form letter	6.	Oppose the reconstruction of SR 504 because of extreme cost. (165C, 191S)	6. Yes, the reconstruction costs for SR 504 are high; however, this state highway will replace service to traditional commercial and recreational pursuits throughout the vicinity. Considerable cost savings have already been realized in reducing the design speed and assessing alternate route locations.
178	7.	Improve roads for safety. (1C, 1S)	7. Roads open to the public will be constructed or reconstructed to ensure compliance with the 1966 Highway Safety Act, 23 USC, Title 402(a), which requires highway safety standards for all Federal Agencies.
123, 10, 262, 28, 275, 195, 357, 346, 347, 21, 46, 305, 306	8.	Support extending SR 504 to Coldwater Lake (13C, 16S)	8. Comment agrees with the preferred DEIS Alternative "D".

Letter Number	Comment No.	Comments	Response
275, 263, 46, 357, 125, 154, 179, 215, 355, 240, 288, 294, 302, 340, 341, 361	9.	Support the upper corridor for SR 504 to Coldwater Lake. (16C, 18S)	9. Same as response to comment No. 8.
223, 256*, 198, 216*, 269, 270, 382	10.	The plan should address the many opportunities available between US 12 and US 14. (7C, 11S)	10. The recently developed <u>St. Helens Corridor study</u> , (Federal Highway Administration, February 1985), compared costs between proposed improvements utilizing existing transportation routes between Carson (State Route 14), and Randle, Washington (U.S. Route 12).
			These existing routes consist of interconnected county and Forest Service roads for 86.7 miles, which are seasonally accessible. Of the nine existing segments of roadway from Carson to Randle, the Forest Service has control of 48.44 miles, Skamania County 35.26 miles, and Lewis County 3 miles.
			A transportation plan is presently being completed by the Forest Service on a portion of Road 25, with construction scheduled to a Forest development double lane standard in Fiscal Year 1987. A key connection for a north-south route involves upgrading the Road 51 connection between Roads 90 and 30. The selected alternative includes developing a Forest Service feasibility study for upgrading Road 51 to road standards consistent to those planned for Roads 25 and 99. This road connection would provide a Randle to Carson road, improving access to the east side of the Monument, while enriching travel and economic opportunities between the Columbia Gorge and Mt. Rainier National Park.
294, 345	11.	Limit the roaded public access in the Monument to Road 99 to Windy Ridge.	11. Road 99 will be reconstructed to accommodate increased public travel to the Windy Ridge viewpoint. Without some additional access, views of the crater and dome, which are of very high interest to most visitors to the Monument, would not be possible.
355	12.	No improvements to Road 99 because of the unstable terrain.	12. As the traffic increases, improvements to Road 99 are necessary to ensure public safety. The improvements will disturb some of the terrain adjacent to the present roadway, but will not exceed the biophysical carrying capacity for this area. Road construction disturbances will also be mitigated through innovative design concepts and newer construction techniques.
88	13.	Improve Road 99 to Windy Ridge. (1C, 1S)	13. Improvements are necessary to Road 99 to ensure the public's safe travel, and to meet the Highway Safety Act, especially since a large number of visitors will continue to visit the Windy Ridge viewpoint.

Letter Number	Comment No.	Comments	Response
318	14.	Improve Road 8312 to Marble Mountain, so a bus can turn around. (1C, 1S)	14. Road 8312 to Marble Mountain was not selected for improved access because of the high potential that increased traffic would disturb adjacent sensitive elk habitat.
318	15.	Construct a road on Norway Pass Trail. (1C, 1S)	15. Constructing a road on Norway Pass Trail would exceed the biophysical carrying capacity for this area, so no new roads are recommended.
279*	16.	Improve Road 2588 from Road 25 to Road 83 to a two-way paved standard. (1C, 1S)	16. The portion of Road 2588 within the Monument was damaged by a mudflow, and reconstruction is shown as part of the final proposal. Public use on this road outside of the Monument is limited, so reconstruction is not considered to be cost effective, but upgrading could be reconsidered in the future if resource management outside of the Monument later justifies reconstruction costs.
245	17.	The Green River loop route was not sufficiently analyzed. (1C, 1S)	17. The Mount St. Helens Land Management Plan (October 1981) analyzed the Green River loop route as part of Alternative No. Six. The route was not selected because of high potentials for degrading watershed values, wildlife and habitat disturbances, and high construction costs. This route would require acquisition of 20 miles of road through private property, and would provide very limited viewing of other devastated areas. In accordance with the Monument Act, Section 4(e)(2), roads should be located generally in areas which were developed prior to the 1980 eruption. A Green River loop road was not present before the eruption, and is not needed for future recreation or interpretation.
352	18.	Extend SR 504 to Harrys Ridge to achieve the best view. (1C, 1S)	18. The emergency funding allocated to restore SR504 stipulated that the route should serve essentially the same purpose and destination as the previous route. Extending SR504 to Harrys Ridge doesn't fit the funding criteria, and would severely disturb the debris avalanche overtopping which is a key feature in this area.
327, 342, 294, 125, 275, 154, 179, 215, 252, 361, 357, 288, 134, 240	19.	Road 83 should not be tied across the Smith Creek mudflow to Road 94. (14C, 18S)	19. Comment agrees with DEIS Alternative "D".
195, 123, 375	20.	No more roads are needed than presently exist. (3C, 4S)	20. In accordance with Section 4(e)(2) of the Monument Act, no roads other than those needed for recreation and interpretive purposes are proposed.
305, 222*	21.	Need to further explore the travel patterns between Mt. Rainier and the Monument. (2C, 2S)	21. Same as previous response No. 10.

Letter Number	Comment No.	Comments	Response
206	22.	Need to tie Road 83 to Road 94 for emergency medical services and other reasons. (1C, 1S)	22. The meandering and unstable nature of Smith Creek will continue to make considerable channel changes in the area of Road 83 and the crossing tie to Road 94. The instability of foundation materials for a permanent bridge, combined with massive hillside movement, make a tie between Road 83 and 94 very costly and risky in terms of long-term stability and operational costs.
277*	23.	Recommend that the Forest Service use the National Park Service road standards. (1C, 1S)	23. The Gifford Pinchot National Forest has recently completed a comparison between the National Park Service and Forest Service road standards in regards to satisfying the 1966 Highway Safety Act, 23 USC, Title 402(a). These road standards are very similar and both comply with the Act; therefore, we have chosen to use the Forest Service standards.
216*, 274*, 304, 307	24.	Roads 25, 90, 51, 30, and 99 should all be improved to 2 lane pavement and kept open all year round. (4C, 14S)	24. Same as previous response No. 10. Cost effectiveness will be an important decision criteria, as each individual road is evaluated for snowplowing.
291	25.	Construct SR 504 on the pre-eruption location. (1C, 1S)	25-26. Constructing State Route 504 was analyzed relative to impacts on wildlife, fish habitat, recreation/interpretation, cost effectiveness, impacts on research, stability of geologic features, public safety, and long-term maintenance and operation costs.
273*	26.	Support the lower corridor for SR 504. (1C, 3S)	<p>Either route corridor, lower or upper, will affect wildlife, but the height of roadside out slopes will be much less of an obstacle to deer and elk crossing the upper route due to the less severe slope of the terrain. Neither route location will severely affect fish habitat through the use of bridges to span streams. The location of the upper corridor provides a much better view of the effects of the volcanic eruption than the lower route at near valley bottom.</p> <p>The upper route is much more cost effective than the lower location in terms of initial construction and long-term maintenance costs, due to the more stable terrain and the less steep topography. However, the cost of snowplowing required for winter use of the upper route may equal the rock slide potential on the lower corridor.</p> <p>The stability of geologic features between the lower and upper corridors is key not only to the costs, but also to public safety, and impacts to scientific research opportunities. Since it is above the instability of the mudflow and debris avalanche areas, the upper route significantly reduces the risk to public safety and impacts on research activities on the valley floor.</p>

Letter Number	Comment No.	Comments	Response
302, 304	27.	Favor a loop opportunity between SR 503 and SR 504. (2C, 2S)	27. There is no anticipated loop opportunity between State Routes 504 and 503 due to the unstable geologic features on the northwest flank of Mount St. Helens, and the instability of the South Fork Toutle River banks. Construction would be extremely expensive, and suitable foundation materials to support bridge structures does not exist. Road maintenance costs would be excessive for a tie between SR 504 and 503, and keeping the road passable would present daily problems since the debris avalanche is continually moving.
9	28.	Roads 25, 26, and 99 are among the best routes because of the incredible and unmatched views, and the proximity to other attractions such as the Mt. Adams Wilderness. (1C, 1S)	28. Same as previous response No. 10.
254	29.	Good access should be provided from all sides. (1C, 1S)	29. Same as previous response No. 10.
381*	30.	A comparison of the pre and post eruption facilities should be made and new roads and upgrading justified. (1C, 1S)	30. A comparison of the pre and post eruption road systems, in view of the projected public demand for access, balanced with authorities stated in the Monument Act, were the underlying bases for the seven alternatives displayed in DEIS.
381*	31.	Train and bus travel are the best alternatives to minimize impacts. (1C, 1S)	31. Train access was used for making relative cost comparisons (in Appendix F of the DEIS), but construction of a railroad access system is quite similar to constructing a major highway. Where there is a need to protect public safety, or to minimize environmental impacts, the concept of using buses was included in Alternatives B, C, D, and E; as displayed in Chapter II of the DEIS.
381*	32.	Oppose a cross-Monument highway or road because of disruption of wildlife. (1C, 1S)	32. Comment agrees with the DEIS Alternative D.
19	1.	The financial impacts from hunting and fishing should be identified and given consideration. (1C, 1S)	1. The FEIS has been changed to better identify by alternative the hunting and fishing days supplied; however, the financial impacts for these activities or any other recreation activities have not been displayed. Average expenditures for hunting and fishing are available in research literature. Figures like this were not displayed in this plan because they would be used to determine a preferred alternative.

Letter Number	Comment No.	Comments	Response
Randle Form Letter	2.	The \$64 million cost of SR 504 is not justified for a deadend road. (162C, 18MS)	2. Same as previous response No. 6 under Access section.
24, 344	3.	Question if Alternative D is really the most cost effective. (2C, 2S)	3. The costs of the DEIS Alternative "D", including the cost of constructing State Route 504, are not the most cost effective among the alternatives shown. However, whether the costs of State Route 504 are included in determining the average cost per visitor day or not, the worth of the investment in State Route 504 goes far beyond just access to the newly created National Volcanic Monument. Since the volcanic eruption and the loss of the Spirit Lake Highway, old SR 504, public access and access to vast areas of private land were denied. This has created a loss of economic security to an area highly dependent upon timber production from the vast private land holdings and public recreational activities. The worth of replacing this portion of the State of Washington's highway infrastructure was well documented in the Governor's Public Access Task Group Report of 1982.
344	4.	The SR 504 cost should have been used to determine the average cost per visitor day. (1C, 1S)	4. Same as response to No. 3 above.
25, 15, 20, 67, 85, 227	5.	Less money should be spent on this proposal, and priority given to upgrading the existing sites in eastern Lewis County. (6C, 6S)	5. High priority has been given to eastern Lewis County as well as Skamania County with some 29 million dollars worth of road improvements leading visitors into the Monument from the east side. An additional 16 million dollars worth of further road improvements are scheduled in fiscal years 1986-1989.
280	6.	Need to display the O&M costs. (1C, 1S)	6. The operation and maintenance cost are summarized in Table 41 of Chapter VI of the DEIS.
280	7.	Need to identify funding needs for recreation research. (1C, 1S)	7. The FEIS displays the cost for monitoring, including recreation research.
24, 276, 357	8.	Concerned about the high cost of road development in Alternative D. (3C, 3S)	8. Yes, the costs are high for the proposed road development in the DEIS Alternative "D". However, the present annual cost for road maintenance on routes open to the public, like Road 99, is the highest of all the roads in the National Forest. In order to control these annual operational costs, and to comply with the Highway Safety Act, these emergency access roads now have to be reconstructed; since they were not originally roads designed and constructed for public use.

Letter Number	Comment No.	Comments	Response
50, 111	9.	The access from Randle (east side) is already paved and ready for visitors and therefore more cost effective. (2C, 2S)	9. The access from Randle (east side), namely Roads 25, 26, and 99, does have some paved surfaces, but originally some of these roads weren't paved prior to the eruption of Mount St. Helens. As a result of the massive timber salvage operations after the eruption, more of these roads were paved to support the increased log truck use; with recreational traffic also benefitting from the enhanced paved surfaces. However, since the volcano has attracted more and more visitation, the recreation traffic has intensified to the point where operational restrictions had to be invoked, such as the one-way system on the 25 and 2573, while waiting for much needed reconstruction.
<u>Coldwater/Johnston Ridge Complex</u> (139C, 160S)			
2, 18, 47, 123, 124, 125, 131, 154, 178, 179, 193, 199, 202, 215, 240, 241, 244, 252, 254, 258, 262, 263, 268, 269, 275, 280, 282, 283, 284, 286, 288, 289, 293, 294, 295, 297, 300, 304, 305, 310, 318, 319, 321, 327, 329, 340, 341, 342, 344, 345, 346, 347, 349, 352, 354, 355, 361, 362, 364, 366, 375 378	1.	Oppose the tram for one or more of the following reasons: It would cost the visitor too much; it would have a visual impact on the view of the mountain from Coldwater Lake; it would be unsafe because of high winds and earthquakes; it would make it difficult to evacuate Johnston Ridge in the event of volcanic activity; it would become the attraction rather than the means of access, thus creating a Disneyland atmosphere; and it is unnecessary since the sensitive feature it was intended to protect has already been roaded by the Corps of Engineers. (62C, 69S)	1. The selected alternative has been changed to replace the aerial tram access to Johnston Ridge shown in Alternative D with a single lane shuttle bus access route as shown in Alternative C. The principal reason for proposing the aerial tram was our concern for protecting the debris avalanche near Coldwater Lake. This area has been substantially modified in the past several years by the U.S. Army Corps of Engineers during their efforts to stabilize the Coldwater Lake blockage. In addition, they have constructed a road along south Coldwater Creek to facilitate the construction of the tunnel needed in the permanent solution of the Spirit Lake problem. It is feasible to use major portions of this road to access Johnston Ridge. The single lane shuttle bus access road will allow the public to enjoy the excellent views and interpretive opportunities available at Johnston Ridge, while improving the conditions that were cause for concern in your letters; i.e.: a) reduces the potential for high winds or earthquakes to disrupt service; b) improves access for evacuation; c) reduces the visual impact on the view from Coldwater Lake; d) improves access and reduces cost for U.S. Geological Survey monitoring and other research; e) reduces the cost to the visitor (\$5 to \$6 for the aerial tram compared to \$3 to \$4 for the bus).
333, 46, 266, 249, 254 273, 301, 27	2.	Run tram all the way to the observation post to avoid the need for the shuttle bus, and to eliminate the tram from the view from Coldwater Lake. (8C, 11S)	2. The alternative to run the aerial tram directly to the observation post was analyzed, and it was not economically feasible since it would cost about \$8 million to build.
120, 305, 319, 362	3.	Construct double lane road to Johnston Ridge for safety. (4C, 5S)	3. A double lane road to Johnston Ridge would create major impacts on water quality and research, primarily due to unstable soils and steep topography. The recreation experience at Johnston Ridge would also be degraded by the

Letter Number	Comment No.	Comments	Responsee
321	4.	Construct a jeep route, rather than the aerial tram or shuttle bus for access to Johnston Ridge. (1C, 1S)	4. A jeep route would accommodate less than 5 percent of the anticipated use.
283, 286, 318, 244, 288, 254, 305, 314, 340, 349, 366*	5.	Prefer the shuttle bus to Johnston Ridge. (11C, 11S)	5. Same as response to No. 1.
288, 262, 254	6.	Prefer a shuttle bus to Johnston Ridge, but only when demand warrants it. (3C, 3S)	6. The demand necessary to adequately support a shuttle bus to Johnston Ridge presently exists. State Route 504 will probably be completed to Coldwater Lake by 1990. The shuttle bus concession would be implemented at about that time.
284	7.	Opposed to the shuttle bus because of the roads, storage buildings, garages, fuel storage, etc. (1C, 1S)	7. The facilities needed to support the bus shuttle will either be at Coldwater Lake or on private land outside the Monument. Any facilities developed within the Monument must meet architectural standards that provide for visual compatibility with the landscape.
18, 47, 294, 342, 123, 202, 300	8.	Opposed to a shuttle bus. (7C, 12S)	8. Same as response to No. 1.
355	9.	No road to Johnston Ridge in the next 10 years. (1C, 1S)	9. The biophysical assessment in Appendix B indicates that the sensitive area is the debris avalanche deposit in the Coldwater Lake area and the blast pyroclastic flow deposit in south Coldwater Creek. The deposits in the Coldwater Lake area have been substantially modified by the Army Corps of Engineers in efforts to stabilize the Coldwater Lake blockage. The blast pyroclastic flow deposit has undergone minor surface modification in the vicinity of the downstream portal of the Spirit Lake tunnel. An access road was constructed in 1984 on the south margin of South Coldwater Creek, for the most part avoiding the blast pyroclastic flow deposit. The shuttle bus road will be constructed about 1990 in these modified areas.
246, 295, 268, 282, 275, 240, 327, 179, 247, 258	10.	Suggest constructing the observation post near Elk Prairie (Ash Flats) on Coldwater Ridge rather than at Johnston Ridge. (10C, 12S)	10. The Elk Prairie site was analyzed at the time alternatives were considered, and was not selected to be included in the alternatives. The section in the FEIS on other alternatives considered but not analyzed in detail has been changed to show the rationale for not studying this site further. Some of this rationale are as follows: (a) The view is less spectacular since it is about nine miles away from the crater and dome, and has two ridges blocking the view of the lower slope of the mountain, the debris avalanche, the overtopping of Johnston Ridge and Spirit Lake.

Letter Number	Comment No.	Comments	Response
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			<p>(b) It would concentrate visitor use near the most hazardous fuel types, and encourage easy access to recovering lakes.</p> <p>(c) It would be a less appealing experience for interpretation because of the view discussed in (a) above, and because the rapid changes since the May 1980 event would be less obvious.</p> <p>(d) It would require acquisition of private land for the access and development, and it would be difficult to manage for a quality view since the area to the northwest is all privately owned.</p>
263, 346, 294, 347, 327, 310, 178, 353, 288, 361, 10, 123, 202, 215, 355, 300, 321, 357, 364	11.	Use the Coldwater Lake complex area as the principal viewpoint with trail access to Johnston Ridge. (19C, 20S)	<p>11. The photos in Chapter II compare the view from Coldwater Lake with the view from Johnston Ridge. Some of the important benefits that would be eliminated by not accessing Johnston Ridge are:</p> <p>(a) The improved access for U.S.G.S. monitoring and other research.</p> <p>(b) The opportunity for visitors to observe scientists at work.</p> <p>(c) The opportunity for private enterprises.</p> <p>(d) The excellent view and interpretative opportunities.</p>
200	12.	Shuttle bus to Harrys Ridge. (1C, 1S)	<p>12. A road to Harrys Ridge would damage one of the most sensitive features in the Monument, the overtopping of the debris avalanche on Johnston Ridge. The space at Harrys Ridge is very limited for developing facilities and for turning around buses. The 2-mile trail from Johnston Ridge to Harrys Ridge adds to the experience while still remaining within the time limits and physical abilities of most visitors.</p>
346, 275, 355, 120	13.	Gift shop and restaurant should be proposed outside the Monument by private enterprises. (4C, 6S)	<p>13. Forest Service administration of an integrated concession for public services plus Johnston Ridge access would ensure that Monument visitors will receive quality services at relatively reasonable prices. An integrated concession should also present an attractive opportunity for private-sector investment. The concession will be made available for public bids during project implementation. If no successful bid is selected, then such service will, by necessity, be provided outside of the Monument. Presently, there are none of these types of services beyond the Camp Baker area, 20 miles to the west. Visitors will arrive at Coldwater Lake and be there for 4 hours or longer, so food service at a minimum is appropriate. The major landowner</p>

Letter Number	Comment No.	Comments	Response
352	14.	Construct SR 504 to Harrys Ridge. (1C, 1S)	14. Same as response to No. 12 above.
310	15.	Favor a shuttle bus to Coldwater Lake in lieu of SR 504. (1C, 1S)	15. A bus shuttle, monorail, and light rail system were briefly examined and eliminated from further consideration because of the high cost to the visitor.
314*	16.	The best launch seems inappropriate since motors are restricted. (1C, 1S)	16. The selected alternative allows boats with electric motors, and some type of parking and launch facility are necessary. The final design will scale the facility to the type and anticipated amount of use. A hardened facility for launching will prevent lakeshore damage at other potential launching areas.
4	17.	A 600-car parking area, restaurant, and increased camping would attract too much use. (1C, 1S)	17. The selected alternative does not plan any developed camping within the Monument. The facilities are planned to relieve congestion and improve the experience. Also the demand for the experience is there so visitors will come. This proposal will enhance their experience, prevent damage, and provide for safety.
313, 381*	18.	Reconstruct U.S.G.S. facilities at Harrys Ridge since they will continue to be necessary (building, helispot, and antenna). (2C, 2S)	18. The selected alternative has been changed to allow the continued maintenance of the present U.S.G.S. facilities at Harrys Ridge. Reconstruction potentials and limitations will be explored during project planning.
381*	19.	Provide power and telephone cable to the U.S.G.S. antenna on Harrys Ridge. (1C, 1S)	19. The feasibility and limitations for providing telephone and power to Harrys Ridge will be assessed during project implementation.
268, 307, 244, 275, 282, 271, 294, 327, 355, 293	1.	Close the Goat Marsh RNA to snowmobiles to eliminate potential damage to vegetation and hydrologic patterns. (10C, 11S)	1. The selected alternative has been amended to close the Goat Marsh RNA to over-the-snow vehicles.
244, 294, 275, 355, 364	2.	End snowgrooming of Road 99 at Windy Ridge and close the Pumice Plain to snowmobiles. (5C, 6S)	2-3. Snowmobile use, perhaps more than any other recreation use, has been extensively monitored in the past, and experience has shown that it has a very low impact.
124, 134, 154, 195, 215, 240, 249, 333, 334, 345, 337, 357, 285, 355, 288, 263, 285, 193, 47, 327, 202	3.	Snowmobiles should be prohibited in the Monument as it seems inappropriate. (21C, 27S)	The greatest potential impact of snowmobiles on the natural features and processes is from operating snowmobiles when there is insufficient snow cover to prevent contact of the machine with vegetation or the soil. The Monument Manager will monitor over-the-snow motorized use and regulate this use to prevent impacts to the natural features and processes.

Letter Number	Comment No.	Comments	Response
			<p>There is nothing in the Act to indicate that snowmobiling should be prohibited from the Monument. Snowmobiling has been a popular and traditional winter use of the area around Mount St. Helens.</p> <p>Snowgrooming will add to the separation of snowmobiles and cross-country skiers because the groomed trails will allow snowmobiles to disperse more quickly.</p> <p>The selected alternative presents the objective to snowgroom a limited number of roads, but actual snowgrooming will depend upon the availability of state funding. The objective for snowgrooming in the selective alternative for Road 99 has been changed to Cascade Peaks viewpoint.</p> <p>It was the intent of the preferred alternative that the snow trails designated for cross country skiing be closed to motorized use. The FEIS has been changed to clarify this intent.</p>
257	4.	Cross country ski trails should be closed to snowmobiles to improve the experience. (1C, 2S)	4. Same as response to No. 2.
294, 361, 310, 327	5.	Limit snowmobiles to groomed trails or roads. (4C, 4S)	5. Same as response to No. 2.
362	6.	No snowmobiles in Mt. Margaret area. (1C, 1S)	6-7. The management objective for the Mt. Margaret area and Mount St. Helens slopes is to provide a semi-primitive, non-motorized experience. Snowmobiling has not occurred here in the past because of the extremely steep topography. The area will be monitored by the Monument Manager, and if this activity is observed, the area will be closed.
362, 212	7.	No snowmobiles on the mountain slopes. (2C, 2S)	
27, 244, 131, 282, 125, 307, 271, 362, 275, 327, 361, 310, 293, 257, 212, 254, 284	8.	Wants more separation of cross-country skiing and snowmobiling to reduce conflict. (17C, 20S)	9. The Monument Manager will monitor winter recreation use and as areas of conflict are identified, the Monument staff will work with user groups to identify single use areas, if necessary. It would be unfair to make decisions on separation of users without input from all types of users.
275, 293, 282, 27	9.	No snowmobiling north of Roads 81 and 83 on the entire south side of the mountain. (4C, 5S)	
275, 244, 310, 282, 257, 293	10.	Do not groom 8123 as it is an excellent cross-country ski trail and will attract snowmobiles to the Goat Marsh RNA. (6C, 8S)	10. The selected alternative has been changed to eliminate snowgrooming on Road 8123, and the Goat Marsh has been closed to all motorized uses.
307, 271, 27	11.	Provide a separate area for snowplay. (3C, 3S)	11. Snowplay is expected to occur naturally, especially within or near snow-parks. This use will be administered and regulated as needed for resource protection by the Monument Manager.
310, 284	12.	No snowmobiling on the lahar. for 251	12. Same as response to No. 2.

Letter Number	Comment No.	Comments	Response
244, 257	13.	No snowmobiling north of Road 81 between 8123 and 8100830. (2C, 3S)	13. Same as response to No. 8.
244, 27	14.	Agree with plan to separate users at Johnston Ridge. (2C, 2S)	14. The change to a shuttle bus access route will probably reduce winter use on Johnston Ridge. The selected alternative continues to close the ridge to over-the-snow vehicles to provide separation of users, thus reducing potentials for conflicts.
327, 329, 282, 293	15.	Oppose grooming of Road 99 because it will damage the resources, provide access to the pumice plains, and impact research. (4C, 4S)	15. Same as response to No. 2. The topography along Road 99 will prevent much of the off-road snowmobile travel.
271, 300, 294, 275	16.	Agree with sno-park at Road 83, but believe the picnic shelter is not essential as it will attract resource damage and vandalism. (4C, 5S)	16. User groups are encouraged to build and maintain a picnic shelter under the selected alternative. If user groups request this shelter, then construction will be of heavy materials, native rock and large timbers that will be less vulnerable to vandalism.
262, 27	17.	Sno-park areas are needed. (2C, 2S)	17. Traffic congestion because of a lack of parking for winter recreation has been a serious problem. The selected alternative will eliminate this congestion.
261	18.	Expand sno-park at Road 25/99 junction to 40 spaces. (1C, 3S)	18. The present estimate of use indicates that a 20 car (with trailers) parking lot will meet the projected demand for winter recreation from the north. Many users will not be pulling trailers which will allow for more than 20 cars when necessary.
261	19.	Consider Ryan Lake for Sno-park. (1C, 3S)	19. The snow level around Ryan Lake would result in a very short winter season. Although no sno-park is planned along Road 26, the area can be used in the winter when snow conditions are favorable.
362	20.	Plow Road 99 in winter. (1C, 1S)	20. The cost to plow Road 99 would be extremely high relative to the cost per visitor.
362, 283, 352, 351	21.	Plow Hwy. 504 in winter. (4C, 5S)	21. The Washington State Department of Transportation does plan to plow to Coldwater Lake.
195, 307, 351, 27	22.	Provide separate sno-park areas for cross country skiers as in Alternative F & G at the former Kalama Work Center site. (4C, 6S)	22. The selected alternative does provide separate cross country ski trails north of Marble Mountain. The sno-park areas in Alternatives F and G were not selected because of unfavorable impacts to Winter Big Game Range. Concentrated winter use and noise from the operation of snowmobiles would put stress on wintering elk and deer.

Letter Number	Comment No.	Comments	Response
284, 293, 355, 202	23.	Opposed to snowmobiles on the Pumice Plain because of damage to the sensitive features, altering the hydrological patterns, and damage to recovering vegetation. (4C, 5S)	23. Same as response to No. 2.
288, 310, 342	24.	Limit snowmobiles to established roads. (3C, 3S)	24. Same as response to No. 2.
27	25.	Prefer Alternative E for winter recreation since it separates cross country skiing from snowmobiling. (1C, 1S)	25. Same as response to No. 8.
284	26.	Close the area north of Roads 83 and 8303 to snowmobiles. (1C, 1S)	26. Same as response to No. 8.
254	27.	Close the area west of Red Hook pass to snowmobiles. (1C, 1S)	27. Same as response to No. 8.
351	28.	Provide snow-park on SR 504. (1C, 2S)	28. The selected alternative recommends that Washington State Sno-park funds be used to plow 200 parking spaces at Coldwater Lake.
254, 271	29.	Provide a snow-park near the junction of Roads 81 and 8122 for cross-country skiing. (2C, 2S)	29. Same as the response to No. 22.
125, 193, 195, 199, 283, 241, 252, 344, 289, 288, 294, 327, 280, 362, 295, 284, 342, 275, 244, 310, 328, 357, 361, 240, 46, 124, 179, 215, 282, 288, 335*, 355, 358, 375, 378, 381*	1.	<u>Castle Lake Proposal</u> (66C, 72S) Unrestricted public access to Castle Lake should be denied to protect high potential scientific values. (36C, 29S)	1-3. Castle Lake is a fragile area of high scientific value, with many current research projects underway. Unrestricted public access would present high potentials for disturbance of these sensitive values. The relative remoteness of this area would also make Forest Service administration of unrestricted use difficult. Since the DEIS was issued, we have learned that the Castle Lake blockage has the greatest potential of all the new lakes for failure.
284, 275, 244, 344, 355, 362, 46, 358, 381*	2.	Access by public should be by trail only. (9C, 10S)	Therefore, the Alternative D has been modified to close the access road about two miles west of the lake, at the point where the road crosses the ridge. Public access would be limited to hiking. The road would be gated and vehicle access permitted only for research and administration.
328, 357, 179, 344, 362, 275, 361, 358	3.	Road access permitted for research and administration only. (8C, 9S)	
344, 244, 310	4.	Object to access for boating on Castle Lake. (3C, 3S)	4. Boating will be limited to the type of boat that can be hand carried for two miles. No motors will be permitted.

Letter Number	Comment No.	Comments	Response
288, 46, 303, 335*	5.	Acquisition of public access rights to Castle Lake unjustified. (4C, 4S)	5. There will be no planned acquisition of public access rights in the selected alternative. The changes described in response No. 1 above, will discourage use to the area, and make acquiring these rights unjustified. The anticipated recreation traffic is about 1,000 vehicles per season. The landowners have traditionally had an open access policy for public recreation and research. If in the future public demands indicate a need for public access rights, the Forest Service will acquire these rights.
279*	6.	Favor Alternative F through road across the south fork of the Toutle. (1C, 1S)	6. Analysis of private land acquisition costs to provide public use and construction costs didn't outweigh the preferred Alternative "D". The difficult river crossing and unstable geologic features that would have to be traversed with the size of a roadway suitable for public use pose major construction problems.
346, 347	7.	No prescribed management fires in this area. (2C, 2S)	7. The selected alternative does not allow prescribed management fires in these fuel types.
275	8.	Opposed to the road to the trailhead for Trail No. 216G, because it is not needed. (1C, 2S)	8. The selected alternative does not acquire public access rights to this road. If the landowner continues to maintain the road, access to the proposed trailhead will be possible. If not, the public will have to begin hiking where the road is impassable.
310	9.	Public access by permit and limited to hiking. (1C, 1S)	9. Anticipated use is expected to be light because of the type of access. If use exceeds the carrying capacity, a permit system could be added by the Monument Manager in the future.
179	10.	No overnight camping. (1C, 1S)	10. The selected alternative does not allow camping in areas of standing dead trees, due to heavy fuels buildup that present high fire hazards.
46, 120, 178, 195, 244, 262, 271, 280, 293, 321, 342, 344, 349, 333, 284, 275, 361, 328, 357, 347, 294, 346, 18, 78, 125, 131, 193, 199, 202, 240, 241, 246, 249, 252, 254, 263, 280, 295, 327, 329, 345, 355, 358, 364, 378, 381*	<u>Spirit Lake Proposal (55C, 63S)</u>		
	1.	Opposed to shuttle bus and proposed development at Spirit Lake at this time, since it violates the biophysical rating and the road is not needed to service the lake control device. (46C, 51S)	1-2 The existing road to the pumping station will not be needed in the future to maintain the lake control structure. Portions of this road exceed the biophysical rating for the area, and are in an area of high volcanic risks from mudflows and pyroclastic flows. The selected alternative has been revised to discontinue maintenance on this temporary road. In this way, the road will self-obliterate naturally, allowing a phase-out period for existing research use.
261	2.	Utilize existing road to the pumping station as shuttle bus access to Spirit Lake. (1C, 3S)	

Letter Number	Comment No.	Comments	Response
195, 271, 321, 333, 361	3.	Hiking trail from Windy Ridge to Spirit Lake is sufficient. (5C, 6S)	3-4 A hiking trail is proposed from Windy Ridge viewpoint north to the Spirit Lake shoreline to a point that provides a good view of the crater and dome. This trail will be extended along the south shore of Spirit Lake to provide a tie to Harrys Ridge. This trail will avoid the unique features and intensive research presently on-going in the bas'n, and could provide access for fishing sometime in the future. Trail construction is scheduled later in the selected alternative, after Johnston Ridge access is provided, to minimize parking lot congestion and trail overuse in this ecologically sensitive and geologically unstable area.
283	4.	Limit lakeside development to an interpretive trail. (1C, 1S)	
18	5.	If road access is to be provided, it should be by car as in Alternative E. (1C, 1S)	
368*	6.	Trail along part of Spirit Lake for fishing. (1C, 1S)	
<u>Mt. Margaret Area (50C, 64S)</u>			
244, 249, 275, 284, 286, 288, 293, 310, 327, 329, 344, 345, 355, 282, 301, 358	1.	Support reestablishment of trails, but only to those lakes that were accessed prior to the eruption. (16C, 18S)	1. The selected alternative has been revised to reflect this comment. Proposed trails to Holmstedt and Venus Lake have been eliminated. In some specific locations, such as Shovel, Grizzly, and Snow Lake, the new trail location will be higher on the slope, with primitive trails to the lake. This will reduce traffic to these lakes and thus protect the recovering shoreline.
28	2.	Support a trail across Mt. Margaret Ridge to Coldwater peak and Johnston Ridge. (1C, 1S)	2. Supports this portion of Alternative D.
261, 297, 220*	3.	Retain option for horse use on trails in the Mt. Margaret area. (3C, 7S)	3. Retaining horse use in the Mt. Margaret area was considered in the early phases of alternative planning and was not shown in any alternative because of the biophysical rating for the area. Horses are a potential source of non-native plants, and also will heavily impact the new ash soils. This decision will be reevaluated as the area recovers.
288, 193, 294	4.	Concerned that increased horse use in the Green River and Mt. Margaret area will cause resource damage. (3C, 3S)	4. The selected alternative excludes horse use from the Mt. Margaret area. The Green River area was less impacted, and is estimated in the biophysical rating to be able to withstand horse use. Horses, as a seed source, are less of an impact here since horses have used the area for many years and the vegetation has historically been influenced by their presence.
244, 268, 275, 284, 310	5.	Reestablish the Miner's Creek Trail No. 212 rather than construct a new trail in Falls Creek. (5C, 6S)	5. The principal reasons for selecting the Falls Creek trail location rather than reopening the Miners Creek trail were recreation experiences and fire hazards. The Miners Creek trail is adjacent to private lands which are not administered by the Forest Service and subject to visual modification. A trail in Miners Creek would bring visitors through large areas of standing dead trees with high fire hazards

Letter Number	Comment No.	Comments	Response
268, 275	6.	Remove roads in the headwaters of Miner's Creek. (2C, 3S)	6. These roads will be closed and nature allowed to reclaim them.
297, 220	7.	Limit Mt. Margaret area to day horse riding only. (2C, 4S)	7. Same as response to No. 3.
239, 297	8.	Falls Creek Trail should be open to horse use since it is in the green timber, and could be used as a loop opportunity with the old Miner's Creek Trail, or Trail No. 211F. (2C, 2S)	8. The selected alternative does not provide a loop trail as described because it would provide easy access to Obscurity and Panhandle Lakes from Road 2612. This would cause damage to recovering shoreline vegetation. Permitting horse use to a dead end situation on the Falls Creek Trail would tempt violations in the sensitive blast area.
297, 220	9.	Provide horse camp facilities at both ends of the Green River Trail No. 213. (2C, 4S)	9. The selected alternative doesn't include any horse camp facilities. The Forest Service will not acquire public access rights on private road 2500 to the west end of Trail No. 213, and therefore, could not ensure access to a horse camp. The east end of the trail near Road 2612 is in the blast area, and not suitable for camping.
275, 374	10.	Need to closely monitor user impacts. (2C, 3S)	10. The Backcountry Management Plan will include provisions for monitoring user impacts. Restrictions will limit uses when unacceptable levels of impacts are found. The plan will also provide criteria to determine the time of trail construction relative to lakeshore recovery and fire hazard reduction.
275, 344, 358, 362	11.	Snowmobiles should not be permitted in the Mt. Margaret backcountry. (4C, 5S)	11. Same as the response to No. 6 under winter recreation.
284, 123, 355	12.	Opposed to horse use in the Mt. Margaret area. (3C, 3S)	12. Alternative D closes all trails in the Mt. Margaret area to horse use.
284	13.	Locate trails higher on the ridge in the area around Shovel Lake rather than in the flat areas around the lakes. (1C, 1S)	13. Same as the response to No. 1.
358	14.	There are too many miles of trail in the standing dead timber areas resulting in impacts on snag dependent wildlife. (1C, 1S)	14. Trails in the Mt. Margaret Backcountry will be routed as much as possible to avoid scattered patches of standing dead trees. Where trails or campsites do occur in standing dead trees, individual trees will be cut only where an unavoidable safety hazard exists. This will be determined on a case-by-case basis.
8	15.	Suggest a system be developed to warn backcountry users of sudden changes in the mountain's activity level. (1C, 1S)	15. The Mt. Margaret area is believed to be safe from most eruptive events with the exception of a major explosive eruption. U.S.G.S.'s ability to predict pending eruptions of this kind has improved to the point where the area could be closed at least several days prior to any eruption.

Letter Number	Comment No.	Comments	Response
374	16.	A detailed plan for Mt. Margaret should be available for public review. (1C, 1S)	16. The Backcountry Management Plan will include normal environmental analysis and public review.
381*	17.	Improving access to Grizzly, Ryan, and St. Charles lakes may adversely affect research values. (1C, 1S)	17. The proposed trail in the Mt. Margaret Lakes area will bypass Grizzly Lake with only a primitive trail to the lake. Ryan Lake presently has road access with no trail to the lakeshore. St. Charles Lake access will not be improved and will not be advertised to the general public.
120, 266	1.	Development (49C, 81S) No developed camping in the Monument. (2C, 3S)	1. The selected alternative has no developed camping planned in the Monument.
195	2.	Campground in the Lewis River area would ruin the wilderness atmosphere. (1C, 2S)	2-3. The selected alternative "recommends" a 60-unit campground in the Lewis River area. Since this area is outside the original land use planning boundary, it is a recommendation that this be considered in the Forest Land Use Plan.
271	3.	Support a campground in the Lewis River area. (1C, 1S)	4. The planned day use at Strawberry Mountain is limited by the topography. Camping facilities were expanded at Iron Creek Campground to meet the estimated camping demand on the northeast side of the Monument.
198, 220*, 223, 261	4.	Want additional day use and camping facilities near Strawberry Mountain and Elk Pass on the northeast side of the Monument. (4C, 9S)	5. The project design for Kalem Springs will include parking and a trail to McBride Lake.
271	5.	Develop new parking and a trail to McBride Lake. (1C, 1S)	6. The unmet demand for picnicking will be in support of day use visitors to the Coldwater-Johnston Ridge area. This demand will be met by developments on private land to the west of the Monument.
19*, 18, 318	6.	Increase picnicking facilities more in line with demand. (3C, 3S)	7. The crowds presently visiting the Windy Ridge site demonstrate the need for this size amphitheater.
354	7.	Do not believe a 200-seat amphitheater is needed at Windy Ridge viewpoint. (1C, 1S)	8. A large proportion of the demand for camping will be enroute to Coldwater Lake. Since there are no suitable areas for developed camping inside the National Forest, this demand will stimulate development on the state and private land to the west.
19*	8.	Increase camping facilities to the level in Alternative E. (1C, 1S)	9. The anticipated size of development is based on demand, and is limited by topography.
328	9.	Dispersed parking and viewing areas could be smaller. (1C, 1S)	10. Same as response to No. 8.
283, 18, 271, 334, 19*, 269	10.	Too few campgrounds to supply the demand. (6C, 6S)	

Letter Number	Comment No.	Comments	Response
9,270	11.	East side should be developed equal to the west side. (2C, 3S)	11. The selected alternative actually provides more access and facilities on the east-side than on the west. The demand on the west will be higher because of easier access from the major population centers. This caused the need for the large parking lot on the west side.
22, 24, 120, 127, 223, 310, 345, 211, 355, 282, 29, 301	12.	Concessions are inappropriate in the Monument. (12C, 17S)	12- Same as response to No. 13 under Coldwater/Johnston Ridge.
120	13.	Opposed to development of restaurants, gift shops, etc., on the Monument. (1C, 2S)	13.
261	14.	Maintain quality control of all commercialism within and adjacent to the Monument. (1C, 3S)	14. Concession permits will be closely administered using current Forest Service policy. All structures will meet the architectural standards for the Monument.
211	15.	Opposed to developments (concessions) at Spirit Lake. (1C, 2S)	15. There are no concessions planned at Spirit Lake.
283, 249, 280	16.	Concessions should remain outside the Monument except for Coldwater Lake area. (3C, 3S)	16. Other concessions will be evaluated upon request using current Forest Service policy. The Ape Cave concession included in the proposal is intended to meet visitor needs for equipment and interpretation, and through improved understanding of the visitors, will continue to help in resource protection.
47	17.	Food service and other concession should be managed to keep prices low. (1C, 5S)	17. The special use permits for concession services will have a clause that requires the vendor to keep financial records that are subject to review and audit by the Forest Service, including review to ensure that the vendor is not charging exorbitant prices.
274*, 328	18.	Identify opportunities for private business to provide services. (2C, 10S)	18. This FEIS provides a significant amount of information on anticipated visitor use by location. A prudent business person should be able to make decisions on where to invest.
269	19.	Questionable if concessions planned can financially make it. (1C, 1S)	19. The concessions will be advertised and interested investors will have the opportunity to evaluate the best data available and bid accordingly.
344	20.	Concessions were used too much to determine a preferred alternative. (1C, 1S)	20. Concessions were not the only factor considered in selecting the preferred alternative. Other decision criteria based on the issues were used to compare alternatives.
328	21.	Having fewer concessions would reduce administrative cost and eliminate other problems. (1C, 2S)	21. Concessions will actually reduce the costs to the U.S. Government, because the special use permittee will pay for the construction of the facility, and also pay for the operation and maintenance costs.

Letter Number	Comment No.	Comments	Response
216*	22.	A year round destination lodge and restaurant should be developed at Swift Creek Reservoir to improve the socioeconomics in that area. (1C, 3S)	22. There are many good opportunities for recreation support type business around Mount St. Helens on private land.
375	23.	Exercise great care in selecting heavy development. (1C, 1S)	23. Selecting an alternative that provides too few facilities can also be negative to the resources of the area since it would force the overflow of visitors into unregulated dispersed activities.
		<u>Research</u> (41C, 43S)	
123, 244, 356, 294	1.	Support the Class I Protection system concept. (4C, 4S)	1. Supports Alternative D.
195, 244, 293, 361, 344, 268, 124, 288, 327, 329	2.	Wants more of the Monument in Class I protection. (10C, 11S)	2. In response to specific suggestions, we increased the area in Protection Class 1 to include the north flank of the mountain and the crater area. In general, areas in lower protection classes were not considered less important from the standpoint of protection of natural processes and features, but rather that these areas are less sensitive to disturbance and more able to "take care of themselves" than areas assigned to Protection Class 1.
275	3.	Recommend a combination of the Research Protection class system and Biophysical Rating System be used to protect the natural features and processes. (1C, 2S)	3. The Biophysical Rating System and the Protection Class System are similar in that they were developed by similar evaluation criteria applied to the same landscape. However, they differ in terms of scale of landscape units evaluated, and how they are used. The Biophysical System was used to evaluate potential development alternatives, and Protection Classes describe aspects of management of areas even where no development has occurred, particularly focusing on management of research activities. Therefore, we see the two systems as compatible, and it is useful to keep them separated.
317	4.	Plan to keep a representative portion of the Monument like it is today by controlling regrowth of vegetation. (1C, 1S)	4. Keeping a representative portion of the Monument like it was soon after the May 18, 1980, eruption would be very interesting for the visiting public. However, it is virtually impossible to "freeze" the landscape because erosion of soil and tephra and decomposition of exposed and buried organic matter will proceed even though vegetation recovery is suppressed. The course and processes of revegetation are being documented with photographs and repeated sampling of vegetation plots. This information will give the visitor a mental image of initial post-eruption conditions.

Letter Number	Comment No.	Comments	Response
361	5.	Class I Protection Class should prohibit construction of roads and buildings. (1C, 1S)	5. With the removal of the bus shuttle and development at Spirit Lake, there is no construction of roads and buildings planned for Class I Protection areas in the selected alternative.
293, 298, 373	6.	Support an in-house staff person to coordinate research. (3C, 3S)	6. The in-house staff or science coordinator to coordinate research activities is included in the "Management Practices Common to all Alternatives."
78	7.	Suggests a research council to advance scientific research. (1C, 1S)	7-8. The Scientific Advisory Board (established for 10 years in the Act) performs this function and will do so for the life of the plan. The proposed panel of local scientists would cooperate with proposed Monument research management staff to assist the Scientific Advisory Board in this activity.
78	8.	Need a group of scientists to determine research needs and opportunities, and set priorities before these opportunities are lost. (1C, 1S)	
272, 355, 381 ^a	9.	Eliminate Trail No. 237 and the trailhead to protect the Goat Marsh RMA. (3C, 3S)	9. The construction of a trailhead for Trail No. 237 has been removed from the plan. The trail will be retained for use by researchers and the limited public that knows about it.
342, 375	10.	Class I doesn't provide enough protection. (2C, 2S)	10. Protection Class I provides the maximum protection that we judge to be manageable. Furthermore, the level of protection it provides has been increased by removal of all proposed roads and developed visitor sites.
212, 334	11.	It doesn't make sense to restrict travel in protection class I areas when there is snow cover. (2C, 2S)	11. Over-snow travel will be permitted in Class I Protection Areas at the Monument Manager's discretion. The Monument Manager will monitor impacts and regulate entry to prevent alteration of natural processes and features.
368 ^a	12.	Remove St. Helena Lake and Spirit Lake from protection class I so that fishing opportunities are made available. (1C, 1S)	12. Fishing in these lakes is now regulated by red zone closure, absence of fish, and the existing moratorium on fish stocking. A Fish and Wildlife Management Plan currently being developed cooperatively by the Forest Service and the Washington State Department of Game will determine which lakes will have fishing in the future. This plan will be completed by the end of the moratorium in 1988. Administrative action in Protection Class I areas will be coordinated in the cooperative plan to minimize adverse impacts.
368 ^a , 19	13.	Remove Butte Camp area from class I so that this popular hunting area is available. (2C, 2S)	13. A portion of the Butte Camp area is dedicated primarily to research as a result of an investment of more than \$200,000 in research there and the present installation of more than \$15,000 in equipment to monitor environmental factors controlling ecosystem recovery. Scientific Research Protection Class I areas do not preclude hunting. However, the Washington Department of Game and Forest Service will be working with researchers and sportsmen to protect research sites and alleviate conflict.

Letter Number	Comment No.	Comments	Response
269	14.	Goat Marsh, Butte Camp, and the Muddy River Fan should remain open to all. (1C, 1S)	14. Goat Marsh Research Natural Area (RNA) is protected under the rules for RNA's which have been established previously, and proposals in this plan comply with those rules. Butte Camp and Upper Muddy Fan have had similar histories, as described in No. 13 above, for Butte Camp.
212, 215	15.	Support class II for the entire Monument area. (2C, 2S)	15. Protection Class 2 is inadequate to protect the sites that are most unique and sensitive to alteration by man, so we assigned Class 1 to these areas to comply with the Act. On the other hand, Protection Class 3 is adequate for green-forest areas of steep slopes, which are widespread in the region.
78	16.	Control areas should be set up. (1C, 1S)	16. Requests and designs for establishment of control areas should be proposed by scientists, because control areas may have very different characteristics, depending on the scale and objectives of a particular research project. The Goat Creek watershed provides a forested control area at a watershed scale, and areas within Protection Class 1 provide control areas of a variety of types and scales in the zone of significant volcanic disturbance.
8	17.	Need an information program to make research notes available to the public. (1C, 1S)	17. Information about research results is provided to the visiting public through the interpretive program. The Monument Newsletter, which includes short articles by scientists, fills this need.
373*	18.	A local committee of concerned scientists and lay people should serve as an advisory committee to the SAB. (1C, 1S)	18. The same as the response to No. 7 and No. 8.
381*	19.	Need to modify protection class I to more fully protect the biological aspects of the debris avalanche, Goat Marsh, Butte Camp, Spirit Lake, and Castle Lake. (1C, 1S)	19. Protection Class I is adequate to protect the biological aspects of the sensitive areas of the Monument because of (a) access route location; (b) monitoring; (c) annual reporting of the results of monitoring; and (d) annual recommendations for additional or different measures if research plot protection is determined to be inadequate.
381*	20.	The crater and north flank should be included in Protection Class I. (1C, 1S)	20. The crater and north flank have been included in Protection Class I in the selected alternative.
381*	21.	Provide the maximum support for research, Alternative C, regardless of the other alternative selected in other areas. (1C, 1S)	21. The administration and Protection Class I are the same in the selected alternative as in Alternative C.

Letter Number	Comment No.	Comments	Response
		Horse Use (35C, 38S)	
244	1.	A horse ramp should not be constructed at the end of 8123. (1C, 1S)	1-3. The biophysical ratings in Appendix B indicate the areas of the Monument that are suitable for horse use. This area is very limited. The Monument Manager will monitor use in these areas for resource damage and social conflict, and take appropriate action when problems occur. Facilities are needed at trailheads to reduce impacts and control the animals.
244, 310, 355, 373*	2.	Object to horse use on Trail Nos. 238, 238a, 238d, and 216 near Sheep Canyon, as there will be conflict with research and mountain climbing. (4C, 5S)	
244, 284, 310, 328, 342	3.	Too many horse facilities planned. (5C, 5S)	
345, 333, 271, 381	4.	Horses should be excluded from the area affected by the volcanic activity. (4C, 4S)	4. The selected alternative does exclude horse use in the areas affected by the blast.
346, 347, 266, 296, 301, 357, 381*	5.	No horse use or facilities in the Monument. (7C, 8S)	5-6. Horse use has been a long time traditional use in this area, and to exclude it without good reason would be unfair. A team of specialists in soils, hydrology, wildlife, and research worked together to determine the biophysical carrying capacity of similar portions of the Monument (See Appendix B). Based on their recommendations, horse use is allowed in the portion of the Monument not affected by the blast. This use will be monitored and action taken as needed to prevent damage.
249, 215	6.	Horse use should be severely limited. (2C, 2S)	
239, 271, 307	7.	Construct a horse camp at the Kelama Work Center site and trails shown in Alternatives F and G. (3C, 3S)	7. The trails in Alternatives F and G were not selected because of the potential impacts to oases in the lava flow area. A horse camp at the former Kelama Work Center site would be lacking sufficient trail opportunities. The proposal has been modified to include the Kelama River Trail.
334, 355	8.	Horse use as shown in Alternative B. (2C, 2S)	8. Same as response to No. 5 above.
239	9.	Provide horse use opportunities in the devastated areas. (1C, 1S)	9. Horse use will be permitted on trails in the devastated area outside the Monument. (Example, Trail Nos. 217, 213, and 220.)
355, 123	10.	Close Goat Marsh to horse use to eliminate non-native seed source. (2C, 2S)	10. The selected alternative closes the Goat Marsh RNA to horse use, in keeping with the plan specifically developed for the RNA. (Supplement No. 10 to Federal Research Natural Areas in Oregon and Washington.)

Letter Number	Comment No.	Comments	Response
239	11.	Trails of only 2 miles length will probably not be used. (1C, 1S)	11. Alternative D proposed a short trail experience between Blue Lake and Sheep Canyon in an attempt to provide horse use in the biophysically acceptable portion of the area. This short trail will be added to in the selected alternative by retaining 2 miles of Trail No. 238 that previously were to be abandoned, and by adding 5 miles of the old Kalama River Trail.
239	12.	Provide loop trail opportunities. (1C, 1S)	12. The selected alternative does provide two loop opportunities in the Green River/Vanason Peak area.
123	13.	Excludes horse use from class I areas to eliminate non-native seed source and other damage. (1C, 1S)	13. The FEIS has been revised to make the exclusion of horses from Class I areas clear.
273*	14.	Trail access for horse use should be provided to the North Toutle River Valley. (1C, 3S)	14. This is a Class I research area, and the biophysical rating and protection class indicates that horses would exceed the carrying capacity of the area and damage research values.
<u>Land Acquisition and Boundary Adjustments</u> (30C, 33)			
195, 275, 303, 342, 355 340, 362	1.	Agree with the proposal to acquire the private land between SR 504 and the Monument boundary. (7C, 9S)	1. The proposal is to acquire these lands.
185, 286	2.	Unnecessary to acquire private land between SR 504 and Monument, since Section 6 of the Act prohibits buffers or protective perimeters. (2C, 2S)	2. We agree with your comment that Section 6 of the Monument Act prohibits buffers. The concern along major road corridors to feature attractions such as Mount St. Helens, Mount Rainier, etc., is for the visual appearance of the landscape. This is a concern Forest-wide on all roads. The narrow corridor of private land between SR 504 and the Monument is one of these areas of visual concern.
275, 361	3.	The Forest Service should retain ownership of the Frededollar tracts just outside the Monument to protect outstanding snag habitat and a corridor for the Green River Trail. (2C, 2S)	3. The selected alternative provides that a right-of-way for a protective corridor for Trail No. 213 will be retained through this tract. Nearby areas inside the Monument have standing dead timber and provide a large area of snag habitat.
275, 361	4.	Agree with proposal to acquire state and private lands along Road 2612 and 83. (2C, 2S)	4. The proposal is to acquire these lands.
275, 271, 340, 246	5.	Acquire private land east of the lava flow between Roads 90 and 83 to protect the Cave Basalt area. (4C, 4S)	5. The Monument boundary in this area was posted, with a 100-foot offset from the edge of the lava flow, to ensure all the sensitive features were included in the Monument. The Cave Management plan will address additional measures necessary to protect the area.

Letter Number	Comment No.	Comments	Response
246, 271	6.	Includes the area between Road 83 and the Monument boundary in the Monument as multi-use management of these lands is inappropriate. (2C, 2S)	6. A review of the Congressional record indicates that the reference in the Monument Act for making Monument boundary adjustments in the Comprehensive Management Plan was limited to minor adjustments.
246, 271, 362	7.	Acquire and include the area at Ash Flats (Elk Prairie) in the Monument. (3C, 3S)	7. The selected alternative does not include developments at Ash Flats; therefore, it would not be appropriate to acquire and include this area in the Monument.
340, 362	8.	Include the Bear Meadows viewpoint and all the land to the Monument boundary in the Monument to protect the view in the Rosengquist photos. (2C, 2S)	8. Road No. 99 is managed as a Level 1 sensitivity which provides a visual management objective of Retention for the landscape that is viewed from Bear Meadow. (Also, see response to No. 6 above.)
246	9.	Agree with acquisition of hauling rights from Road 8303 west to Road 81, but should also acquire public use. (1C, 1S)	9. The existing private road to the west is too steep, narrow, and poorly aligned to provide safe public access.
303	10.	Support a public access agreement for those roads leading to Vanson Peak trailheads, if it does not reduce Meyerhaeuser's flexibility to haul timber. (1C, 1S)	10. Public use along the private road to Vanson Peak is expected to be very light, and the landowner has traditionally allowed public use on these roads. Acquiring public access rights would be prohibitively expensive in light of this anticipated low level of use. If in the future the demand appears to warrant public access rights, this decision will be reconsidered.
275, 361	11.	Support acquisition of the private land along Roads 2612 and 83, and add to the Monument when boundaries are adjusted. (2C, 3S)	11- Same as response to No. 6 above. 13.
214	12.	The area north of the Green River should be excluded from the Monument. (1C, 1S)	
214	13.	The area south of Road 8303 in Cougar Creek should be excluded from the Monument. (1C, 1S)	
		<u>Visitor Center (29C, 33S)</u>	
42, 70, 77, 224, 228, 379	1.	Keep visitor center at Lewis & Clark. (6C, 7S)	1-9. The decision to locate the permanent visitor center at Sequoia State Park was made outside of this document; Forest Service funding will be inadequate to operate two centers.
353	2.	Keep visitor center at Lewis & Clark until SR 504 is open. (1C, 1S)	

Letter Number	Comment No.	Comments	Response
28, 76, 224, 362, 318, 352	3.	Visitor center should be located closer to the mountain. (6C, 6S)	
77, 221, 20, 223, 245	4.	Move visitor center to the north or east. (5C, 5S)	
228, 328	5.	Sequest location misses visitors coming from the north and east. (2C, 3S)	
28, 325	6.	Suggest Windy Ridge as a visitor center. (2C, 3S)	
76, 144	7.	Visitor center expenditure is not justified. (2C, 2S)	
261, 305, 324, 363	8.	Need a visitor center on all major access routes. (4C, 5S)	
360	9.	Need a visitor center at the south entrance in the Columbia Gorge. (1C, 1S)	
301		<u>Muddy River Lahar</u> (27C, 32S)	
125, 154, 179, 215, 252, 361, 275, 342, 327, 357, 294, 288, 134, 240	1.	Approve the plan for the Muddy River. (1C, 2S)	1. Supports the proposal.
	2.	Agree that Road 92 should not be constructed between Road 83 and 94 since it would disturb an unstable area of shifting alluvial deposits. (14C, 16S)	2. Supports the proposal.
244, 275, 342, 327	3.	Recommend that the entire lahar be closed to camping. (4C, 5S)	3. A study of the impacts of hunter camping on the south side of Mount St. Helens was completed in 1985 and is available at the Monument headquarters. This study showed that the camping problem at the Lahar is immediately adjacent to the roadway. The selected alternative has been changed to close the Lahar area for 300 feet on either side of the road.
275, 268, 342, 244	4.	Extend the boundary of the Cedar Flats RNA along the Muddy River to include all of the lahar not included in the Monument. (4C, 4S)	4. Expansion of Cedar Flats RNA cannot be accomplished in this plan because the area in question is outside the Monument and change in status of RNA's is accomplished through administrative procedures outside the scope of this plan. Furthermore, natural processes and features in the proposed annexation have been substantially altered by salvage logging and cleanup of organic debris.

Letter Number	Comment No.	Comments	Response
275, 244	5.	Protect the small stand of living trees at the upper end of Lava Canyon for interpretation. (2C, 3S)	5. The proposal is to allow the natural processes to proceed in this small stand of trees and provide interpretation.
355	6.	Remove all roads from the mud flows. (1C, 1S)	6. The biophysical rating permits roads on the Pine Creek Mudflow (Appendix B). Roads 83 and 2588 are needed to provide access for recreation.
375	7.	More protection is needed. (1C, 1S)	7. Same as the response to No. 3 above.
		<u>Strawberry Mountain Area</u> (26C, 29S)	
125, 268, 266, 193, 215, 244, 288, 282, 284, 294, 300, 301, 355, 263, 275, 361, 344, 357, 327, 342	1.	Object to motorized traffic on Trail No. 220 and Trail No. 1 to Bear Meadow, between Roads 25 and 26. (20C, 22S)	1. Your comments that motorized use on Trail No. 220 and Trail No. 1 would conflict with the interpretation objectives at Bear Meadow and Strawberry Mountain are valid concerns. Therefore, the selected alternative has been changed to limit motorized use on Trail No. 220 to north of Road 2516. Motorized use of Trail No. 1 would be allowed only to the east of the trailhead located on Road 99, 1 miles east of Bear Meadow.
198, 223, 305, 318	2.	Improve access to Strawberry Ridge. (4C, 5S)	2. The selected alternative improves Road 2516.
305	3.	Investigate loop trail opportunity between Strawberry Mountain and lake. (1C, 1S)	3. A loop trail opportunity such as described was examined but discarded on the basis that it would encourage more traffic to Strawberry Lake than the land conditions could support without damage. It would also attract more visitors into one of the higher fire danger fuel types in the Monument.
305	4.	Provide a trailer drop off area near Road 25. (1C, 1S)	4. The selected alternative has been changed to utilize the Sno-park at the 25/99 road junction for this need.
		<u>Safety, Law Enforcement & Emergency Medical</u> (28C, 46S)	
304, 279, 223, 366, 369, 274, 261, 273, 377	1.	Law enforcement and emergency medical services are not adequately addressed. Who will pay, etc.? (9C, 21S)	1. The Forest Service relies on the memorandum of understanding between the Washington State Sheriff's Association and Region 6, June 1962, for direction for search and rescue and public sector accidents and injuries. For further information, see the Gifford Pinchot National Forest Law Enforcement Plan.
279	2.	There is a need to develop an emergency medical service plan for the Monument. (1C, 1S)	2. The Monument staff has recently prepared a Safety Plan and an Evacuation Contingency Plan, both of which indirectly address emergency medical service. These plans, in

Letter Number	Comment No.	Comments	Response
261, 380	3.	Recommend financial aid and/or personnel to assist with emergency medical and law enforcement needs. (2C, 4S)	conjunction with plans prepared by the North County Emergency Medical Services Group, should adequately address Monument medical service needs. 3. Same as response to No. 1. The Forest has the authority to enter into cooperative agreements with law enforcement agencies, and reimburse them for services directly caused by recreation activities on the National Forest that are beyond their normal activities. There is no authority for reimbursing cooperators for emergency medical services, and it would require Congressional action to acquire this authority.
261	4.	Provide a specific evacuation plan before construction of the Coldwater/Johnston Ridge complex. (1C, 3S)	4. The detailed plan for this development (3 years prior to construction) will include an evacuation plan.
273*	5.	Need to establish plans and procedures for providing public warning of impending volcanic hazards (not only for heavily used areas, but also for trails, etc.). (1C, 3S)	5. Because of the uncertainties and potentially short time frame associated with warnings and evacuation, the Forest Service will close areas where monitoring indicates an unsafe situation. The plans and procedures for public warning and evacuation are presented in the Mount St. Helens Contingency Plan. This plan contains differing responses, depending on degree and nature of volcanic activity, and is frequently updated.
273*	6.	Favor continuation of cooperative agreements whereby the Forest Service pays for law enforcement. (1C, 1S)	6. Same as the response to No. 3.
277*	7.	Plan should address highway safety. The National Park Service road standards provides for public safety while protecting the environmentally sensitive landscape. (1C, 1S)	7. Same as the response to No. 7 under Access.
279*	8.	A high percentage of the vehicle accidents have resulted from narrow and/or graveled roads. All roads should be double laned and paved. (1C, 1S)	8. Same as the response to No. 7 under Access.
279*	9.	Provide good access for emergency evacuation of injured: Support the Sheep Canyon to Castle Lake tie. Retain the tie from Road 83 to 94. Reconstruct Road 2588 as a	9. Other options for medical evacuation other than roaded access are possible and should be planned. (For example, helicopter evacuation would be preferred in the Mt. Margaret area.) Although the described access would shorten response time for law enforcement and emergency medical service, the cost and adverse resource impacts outweigh the benefits.

Letter Number	Comment No.	Comments	Response
304, 207		two way paved route between Roads 25 and 83. Support the cross Monument tie between SR 504 and Road 99. (1C, 1S)	
279*	10.	Meet with all local area EMT's and cooperators from the Sheriff's Department. (2C, 2S)	10. The Forest Service does meet with the appropriate cooperators and providers on request or as otherwise needed.
279*	11.	The tram creates a tremendous medical evacuation problem. (1C, 1S)	11. The selected alternative has been changed to replace the aerial tram with a bus shuttle road to Johnston Ridge.
279*	12.	Need to plan key helispots in remote areas for medical evacuation. (1C, 1S)	12. The selected alternative provides helispots in the backcountry areas. The FKIS has been changed to make this clear, and they are shown on the maps.
283	13.	Recommend that those developments most likely to be damaged by volcanic activity be scheduled last. (1C, 1S)	13. The schedule of development in the Appendix J used volcanic risk as one of the criteria for scheduling.
287	14.	Identify levels of risk for major facility developments by either the government or a permittee. (1C, 1S)	14. The Emergency Medical and Evacuation Plans will provide the specific detail that you requested.
26*	15.	Provide a shelter somewhere along Road 99 for a law enforcement specialist. (1C, 1S)	15. When Road 99 is upgraded to double lane standard, the traffic problems should decrease, and the need for a stationary law enforcement officer will lessen.
26*	16.	Provide a communication system at Windy Ridge viewpoint for emergency. (1C, 1S)	16. Windy Ridge will continue to have interpreters on sites at times when there are large numbers of visitors present. The interpretive staff will have radio communication and will be able to report emergencies. The Forest Service and the Skamania County Sheriff's Department are exploring the possibility of installing an emergency radiotelephone (911 number) somewhere along Road 99.
290*	17.	Improve access on Skamania County side and violations will decrease. (1C, 1S)	17. Same as the response to No. 14 under Access.
26*	18.	Public needs to know the evacuation procedure and route from the Road 99 area. (1C, 1S)	18. Same as the response to No. 5.

Letter Number	Comment No.	Comments	Response
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Hunting and Fishing Opportunities
(27C, 42S)

30, 47	1. Prefer to have no hunting in the Monument. (2C, 8S)	1. The Monument Act specifically states that hunting and fishing are not excluded from the Monument.
367*	2. Retain the option to restock suitable salmon habitat. (1C, 1S)	2. The Washington Department of Fisheries will continue to regulate salmon fishing and other salmon population management in the Monument. The Forest Services will work cooperatively with the Department of Fisheries and the Department of Game in developing a Monument Fish and Wildlife Management Plan. This planning process would include an evaluation of current and projected habitat recovery and integrate Salmon Management objectives with Monument Act requirements.
278, 368*	3. Opposed to anything that would preclude hunting, especially in the Mt. Margaret and Marble Mtn. game units. (2C, 2S)	3. The Monument Act specifically states that hunting and fishing are not excluded from the Monument. It also places a high priority on scientific research and the preservation of natural features and processes. Scientific Research Protection Class I Areas do not specifically preclude hunting. The Forest Service, Washington State Department of Game, researchers, and sportsmen will work together to determine specific protection measures and alleviate conflict. The Forest Service, Department of Game, and Department of Fisheries will cooperatively develop a Fish and Wildlife Management Plan that meshes hunting season regulations with protection measures. The area north of the mountain is presently protected by the restricted access zone around the volcano.
46, 379	4. Support a cooperative wildlife management plan between the State Game Department and the Forest Service. (2C, 2S)	4. The selected alternative has been amended to include a cooperative fish and wildlife management plan which will coordinate Forest Service Monument management with Washington Department of Game and Washington Department of Fisheries season setting, resolve issues regarding reintroduction of species, including the stocking of fish in Monument lakes, and address the handling of animal damage or problem animals in visitor use areas.
310	5. Restrict visitor use in Spotted Owl Management Areas. (1C, 1S)	5. No additional roads or any other habitat reductions, are proposed in the CMP for spotted owl habitat. Spotted owls are not very sensitive to disturbance from road travel or recreational use, so we do not feel visitors need to be restricted from using spotted owl habitats areas. These older timber stands provide the visitor an opportunity to see, learn about, and enjoy the old-growth type of forest, and perhaps to see or hear a spotted owl.

Letter Number	Comment No.	Comments	Response
274*	6.	Allow for eventual return of hunting and fishing to all areas of the Monument. (1C, 9S)	6. Same as response to No. 3/4.
283	7.	Fish stocking should never be done since it is not a natural process. (1C, 1S)	7. The fish stocking issue will be addressed in the cooperative fish and wildlife management plan. At that time, such items as the requirements of the Monument Act, the natural recovery of lakes, survival of pre-eruption fish (pre-eruption fish in high elevation lakes were stocked), the research value of each lake, the recreational demand for fishing in the Monument, and recovery of lakeshores will be considered.
368*	8.	Need more evaluation of the impact of SR 504 on wildlife. (1C, 1S)	8. The brief discussion in the DEIS of the impacts of SR 504 corridors on wildlife did not adequately reflect the evaluation which actually took place by the Washington Department of Transportation and the Forest Service. The FEIS has been changed to better present this.
311	9.	The Green River Fish Passage is needed really soon to replace spawning area lost elsewhere. (1C, 2S)	9. The Regional Forester's moratorium on the Green River Fish Passage project precludes its taking place prior to May 18, 1988. Prior to that time, the Cooperative Fish and Wildlife Management Plan will address this issue.
19, 368*	10.	Opposed to the Marble Mountain viewpoint because of the impact to critical elk caving area nearby. (2C, 2S)	10. The Marble Mountain viewpoint is not included in the selected alternative, due to unacceptable impacts of increased use of the Marble Mountain road on critical elk habitats.
366	11.	Concerned about the safety and aesthetics impacts that hunting will have on the visitor. (1C, 1S)	11. Volcano visitor use is seasonal, decreasing during hunting season. A survey during the 1984 hunting season revealed that 64% of the visitors to the south end of the Monument during deer hunting season were Monument viewers, while only 26% of the visitors during elk season were there to view the Monument. The Monument Manager will designate specific no camping areas along major roads and on the lahar if resource damage or user conflicts occur. Goat Marsh RNA will be closed to camping. There will be another opportunity to address any safety and aesthetic conflicts which may develop in the Fish and Wildlife Management Plan.
286	12.	The spawning area in the backcountry lakes should be repaired. (1C, 1S)	12. This would be in conflict with the Monument Act. Natural recovery is already underway resulting in spawning beginning to return to some of the lakes.
368, 374	13.	Need more comparison of how the alternatives effect hunting and fishing. (2C, 2S)	13. A fuller display of how alternatives affect hunting and fishing has been added to the final.

Letter Number	Comment No.	Comments	Response
19, 368	14.	Opposed to class I protection for Butte Camp because it is a prime elk hunting area. (2C, 2S)	14. Hunting will not be precluded in the Butte Camp area. There are important research values in this area, and measures such as signing and public information and education will be used to ensure that visitors will respect research plots and equipment. The Monument Manager will monitor the effects of visitor use on these research values, and take appropriate action to ensure that they are protected. The Cooperative Fish and Wildlife Management Plan will further address this issue.
374	15.	Plan is a recreation plan and not a wildlife/fish plan. (1C, 1S)	15. When alternatives were evaluated, the degree to which key habitats were protected from adverse effects was an evaluation criterion. The biophysical ratings provided minimum protection needs for habitats vulnerable to visitor use and management impacts. The Act itself protected traditional hunting and fishing activities, and the proposal continues the popular Marble Game Management Unit hunting season road closures. Critical cave habitats are protected. Other fish and wildlife management issues; such as, integrating season setting, stocking, and reintroduction of animals with other Monument management objectives have been deferred to the Fish and Wildlife Management Plan, the Cave Management Plan, and the Backcountry Management Plan.
381	16.	Should indicate how and when the issue of fish stocking will be resolved. (1C, 1S)	16. Same as response to No. 2.
381	17.	Need to describe impacts of alternatives on fish and wildlife management and associated recreation. (1C, 1S)	17. The FEIS has been modified to include this information.
381	18.	Develop a wildlife management plan cooperatively with the Washington State Department of Game. (1C, 1S)	18. Same as response to No. 4.
381	19.	Information is needed on limnological status of lake ecosystems and expected impacts from increased use. (1C, 1S)	19. Information on the effects of visitor use on the limnological status of lake ecosystems has been added to the FEIS.
381	20.	Monitor the effects of development on fish and wildlife and their habitat. (1C, 1S)	20. The Fish and Wildlife Management Plan will include a plan for monitoring the effects of visitor use and Monument management on fish and wildlife and their habitat. In addition, coordination between the Forest Service and Washington Department of Fisheries and Washington Department of Game will occur on an on-going basis.

Letter Number	Comment No.	Comments	Response
381*	21.	How will fishing and hunting be accommodated with class I protection. (1C, 1S)	21. The cooperative Fish and Wildlife Management Plan will identify ways to protect research values and allow hunting in these Class I areas.
		<u>Trails</u> (25C, 29S)	
123, 275, 293, 310, 327, 329, 355, 178	1.	No trails on the debris avalanche during this planning period. (8C, 9S)	1. An extremely low level of trail construction is proposed for the debris avalanche in order to protect natural processes and features as well as the visiting public. Trail No. 216 on the north flank of the mountain is proposed for late in the 10-year planning horizon of this plan, and volcanic hazards and the extremely rugged terrain are likely to push implementation back even further. An interpretive trail is planned at the Coldwater Lake development site to provide visitor access in a safe, managed format, where otherwise we expect a significant level of cross-country travel by curious visitors.
46, 381*	2.	Move the portion of Trail No. 216 that is in front of the crater further north. (2C, 2S)	2. The location of this trail is conceptual at this time. Where the specific project planning occurs, the best on-the-ground location will be selected. This location could very well be further north than shown on the map.
266	3.	Limit trails to where they were prior to the eruptions. (1C, 1S)	3. This was done to a great extent; but pre-eruption trails were sometimes in poor locations and, as a result, in poor condition. Some new trails were also needed to access new attractions such as Lava Canyon. Section 4 E(1) of the Act gives direction to provide access for recreation.
306, 333	4.	Trails proposed in Alternative D acceptable. (2C, 2S)	4. Agrees with the proposal.
310	5.	Proposed Smith Creek Trail in an unstable area. (1C, 1S)	5. The final location of the trail will ensure that the unstable areas are avoided, or that disturbance to these areas are minimized.
346, 347, 301	6.	An around-the-mountain trail can wait 50 to 100 years. (3C, 4S)	6. Same as the response to No. 1.
271	7.	Connect the old Kalama River trail to Trail No. 238. (1C, 1S)	7. This trail location has been analyzed and found to provide a good recreation experience with minimal impact on the resources. The trail has been added to the selected alternative.
195	8.	Need a trail between Coldwater Lake and Castle Lake. (1C, 2S)	8. A trail between Castle and Coldwater Lakes was considered, but rejected because of concerns about public safety. Stream crossings on the debris avalanche are extremely hazardous and construction of foot bridges is impractical.

Letter Number	Comment No.	Comments	Response
195	9.	Continue Trail No. 230 north to Minnie Peak Trail to improve ease of access. (1C, 2S)	9. This trail access was considered in Alternative D and not selected because it improves access to the lakes area north of Mt. Margaret to a day use experience. This would increase use of the recovering lake shores and on the fishing resources of the lakes.
178	10.	Trails across mudflows are a poor idea. (1C, 1S)	10. Same as the response to No. 1.
46	11.	Trail No. 237 should not be built. (1C, 1S)	11. Trail No. 237 is existing. The selected alternative eliminates the road and trailhead.
301	12.	Monitor trails for overuse. (1C, 1S)	12. The selected alternative provides for monitoring this use.
381	13.	Delay construction of Trail No. 216 on the north side of the mountain. (1C, 1S)	13. Same as the response to No. 1.
381	14.	Trails constructed for research should not be open to the public.	14. The selected alternative allows the public to use trails that are constructed for research, but places emphasis on educating the public of the sensitivity and research value of the area.
<u>Mountain Climbing (24C, 24S)</u>			
281, 212	1.	Important that mountain climbing be recognized as a major activity. (2C, 2S)	1. The plan recognizes that mountain climbing is a major activity.
281, 212	2.	Restrictions should be limited to those essential for safety. (2C, 2S)	2-3. The punice slopes of the mountain are very susceptible to erosion from hikers during the time of the year when not covered by snow. The pre-eruption hiking use of the north side of Mount St. Helens was a problem from foot traffic causing gullies. The post-eruption use on the south side will be much heavier, and there will be less snow. Climbing use will be closely managed to limit resource damage through a permit system. It is the objective of the Forest Service in the final proposal to allow climbing to begin on or before 1987 with a maximum of 100 climbers per day. The Monument Manager will monitor this activity and adjust the number of permits to stay within the carrying capacity. Permits and other informational materials will be developed to educate users of specific hazards such as climbers causing the crater rim to break off, endangering U.S.G.S. workers in the crater.
281, 285, 243, 212, 288	3.	Prefer a voluntary registration system over permits. (5C, 5S)	
243, 212	4.	There should be no ban on climbing in the crater. (2C, 2S)	4. The crater will remain closed to the public because of risk. The U.S.G.S. cannot provide adequate warning of a life threatening eruption or rock fall to allow evacuation in time to prevent untimely deaths.

Letter Number	Comment No.	Comments	Responses
355, 13	5.	Require permits. (2C, 2S)	5. See response to Nos. 2/3 above.
243, 212	6.	Develop parking for 150 cars on the south and west sides of the mountain and provide for campers. (2C, 2S)	6. The climbing use that is supported by a 150 car parking lot at timberline would exceed the carrying capacity of the resource. As the effects of mountain climbing are monitored, the parking provided in the proposal could be reevaluated and increased within the measured carrying capacity of the area.
334, 212	7.	Remove climbing ban immediately. (2C, 2S)	7. The goal of the Forest Service is to allow climbers back in as soon as possible, with a target date of 1987. The Forest Service will continue to work with the State Department of Emergency Services to allow climbing to begin as soon as possible.
285, 212	8.	Provide climber's camps along Roads 8123, 81, and 8100830. (2C, 2S)	8. The selected alternative designated dispersed camping sites at Road 8100830, and a hike-in camp at the junction of Trail Nos. 238 and 238C. More camping could be provided if monitoring indicates the carrying capacity of the mountain is greater than estimated.
249	9.	Prefer no regulations on climbing. (1C, 1S)	9. Same as responses to Nos. 2 and 7 above.
285, 334	10.	Want a few primitive camps near the road ends, and bivouac sites near timberline. (2C, 2S)	10. Same as response to No. 8.
285	11.	The estimate of climbers in the year 2,000 is too low, and should be increased at least 50% because of the extreme national interest. (1C, 1S)	11. The plan has been revised to reflect this extreme national interest in the demand for climbing this mountain; however, the supply will be limited by permits as shown because of the biophysical carrying capacity of the area.
13	12.	Starting June 15, 1986, allow mountain climbing and camping by permit using volcanic risk to determine when permits are issued. (1C, 1S)	12. Same as the response to No. 7 above.
244, 310, 266, 275, 262, 377	1.	<u>Caves Area</u> (22C, 25S) Support continued development at Ape Cave. (6C, 7S)	1. Agrees with the selected alternative.

Letter Number	Comment No.	Comments	Response
296, 340	2.	Opposed to a concession building at Ape Cave or concession idea because it will increase visitor use and requirement payment to enter the cave. (2C, 2S)	2. A concessionaire at Ape Cave would provide lamp rental, maps, tours of the cave, and information on low-impact use of the cave. All of these would help reduce damage to the cave. For example, presently visitors who arrive at the cave unprepared (without lamps) often use the emergency flares from their automobiles to provide light. This is very damaging to the cave. Presence of a concessionaire could also provide for ongoing monitoring of damage to the cave and pickup of litter. No food will be provided at this concession, to reduce the likelihood of bringing in non-native invertebrates, and lamps will be rented only for use at Ape Cave. The road to Ape Cave will not be snowplowed from the Road (8303) to Ape Cave. At the present time, the plan is to charge fees only for equipment rental or guided tours. If, at a later time, a fee for entering the cave is proposed, there would be an opportunity for public input.
344, 275, 368*	3.	Support more protection for Powerline and/or Lake Caves. (3C, 4S)	3-4. The selected alternative provides protection for caves, including Powerline Cave, by closing the 8300030 Road and closing key Townsend's big-eared bat habitat sites during the seasons of use. The Cave Basalt Area Management Plan will provide protection measures beyond these interim measures. In the meanwhile, the interpretive trail at Lava Cast will be located away from Lake Cave, and will help reduce use of unofficial trails created by undirected use. No signs will be posted drawing attention to entrances or locations of any caves other than Ape Cave. There are no new roads, trails or visitor use sites proposed in the Cave Basalt area. Only Ape Cave is being managed as a recreational cave, and recreational use is being discouraged at other caves.
244, 350, 46, 327, 275, 355	4.	Request increase protection of the caves. (5C, 6S) caves.	
246	5.	Acquire public access rights across private land west to Road 81 and end the road at the Ape Cave development. (1C, 1S)	5. The existing private road to the west is too steep, narrow, and poorly aligned to provide safe public access.
355	6.	Require permits to enter caves during the hibernation season. (1C, 1S)	6. The selected alternative requires permits to enter caves used for Townsend's big-eared bat hibernation and other key Townsend's big-eared bat habitats during the season of bat use. The Cave Basalt Area Management Plan may require permits in other caves.
271, 374	7.	More of the caves area management should be addressed in this plan rather than waiting for another plan. (2C, 2S)	7. This suggestion has been incorporated into the FEIS, by further clarifying the intent of the DEIS to provide immediate protection for the most sensitive caves, and by adding further protection measures. Displaying a detailed management plan for the sensitive Cave Basalt area in a

Letter Number	Comment No.	Comments	Response
377	8.	More protection for Ole's Cave. (1C, 1S)	8. Ole's Cave will be closed during the winter and the effectiveness of the closure will be monitored. Road R300030 will be closed. Any further protection measures needed will be determined in the Cave Basalt Area Management Plan.
381	9.	Close all caves during bat hibernation. (1C, 1S)	9. The DEIS and FEIS do this for all caves where Townsend's big-eared bats hibernate. To the best of our knowledge, these are the same caves where any concentrations of other bats also hibernate. Further needs for hibernation or other closures will be dealt with in the Cave Basalt Area Management Plan.
271	10.	Protect caves from mudflows.	10. An assessment will be made to determine the magnitude of the threat of alluvial deposits on the caves. The Cave Basalt Area Management Plan will address this issue.
7	1.	<u>Air Traffic</u> (19C, 30S) Current F.A.A. regulations, part 91, adequately address all public safety aspects. (1C, 1S)	1. These regulations do this, but the special situation of heavy traffic at Mount St. Helena indicates an elevation above the average ground level (AGL) and radio frequency are needed to improve safety.
294, 288, 355, 128, 283, 349	2.	Suggest a 2,000 feet above the terrain restriction. (6C, 6S)	2. The objective is to improve safety and eliminate disturbances within the Monument, while allowing good aerial viewing opportunities of the key features. The 1,000 ft. AGL allows better viewing opportunities than the 2,000 ft. AGL.
244, 46, 273	3.	Support 1,000 feet restriction, if enforceable. (3C, 5S)	3. The 1000 ft. AGL regulation is enforceable to the same extent as other air restrictions.
274, 270, 304	4.	Support 1,000 feet restriction for fixed wing with lower elevation for helicopter, or predetermined corridor. (3C, 12S)	4. The exclusion of helicopters or aircraft in a predetermined corridor, from the 1000 ft. (AGL), would complicate the regulation and make it less enforceable.
304	5.	Monument managers should meet with "Air Tour Operators Advisory Board" before taking action that will affect their business. (1C, 1S)	5. The Monument Manager will continue to meet periodically with air tour operators and other air users to discuss their recommendations on safety and business considerations.

widely circulated public document such as this would attract attention to presently little-known caves. Local saving organizations, Washington Department of Game, and environmental organizations will all have input into the Cave Basalt Area Management Plan.

Letter Number	Comment No.	Comments	Response
368*	6.	Include specific wording that will exempt federal and state aircraft on official missions from the elevation restriction. (1C, 1S)	6. The wording has been added to the proposed restriction that is to be recommended to F.A.A. (Appendix H).
7*, 46	7.	A discreet radio frequency is an excellent safety feature. (2C, 2S)	7. The selected alternative recommends to the F.A.A. that there be a radio frequency assigned for the area.
377	8.	Support 1,500 feet restriction. (1C, 1S)	8. Same as response to No. 2.
381*	9.	Restrict air traffic to 7,000 feet. (1C, 1S)	9. Same as response to No. 2.
77, 198, 220, 362, 223, 305, 308, 324, 261, 222, 322, 325, 363	<u>Information Stations (18C, 25S)</u>		
	1.	Move Iron Creek station to Randle and upgrade to visitor center. (13C, 20S)	1. In the final selection of a specific site for the northern information station, consideration will be given to moving it to U.S. 12 in Randle, based on the availability of a suitable site. If a suitable site is located, it will be evaluated. If none are located that meet the evaluation criteria, the public would be best served by a facility located on Road 25 between U.S. 12 and Road 26. The facility is intended to be an entrance station, and would best serve the visitor as a drive-up building. Converting it to a visitor center would increase the operation and maintenance costs. The Forest Service is willing to discuss designing it as a small visitor center type facility with potential cooperators.
226, 289	2.	Retain station at Iron Creek Campground. (2C, 2S)	2. The temporary facility at the present location does not provide the opportunity to contact most visitors to the Monument because of the location south of the Road 25/26 junction.
353, 362	3.	Develop Pine Creek as planned. (2C, 2S)	3. Agrees with the selected alternative.
362	4.	Move Yale station to junction of Road 81 and County Highway. (1C, 1S)	4. Agrees with the selected alternative.

Letter Number	Comment No.	Comments	Response
		<u>Common Management Direction (15C, 25S)</u>	
361, 195, 357, 346, 347, 294, 344, 275, 342	1.	Herbicides should not be used in the Monument. (9C, 11S)	1. Combinations of chemical, mechanical and manual vegetative control will be periodically needed along roads, at recreation sites, and in the Monument to ensure public safety. Recognizing that the Monument is a special place, and that the continuance of biological succession is paramount, the use of chemicals in the Monument will be strictly controlled and carefully evaluated. They will be considered only when needed to ensure public safety, primarily along roads, to allow proper site distance for travelers. Vegetative control will be prohibited in scientific research areas. The above direction conforms to the Region Six Final Environmental Statement <u>Methods of Managing Competing Vegetation</u> , (May 1981).
361	2.	Revegetation for erosion control should be limited to indigenous species throughout the Monument. Would like to know the normal Forest Service erosion control mix. (1C, 1S)	2. The area not directly impacted by the blast has had normal erosion control seeding for many years, and these erosion control species are well established throughout the area. All erosion control mixes will continue to be specified contractually, and will continue to be limited to those species already well established in the area.
303	3.	Not necessary to designate the area as a Class I airshed. Slash burning should not be further restricted. (1C, 1S)	3. Air quality, particularly atmospheric clarity, is an especially important management consideration. At present, an Air Quality Monitoring Plan will be developed upon finalization of this plan. This monitoring plan will assess the additional impacts of human activities and determine the appropriate level of air quality management. Potential impacts on slash burning will be assessed as part of this plan. In the interim, management will be committed to the avoidance of impacts on atmospheric clarity during the high visitor use season, including efforts to secure the cooperation of adjacent landowners.
244	4.	Recommend a larger size for prescribed natural fires. (1C, 1S)	4. Alternative D as presented in the DEIS allows for larger sized prescribed fires. This wording has been clarified in the FEIS.
274*	5.	Fire control should emphasize suppression in all areas of the Monument. (1C, 9S)	5. The intent is to have an aggressive suppression program within the Monument, but to utilize tools and techniques that limit disturbances as much as possible. This wording has been clarified in the FEIS.
327	6.	Visual standard should be preservation with minimal retention around developed sites. (1C, 1S)	6. The Monument Act allows for several types of activities to take place within the Monument (re: Sec. 4 of the Act). The visual quality objectives assigned must in turn be compatible with the provisions of the Act. The "Preservation" VQO by definition allows for ecological

Letter Number	Comment No.	Comments	Response
			changes only, and this would be incompatible with the direction to provide facilities given in the Act. Only the Goat Marsh Research Natural Area meets the criteria for "preservation" within the Monument.
		<u>Kalama Springs (15C, 17S)</u>	
271, 268, 344, 293, 244, 275, 254, 381*	1.	Prefer development as an interpretive site to protect the standing dead trees. (8C, 9S)	1-3. The selected alternative has been changed to show Kalama Springs as an interpretive site, dropping the picnic area as shown in Alternative D in the DEIS. The design of the facility will emphasize protecting the dead standing trees.
342, 355	2.	Oppose to development as a picnic area. (2C, 2S)	
301, 375	3.	Oppose any increase in facilities. (2C, 3S)	
284	4.	Oppose overnight use at this site, and desire trail access only. (1C, 1S)	4. The parking area serving Kalama Springs in the selected alternative would be developed in the green timber, and trail access would be provided to the springs and volcano impacted area. There is no camping proposed.
271	5.	Delay improvements until the area is safe from dead trees. (1C, 1S)	5. There would be no facilities developed in the dead tree area, under the selected alternative.
10	6.	Retain picnic area. (1C, 1S)	6. The picnic area would require removal of some of the dying trees for public safety. This would reduce interpretive values and eliminate habitat for wildlife that depend on snags.
		<u>Green River/Tanson/Goat Creek Backcountry (14C, 19S)</u>	
275	1.	End Road 2612 at the Green River, remove the bridge and extend Trail No. 213 to that location. (1C, 2S)	1. Road 2612 and the bridge across the Green River are needed to manage Forest Service and private lands outside of the Monument. A trailhead is proposed in the selective alternative to direct parking, eliminate congestion, and provide for sanitation. The trailhead location has been moved to the east near where the present spur road leaves Road 2612.
284	2.	No horse facilities at Trail No. 213, Road 2612 trailhead. (1C, 1S)	2. The biophysical rating allows horse use in the area north of the Green River. The horse facilities are provided to improve control of the animals at trailheads where use is concentrated, and thereby reducing the potential for impacts to the resources.
275	3.	Hiker and horse access could affect the use of Goat Creek as a baseline area for research. (1C, 2S)	3. The selected alternative has been changed to eliminate the trail along Goat Creek.

Letter Number	Comment No.	Comments	Response
311, 19	4.	Implement the Green River fish passage. (2C, 3S)	4. The Green River Fish Passage Improvement is included in a 5-year moratorium by the Regional Forester, which prohibits consideration of this project until May 18, 1988. An environmental assessment will be made of this project prior to the expiration of the moratorium.
249, 374	5.	Goat Creek area should remain untouched. (2C, 2S)	5. Same as response to No. 3.
244	6.	Horse use is inappropriate in and to the Goat Creek drainage on Trail Nos. 205, 218, and portions of 213 and 217. (1C, 1S)	6. This portion of the Monument was minimally impacted by the eruption, and the biophysical analysis indicated it can withstand camping and horse use. The Backcountry Management Plan will include a monitoring plan for this area. Some selected meadow areas will be closed to camping as shown in Appendix B.
275, 284	7.	Trail No. 217D should not be built along Goat Creek. (2C, 3S)	7. The trail along Goat Creek will not be in the selected alternative. Trails No. 217 and 218 will be located near the western boundary of the Monument and will have no effect on planned research.
305	8.	Opposed to permits for camping. (1C, 1S)	8. No permits are required in this portion of the Monument.
301	9.	Favor no overnight use. (1C, 2S)	9. Same as the response to No. 7.
284	10.	Road 2612 should end at the bridge across the Green River. The road bridge should be removed and Trail No. 213 begin here. There should be no trailhead. (1C, 1S)	10. Same as the response to No. 1.
283	1.	Information on alternatives displayed in Appendix D should have been in Chapter II. (1C, 1S)	Detailed discussion of the alternatives appear in Appendix D because this level of detail tends to obscure an overall view of the alternatives. We believe that the majority of readers need this overview to fully understand the alternatives. The CEQ regulations (Sec. 1502.18b) allow this information to appear in an appendix. However, the CEQ regulations (Sec. 1502.14) also state that the alternatives are the "heart" of the EIS. Therefore, the detail of the selected alternative has been moved in the FEIS to the front of the document.
342, 349, 320, 375	2.	Wilderness alternative should have been assessed. (4C, 4S)	Congress considered and eliminated wilderness designation as the Monument Act was being developed.
306	3.	Would like to see an open house public meeting in Tri-City area. (1C, 1S)	Public meeting locations were based on comments received on the newsletter, and on earlier comments on the Land Management Plan (October 1981). By the time this comment was received, public meetings had already concluded.

Letter Number	Comment No.	Comments	Response
310	4.	Consider reviewing the plan every 4 years. (1C, 1S)	4. The Monument Act requires that "subsequent plans shall be integrated with and periodically revised as a component of the Gifford Pinchot land management planning process." This plan is scheduled to be updated about every 10 years. However, the monitoring specified in this Comprehensive Management Plan will trigger future environmental analyses.
24	5.	Disturbed that a preferred alternative was chosen before public input. (1C, 1S)	5. The alternatives presented in the DEIS were compared based on "elements of issues" (as prescribed in the Forest Service Planning Handbook, FSH 1909.15) and this led to a known preferred alternative. The CEQ regulations (1502.14) require that the preferred alternative be identified, if it is known.
344	6.	Request that FS amend its discussion of the final step to reflect that the FS must select an alternative which protects the NVM and provides a level of recreation which is compatible with preservation of the NVM's geologic, ecologic, and cultural resources. (1C, 1S)	6. As described in Appendix B, the use of subcharacter land types, with maximum development categories for each management concept area within the Monument, places a higher priority on the protection of geologic, ecologic, and cultural resources. Any portion of the alternatives that exceeded these maximum development categories was identified in chapter II of the DEIS (specifically the Spirit Lake bus shuttle). Based on public comment, those portions of Alternative D that exceeded biophysical carrying capacities have been dropped to form the selected alternative.
275, 342	7.	Request public involvement on the specific project plans and special management plans resulting from this plan. (2C, 3S)	7. Specific project plans will be prepared after the selected alternative adopted. These plans will conform to environmental analyses (EA's) requirements as specified in the CEQ regulations for NEPA. Such analyses will include public review as required by the CEQ regulations.
361	8.	Objectives common to all alternatives are not really goals for each alternative and are only appropriate to one or two alternatives. (1C, 1S)	8. This is correct; the document has been modified to reflect that these goals apply only to development proposals, not the "No Change Alternative."
78	9.	Need to show how this plan will be reviewed in the future. (interval) (1C, 1S)	9. Same as response to No. 4.
273*	10.	Need to identify future concepts that may be developed when recovery permits. (1C, 3S)	10. Future development shown in the selected alternative is limited by maximum development categories defined in Appendix B. These ratings were developed for the 10 year life of this plan. Later proposals can be considered during the next planning cycle.
220*, 308	1.	Overemphasis on the importance of the I-5 corridor. (2C, 4S)	1. The Washington State Department of Transportation reports that the average daily traffic on I-5 is 30,000 vehicles. This compares with average daily traffic of 4,000 vehicles

Letter Number	Comment No.	Comments	Response
15 ^a , 33, 222 ^a , 245, 305, 352	2.	More information is needed on the impact that the relationship between Mt. Rainier and Mount St. Helens from the visitor use pattern standpoint. (6C, 6S)	2-3. Same as response to No. 10 under <u>Access</u> .
381 ^a	3.	No mention of potential impact of the Monument upon visitor use of other recreation sites in the PNW. (1C, 1S)	
15 ^a , 222 ^a	4.	Economic conditions in eastern Lewis County are at least as deserving of attention as are other negatively impacted communities near the Monument. (2C, 2S)	4. Same as response No. 5 under <u>Costs</u> .
274 ^a	5.	Request an advisory committee of local representatives to review social and economic impacts and work with the Forest Service to identify opportunities. (2C, 10S)	5. Public review and comments will be welcomed by the Forest Service as specific project plans (environmental analyses) are developed for the Monument.
380 ^a	6.	The economic impacts of Alt.D on Skamania County need to be given more consideration. (1C, 1S)	6. Same as the response No. 5 under <u>Costs</u> .
303, 274 ^a	1.	<u>Fire, Insect, and Disease</u> (14C, 22S) Favor a more aggressive approach to fire management. (2C, 10S)	1. The Forest Service recognizes a potential high fire hazard in the blowdown and fringe areas of the Monument, especially along Miner's Creek. We monitor fuel and weather conditions closely in these areas throughout the fire season. Our policy is to maintain an aggressive prevention, suppression, and detection program in the Monument. Our suppression strategy is to achieve the "quickest reasonable control" of all fires in the blowdown and fringe, using modified suppression techniques to minimize adverse environmental effects. The strategy for more remote areas of the general forest allows for natural fires, only if they are well within control capability (see the Decision Guidelines in Appendix K).
368 ^a , 244	2.	A larger natural limit is needed to provide any benefit to wildlife. (2C, 2S)	2. The reference to a 10 acre limit on prescribed natural fires has been dropped. Prescribed natural fire size will be determined on a case-by-case basis, following the considerations outlined in the proposed fire management Decision Guidelines (in Appendix K.)

Letter Number	Comment No.	Comments	Response
335*	3.	Cooperate with adjacent landowners to start the process to make a decision on control at the threat stage rather than wait for a catastrophic infestation. (1C, 1S)	3. The Forest Service will cooperate with adjacent landowners at the threat stage of an insect or disease infestation, to analyze the extent of the problem and the need for control.
284, 342, 361	4.	Entire Monument should be closed to camp fires to protect the natural state. (3C, 3S)	4. We have modified the FEIS to clarify how campfires will be managed. Open campfires will be excluded in all areas of blowdown or fringe timber, the blast zone, and mudflows, to reduce fire hazard and preserve the natural state. The remaining area of the Monument is open to campfires and will be monitored to determine the impact.
346, 361	5.	Question the need for scheduled, prescribed fires in the Monument. (2C, 2S)	5. Scheduled prescribed fires are recommended only as a potential mitigation measure. Any application of scheduled fire would require a NEPA environmental analysis process, approved by the Regional Forester. The rationale for referring to scheduled fire is that it may be the only means available to reduce fire hazard in isolated areas of high use (e.g., around campsites in the fringe zone).
355, 361	6.	Hazard zones should be mapped and displayed. (2C, 2S)	6. The potential high fire hazard area is shown on Figure No. 39. Trail access in this area is restricted until 1990, when natural fuel reduction should significantly lessen the risk. Access to the entire blowdown and fringe zone (Figure No. 39) may be restricted during times of extreme fire danger.
344, 361	7.	Please define "irreplaceable features" and "significant resources" as they relate to fire control. (2C, 2S)	7. Section 4(b)(2) and (3) of the Monument Act authorizes the Forest Service to take fire control measures as necessary to protect "irreplaceable features within the Monument" or to prevent "substantial damage to significant resources adjacent to the Monument." Our proposed fire strategy considers all areas of volcano-created blowdown and fringe an "irreplaceable feature" within the intent of the Act (see Zone II, Figure No. 39). The selection of "quickest reasonable control" as the strategy for this area is based primarily on a concern for public safety. The requirement for "modified suppression techniques" is important. Suppression actions often cause more of a disturbance to ecological processes and resources than does the presence or absence of fire itself. Modified suppression techniques can reduce the potential for adverse environmental effects during fire control activities. Since the Monument Act specifies that "no protective perimeter or buffer zones" around the Monument are implied

Letter Number	Comment No.	Comments	Response
			(Sec. 6), we consider all areas adjacent to the Monument boundary to be "significant resources". A control strategy will be used on any fires threatened private land adjacent to the Monument boundary. Natural fires within prescription may be allowed to cross the Monument boundary onto other Forest Service land, if the resource objectives of that land so permit.
195		<u>Dispersed Recreation</u> (10C, 13S)	
	1.	Want 8 to 10 free primitive tent sites near Ole's Cave. (1C, 2S)	1. Recreational use is not being encouraged at this time at or near any cave, other than Ape Cave. Campsites near Ole's Cave would increase use of the cave, which is unacceptable, due to the cave's sensitive biota.
195	2.	Require permits for backcountry use. (1C, 2S)	2. The selected alternative requires permits for use in those areas of the Monument where the biophysical carrying capacity is estimated to be substantially below anticipated demand.
275	3.	No dispersed camping within one-half mile of Monument roads. (1C, 2S)	3. In the fall of 1984, an administrative study was conducted by the Monument Manager to determine the resource and social impacts of camping (primarily hunter camps) along Roads 81, 83, 8303, and 8123. As a result of this study, the selected alternative has been modified to restrict camping at three areas along these roads where camping is having a noticeable impact. The two areas to be closed, for 300 feet on either side of the road, are along the portion of Road 83 on the Muddy River Lahar, and Road 8303 from Road 83 to Ape Cave. This survey, entitled <u>Hunter Study</u> (Fall 1984) is available at the Monument Headquarters, and is incorporated as part of the selected alternative. The Monument Manager will monitor camping along Road 8123, and restrict when and if resource damage occurs.
355	4.	Require a permit for camping by backpackers. (1C, 1S)	4. Same as the response to No. 2.
286, 269, 368 ^B	5.	Unnecessary to restrict camping along Roads 81, 83, 8303, as there is no resource damage, and it will impact traditional hunting use. (3C, 3S)	5. Same as the response to No. 3.
345	6.	No camping in the area affected by the October 1981 volcanic activity. (1C, 1S)	6. We could not determine the significance of the October 1981 activity.
327	7.	Close Goat Marsh RNA to camping. (1C, 1S)	7. The selected alternative has been modified to close the Goat Marsh RNA to comply with the objectives for managing Research Natural Areas.

Letter Number	Comment No.	Comments	Response
355	8.	Restrict car camping along Road 8303. (1C, 1S)	Camping will be restricted along Road 8303 from Road 83 to the Ape Cave.
47, 310		<u>Boating (9C, 15S)</u>	
	1.	No motors on boats within the Monument. (2C, 6S)	1. The size of Coldwater Lake and potential for high winds were reasons for permitting electric motors. Gasoline powered motors were restricted to eliminate potential petroleum products from entering the lake, to avoid the noise associated with these motors, and to prevent erosion from wave action. Gasoline motors will be allowed by permit for administration such as search and rescue activities. These restrictions will be re-evaluated through the NEPA process if changes occur that may permit wider use of gasoline engines.
314*	2.	Questions the need for either the boat launch or dock at Coldwater Lake since motors are limited to electric. (1C, 1S)	2. Same as No. 17 under Coldwater/Johnston Ridge Area.
271	3.	Consider no motors on McBride Lake. (1C, 1S)	3. Access to McBride Lake is not conducive to using boats with motors. It will be monitored, and if it is determined to be a problem, action will be taken.
346, 347	4.	No recreation boating on any lake in the Monument. (2C, 2S)	4. The impacts of non-motorized boating on the lakes in the Monument will be negligible. The limited access to most lakes will confine boating to the pack-in type. As lake shores are monitored, some regulations may occur in instances where resource impacts are observed.
19, 368*	5.	Gasoline engines should be permitted on boats using Castle and Coldwater Lakes for safety. (2C, 2S)	5. Same as No. 1.
273*	6.	Coldwater Lake is sufficient size to eventually accommodate more intensive recreational uses including fishing and water skiing. (1C, 3S)	6. Presently, the research values of the lakes are not well known and the management guidelines for the lakes will be reevaluated during the next planning cycle.
		<u>Entrance Fees and Other Fees (7C, 16S)</u>	
211, 283, 362, 47, 288	1.	Favor an entrance fee if it can be used to provide O&M dollars. (5C, 10S)	1. The selected alternative has been amended to recommend that the Forest Service seek authority from Congress to charge an entrance fee for this area, and further stipulate that a

Letter Number	Comment No.	Comments	Response
47	2.	Set an upper limit of fees charged by concessionaires to keep Monument accessible to all visitors. (1C, 55)	portion of the amount collected be made available for funding of the Monument. This has been added to Common Management Practices in the FEIS.
353	3.	Object to concession fees. The Monument should be accessible to all visitors. (1C, 1S)	2. Same as the response to No. 17 under Development. 3. Concession-provided services are common to many National Parks and Monuments. The shuttle bus service to Johnston Ridge is proposed because it allows a narrower road which will have less impact on the natural features and processes.
280	1.	<u>Recreation Experience</u> (7C, 7S) Proposed development on Road 99 is providing more of a rural experience than roaded natural. (1C, 1S)	1. The developments along Road 99 will be designed to be compatible with the roaded natural guidelines as noted in Appendix G.
305	2.	RCS mapping in the Vanson Peak Goat Mountain area is incorrect. Need to consider proposed roading outside the Monument. (1C, 1S)	2. The RCS mapping is correct as shown in Alternative D for the Goat Mountain/Vanson Peak area. RCS classes are objectives which will be given consideration as individual project planning is done on adjacent National Forest areas. For example, roads to timber sales can be managed to meet the RCS objective inside the Monument.
283	3.	Primitive RCS class on the north side of the mountain is not attainable, change to semiprimitive. (1C, 1S)	3. The RCS Primitive class is very marginal for the reasons you presented. The primitive experience will be achieved in the selected alternative since access to Spirit Lake is eliminated.
262	4.	The east side should have a more primitive objective than the west side. (1C, 1S)	4. The selected alternative has been modified dropping the road to Spirit Lake. Approximately 80 percent of the Monument would be available for primitive or semi-primitive recreation.
287	5.	Need more explanation of how RCS changes by alternative. (1C, 1S)	5. The explanation of RCS classes has been expanded in Appendix G. However, the regulations governing what should be included in environmental impact statements require that detailed background information should be cited and only briefly described (CEQ regulations, 40 CFR 1502.21). A more complete explanation of RCS classes is available in <u>The Recreation Opportunity Spectrum: A Framework for Planning, Management, and Research</u> (Clark and Stankey, Technical Report PMW-98, Dec. 1979). This publication is available from the Forest Service, PMW Forest and Range Experiment Station, 809 N.E. 6th Avenue, Portland, OR 97232.

Letter Number	Comment No.	Comments	Response
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185, 327 6. Emphasis should be placed on keeping as much of the Monument in the Primitive class as possible. (2C, 2S)

6. See the responses to No. 5 above.

Biophysical (7C, 8S)

361 1. The ratings for the biophysical are too weak. No area of the Monument should be considered to have a physical sensitivity rating of 1, and no area except the visitor center should have a development category of 5. (1C, 1S)

1-3. The Biophysical Sensitivity Ratings (Appendix B) were established by an interdisciplinary team of resource specialists and researchers. The sensitivity ratings were assigned on a relative scale to other features and processes in the Monument, and as such were not compared to those similar items in the surrounding landscape. Even though Subcharacter landtypes were subdivided into smaller Biophysical areas, the ratings still apply to a rather large area. Key bat habitats qualify for, and will be managed in accordance with Maximum Development Category 1. In the specific instance of the bat caves, the decision was made not to show the locations of these caves on a map to afford protection to them from increased visitor use. Potential activities will be examined at the time of proposed action to ensure that such proposals will not affect the sensitive features or processes in these areas.

361 2. Some areas such as the bat caves, portions of the debris avalanche, and lakes should be designated maximum Development Category I. (1C, 1S)

361 3. There should be no areas within the Monument relegated to level #1 on the sensitivity rating scale. (1C, 1S)

275 4. Recommend that the biophysical rating system be incorporated with the research protection system to ensure the full intent of the Act is met. (1C, 2S)

4. The Biophysical Analysis/Rating System and the Scientific Protection Class Program are based on similar evaluations of the same natural processes and features. Biophysical areas inventory sensitivities inherent to the resource, while protection classes set future monitoring and management goals for these same resources. Thus, they are expressed in different terms and applied at different places in the planning process. Many of the boundaries are similar, and the two systems are compatible, except for minor boundary discrepancies which we have attempted to correct.

375 5. More protection is needed for Kalama Springs, Goat Marsh, Muddy River Lahar, and fragile lakeside zones such as Castle and Spirit Lakes. (1C, 1S)

5. The selected alternative reflects your concern for more protection of areas around Kalama Springs, Goat Marsh, Muddy River Lahar, and the lakeside zones around Spirit and Castle lakes. The road and facilities in the Spirit Lake basin and at Castle Lake have been dropped. Snowmobiles will not be allowed at Goat Marsh, and only trail access provided. No camping or open fires will be allowed on the Muddy River Lahar within 300 feet of the roads. In addition, the five unit picnic area at Kalama Springs has been dropped.

Letter Number	Comment No.	Comments	Response
374	6.	An annual biological review process needs to be built into the planning system, with adequate funding and personnel. (1C, 1S)	6. An "Annual Report on Protection of Natural Processes and Features" will be prepared by the Monument. This report will include the results of a monitoring program. This monitoring program will assess man's impacts on the natural processes and features and research plots, and will be instituted in accordance with procedures described in Appendix C.
381*	7.	Considered protection categories for biological and physical features. (1C, 1S)	7. Same as the response to No. 4 above.
348		<u>Visitor Use (5C, 5S)</u>	
280, 341	1.	Estimate of visitor use supplied seems low in Alternative G when compared to Alternative D. (1C, 1S)	1. The reason this use seems low is because the visitor use was measured in visitor days which are 12 hour periods of recreation use by 1 person. A visitor using facilities proposed in Alternative G would spend less time in the Monument because of the improved access.
287	2.	Appear to be too high. (2C, 2S)	2. This use is not unreasonable when compared to other National attractions, such as, the Grand Canyon and Mount Rainier.
287	3.	Need to show a visits/visitor day relationship. (1C, 1S)	3. There is no clear relationship between visits and visitor days. (A visit to a visitor center may be 20 minutes, while a visit for the purpose of camping, may last for days.)
287	4.	Total NVDs for 1969 seems wrong, should it be 571.97 (1C, 1S)	4. This has been corrected.
334, 340		<u>Off Road Vehicles (5C, 5S)</u>	
284, 378	1.	Inappropriate to mix ORV use at interpretive site at Bear Meadows. (2C, 2S)	1. The selected alternative adds the ORV experience about 1 mile east of Bear Meadow. (See response to No. 1 under Strawberry Mountain.)
246	2.	Agrees that ORV are not appropriate in the Monument. (2C, 2S)	2. Supports the proposal for excluding ORV use except for over-the-snow vehicles from the Monument.
	3.	Designate the entire lava flow south of Road 8303 as non motorized. (1C, 1S)	3. The entire Monument is closed to ORV use except for over-the-snow use. The lava flow area will be monitored for over-the-snow impacts, and appropriate action taking if there are problems.

Letter Number	Comment No.	Comments	Response
		Army Corps Project (4C, 5S)	
244, 327	1.	CHP must define a coordinated plan with the Corps of Engineers to ensure that the work they have done is totally mitigated. (2C, 2S)	1. The FEIS has been revised to more fully identify the impacts of the Corps of Engineers projects upon the Monument. The work done by the Corps was of an emergency nature and at the direction of the President. Alternatives and mitigation measures were identified in Environmental Statements published by the Corps. The completion of the projects and scheduled rehabilitation measures will take place before implementation of this Final Environmental Statement.
275, 327	2.	Need to better address the Corps activity and its mitigation. (2C, 3S)	2. Same as response to No. 1.
		Cultural Resources (4C, 4S)	
12*	1.	Recommend development of a Programmatic Memorandum of Agreement to address compliance issues in implementation. (1C, 1S)	1. The Forest Service will respond to the need to conduct a comprehensive cultural resource inventory of NVM lands, particularly with respect to archeologically sensitive areas. The Forest Service will work with the State Historic Preservation Officer (SHPO) on a Programmatic Memorandum of Agreement. Until completion of that Agreement, cultural resource inventories and SHPO consultation will continue on a project-by-project basis.
12*	2.	Consider integrating the cultural resource studies into larger framework of scientific research. (1C, 1S)	2. The study of adaptations of human populations to catastrophic events, particularly related to prehistoric adaptations to Mt. Mazama's eruption, are of extreme interest to the archaeological community. Proposals for research can be integrated as suggested.
12*	3.	Have a strong emphasis on developing a means to reduce vandalism. (1C, 1S)	3. A high priority will be given to prevent vandalism including user education and law enforcement.
2	4.	Cultural resources from the volcano should be interpreted. (1C, 1S)	4. Once the means to protect individual sites from use are developed, these resources will be interpreted.
		Mining (3C, 3S)	
1*, 361*	1.	What is the situation on patented and unpatented mineral properties within the Monument. (1C, 1S)	1. The Monument Act contains direction to "acquire all lands and interests in lands within the boundaries of the Monument" Patented mines are private land and thus are to be acquired. There are five patented properties within the Monument--three near Spirit Lake, one a mile north of Spirit Lake, and one in the Green River.

There are 23 unpatented groups of mining claims within the Monument, comprised of 52 individual unpatented claims. None of the claims are active. Most of the claims are in the Upper Green River area, near Polar Star.

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| 1 ^a , 381 ^a | 2. What will be the management guidelines for owners of patented or unpatented claims. (1C, 1S) | 2. Guidelines for owners seeking to develop and mine their mineral estate are provided by the 1872 Mining Laws and the Federal Land Policy and Management Act (FLPMA), and the Mount St. Helens National Volcanic Monument Act. The claims, under the guidelines of the mining laws, require operating plans, approval of which may require validity exams by the Forest Service, and other operational requirements. |
| 1 ^a , 381 ^a | 3. The entire area should receive a detailed study of the mineral natural resources. (1C, 1S) | 3. Section 4(f) withdraws the Monument area from mineral entry except for valid existing rights; therefore, it would be inappropriate to commit personnel and funding to perform a detailed study of the mineral resources. |
| 275, 342 | <u>Staffing</u> (3C, 4S) | |
| 381 ^a | 1. Should identify staffing needs so the public can judge the implementation. (2C, 3S) | 1-2. Staffing needs will be determined after approval of the plan. |
| | 2. No mention of staffing. (1C, 1S) | |
| 287 | <u>Mitigation</u> (3C, 3S) | |
| 344 | 1. Measures for public safety seem very broad. (1C, 1S) | 1. Same response as No. 4 under Safety, Law Enforcement, and Emergency Medical. |
| | 2. Separate those mitigating measures with teeth from those that should be proposed management guidelines. (1C, 1S) | 2. The format is arranged by issue, and rearranging it at this time could be confusing to other readers. |
| 344 | 3. How will the Forest Service mitigate the introduction of non-native vegetation. (1C, 1S) | 3. The intent of this plan is to prevent the introduction of non-native species. The plan does this by limiting horses in the least area, and limiting erosion control seeding to native species. |
| 303 | <u>Air Quality</u> (2C, 2S) | |
| | 1. Not necessary to designate Class I airshed. (1C, 1S) | 1. Same response as No. 3 under Common Management Practices. |

Letter Number	Comment No.	Comments	Response
314	2.	Seek cooperation on slash burning on adjacent State and private land to improve visibility. (1C, 1S)	2. The statement on air quality under Common Management Practices, Chapter II of the DEIS was intended to provide for cooperation from state and private landowners.
239, 361		<u>Scheduling (2C, 2S)</u>	
	1.	Need a more phased construction over a longer period of time so changes can occur based on available funding. (2C, 2S)	1. Scheduling will be adjusted based on future volcanic activity, resource recovery, and funding availability. A phasing schedule is shown in Appendix J. Should funding be constrained, the duration of each phase can be extended.
349		<u>Maps (1C, 1S)</u>	
	1.	Show county line boundary lines on the alternative maps. (1C, 1S)	1. The FEIS has been modified to show county lines on the alternative and vicinity maps.

V. LIST OF RESPONDENTS BY COMMENT NUMBER

The following individuals and agencies responded to the DEIS. Copies of the comment letters from federal, state, and local agencies are included at the end of this section.

Comment Number Individual/Organization

1. United States Department of Interior, Bureau of Mines
2. Shirley Rosen
3. Jess F. Minium, Jr.
4. Mr. & Mrs. R.D. Milliner & Family
5. Fred M. Veatch
6. Michelle Pinard
7. Washington State Department of Transportation, Division of Aeronautics
8. Anne Kinneman
9. Mr. Randall R. Sharp
10. Jerry M. Collison
11. Barbara J. Morris and Gene Morris
12. Washington State Office of Archaeology and Historic Preservation
13. William M. Lynch
14. Washington State Interagency Committee for Outdoor Recreation
15. Lewis County Economic Development Council
16. B.I. Ackerman
17. Keith Ciesielczyk
18. Jeanette M. Remcle
19. Vancouver Wildlife
20. W.T. McMahan
21. Ray E. Phyllis Davis
22. Becky & Paul Ellis Sr.
23. Tourist Regional Information Program, SW Washington
24. Denise Nelson
25. W.T. McMahan
26. Sheriff's Office, Skamania County
27. Tom Paulu
28. Bob & Ira Spring, Photographers
29. Craig Uren
30. Mr. & Mrs. Ty Kearney
31. Irene Ward
32. L.J. Johnson
33. Mary Beth Maroni
34. Michael L. Marvin
35. Jean Shields
36. Isabelle Tveter
37. Leif G. Tveter
38. Harriet E. Kennemer
39. Pat Van Eaton
40. Edwinna Van Eaton
41. Mrs. Hazel Wilson
42. Helen Tapia
43. Harold McNelly
44. Ann M. Porter
45. Ava Colton
46. Raymond Lasmanis
47. L. Jacobson
48. Jim Chambers
49. Glen McCain
50. Norman J. Sadler
51. Mr. & Mrs. B.E. Wilsey
52. Carol Whitlow
53. Darrell H. Ward
54. Stanley K. Pyles
55. James Johnson
56. Helen M. Coleman
57. Bob & Betty Currey
58. Mr. Kenneth L. Moore

Comment Number Individual/Organization

59. Kevin J. Lindy
60. Dolores L. Johnser
61. John B. Hull
62. Judith Evans
63. Harry E. Kobas
64. Herschel Wilson Jr.
65. Marie L. Wilson
66. Richard Studhalter
67. Richard Studhalter
68. Rodney D. Musin
69. Eva Schliesser
70. Sidney Butts
71. Mr. & Mrs. T.M. Smith
72. R. Samuelson
73. Patricia R. Johnson
74. John Mullenix
75. Doris Sanders
76. Women of Morton & Neighbors
77. Kathi Sellers
78. F. Stuart Chapin
79. Charlotte Swanson
80. Dennis O'Leary
81. Willard R. Howell
82. Linda M. Manberg
83. Shirley Goble
84. Martha Studhalter
85. Martha Studhalter
86. Linda Mettler
87. Audrey Kenny
88. Dale M. Anderson
89. Mary C. Anderson
90. Della Sjoblom
91. Jim Daniel
92. Alata J. Daniel
93. William Kennemer
94. Terry Supplee
95. Howard G. Smith
96. Keith E. Calton Jr.
97. Trinna T. Ryan
98. Laura Christianson
99. Morton Chamber of Commerce
100. Lori Wright
101. Mr. & Mrs. Vaghn Aust
102. Mr. & Mrs. Frank DeWeese
103. Donald G. Gauld
104. Floyd Hoage
105. Mr. & Mrs. W.E. Robinson
106. Greg C. Lansberg
107. Elmer D. Bailey
108. William C. Panter
109. Wesley E. Robinson
110. Edward Crook, DVM
111. Russell B. Timms, D.D.S.
112. Kathy M. Howell
113. Scott Hamilton
114. William T. Hillier
115. Carol J. Ward
116. Jim Prather
117. G.L. Dobbs
118. Kathleen Abbott
119. Linda M. Sillers
120. National Campers and Hikers Association Inc.
121. Angie Ouderkirk

Comment Number	Individual/Organization
122.	Mike Stockdale
123.	Russell M. Maynard
124.	Jill Wyatt
125.	Kay and Bill Goodhue
126.	Patricia J. Siesser
127.	B. Stansby
128.	United State Department of the Interior National Park Service
129.	Carol J. Brown
130.	David E. Wooden Jr.
131.	Michael E. Boyd, M.D.
132.	Clarence W. Palmer
133.	Lloyd George
134.	Randy L. Patereau
135.	Gorden Osborne
136.	Kelly W. Lee
137.	Patricia A. Steele
138.	Laura Strouth
139.	Barry Godfrey
140.	W.L. Welch
141.	Richard Chapman
142.	Shirley Daniel
143.	Shirley M. Fairhart
144.	Shirley M. Fairhart
145.	Irene McCormack
146.	Dan Gray
147.	Marian L. Chapman
148.	Louis L. Van Keuren
149.	James A. Chapman
150.	R.G. Whitlow
151.	Dan A. Kelly
152.	Tim Klingman
153.	Road House Inn
154.	H.M. Bardsley
155.	Furn Gordon
156.	Bob Nelson
157.	Jerry Esposito
158.	T. Brooks
159.	Barbara Davis
160.	Wilma Cox
161.	Clifford Cox
162.	Myrna Hullturg
163.	Gary Blang
164.	Jeff Blang
165.	Anna Mary Blang
166.	Jack E. Pell
167.	Ophelia Pell
168.	Washington State Department of Transportation
169.	Virginia L. Jameson
170.	Mrs. Norma Fry
171.	Vicki M. Williams
172.	Rebecca B. Fredrickson
173.	Shirley Guest
174.	Mr. & Mrs. Frank F. Stiltner
175.	Penny Jablonski
176.	Warren Dunlap
177.	Gilbert T. Mitchell
178.	MS Edith G. Goodman
179.	M.A. Junelo, P.E.
180.	Kenneth Olson
181.	Daniel Dantine
182.	William D. Haynes
183.	Vicki R. Mitchell
184.	R.L. Nelson
185.	Frank Vaughn
186.	Michael W. Overboy
187.	Tri Mountain Wanderers Good Sams
188.	Alvin Chapman

Comment Number	Individual/Organization
189.	Dick J. Newell
190.	Joni Butler
191.	Kristin M. Hill
192.	Rick J. Youngblood
193.	Dawn Marie
194.	W. B. Criss
195.	Cynthia Hovezak & Richard Hamby
196.	David M. S. Jr.
197.	U.S. Department of Transportation, Federal Highway Administration
198.	Marlys E. Lagerquist
199.	Patrice M. Bunge
200.	Frank J. Mainella
201.	Gary W. Walker
202.	Donald & Linda Parks
203.	Marjorie Chrisman
204.	O.A. Chrisman
205.	Louise Weinke
206.	Dorothy McCoy
207.	Robert L. Bryant
208.	Wallace W. Osborne
209.	Tom Whannell
210.	Janet & William Moe
211.	National Campers and Hikers Assn.
212.	Jim Angell
213.	Linda A. Russell
214.	Howard G. Hopkins
215.	Mark Egger, Washington Native Plant Society
216.	Skanania County Board of Commissioners
217.	Sandra T. Zacher
218.	Rick Robinson
219.	Mr. Mrs. Sam Sealf
220.	Office of The Commissioners, Lewis County
221.	W.T. McMahan
222.	Lewis County Economic Development Council
223.	Marlys & Ken Lagerquist
224.	Kathi Sellers
225.	The Journal
226.	B. Coleman's
227.	Richard Studhalter
228.	Pat & Edwinna Van Eaton
229.	Pat & Edwinna Van Eaton
230.	Louis L. Handy
231.	Howard L. Handy
232.	Carol Stanley
233.	Ronald G. Stanley
234.	Bob Collins
235.	Mr. & Mrs. Fred Baker
236.	Mr. & Mrs. Frank Heppe
237.	Mr. & Mrs. Chel Baird
238.	Burt & R. Handy
239.	Jim Murphy, Backcounty Horsemen of Washington
240.	Gary M. Smith
241.	Faye Ogilvie
242.	April Doolittle
243.	The American Apline Club
244.	Stephen Bachhuber, Willapa Hills Audubon Society
245.	B. Rose
246.	Dr. William R. Balliday
247.	Ed & Elizabeth Chan
248.	David & Gwen Jones
249.	Mazamas
250.	Lois F. Justman
251.	David P. Yocom Jr.
252.	Rodney L. Brown Jr.
253.	Peter Frenzen, Oregon State University
254.	David A. Anderson

Comment Number Individual/Organization

255. Lorraine L. Moffett
256. Skamania County Treasurer
257. Stephen R. Baohhuber
258. Ed. Grumbine
259. Dave Chamber
260. Christie Greiter
261. Handle Unincorporated
262. Dave A. Ek
263. Andrew R. McMillan
264. Robert Boutain
265. Mrs. Alice Boutain
266. Mrs. P.J. Oberlander
267. Kenneth & Lois Miller
268. Richard C. Wilson
269. Mr. C.F. Remmers
270. Ken Guthrie & Suzanne Witham
271. Jim Nieland
272. Sarah E. Greene
273. Cowlitz County Board of County Commissioners
274. Skamania County Board of County Commissioners
275. Mount. St. Helens Protective Assoc.
276. John Beilharz
277. U.S. Department of Transportation Federal Highway Administration
278. John Harrison
279. North County Emergency Medical Services
280. S.J. Mofield
281. Lewis L. McArthur
282. Klindt Vielbig
283. Stacey Clark
284. Noel McRae
285. The American Apline Club
286. B&B Logging Inc.
287. Donald A. Warman
288. The Mountaineers
289. Pat Dick
290. Skamania County District Court
291. Theodora E. Bond
292. Kathy A. Heimbigner
293. William P. Kaiser
294. Ruth Ittner
295. Elsie Stoller
296. R.J. Carson, Whitman College
297. Jim Blankenship
298. Mark E. Harmon, Oregon State University
299.
300. Gary L. Westerlund
301. Trails Club of Oregon
302. Woodland Chamber of Commerce
303. Weyerbaeuser Company
304. Cougar-Yale Chamber of Commerce
305. Ronnie L. Freeman
306. Mr. & Mrs. L.J. Skeajane
307. Yale/Cougar Community Council
308. Wm. A. Fischer
309. Castle Rock Chamber of Commerce
310. Mary Ellen Covert
311. Washington State Sportment's Council
312. Understanding Survival
313. United States Department of the Interior, Geological Survey
314. Regional Planning Council of Clark County
315. Mike & Cathy Jordan
316. Glenn & Wistey Aldrich
317. Ernest W. Zimmerman
318. Rosella Grafton, Escapades
319. Mt. St. Helens Chamber of Commerce
320. John R. Swanson
321. Kevin Stoops
322. Jeanette Woodruff, Cispus Learning Center

Comment Number Individual/Organization

323. Audrey Lawson
324. Donald Fischer, Fischer's Shopping Center
325. Rich R. & Kathy L. Fuller
326. Pamela A. Pollman
327. Richard Rutz, Ph.D.
328. Roscoe T. Files
329. Shirley Lutz
330. Joseph G. Dobias
331. Anita M. Carroll
332. Anna L. Dobias
333. Bob Powne
334. Robert E. Darragh
335. Washington State Department of Natural Resources, Southwest Area
336. Gayle A. McKeazie
337. L.J. Reenan
338. Claudia Clark
339. Marianne Paulson
340. Lee Siebert
341. Gail Cameron
342. Washington Wilderness Coalition
343. Mort Robbins
344. Friends Of The Earth
345. Patrick D. Godsworthy, North Cascades Conservation Council
346. Mary A. Fries, Washington Native Plant Society
347. Mary A. Fries, Washington Native Plant Society
348. C. Glen Jorgensen
349. Ron West
350. National Speleological Society, Inc.
351. Carol Carver
352. Chuck Tonn
353. Barb Selby
354. Darrel Q. McMurphy
355. The Wilderness Society
356. V.H. Dale, Oak Ridge National Laboratory
357. Janet A. Thompson
358. National Audubon Society
359. Lewis County Public Utility District
360. Tom Stacer
361. Sierra Club, Cascade Chapter
362. James P. Quiring
363. Yakima Valley Visitors & Convention Bureau
364. Judy A. Henshel
365. U.S. Environmental Protection Agency, Region IX
366. Washington State Department Of Ecology
367. Washington State Department Of Fisheries
368. Washington State Department Of Game
369. Washington State Department of Emergency Management
370. Washington State Parks and Recreation Commission
371. Washington State Office of Archaeology and Historic Preservation
372. Washington State Department of Transportation
373. Lawrence C. Bliss, University of Washington
374. Mary Walter
375. Del Blackburn, Washington Native Plant Society
376. Phil H. Henderson Jr., M.D.
377. Jim Stepp
378. Margaret Enderlein
379. Chehalis Chamber
380. Skamania Regional Planning Council
381. U.S. Department of the Interior, Pacific N.W. Region.
382. Lafromboise Newspapers, Centralia



United States Department of the Interior

BUREAU OF MINES
WESTERN FIELD OPERATIONS CENTER
EAST AND FIELD AVENUE
SPOKANE, WASHINGTON 99202

October 3, 1984

Mr. Robert W. Williams
Forest Supervisor
Gifford Pinchot National Forest
500 West 12th Street
Vancouver, Washington 98660

Dear Mr. Williams

SUBJECT: MOUNT ST. HELENS NATIONAL VOLCANIC MONUMENT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
COMPREHENSIVE MANAGEMENT PLAN

Our review of the Mt. St. Helens National Volcanic Monument Draft Environmental Impact Statement (DEIS) Comprehensive Management Plan raised a few questions or comments. They are:

1. What is the situation on patented and unpatented mineral properties within the Volcanic Monument (i.e., how many patented claims are in the area, and which claims are active; how many unpatented claims have been staked in the area, and what is the general location of those still active and those no longer active?)
2. What will be management guidelines for owners of patented and unpatented mining claims seeking to develop and mine their mineral estates?
3. Such a large area of probable mineral activities drastically impacted by new management direction obviously suggests that the entire area receive a detailed study of the mineral natural resources.

Thank you for the opportunity to review this DEIS.

Sincerely,

Walter D. Sargis
D'Arcy P. Banister, Supervisor
Minerals Involvement Section

JOHN STEUHAN
Governor



STATE OF WASHINGTON DEPARTMENT OF TRANSPORTATION

Division of Aeronautics • 8620 Pioneer Road, King County Int'l Airport
Seattle, Washington 98148 • (206) 764-4111 • (Toll Free) 1-800-888-0666

October 16, 1984

Robert W. Williams
Forest Supervisor
Gifford Pinchot National Forest
500 West 12th Street
Vancouver, Washington 98640

Re: St. Helens DEIS

Dear Mr. Williams:

The Washington State Aeronautics Division has studied the proposals to restrict air traffic around the Mt. St. Helens Volcanic Monument and has the following comments.

Mt. St. Helens is awesome when viewed from the air and thousands of people from all over the world have come here to do so. We naturally feel that right should be preserved to the maximum extent possible and, therefore, feel that the no restriction provisions found in alternatives A, F and G are preferable. Current Federal Aviation Administration Regulations, Part 91, adequately addresses all public safety aspects that need to be addressed.

Appendix H contains your preferred alternative to which we have two specific comments. First, from personal observation, we know that the Mt. St. Helens landscape is so foreign to the eye, that depth perception is difficult. To maintain 1,000 feet AGL accurately is difficult enough in mountainous terrain. We appreciate that your regulation "request" this altitude be maintained. FAR 91 will still pertain to operations.

In regards to any alternative, the maintenance of a discreet traffic frequency as you have suggested is an excellent safety feature which should receive wide dissemination.

Thank you for the opportunity to comment.

Sincerely,

WM. H. HAMILTON
ASSISTANT SECRETARY FOR AERONAUTICS

W. H. Hamilton
LeMondine D. Stitt
Aeronautics Program Specialist

LD5me

cc: Bill Lokey, Dept. of Emergency Services

42-3

JOHN SPILLMAN
Governor



STATE OF WASHINGTON

INTERAGENCY COMMITTEE FOR OUTDOOR RECREATION

4800 Capitol Blvd., N-11 • Tumwater, Washington 98501 • (206) 753-7140 • (SCAN) 234-2740

October 23, 1984

Mr. Robert W. Williams
Forest Supervisor
Gifford Pinchot National Forest
500 W. 12th Street
Vancouver, WA 98660

Dear Mr. Williams:

Thank you for providing us with a copy of the Draft Environmental Impact Statement for the Mt. St. Helens National Volcanic Monument Management Plan. A member of my staff also attended the open house meeting held in Tacoma on October 16, 1984. Based on our review of the DEIS document and discussions with your staff at Tacoma, we offer the following comments and suggestions.

We concur with the selection of Alternative B as the preferred plan, but request consideration of the following proposed modifications:

Figure 11 on Page 35 compares supply/demand for traditional forest-type recreational activities to the year 2000. We note that in Alternative B, supply is expected to equal or exceed demand for all activities except picnicking. Since most day-use visits to the Monument will involve several hours, a meal function (usually a picnic) within the area would seem to be a common activity desired by many of your visitors. No alternative (including D) indicates sufficient supply to meet even 50 percent of the anticipated picnicking demand. We would suggest that consideration be given to increasing the proposed picnic facilities in the final Management Plan.

In the same Figure 11, projections for camping appear to provide adequate facilities to meet anticipated demand for the preferred alternative. We would request that you consider the following information in your final decision and suggest that as a minimum, the increased campground facilities proposed for Alternative E be considered.

As the agency responsible for the development and maintenance of the Statewide Comprehensive Outdoor Recreation Plan (SCORP), we are required to maintain an inventory of public recreation facilities within the state of Washington. This includes federal facilities as well as those of state and local governments and the private sector. At the present time, state and federal governments are the primary providers of overnight camping facilities in the rural and semi-remote areas of the state. In 1976 federal agencies provided 9,101 overnight campsites within the state. In 1983 there were 8,243 campsites, an overall decrease

42-1

14

ROBERT L. WILDER
Director

Mr. Robert W. Williams
Page two
October 23, 1984

of 652 sites. While state government increased the actual number of sites during this same period (from 7,244 sites in 1976), population increases alone were such that there was an 11 percent increase in people served per campsite, thereby creating a greater impact on already crowded facilities. Because of the decrease in actual campsites available, the overall impact on existing federal facilities for this same period increased by 25 percent.

We are well aware of the fact that statistics applicable on a statewide basis can vary considerably from those of a specific area or site. We do, however, feel that because of this statewide trend of supply being unable to keep up with increasing population and demand, the future need for overnight camping facilities in the National Monument area may have been underestimated.

Thank you for considering our suggestions. May we continue to be "Partners in Progress."

Sincerely,

ROBERT L. WILDER
Director

RLW:GWP:ah

cc: Jerry Pelton
Planning Services Division

Lewis County

Economic Development Council



Robert W. Williams
Forest Supervisor
Clifford Pinchot National Forest
500 West 13th Street
Vancouver, WA 98660

Dear Bob,

Since our meeting at the June 13th Workshop held at the Clapson Learning Center, I have looked forward with anticipation to receipt of the DEIS on the Comprehensive Management Plan for the St. Helens National Volcanic Monument. The insights you shared with me then reassured me that the "issues, concerns, and opportunities" would receive careful scrutiny in development of this plan. The depth and breadth of the DEIS's coverage, however, do not compensate for the imbalance in its emphasis. Without debating the merits of the seven alternatives presented, I share the view of many Lewis County citizens who feel that significant opportunities have been excluded from consideration. Stated succinctly, all seven alternatives de-emphasize the attractiveness of and existing access to some of the Monument's finest features.

The blow-down area of devastation is the volcanic site to many travelers, and is best accessed from the White Pass Highway. It is right next to Mt. Rainier, on many tourists' list of "things-to-see". Often, it is their plan to tour both sites while traveling the "loop" which has received national media coverage. Naturally, their easiest access is through eastern Lewis County. Even if their intention is to visit only St. Helens, this same access is the most direct from all points east, as well as from the Seattle and Tacoma areas and our Canadian neighbors to the north.

Regardless of their origin, however, all tourists will find they can get closest to the crater and to Spirit Lake from the northern entrance. They must pass that way to see the devastation zone. And, the basic roadways to those features already are in place. Of course, some upgrading is necessary to fully realize these roadways' potential; but, this would not likely cost the \$64 million planned for roadbuilding from 1-5 access points.

Presumably, such excessive road construction expenditures are defended by the related decision to relocate the main visitor center. As we see it, however, this relocation decision is a tremendous concession to the Coville County interests. Such interests are not without merit, in light of the negative impacts on their local economy precipitated by the

15/222

315 So. Washington St.
Centelle, WA 98531
[206] 736-2595
[360] 338-2788

15/222

maintain's eruption. But similar impacts have been felt in Lewis County. Therefore, similar concessions for Lewis County ought to have been made part of the "preferred alternative". Clearly, this is not the case.

As you already know, Forest Products industries historically have been the driving force of Lewis County's economy. National conditions aside, St. Helens' eruption dealt a crippling blow to these industries. As we look to diversify our local economy, tourism offers a gleam of hope in an otherwise gloomy future. The DEIS preferred alternative favoritism of non-Lewis County developments, further darkens the picture by its imbalance.

To summarize, let me encourage revision of your plans to manage the St. Helens Monument with an alternative more oriented toward eastern Lewis County for the following reasons:

1. Some of the monument's best features are most accessible through eastern Lewis County;
2. Less costly improvements are required to upgrade this existing access;
3. Increased visitor volumes are achievable through the natural linkage of the monument with Mount Rainier; and
4. Economic conditions in eastern Lewis County are at least as deserving of attention as are other negatively impacted communities near the Monument.

Particularly regarding point #4 above, we would be happy to provide supportive information, if it will help in your review of our request. We are not challenging the merits of the preferred alternative, as much as we are advocating a more balanced development and management plan, which more efficiently applies the available resources. If we can be helpful in your efforts to chart the best course toward these objectives, we hope you will call on us for assistance.

Sincerely,

Tom Newton

Tom Newton
Director

TV/hb

cc:Harold Cooper, Chairman Lewis County Commission
Kathy Fuller, Secretary, Bendia Unincorporated
Jim Marvin, Publisher, The Journal
Jack Underwood, Publisher, The Daily Chronicle
Don Bonker, U.S. Congressman, Washington 3rd District
Stade Garton, U.S. Senator, Washington
Daniel Evans, U.S. Senator, Washington
Ms. Leslie Sluman, Director, State Tourism Development Division

WORKING TOGETHER TO BUILD A BETTER TOMORROW!

26



SHERIFF'S OFFICE SKAMANIA COUNTY

Stevenson, Washington 98648
Phone 509 427-5047

WILLIAM R. CLOSNER
Sheriff

GLENDIA KAILAS
Chief Civil Deputy

RAYMOND D. BLAISDELL
Chief Deputy

November 2, 1984

Robert Williams
Forest Supervisor
Gifford Pinchot National Forest
500 W. 12th St.
Vancouver, WA 98660

Dear Sir:

This letter is in response to your DEIS Comprehensive Management Plan for Mt. St. Helens National Monument.

In the interest of public safety we recommend the following:

- #1. Communications - The only communication available on the 99 Rd. and at Windy Pass is when our staff and your interpretive staff are in the area.
- Due to the large congregations of tourists, and the potential for a major accident over the bank we recommend that some method of communication be available on the 99 Rd. and at the Windy Pass parking lot.

- #2. Evacuation - The 99 Rd. has the highest concentration of tourists and vehicles than any other routes to view the crater. We feel that there needs to be adequate signing on the 99 Rd. and information available at each viewing station that speaks to a procedure for evacuation and the location of the evacuation route. An alternate evacuation route from the 99 Rd. should receive a high priority in the evacuation planning process.

- #3. Day Use Shelter - We would like to propose that some thought be given to a Day Use Shelter for a law enforcement representative and include sanitation and small office space that is readily accessible to the tourists on the 99 Rd.

We feel the above suggestions are a high priority for your final EIS for the Mt. St. Helens National Volcanic Monument.

Sincerely,

William R. Closner
Sheriff, Skamania County

WRC:dk



United States Department of the Interior

NATIONAL PARK SERVICE
MOUNT RAINIER NATIONAL PARK

Tahoma Woods, Star Route
Arlford, Washington 98304

IN REPLY REFER TO:

L76

November 21, 1984

Robert W. Williams, Forest Supervisor
Gifford Pinchot National Forest
500 West 12th Street
Vancouver, Washington 98660

Dear Mr. Williams:

We have reviewed the draft EIS for Mount St. Helens National Monument. We believe, as is stated, that this is an opportunity to witness recovery of an area following a violent volcanic eruption. Because of the uniqueness of the opportunity, and the scientific research and learning opportunities we believe that emphasis should be placed on natural recovery of the ecosystem, and on scientific study. The act which established the Monument provides a strong charge "...to protect the geologic, ecologic, and cultural resources... allow- ing geologic forces and ecological succession to continue substantially unim- peded." We believe that visitor use of the Monument should emphasize seeing and learning about volcanic phenomena. A strong emphasis on interpretation vs. mechanized recreation should receive very high priority in order to take full advantage of the unique resources and the dynamic ecosystem found at Mount St. Helens.

Tram and bus travel are the best alternatives to minimize human impacts on the fragile ecosystem. We suggest a 2,000' air traffic restriction. We see no mention of the kind of organization or number of employees required to op- erate the Monument, and no mention of the potential impact of the Monument upon visitor use of other recreation sites in the Pacific Northwest.

We found this draft to be well organized and appreciate the opportunity to review it. I hope that our comments can be used constructively.

Sincerely,

Neal G. Guse

Neal G. Guse
Superintendent

128



U.S. Department
of Transportation
Federal Highway
Administration

197 Memorandum

711 S. Capitol Way, Suite 501
Olympia, Washington 98501

Subject: Mt. St. Helens National Monument

Draft Environmental Impact Statement and
Comprehensive Management Plan

Date November 26, 1984

From: Paul C. Gregson, Division Administrator
Olympia, Washington

Reply to
Ain of HEO-WA


To: Mr. Robert Williams, Forest Supervisor
Gifford Pinchot National Forest
500 W. 12th Street
Vancouver, Washington 98560

We have reviewed the Draft Environmental Impact Statement for the Mt. St. Helens National Monument Management Plan and it appears to adequately support the preferred Alternative D. Alternative D is acceptable to us and the DEIS will provide the necessary basis for determining the location of SR 504 for reconstruction to Coldwater Lake.

We did note that the name and qualifications of Area Engineer Donald Levien had been omitted from the List of Preparers and Resource Specialists on page 174. He should be added to that list. The necessary information on Mr. Levien is given below:

Name	Qualifications
Levien, Donald L.	Engineer - Highway, BS, Civil Engineering Oregon State University 1959. 24 years Experience with the Federal Highway Administration in Planning, Design, Construction, and Administration.

If you have any questions concerning our comments, please let us know.

By: 
L. P. Renz
Chief, Engineering &
Operations



Skamania County
Board of Commissioners
COURTHOUSE
P.O. Box 437

Stevens, Washington 98648
(509) 427-5141, ext. 200
November 27, 1984

Det. J. William V. Benton
Det. 2 Eric M. Weldon
Det. J. Ed Callahan

SKAMANIA COUNTY POSITION PAPER ON MOUNT ST. HELENS VOLCANIC MONUMENT ENVIRONMENTAL IMPACT STATEMENT

In the creation of the Mount St. Helens Volcanic Monument, Skamania County lost the future rights to millions of dollars of timber value. In addition to the timber rights loss, 21,584 acres of private land in our county were added to the Monument area resulting in a loss to our tax base.

With these economic losses and the fact that 85% of the Monument lies within our county's border, we were concerned that any Monument development and management plan proposed by the U.S. Forest Service contain elements that would provide an acceptable degree of economic return to our county.

After investigating the U.S. Forest Service Draft Environmental Impact Statement Comprehensive Management Plan for Mount St. Helens National Volcanic Monument, it is our opinion that none of the seven alternatives of the E.I.S. contain those elements necessary to replace our economic losses brought about by the establishment of the Monument.

It is also very apparent that the U.S. Forest Service's preferred alternative "D" would provide a substantial economic gain to the businesses located along the Highway 504 corridor, which lies entirely within one county.

We realize that, due to the importance of the I-5 highway and its relation to the monument, perfect economic equality between all four surrounding counties, is not possible. However, we do feel that

developmental alternatives available to the U.S. Forest Service could provide a more equitable situation.

We, therefore, take the position that none of the seven alternatives are acceptable, and that any plan adopted by the U.S. Forest Service should contain the following as their major goals.

Skamania County Recommendations:

1. That the South Corridor through Skamania County be given adequate study and consideration, and that vehicular traffic volume through the Columbia River Gorge on both State Road 14 and I-84 be considered when figuring potential users of the Monument.
2. That an interior Monument roadway system be designed that offers a loop system, or crossing of the Monument from east to west, so that visitors can travel the Monument from any of the four portals without back-tracking or being forced to travel great distances out of their way in order to enjoy the entire Monument.
3. That a destination year-around lodge and restaurant facility be developed in the vicinity of Swift Creek Reservoir to attract and service non-camping visitors who wish to spend more than a day enjoying the Monument's various features. The lodge would also serve the activities of hunting, fishing, boating, spelunking, berry-picking, hiking, winter sports and others that are available in and around the Monument and the Gifford Pinchot National Forest.
4. That Forest Service Road 25 from State Road 12 at Randia to Forest Service Road 90 at Swift Creek Reservoir be developed into a two-lane, year-around road. This would open up the Monument for year-around use and greatly increase the potential for winter sports and the number of users of the proposed lodge at Swift Creek Reservoir.

Funds for achieving the above goals are presently available to the U.S. Forest Service and simply need to be redirected from the number of

extensive improvements planned solely along State Road 504 and at the Lewis and Clark State Park.

A plan that includes the aforementioned goals would provide for a more balanced and equitable economical impact to all four counties.

It would also provide development outside the danger zone of the volcano should another catastrophe occur in the near future.

It would also aid in the dissemination of traffic flow, thereby making road travel safer and emergency evacuations much quicker and more efficient.

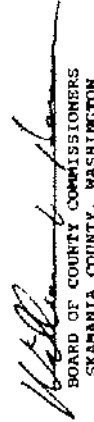
In closing, we again state our position, that the plan adopted by the U.S. Forest Service should contain elements that will help replace the millions of dollars lost by Skamania County in the establishment of the Volcanic Monument.

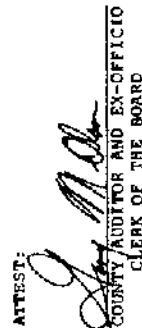
We thank you for a chance to investigate your proposal and for allowing Skamania County an opportunity to respond to the proposal.

Sincerely,


Chairman


G. W. Wilson


BOARD OF COUNTY COMMISSIONERS
SKAMANIA COUNTY, WASHINGTON

ATTEST:

COUNTY AUDITOR AND EX-OFFICIO
CLERK OF THE BOARD



OFFICE OF THE COMMISSIONERS
LEWIS COUNTY, WASHINGTON
CHEHALIS, WASHINGTON
98512

P.O. BOX 76
(208) 746-9121

November 26, 1984



GARY ELY
FIRST DISTRICT
ROBERT J. VERNERSON
SECOND DISTRICT
HAROLD COOPER
THIRD DISTRICT

Mr. Robert W. Williams
Forest Supervisor
U. S. Department of Agriculture
U. S. Forest Service
500 West 12th Street
Vancouver, WA 98660

Dear Mr. Williams:

The following comments represent the position of the Lewis County Board of County Commissioners regarding the Draft Environmental Impact Statement for the Mt. St. Helens National Volcanic Monument.

This position is based on:

- A. Verbal and written comments submitted to the Lewis County Board of County Commissioners from the citizens of Lewis County.
- B. A thorough analysis of the Draft Environmental Impact Statement by the Lewis County Board of County Commissioners.
- C. The desire to develop a quality visitor experience to the Mt. St. Helena National Monument.

Two years ago, the U. S. Forest Service selected the Sequest site, on State Route 504, as the location for the permanent Mt. St. Helens Visitors Center. Lewis County's arguments opposing this site and supporting the Lewis & Clark State Park location for the center have been well documented. However, at an early stage, the U. S. Forest Service established its desire to develop the major features of the Monument on State Route 504 (the Spirit Lake Memorial Highway). We feel that this tendency is unfortunate, especially in light of the proposed reconstruction of State Route 504 into the National Volcanic Monument at an estimated cost of \$64 million. This project is an extremely expensive undertaking and even more difficult to understand is that the proposed route will dead-end at Coldwater Lake approximately 28 miles from the beginning reconstruction point at Camp Baker.

Mr. Robert W. Williams
November 26, 1984
Page Two

In its current format, we cannot support, nor justify, the reconstruction of State Route 504 as described in Alternate Plan D. If the re-establishment of this highway is critical to the development of the Monument, we would recommend the construction of a combination loop road that would unite the Forest Service roads on the north and east sides of the Monument with an extended State Route 504.

No one can deny the fact that Cowlitz County bore the brunt of the 1980 eruption. However, the tourists who will continue to come to the Monument will not care which County they are in -- they will want a quality experience and this experience must include elements of the mudflow, the blow-down devastation area, the mountain, the crater, and Spirit Lake.

It is our opinion that the U. S. Forest Service's Alternate Plan D essentially ignores any major tourism developments on the north and east sides of the Monument. Furthermore, the cost of a \$4-\$5 million visitors center on State Route 504 cannot justify an additional \$64 million expenditure on a dead-end road.

We basically agree with the proposed improvements to Roads 25, 99, etc. and the additions to the Iron Creek Campground. We would suggest that the Iron Creek information station be moved to Randle and staffed on a year-round basis. Furthermore, we would propose that additional day-use facilities and perhaps campgrounds be provided on Road 2516, Strawberry Mountain, and the Elk Pass areas.

It is our consensus that the U. S. Forest Service has overemphasized the importance of Interstate 5 to the development of major tourism facilities for the Monument. U. S. Highway 12 is a major thoroughfare in the State of Washington. This highway provides access not only to Eastern Washington but also to Mt. Rainier National Park and the population centers in both King and Pierce County via State Routes 410, 123 and 7.

The most important facts for the U. S. Forest Service to consider are that the premium views of the crater, mountain and the blow down areas are on the north and east sides of the Monument. If a tramway is desired, we would propose that the U. S. Forest Service consider such equipment near Independence Pass. Such a tram would give visitors a spectacular view of the lake, crater and mountain, and would be considerably shorter than the proposed tram from Coldwater Lake.

Mr. Jim Blankenship, Director of the Back Country Horsemen of Washington, submitted a letter to the Board of County Commissioners (a copy is attached) that deals strictly with the trail system. We have reviewed this letter and concur with Mr. Blankenship's findings.

Mr. Robert W. Williams
November 26, 1984
Page Three

220

The Mt. St. Helens National Volcanic Monument has, and will continue to become, a popular tourist destination point. Lewis County is challenging the U. S. Forest Service to seriously review its Draft Environmental Impact Statement in lieu of these concerns and those mentioned in the attached letters. Furthermore, we would invite you to tour these proposed areas with us and allow us to discuss these matters with you in person.

Sincerely,

BOARD OF COUNTY COMMISSIONERS
LEWIS COUNTY WASHINGTON

W. H. H. H. H. H.
Chairman

Member

W. H. H. H. H.
Member

cc: Honorable Dan Evans
Honorable Slade Gorton
Honorable Don Bonker
Honorable Sid Morrison
Honorable John Spellman
The Horton Journal
The Daily Chronicle
Duane Berentson

220

To - Mr. Dave Schillerort
Lewis County Parks & Recreation

RE: Mt. St. Helens National Volcanic Monument Draft
Environmental Impact Statement & Comprehensive Management Plan

Dear Mr. Schillerort:

Thank you for your letter of October 30, 1984 concerning my input on the above matter.

As I am the Lewis County area director representative for Backcountry Horsemen of Washington and do have a definite interest in this plan from a Backcountry Horseback riders' point of view. I have received a copy of the draft and all the management alternatives, plus attending meetings regarding the plan. After giving considerable thought to the various plans, I cannot fully endorse any particular one of these alternatives. I do have some definite ideas as to what I would like to have incorporated into the final plan.

My comments will be confined primarily to trail use in the Mt. Margaret Concept area and the Backcountry Management Concept Area. I am not familiar with the trails and horse use in the Cove Basalt/Goat Marsh Management Concept areas and the Mudflow Management Concept area, so will therefore not comment on these areas.

I would like to suggest that all trails in the Mt. Margaret and Backcountry Management Concept areas be open to horse use. The Mt. Margaret Concept area trails could be limited to day riding only. This would eliminate overnight camping and the undesirable characteristics. The Backcountry Management area should be open in its entirety to all types of horse/hikers riding and camping. Most of the area, except Falls Creek, is currently being used as such. Falls Creek trail #212 from the Green River trail #213 to trail #211 in the Mt. Margaret area should be open to horse use. Much of this trail is in standing, green timber and conditions would be no different than prior to the eruption. This trail system could be further enhanced by using Falls Creek trail #212 to trail 211 to 211.2 to proposed trail 217c and connect to trail #213 (Green River Trail). This trail system would provide a loop ride for horsemen, would provide minimal horse/hiker contact and would make a nice one-day ride without overnight camping in the Mt. Margaret Concept area.

(Cont.)

Page 2.

Trail 217F and the above mentioned loop are mapped in the Alternative C. The 213 (Green River) trail and the 217 (Ryan Lake/Deadman Lake/Vanocan Peak) trail system would provide another loop ride. This loop has always been and is currently being used by horsemen.

Many of today's trail riders haul their horses to a trailhead/horse camping area, ride during the day and return to their campers/trailers at night. By providing horse camp facilities at both ends of the trail, Green River trail #213 and using the aforementioned loop ride trail system, this would provide quality horse back riding with the probability of little horse/hiker contact. Most hikers will most likely use the Mt. Margaret/Lakes Basin trail system.

One of the other aspects of providing as much horse riding trails as possible is that it permits many disabled and handicapped people to enjoy this area. Hiker trails are for the physically fit person and pretty well eliminates many older, disabled and handicapped individuals. Governmental agencies are committed to provide facilities for the handicapped and disabled and I suggest a good horse trail system is one way of addressing that program.

I appreciate the opportunity to comment on this plan and would appreciate your consideration.

Sincerely,

Jim Blankenship
Jim Blankenship

SKAMANIA COUNTY TREASURER

WILMA J. CORNWALL

P. O. Box 254
Vancouver, Washington 98660
November 30, 1986



Robert W. Williams, Forest Supervisor
Gifford Pinchot National Forest
500 M. 12th Street
Vancouver, Wa 98660

Dear Mr. Williams:

RE: Draft Environmental Impact Statement
Mt. St. Helens National Volcanic
Monument Management Plan

I do not believe that any of the alternatives of the E.I.S. will help Skamania County recover the losses it will experience by establishment of the Monument.

Skamania County will lose thousands of dollars in timber revenue due to the eruption of Mt. St. Helens. Acres of private land were taken for use in the Volcanic Monument area which resulted in a loss to Skamania County's tax base.

In planning for this development, consideration should be given to provide for a more equitable and economical return to the counties affected by this legislation to compensate for their losses.

Roads should be designed and developed so that the Monument is accessible from all sides. Access should be provided thru the Columbia River Gorge on both sides of the river and on the eastern section of the Monument so that visitors from south of the Monument and from the eastern and south-eastern sections do not have to travel many miles out of the way. This would also encourage more tourism.

Sincerely,

Wilma J. Cornwall
Wilma J. Cornwall
Skamania County Treasurer



United States
Department of
Agriculture

Forest
Service

Pacific Northwest
Forest and Range
Experiment Station

Forestry Sciences Laboratory
3200 Jefferson Way
Corvallis, OR 97331

272

Form 4060

Dec 3, 1984

Robert W. Williams
Forest Supervisor
Gifford Pinchot National Forest
500 W. 12th Street
Vancouver, WA 98660

Dear Mr. Williams:

As coordinator of the Research Natural Area (RNA) program in Washington and Oregon, I would like to make some comments on the Mount St. Helens Draft Environmental Impact Statement (DEIS). There are two RNAs within the National Volcanic Monument, Cedar Flats, established in 1946, and Goat Marsh, established in 1974. Both RNAs have a history of research use and contain permanent sample plots.

Page 137 of the DEIS under Protection concerns states that "recreational trails in and adjacent to Goat Marsh and Cedar Flats RNAs may significantly affect research opportunities, particularly those associated with wildlife." This is, indeed, an important concern. Several sections of the Forest Service Manual address this very issue.

Research Natural Areas are limited to research, study, observations, monitoring, and kinds of educational activities that are nondestructive and nonmanipulative, and that maintain unmodified conditions. (4063.3)

A Research Natural Area must be protected against activities which directly or indirectly modify ecological processes if the area is to be of value for observation and research on plant and animal succession, (etc.)... Discourage recreational uses. (4063.02)

Picnicking, camping, collecting plants, gathering nuts and herbs, picking berries, hunting, fishing, trapping, and other public uses which contribute to modification of a Research Natural Area should be discouraged or expressly prohibited if such uses threaten serious impairment of research or educational value. (4063.36)



PS-000-196 (7-81)

272

Robert Williams

Page 2

I hope this will continue to be a concern. If there is anything I or the RNA Committee can do to help with this problem, please notify us. I feel it is especially important at Goat Marsh RNA.

In the preferred alternative D mention is made on p. 240 and 244 of trail development and use within the RNA's. As stated above I am particularly concerned about Goat Marsh. The plan is to maintain a parking area for 5 cars at the trailhead for trail #237. This will invite and facilitate use of the RNA by the public. Though public use of RNA's is not prohibited, it should not be encouraged. The trail leads into Goat Marsh Lake and the area around the lake and marsh already shows the signs of human abuse. If anything I feel the forest should be closing off the trail, or at least discouraging, rather than encouraging, use of the area. I appreciate the idea of putting in a sign about low impact use, but the RNA is for research and education, not general public use.

The trail into Cedar Flats in an old one which creates a lot less impact. In this case I see no very serious conflict. A major road runs through the middle of the RNA, making the area very public. I walked the trail this summer and feel comfortable about it. I would be most happy to help with a self-guided trail brochure.

Once again if I can be of help in administering either of the RNA's, please do not hesitate to get in touch. Thank you for the opportunity to comment.

Sincerely yours,

Sarah Greene

SARAH GREENE
Research Natural Area Scientist
Pacific Northwest Region

cc:
Francisco Valenzuela
Ken Johnson



273
BOARD OF COUNTY COMMISSIONERS
DISTRICT NO. 1
WALTER CHURCH JR.
DISTRICT NO. 2
BETTY ROBSON
DISTRICT NO. 3
VAN A. YOUNGQUIST

November 30, 1984

Mr. Robert W. Williams, Forest Supervisor
Gifford Pinchot National Forest
500 West 12th Street
Vancouver, Washington 98660

Re: Mount St. Helens National Volcanic Monument Comprehensive
Management Plan and Draft Environmental Impact Statement

Dear Mr. Williams:

The Cowlitz County Board of Commissioners would like to thank you for the opportunity to review and comment on the Comprehensive Management Plan and DEIS. We would like to express our support for Alternative 'D', east/west side moderate development, as the preferred management strategy.

One of the most important aspects of the National Volcanic Monument (NVM) is the opportunity it provides for diversifying Southwest Washington's economic base. The economy of this area has been hard hit these last few years by high interest rates and the slow housing market. Unemployment rates in Cowlitz County have been double digits every month since September, 1980. The rate peaked at 20.5% in November, 1982, but has been 15.2%, 14.5%, 13.3%, 13.7%, 12.6%, 12.2%, 12.5%, 12.1% and 11% the first nine months this year.

The eruption of Mount St. Helens and the creation of the NVM provide tremendous opportunities for expansion of tourism throughout the County. Alternative 'D' provides a balanced network of recreational/interpretive facilities on all sides of the Monument. These visitor opportunities comply with the provisions of the National Volcanic Monument Act by protecting geologic, ecologic and cultural resources while allowing appropriate public uses during this early phase of volcanic activity.

This alternative also combines actions by government with opportunities for private business. Visitor services such as the tram to Johnston Ridge, shuttle bus to Spirit Lake and other concessions can be developed and operated by private enterprise. Concession lease fees can provide a revenue source to the Forest Service which could be used in providing other facilities/services in the Monument.

207 FOURTH AVE. NORTH • KELSO, WASHINGTON • 98626 • TELEPHONE (206) 577-3070 FAX 542-3000

273

Mr. Robert W. Williams
November 30, 1984

-2-

COMMENTS ON ALTERNATIVE 'D'

Public Access Routes

Access to good viewpoints will strongly influence the number of visitors attracted to the Monument. Cowlitz County urges the Forest Service to determine the final alignment of Spirit Lake Memorial Highway (SR 504) as quickly as possible. The Washington State Department of Transportation (DOT) is prepared to initiate right-of-way acquisition and construction as soon as the final corridor is selected. DOT would like to complete construction of the highway to Elk Rock by the time 1986 Expo opens in Vancouver, B.C. If this proves possible, we would like the Forest Service to seriously consider installing a temporary visitor facility at Elk Rock.

Re-establishment of Spirit Lake Memorial Highway to the Coldwater Lake vicinity will complement the Forest Service Silver Lake Visitor Informational Center. As indicated by the public use of the present temporary facilities at Hoffstadt Viewpoint, there is a demand for access on the west side of Mount St. Helens. This demand will significantly increase when the Visitor Center opens.

Although either the upper or lower corridor for Spirit Lake Memorial Highway is acceptable, the lower corridor is preferred for the following reasons:

- Avoids necessity of acquiring 950 acres of private land between the road and the National Volcanic Monument boundary and the potential for the acquisition process to delay construction.
- Costs about the same as the upper route when considering both land acquisition and construction costs.
- Reduces snow removal maintenance costs and allows year-round use of the road and facilities at Coldwater Lake.
- Provides close-up views of the debris avalanche which will remain visible when clouds block higher elevation viewpoints.
- Reduces potential for indiscriminate public use of adjacent private logging roads.
- Provides opportunity for future trail access to the Toutle River Valley for hiking, horseback riding and fishing.
- Allows potential impacts from the public on the debris avalanche to be reduced through location of good viewpoints and control of parking areas.

Mr. Robert W. Williams
November 30, 1984

-3-

Cowlitz County also supports controlled public access to Spirit Lake from the east side (Road 99) as proposed in Alternative 'D'. Public understanding or ecologic and geologic processes can be enhanced by access to Spirit Lake. Safety of the visiting public can be maintained by controlling the access as proposed in Alternative 'D'.

Aerial Tram

Cowlitz County favors the use of an aerial tram to transport visitors from Coldwater Lake all the way to the Johnston Ridge observation post. If the field surveys and market analysis indicate that changing directions is not technically possible with one tram, we ask that you consider installation of a second tram rather than using a bus shuttle system. Shifting from a tram to a bus and a bus back onto a tram to make the round trip seems very cumbersome for visitors, and we fear it will discourage return visits by many.

Public Safety

As part of the Comprehensive Management Plan, the Forest Service should establish plans and procedures for providing public warning of impending volcanic hazards. This plan should address not only the heavy public use areas of SR 504 and Road 99, but also trails and other facilities around the volcano.

Emergency medical service (EMS) should also be provided within the Monument area by the Forest Service. Past EMS responses have been made by fire protection districts which are staffed by volunteers and serve rural areas. These districts are some distance from the Monument necessitating lengthy response times. Moreover, responses within the Monument area are outside the district's jurisdiction and are placing severe financial strains on their limited budgets as well as reducing their ability to adequately respond to emergencies within their territory. Forest Service assumption of EMS responsibility on federal lands and coordination with local districts will provide the most efficient EMS coverage.

This same concept also applies to law enforcement. We favor continuation of cooperative agreements whereby the Forest Services pay for law enforcement on federal land.

Air traffic around Mount St. Helens has also become a safety concern. Height restrictions of 1,000 feet above the terrain and any other advisories/restrictions deemed appropriate by the Federal Aviation Administration are supported by Cowlitz County.

Hunting & Fishing

Pre-eruption hunting and fishing in the Mount St. Helens area were activities accounting for a significant number of recreational user days. Many opportunities exist for hunting and

Mr. Robert W. Williams
November 30, 1984

-4-

fishing, both now and in the future. The Act allows hunting and fishing to continue within the Monument. Some areas may be restricted for established periods of time because of public safety or to protect geologic/ecologic resources.

The selected management alternative and final EIS should clearly indicate where any hunting or fishing restrictions will be established and how frequently a review of those restrictions will be made. Restrictions should be established only after consultation with the Washington State Departments of Game and Fisheries and with public review.

Future Considerations

Alternative 'D' proposes developments which are appropriate under the present geologic, ecologic and volcanic hazard conditions. However, at some future date these conditions will become more stable and capable of accommodating higher visitor carrying capacities. As part of selecting Alternative 'D' as the preferred management strategy, Cowlitz County favors establishing an element of the plan that defines future action concepts.

On-going scientific research within the Monument is producing a wealth of information. This research data can be used by the Forest Service during subsequent plan evaluations and updates to ascertain when additional public use carrying capacity is appropriate.

For long-term management direction of the Monument, it is important to identify future concepts which may be developed. The following are concepts that Cowlitz County would like included in the long-term development alternatives:

1. Spirit Lake Memorial Highway should be restored to Spirit Lake and connected to Road 99. Allowing public travel along loop routes through and around the Monument increases access to all recreation areas and lessens congestion along major roads by reducing round-trip traffic.

A trans-Monument road optimizes public use of the Monument, improves management of the Monument, allows equitable distribution of recreational/tourist economic impacts to surrounding communities and restores the traditional recreational uses to the Spirit Lake basin.

2. Spirit Lake's pre-eruption size was adequate to accommodate a multitude of intensive recreational uses. Future improved ecological conditions may allow a return of the past traditional uses including camping, fishing, water-skiing, boating, and winter activities.

December 4, 1984

Mr. Robert W. Williams, Forest Supervisor
Gifford Pinchot National Forest
500 West 12th Street
Vancouver, Washington 98660

Dear Mr. Williams:

We, the County Commissioners for Skamania, Lewis and Cowlitz Counties, Washington, express our support for the following positions on issues in the U.S. Forest Service Mount St. Helens National Volcanic Monument Comprehensive Management Plan and Draft Environmental Impact Statement:

1. Develop a loop road system around Mount St. Helens. Extend Spirit Lake Memorial Highway (SR 504) to Spirit Lake and connect to FS Road 99. Improve and maintain FS Roads 25 and 99 as two lanes, and maintaining Roads 35, 99, 51, 90 and 30 for year-round public travel.

By increasing access to all areas of the Monument the number of visitors and recreational users attracted to the area will increase. Establishing a trans-Monument loop road system will allow for equitable distribution of recreational and tourist economic impacts to surrounding communities.

2. Public safety in the Monument area is of great importance. The U.S. Forest Service should provide emergency medical service and law enforcement on Federal land.

Emergency medical service responses to the Monument area are placing severe financial and personal strains on the limited resources of the surrounding local communities. Forest Service assumption of emergency medical service and law enforcement responsibilities on Federal lands with coordination and funding to local jurisdictions will provide the most efficient emergency medical service.

3. Fire control in all areas of the Monument should emphasize suppression of fire as fast as possible. Any uncontrolled fire starting within the Monument could spread very quickly into forested lands outside of the Monument causing extensive damage to both public and private timber resources.

273

Mr. Robert W. Williams
November 30, 1984

-5-

3. Coldwater Lake is also of sufficient size to eventually accommodate more intensive recreational use including fishing, water-skiing and boating.
4. Trail access to the North Toutle Valley for hiking, horseback riding or fishing should be provided.

CONCLUSION

In summary, Cowlitz County favors Alternative 'b' with the modifications noted above. We believe it strikes a good balance between protecting natural features and processes while allowing adequate visitor facilities to expand tourism in Southwest Washington. Please feel free to contact us or any members of our staff if you would like to discuss any of our concepts further, or if you have any questions.

Sincerely,

BOARD OF COUNTY COMMISSIONERS
OF COWLITZ COUNTY, WASHINGTON

Van A. Youngquist
Van A. Youngquist, Chairman

Walter Church, Jr.
Walter Church, Jr., Commissioner

Betty Robinson
Betty Robinson, Commissioner

cc: Nancy Parkes, Congressman Bonker's Office

Mr. Robert W. Williams
December 4, 1984

-2-

4. Hunting and fishing in the Mount St. Helens area have been important recreational and economic factors to surrounding local communities. The selected Monument management alternative should allow for the eventual return of hunting and fishing in all areas, lakes and streams within the Monument. Hunting and fishing regulations should be developed after consultation with the Washington State Department of Game and Department of Fisheries, and with public review.

5. Opportunities for private business to provide public service and facilities should be identified by the U.S. Forest Service. By coordinating with local business organizations or economic development agencies the Forest Service could identify public services and locations that private business could develop and operate.

Revenues from lease fees paid to the Forest Service could then be used to provide other public facilities or programs. Consideration for business and facility development along all access corridors should be given equal consideration.

6. Social and economic impacts from major management plans within the Gifford Pinchot National Forest affect many communities near the National Forest.

We request that the U.S. Forest Service establish an advisory committee of local representatives to review these important issues and work with the Forest Service to identify opportunities for private business.

7. Air traffic around Mount St. Helens can, at times, become busy resulting in hazardous conditions. A general restriction for fixed-wing aircraft to 1,000 feet above ground level, and for helicopters to a lower elevation or to pre-determined flight corridors would improve air traffic safety.

Mr. Robert W. Williams
December 4, 1984

-3-

SKAMANIA COUNTY
BOARD OF COUNTY COMMISSIONERS

Edward Callahan
Edward Callahan, Chairman

William Benson
William Benson, Commissioner

Eric Medin
Eric Medin, Commissioner

LEWIS COUNTY
BOARD OF COUNTY COMMISSIONERS

Harold Cooper
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Gay Ellis
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Robert Vanemon, Commissioner

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BOARD OF COUNTY COMMISSIONERS

Van Youngquist
Van Youngquist, Chairman

Walter Church, Jr.
Walter Church, Jr., Commissioner

Beryl Rabyson
Beryl Rabyson, Commissioner



U. S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
Western District Federal Division
610 East Fifth Street
Vancouver, Washington 98661-3893

277

DEC - 4 1984
100-17.2

Mr. Robert W. Williams, Forest Supervisor
Gifford Pinchot National Forest
500 West 12th Street
Vancouver, Washington 98660

Comments to the October 7, 1984
Draft Environmental Impact Statement for the
Mt. St. Helens National Volcanic Monument Management Plan

Western District Federal Division has reviewed with interest your Draft Environmental Impact Statement on the Mt. St. Helens National Volcanic Monument Management Plan. Having participated in the design and construction of many FDR roads in the Gifford Pinchot National Forest, and being a cooperating agency for this EIS, we share your interest in developing the recently established National Volcanic Monument. You are to be commended on the preparation of this very complete, informative document. WDFD supports your preferred Alternative D as a responsible selection among the various alternatives presented.

The development of this management plan in accordance with Public Law 97-243 is a significant step in the overall development of the Mt. St. Helens National Volcanic Monument. It shifts the emphasis from the immediacy of providing timber access to a more long range objective of accommodating increased recreational travel. As the Federal agency with prime responsibility for highways, we have a major interest in motorist safety and the establishment of appropriate highway standards. Accordingly, we note that the three elements of public safety discussed in this Draft Environmental Statement covered air traffic hazards, hydrologic risks, and volcanic risks but omitted highway safety. Considering that the many millions of recreational visits shown under the alternatives are for the most part, via road access, the existing road network must be upgraded to safely and conveniently handle such use. The 1966 Highway Safety Act, 23 USC, Title 402(a), requires highway safety standards for all Federal agencies where construction of public road facilities is involved.

The American Association of State Highway and Transportation Officials' (AASHTO) highway geometric standards, which meet the provisions of the Highway Safety Act, are usually considered excessive for National Parks and Monuments, etc., because of the need to minimize construction impacts in these special, environmentally sensitive areas. Development of lesser road standards, however, must be done with a great deal of care to ensure the level and continuity in roadway geometrics are commensurate with driver expectations and prevent high accident rates.

Mr. Robert W. Williams

DEC - 4 1984

-2-

277

The National Park Service has recently developed road standards for their parks which have an environmentally sensitive character and recreational uses similar to the Mt. St. Helens National Volcanic Monument. These standards are considerably lower than AASHTO's but provide an acceptable compromise in these special use areas. We recommend the Forest Service consider using the NPS Road Standards (copy attached) to guide the public road improvements in the Monument. The use of these standards would assure a uniformity between the roads in the Mt. St. Helens National Volcanic Monument and those in other scenic, park-like areas, as well as satisfy the mandates of the Highway Safety Act.

We are looking forward to assisting the USFS in the development of the Mt. St. Helens National Volcanic Monument road network.

Sincerely yours,

James M. Hall
Division Engineer

Attachment



279

NORTH COUNTRY EMERGENCY MEDICAL SERVICES

YACOLT FIRE DEPARTMENT

P. O. BOX 172 • YACOLT, WASHINGTON 98563 • (206) 946-1274

December 4, 1984

Gifford Pinchot National Forest
Attn: DCP Response
500 West 12th Street
Vancouver, WA 98660

Gentlemen:

Planning for the future of a new monument area is a unique situation and although Emergency Medical Service (EMS) has been mentioned, we do not think EMS was adequately considered in the planning process.

The Castle Rock Ambulance, Randle Fire and North Country EMS provide Emergency Medical Service in the St. Helens area and have been active in planning for emergency situations. Some of the thoughts presented here are the outcome of these meetings.

A number of suggestions are present for your consideration. All have an EMS basis and do not represent political or personal desires.

- I. Many of the proposals talk about widening or improving roads. A high percent of the motor vehicle accidents that we have had in the St. Helens Monument area have been the result of the narrow and/or gravelled roads. We hesitate to think about it, but based on experience it seems only a matter of time before a loaded vehicle (or perish the thought) a tour bus goes off one of these narrow roads. It is our opinion that all roads used by tourism should be double lane and paved.

- II. Most of the alternatives do not adequately consider access to a victim in the event of an emergency. Distances are great. With the cooperation of the U. S. Forest Service, the State of Washington, and a number of private contributors NCEMS has stationed an EMS unit (Advanced Life Support Ambulance) in the Mt. St. Helens Area during the heavy recreation and tourism seasons the last three years to shorten what would otherwise be life-threatening response times. It is mandatory that responding EMS agencies have adequate access routes. To discuss this further in connection with some of the suggested alternatives we recommend the following:

279

Gifford Pinchot National Forest -2-

December 4, 1984

1. Castle Lake/Sheep Canyon Area - We feel the through road in Alt. F is a necessity. This provides access to the Castle Lake area from the South in the event of an emergency. Conversely it allows EMS access to Sheep Canyon from the North if necessary.
2. An access route from Lahar to 94-99 Junction now exists. Some alternatives suggest eliminating this. We are not suggesting that such a route be maintained or even made available for tourists but for administrative, law enforcement and EMS this rapid access route is imperative.
3. Mudflow Management Concept area - Alternative F recommends that the 2588 road be reconstructed for two-way traffic. We need this as a two-way paved access route from Pine Creek Area to Lahar. It is a key access route that now is extremely hazardous to use under emergency response conditions.
4. Road 99/Spirit Lake Management Area - We feel that the 99 to 904 Interconnect Road should be constructed. The plans to have no access East to West fragment EMS provisions in the area. It complicates response and does not allow for full utilization of EMS resources and will be more costly to provide EMS services. Several instances have already occurred in the area that have dramatically pointed out this need. A route through would allow a multiple agency response within the shortest possible time. It would allow any EMS unit working in the area rapid access to the Spirit Lake Complex or the Coldwater area.

III. The Tramway Concept proposes a tremendous EMS potential. We can cite numerous tramway incidents in the U.S. and provide documentation on the horrendous Emergency Medical and rescue problems posed. We don't know of what might be needed for the Tramway construction but if this is constructed we would encourage, even insist, that a specific EMS plan be developed during the preconstruction phases and a budget established for the rescue equipment and training required in the event of an accident involving the tramway.

- IV. The Forest Service with the EMS providers need to develop an EMS plan for the monument. A number of items we feel should be considered for that plan, since these items have only minimal impact upon the alternatives suggested in the DIES will not be elaborated but only mentioned here.

Gifford Pinchot National Forest -3-

December 4, 1984

3. Emergency communication devices placed in the remote areas such as Windy Ridge, Bear Meadows, etc.
2. A joint office-first aid station between NDEMS and the Skamania County Sheriff's office be located in the Pine Creek Area.
3. The Back Country Ranger should be an EMT or otherwise highly trained in first aid.
4. All interpretive personnel should be CPR and first aid trained.
5. Closest Aid signs of an approved design should be placed at key locations for directions to the tourists.
6. Key hellspots should be constructed in areas where trail access is the only mode of transportation.

NDEMS covers most of the area around the Monument. We are deeply concerned with the Emergency Medical Problems in the St. Helens Area and want to see a good system developed. We offer our services during any further planning stages to represent the EMS viewpoint.

Sincerely,



Tom McNamee II
Chief

SKAMANIA COUNTY DISTRICT COURT

P.O. Box 343 • Skamania, Washington 98641
1509-477-3141 Ext. 278

John Thomas Day
District Court Judge
Karen S. Wyrtinger
Court Reporter - Clerk

December 4, 1984

U. S. Department of Agriculture
Forest Service
500 West 12th Street
Vancouver, WA 98660

Re: Mt. St. Helens feasibility report

Gentlemen:

As indicated by this letterhead, I am an elected official responsible for dealing with most of the criminal law violations occurring in the recreational area of Skamania County. The Court over which I preside has had the obligation with dealing with those persons and companies who have violated various regulations pertaining to control of Mt. St. Helens blast damage area.

It has been the personal feeling of those of us who serve the court that many of the violations would not have occurred if the damage to road systems and consequent lack of access had not prevented better surveillance from the Skamania County side. Those offenders that we did see and those that we expect to see in the future felt that they were taking little or no risk of detection because of the poor access and the consequent lack of patrolling. Now that the controls have been relaxed, we believe that the evidence is mounting to show that more violations and thefts are on the upturn. We sincerely regret that your draft studies have given absolutely no consideration to the existence of Skamania County much less a plan whereby there would be through traffic to and from Skamania County.

We further regret that the Forest Service has failed to consider the economic impact of the blast and that the impact could be palliated by including Skamania County in your plan for access to the National Monument. We will continue to wonder, and probably take some action to satisfy our curiosity, as to why the draft has totally neglected the economic and safety factors that could be provided for if the Forest Service would continue the main access roads to a connection with the existing roads in Skamania County. Likewise, we feel that the protection of the public cannot be assured through our police and court agencies unless such access is so provided.

We respectfully request that the question of road access be placed on your agenda for further consideration.

Very truly yours,



JTD/glw



REGIONAL PLANNING COUNCIL
OF CLARK COUNTY

P.O. Box 5000
Vancouver, WA 98668-5000
Phone 1 206 898-5000
Fax 1 206 898-2381

Executive Director
Richard T. Howsley, AICP

December 5, 1984

Mr. Robert W. Williams
Forest Supervisor
Gifford Pinchot National Forest
500 W. 12th Street
Vancouver, WA 98660

Re: Mount St. Helens National Volcanic Monument
Draft Environmental Impact Statement
Comprehensive Management Plan

Dear Mr. Williams:

This office has reviewed the referenced document and offers the following comments on the Draft EIS.

Although the "preferred" Alternative D would offer fewer visitor industry-related jobs in Clark County than most of the other alternatives considered (Tables 47 and 48), we concur that this management plan probably represents the most balanced approach to meeting objectives of the proposal, while still offering greater employment opportunities to the region as a whole. In this regard, however, we note several discrepancies between the discussion on economic effects at the County level on page 165, and the table to which it refers:

1. Assuming the figures in Table 46 to be correct, the employment impacts on Clark County in the year 2000 would range from 95 in Alternative C, to 222 in Alternative E (rather than 94 to 81); and
2. The lower end of this range for Cowlitz County is shown in the table as 775 (rather than 975), while the high employment of 4,057 would occur under Alternative D (rather than G).

The proposed tramway of the preferred alternative would seem to be justified only to provide unique visual or physical access not otherwise available. Judging from the photo at the bottom of page 36 and Figure D-1, the tram itself would not appear to

PARTICIPATING AGENCIES: Clark County / city of Vancouver / city of Camas / city of Washouak / town of Ridgefield / city of Battle Ground / town of Rainier / town of Yacolt / Vancouver School District / part of Vancouver / part of Camas / Washington / part of Ridgefield / Clark County Senior District No. 1 / Clark and and water conservation district / Clark County utility district

December 5, 1984
Mr. Robert W. Williams
Page Two

offer any special view or access that could not also be provided by the shuttle bus route of Alternative C. If the only objective here is to provide access to Johnston Ridge, a more direct alternative might be to locate a tramway of similar length from the lower portion of South Coldwater Creek to the observation post. This would be less apt to degrade views and photographs taken from the Coldwater Lake Complex or from Trail No. 236, while eliminating the inconvenience of transferring from tramway to shuttle bus as proposed.

It is curious to note that Alternatives C and D both propose a boat launch ramp and dock on Coldwater Lake, while at the same time prohibiting motorized boats (except for electric motors under Alt. D). Although gasoline-powered motorboats may indeed be inappropriate for this lake, it would seem that the demand for and use of such a boat launch facility would be extremely limited under those restrictions.

Finally, an important issue given virtually no consideration under the discussions of air quality and visual resource management is the smoke and haze resulting from timber harvest slash burns. On frequent occasions in recent years, views of the crater have been obscured on otherwise good viewing days by slash burns within or near the monument area. The management plan should seek coordination among timber companies, logging operators, and regulatory agencies to avoid slash burning during periods that might hinder visitor viewing opportunities.

Sincerely,

Richard T. Howsley

Richard T. Howsley, AICP
Executive Director

RTW/RH/mf09.7814



Department of Natural Resources

Southeast Area
P.O. Box 799
Castle Rock, Washington 98611
Phone (206) 877-2025

335

BRIAN BOYLE
Conservation Officer, USA

December 4, 1984

Mr. Robert W. Williams
Forest Supervisor
Gifford Pinchot National Forest
500 W. 12th Street
Vancouver, Washington 98660

Dear Mr. Williams:

The Department of Natural Resources has reviewed the draft Environmental Impact Statement Comprehensive Management Plan for the Mount St. Helens National Volcanic Monument. The United States Forest Service (USFS) is to be complimented on a well written document that is easy to read and clearly lays out the alternatives. Except as otherwise noted below, we support Alternative D, the Preferred alternative.

Castle Lake Access:

Several alternatives include a proposal to provide vehicular access to a proposed day use area at Castle Lake. Such access would be acquired by either fee simple purchase or an agreement whereby public access would be allowed on state and private roads with the USFS paying for annual maintenance. This access would mostly be over what is known as the 3000 Road. This road crosses lands managed by the Department of Natural Resources and Meyerhauser.

There are problems with this proposal. The road system you propose to use no longer connects to State Route 304. Destruction of bridges across the Toutle and subsequent river channel changes have washed out sections of this road. Your report in Table 31 indicates there would be 14 miles of road requiring acquisition of public access. With the lost bridge and road, an additional ten miles of access by logging roads may be necessary. This would bring the total distance closer to 24 miles. Much of this route is on fairly low standard roads. Major renovation would be required to make them safe for recreational traffic. Exact location of this alternative access will depend on if and/or where the Corps of Engineers decides to build a split retaining dam.

The additional annual maintenance cost of 14-24 miles of logging road for public access to a day use area does not appear to be cost effective when compared to the alternative of building a short trail system connecting Castle Lake to the Coldwater area as outlined in Alternatives E, F, and G. Access to Castle Lake is more reasonably obtained by trail from the Coldwater area. This would substitute approximately one mile of trail (#221.1) on Monument land for acquiring public access and assuming high annual maintenance costs on 24 miles of logging road.

Equal Opportunity, Affirmative Action Employer

335

Mr. Robert W. Williams
December 4, 1984
Page 2

Logging roads outside of the Monument have traditionally been used by the public. They receive heavy use during the hunting season. They are only rarely closed for fire or safety reasons. However, if a recreation complex is developed at Castle Lake using the 3000 Road access, much of the land adjacent to this route will, with public use during dry weather, become subject to extreme fire hazard laws. Under state law an extreme fire hazard exists and must be abated when nine or more tons of slash per acre are within 100 feet of a road carrying 75 vehicles per week for recreational purposes. There is existing slash along portions of this route. Public access would add additional future slash abatement costs for pre-commercial thinning and harvesting activities.

Should the USFS decide that vehicular access must be provided over this route, we would prefer a cooperative maintenance agreement over fee acquisition.

Forest Insects and Disease Management:

Forest insects and forest tree diseases which threaten the timber production of the state's forested area is a major concern to all forest landowners. As an adjacent forest land manager and as a state agency that regulates Chapter 76.06 Forest Insect and Disease Control under the Revised Code of Washington, we would start the process to determine control action for those forest lands outside of federal ownership at the threat stage as opposed to the catastrophic infestation stage. We would hope that this type of decision would involve the consensus of all the landowners affected, including the USFS, but realizes additional concerns may affect actual control within the Monument.

Fire Management:

The Department of Natural Resources will continue to work with the USFS on the specific fire management guidelines in those areas where fire may spread from one protection agency to the other.

Thank you for the opportunity to comment on this draft plan.

Sincerely,

Brian Boyle

Jan Cano
Area Manager

JG:nds

cc: USFS
St. Helens
T.f.

Lewis County

PUBLIC UTILITY DISTRICT

COMMISSIONERS
JOHN L. KOSTER, President
LEONARD ALLEN, Vice Pres.
JAMES N. HUBERTHAL, Secy.
OFFICERS
GARY H. KALICH, Manager
RONALD D. RAFF, Supt.
RORY K. MILLER, Treasurer
JAMES W. MELCHARD, Auditor

121 N.W. 1/4, Section 36, T4N, R6W, E1
Malheur National Forest, Oregon 97631

December 3, 1984

Forest Supervisor
Gifford Pinchot National Forest
500 West 15th Street
Vancouver, WA 98660

Dear Sir:

Subject: Mt. St. Helens Comprehensive Management Plan

In response to your Draft Environmental Impact Statement (DEIS) for the Mt. St. Helens National Volcanic Monument Management Plan, Public Utility District No. 1 of Lewis County (District) wishes to submit comments for your consideration. We had only the opportunity to review the summary document from which it appears a great deal of effort has been put forth in developing the seven alternatives.

We would like you to be aware of the District's plans to develop the Cowlitz Falls Project located just outside National Forest lands. The Project (FERC Project No. 2133) is now in the final licensing phase with the NEPA EIS having been published in April 1983.

The Cowlitz Falls Project consists of a concrete-gravity dam and integral powerhouse at river-mile 88.6 on the Cowlitz River. A reservoir, covering approximately 870 acres at elevation 866, would extend 12.3 miles up the Cowlitz River and 1.7 miles up the Cispus River. Included in the development of the Project are a number of recreation facilities. These facilities include an overnight campground, fishing access sites, boat launches, a day-use park on Highway SR-12 and land held in reserve for future development.

With the development of the Mt. St. Helens Volcanic Monument, increased public usage will occur in the area of our Project (see attached map). Larger than planned recreation facilities at our Project may be necessary to meet the new public demand. The impact to our proposed facilities, as well as to Tacoma City Light's facilities on Riffe Lake, needs to be addressed in your EIS.

During the development of our recreation plan, we identified access to our facilities to be of major concern. Much of the existing



Forest Supervisor
December 3, 1984
Page 2

access by the public to this area is now over a private road system. Our recreational facilities were located such that major access routes are provided over county roads and access routes over private roads are avoided. With the introduction of new recreational opportunities from the Mt. St. Helens development, public traffic is again directed onto the private road system via Forest Service Roads #25 and #27. It is our belief that obtaining the necessary rights for public use or public ownership would be to the best interests and safety of the visitors to the area. The necessary action would fit into many of the development plans already presented in the DEIS. Your final EIS needs to address the public access problems through the lower Cispus River area below Woods Creek and along the Cowlitz River near Riffe Lake.

Enclosed is a copy of Exhibit A (recreation) from the Cowlitz Falls Project License Application. Please note that in addition to on-site recreational facilities, there is also a day-use park on Highway SR-12 which will also be greatly impacted through increased usage.

We appreciate the opportunity to present our comments on the Mt. St. Helens Comprehensive Development Plan, and wish to commend your staff on their analysis. If you wish to discuss the impact to our Cowlitz Falls Project as you prepare your final EIS, please feel free to call me at (206) 748-9261.

Sincerely,

Steven J. Grega
Engineer

SJG/ch
Enc.

cc: Gary H. Kalich, Manager
Dave Schilperhoort, Lewis County Park and Recreation



U.S. ENVIRONMENTAL PROTECTION AGENCY

REGION X
3200 SIXTH AVENUE
SEATTLE, WASHINGTON 98101

365

DATE TO
AIR ON: M/S 443

DEC 04 1984

Robert W. Williams
Forest Supervisor
Gifford Pinchot National Forest
500 West 12th Street
Vancouver, Washington 98660

Dear Mr. Williams:

We have completed a review of the Draft Environmental Impact Statement (DEIS) for the Mount St. Helens National Volcanic Monument Comprehensive Management Plan. The DEIS thoroughly evaluates seven alternatives for preserving and developing the monument.

Alternative D is identified as the preferred alternative because it provides a mix of access routes and visitor support facilities while protecting research values. The DEIS identifies impacts of Alternative D that could detract from these reasons. The biological areas proposed for development include features that are subject to significant process impairment and feature impacts (Tables 2 and 3, Appendix B). Alternative D is estimated to cause a 49% increase in sediment delivery to the Coldwater/North Toutle Watershed (Table 1-1, Page 268). Alternative D proposes development of areas that are subject to closure (page 51) and would subject structures to risk (page 107). The DEIS does not estimate the rate of future closure and how it would affect public access.

Based on reduced impacts to research values, sediment delivery and risk to structures, Alternative B would be environmentally preferred. The DEIS does not provide sufficient rationale to support Alternative D.

With the implementation of Alternative D we rate this DEIS EC-1 (EC: Environmental Concerns); i.e. Adequate information in accordance with our responsibility under Section 309 of the Clean Air Act to determine whether the environmental impacts of proposed Federal actions are acceptable in terms of public health, welfare and environmental quality. Attached is a summary of rating definitions.

We appreciate the opportunity to review this report. Should you want to discuss EPA's comments, please contact Daniel I. Steinborn, Chief EIS and Energy Review Section at 206/442-1755.

Sincerely,

Robert S. Burd

Robert S. Burd
Director, Water Division

Attachment

POLICY AND PROCEDURES

1640

SUMMARY OF RATING DEFINITIONS
AND FOLLOW-UP ACTION

365

Environmental Impact of the Action

Low-Lack of Objections

The EPA review has not identified any potential environmental impacts resulting from substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

EC--Environmental Concerns

The EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce the environmental impact. EPA would like to work with the lead agency to reduce these impacts.

EO--Environmental Objections

The EPA review has identified significant environmental impacts that must be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative including the no action alternative or a new alternative. EPA intends to work with the lead agency to reduce these impacts.

EO--Environmentally Unsatisfactory

The EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of public health or welfare or environmental quality. EPA intends to work with the lead agency to reduce these impacts. If the potential unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommended for referral to the CEQ.

Adequacy of the Impact Statement

Category I--Adequate

The draft EIS adequately sets forth the environmental impacts of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis or data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

Category II--Insufficient Information

The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analyzed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses, or discussion should be included in the final EIS.

Category III--Inadequate

EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analyzed in the draft EIS, which should be analyzed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the NEPA and/or Section 101 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

From EPA Manual (a) Policy and Procedures for the Review of Federal Actions Impacting the Environment.

Department of Ecology Comments
on the Mount St. Helens
National Volcanic Monument

1. The proposed aerial tram or gondola system on Johnston Ridge is excessive and inappropriate for this scenic and aesthetic area. A trail or bus shuttle system would be less offensive.
2. The DEIS does not address the cost of emergency medical services in case of an emergency. It should be identified who will pay for the necessary services, such as evacuation of injured people.
3. We are concerned about the adverse impacts to public safety and aesthetics if hunting is allowed in the monument. The shooting of firearms should not be allowed in a high public use area.

366

DONALD W. XXXX
Director



STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
Mail Stop 7000 • Olympia Washington 98512 • (206) 358-2222

November 29, 1984

Mr. Jeff Simon
U.S.D.A. - Forest Service
Pacific Northwest Region
P.O. Box 3623
Portland, OR 97202

Dear Mr. Simon:

Thank you for the opportunity to review the draft environmental impact statements (DEIS) for the Mount St. Helens National Volcanic Monument Comprehensive Management Plan. In accordance with the Governor's procedures for reviewing NEPA documents, we have coordinated the review of this DEIS with the other state agencies. This letter, with the enclosed agency comment letters, constitutes the State of Washington response.

If you have any questions, please call the appropriate agency, or Mr. Greg Sorlie of my staff (206-459-6237).

Sincerely,

Donald W. XXXX
Donald W. XXXX
Director

DWH:bw

cc: State Agencies
Mr. Greg Sorlie

367

JOHN SULLIVAN
Governor

STATE OF WASHINGTON

DEPARTMENT OF FISHERIES

115 General Administration Building • Olympia, Washington 98501 • (206) 753-6000 • RCAM 214-447

November 29, 1984

MEMORANDUM

TO: Barbara Ritchie, Department of Ecology

FROM: Steve Kaller, Habitat Management Division **SK**

SUBJECT: Draft Environmental Impact Statement, U.S. Forest Service,
Mt. St. Helens National Volcanic Monument, Coolidge-Lewis River
Watersheds, WRIA's E-26 and E-27.

We have reviewed this document and have the following comments.

The descriptions of streams and fish populations, while general, are adequate for the purpose of this document. We are pleased the stream crossings on access roads will be bridges. We would like review opportunities of all proposed instream work within the National Volcanic Monument (NVM) to insure adequate consideration of fish habitat is incorporated into the projects.

The document refers to the Department of Game's continued regulation of fishing, hunting and trapping. Accordingly, our department intends to continue regulation of salmon fishing. In addition, we wish to have the opportunity to restock suitable salmon habitat within the NVM as habitat recovers or to rehabilitate marginal salmon habitat. Such stocking or rehabilitation would occur primarily in the North Fork Toutle watershed. Much of our efforts would include, but not necessarily be limited to, the area affected by Corps of Engineers' construction.

We are comfortable with Option B since it provides access for fishery management work and access for possible future recreational salmon fishing.

sp

cc: Mohrle
SEPA File

368

JOHN SULLIVAN
Governor

STATE OF WASHINGTON

DEPARTMENT OF GAME

600 North Capitol Way, G-11 • Olympia, Washington 98501 • (206) 753-5700

November 27, 1984

Robert M. Williams
Forest Supervisor
Gifford Pinchot National Forest
500 West 12th Street
Tacouver, Washington 98660

DRAFT ENVIRONMENTAL IMPACT STATEMENT:
Mt. St. Helens National Volcanic
Monument Management Plan

Dear Mr. Williams:

The Department of Game has reviewed your document as requested; comments follow.

We believe that the DEIS adequately addresses impacts of the various proposed alternatives (A-G) upon fish and wildlife habitat, but fails to address the impacts of each alternative upon recreational use of fish and wildlife. From information provided in the DEIS, hunters, anglers, bird watchers, etc. cannot determine which alternatives would meet their specific desires. We believe that the DEIS is inadequate and either should be rewritten and resubmitted for public review, or an addendum should be developed and circulated prior to adoption of the final plan and release of the DEIS.

We do not take this position lightly, but consider it necessary for the following reasons.

The act establishing the Monument specifically states in Section 4 (h), "... the Secretary shall permit hunting and fishing on lands and waters within the Monument in accordance with applicable federal and state law, except that the Secretary may designate zones within the Monument where, and establish periods when, no hunting or fishing shall be permitted for reasons of public health and safety, the protection of resources, scientific research activities, or public use and enjoyment. Except in emergencies, any regulations issued by the Secretary under this subsection shall be put into effect only after consultation with the appropriate state agencies responsible for hunting and fishing activities. Nothing in this subsection shall be construed as affecting the jurisdiction or responsibilities of the State of Washington with respect to wildlife and fish within the Monument."

Robert M. Williams
November 27, 1984
Page three

We believe that the Forest Service and Department of Game should jointly develop a brochure on hunting and fishing opportunities within the Monument. Currently there is public confusion over where hunting and fishing are allowed and not allowed.

Air traffic restrictions should include specific wording providing for exemptions of federal and state employees on official business.

Page xv. This piechart is confusing and possibly inaccurate. Apparently it is based upon access. Alt. A provides the least access, therefore, it has the most impact on hunting and fishing.

Page 3. No mention is made of the Department of Game's Statewide Strategic Plan, Regional Operations Plan or the Mt. St. Helens' Fishery Management Plan. All of these directly affect the Monument's fish and wildlife populations as well as public use of those resources.

Page 35. Hunting and fishing are identified as issues and concerns, yet there is no graph in Fig. 11 indicating effects of the various alternatives on hunting and fishing. The public, as a result, has no basis for comparing impacts of your proposals upon their recreational opportunity.

Page 44. This area of the report should expand upon impacts of the various alternatives on hunting and fishing. It totally ignores those effects.

Page 52. We commend the Forest on its Mitigation Measures for Wildlife and Fisheries Habitat. We believe that paragraph 10 should be strengthened to read "The need to remove dead trees or other debris from lakes and streams will be evaluated on a case by case basis to retain as much of this type of fish habitat as possible. A fisheries biologist and a hydrologist will coordinate any removal".

The Forest Service, in cooperation with Department of Game, should establish a system for monitoring recovery of lake and stream ecosystems and set up index areas to study the effects of proposed developments on fish and wildlife habitat.

Page 92. Under Fishing, Hunting and Trapping we believe that the statement "A large portion of the Monument is closed to fishing, hunting, and trapping" is misleading. The only large area of the Monument is closed by Executive order of the Governor (the red zone) to protect life and property.

Robert M. Williams
November 27, 1984
Page two

On page 1 under Major Issues item seven identifies "hunting and fishing regulations and the possible reintroduction of animals" as a major issue. The opening statement tells the reader that this issue was addressed by the seven alternatives. However, it was not addressed by each alternative, but was passed over in one paragraph on page 26. How will fish and wildlife habitat and populations be protected and managed? We believe that the public is concerned with the effects various alternatives for roading, trail construction, research, and other land management plans in the Monument will have on their ability to enjoy wildlife and fish either consumptively or nonconsumptively. Establishment of Class I research zones and other land designations was not accomplished after consultation with the state as provided by the Act.

We endorse the statement on page 26 related to fishing, hunting and trapping regulations. However, it should be modified to read "The Washington Department of Game will continue to manage fish and wildlife populations within the Monument which includes the consumptive use of wildlife through fishing, hunting, and trapping". This wording change is necessary, since the Department of Game has a legal mandate for protection and management of both hunted and non-hunted wildlife.

Perhaps most importantly, we disagree with data presented in table 26, showing that visitor days of recreation will remain the same in all alternatives for hunting and fishing. This could not be possible as various proposals dramatically affect access by the public to lakes and streams. In addition, other alternatives would close large areas to off-trail access, thus effectively eliminating those sections for hunting and viewing wildlife.

Specific Comments

The Department of Game has the following additional specific comments on the DEIS. The Department could support either Alternative C or D if our concerns were addressed.

Fish and Wildlife General

We are in favor of the trail complex proposed in Alternative D. Travel through the Monument other than on trails could be extremely dangerous. The proposed complex would allow public access to a large percentage of the lakes. Most accessed lakes contain fish populations that will be at harvestable numbers by 1990. Trail 207 should follow the Spirit Lake shoreline and connect with trails 216 and 224. These would also provide access for hunting and nonconsumptive use of wildlife.

Robert W. Williams
November 27, 1984
Page five

Wildlife

We recommend removal of Protection Class I status from the Butte Camp area. This is a highly used elk hunting area. As proposed, access would be restricted to trails. This would preclude hunting.

Roads 83 and 8303 should not be closed to camping within sight of the road unless pullouts and primitive tent campsites are provided at specified spots. Closure of these roads to camping would place a needless restriction upon hunters, hikers, and other tent campers.

A viewpoint on Marble Mountain should be avoided. We believe that such use would adversely impact the Marble eld herd by increasing human harassment during the summer calving and rearing period.

Insufficient attention is given to the effects of roading on wildlife on any of the main routes. Extension of Highway 504 to Coldwater Lake should be more carefully considered for its potential long range impact on wildlife, as should the impact of increased traffic to other sites.

We are concerned with proposed developments around the Cave Basalt area and their certain adverse impacts to Townsend's big-eared bat. To prevent further reductions of their limited population, public access should be limited to Ape Cave. No access should be provided during the winter hibernation period. In addition, all other caves should be closed to public entry. We believe that protection of the big-eared bat is in direct keeping with the Monument Act, which calls for protection of the natural and scientific values of the Monument. The Department of Game and Forest Service should jointly develop a management plan for the caves.

Page 7. The biophysical carrying capacity concept utilized to partition the NWM is a good approach for geologic and floral features, but has lesser value for more mobile forms of wildlife, such as ungulates and carnivores.

Page 11. We heartily endorse rejection of the Green River road development option. We believe that a road through the Green River valley would severely impact elk populations and wildlife associated with existing old growth forest.

Page 43. Wildfire in the Monument is a natural feature of ecologic succession. Wildlife populations change with the plant community. The policy of allowing fires to burn no more than 10 acres would limit severely the numbers of deer and elk produced on the Monument in future years when forage species are replaced by other plants. We recommend that a minimum of 40 acres be allowed to burn before enacting fire control measures.

Robert W. Williams
November 27, 1984
Page four

Fisheries

Coldwater and Castle Lakes should be opened to motorized boats. We believe that this is necessary to provide adequate safety and mobility on these 800 and 200 acre lakes. Boat launches should be constructed at Castle Lake and Coldwater Lake. A "no wake" restriction could be enacted to reduce impacts of bank erosion, etc. from high speed watercraft.

We recommend removal of Protection Class I status from St. Helens Lake and Spirit Lake. As we interpret this classification, none could fish the lakes because they would be restricted to trails. The clause concerning introduction of organisms could be construed to mean that no fish could be stocked in either lake and none could be removed by an angler. We are opposed to this concept and believe that at some point in the near future Spirit Lake should be restocked with fish and that these fish should be available to the public. We recognize that the natural geologic and ecologic features must be protected. We believe that there are other methods available to the Forest Service than a blanket restriction around St. Helens and Spirit lakes.

It is not clear what configuration the rock wall would take at Meta Lake. We oppose a barrier that would be so restrictive that fishing would not be possible or socially acceptable. We believe that the eastern brook-trout population is healthy and that lake productivity now is at or above pre-eruption levels. Natural reproduction is occurring at Meta Lake. Unless this population is controlled through harvest, the lake will shortly be populated with a large number of stunted fish which are unable to obtain enough food to grow properly. We would favor a hardened path along the south shore with areas at waters edge for visitor use.

Page 124. Lake and Wetland Wildlife Habitat discusses only the status of shoreline ecosystems and the effects of visitation upon their recovery. No discussion is provided to the reader as to the limnological status of the various lakes and what impacts might be expected to occur on lake ecosystems from visitor usage.

All stream crossings and other work in water should comply with the Master Memorandum of Understanding between WOG, WOF, and the U.S. Forest Service for Hydraulics Project approvals. All stream crossings should be constructed in such a manner as to pass migrating fish 10 inches or larger upstream and downstream.

368

Robert M. Williams
November 27, 1984
Page six

An ongoing evaluation of vegetative recovery in the Mt. Margaret back country should be established to determine whether habitat conditions would allow reintroduction of mountain goat.

Thank you for this opportunity to respond to your DEIS. If you have questions or need additional information about our comments and concerns, please call me or my staff in Vancouver (206) 696-6211.

Very truly yours,

THE DEPARTMENT OF GAME

Frank R. Lockard
Director

FRL:ks



JOHN STELLMAN
Coordinator

369

HUGH H. FOWLER
Director

STATE OF WASHINGTON
DEPARTMENT OF EMERGENCY MANAGEMENT
4220 E. Martin Way • Olympia, Washington 98504 • (206) 439-9191 • (SCAN) JH-555

November 21, 1984

RECEIVED

NOV 26 1984

DEPARTMENT OF GEOLOGY
ENVIRONMENTAL REVIEW

Mr. Greg Sorlie
Environmental Review Section
Department of Ecology
Mail Stop PV-11
Olympia, WA 98504

Dear Mr. Sorlie:

The Department of Emergency Management has some comment to make concerning the U.S. Forest Service Draft EIS for the Mount St. Helens National Volcanic Monument Comprehensive Management Plan.

The Draft EIS does a good job setting forth considerations for public safety in the monument. We feel, however, that the issue of law enforcement support in Cowlitz County and U.S. Forest Service participation in Emergency Medical Services within the National Monument are not adequately addressed.

For any future legislative action on the state level for state funding support to the areas, there must be a clearer picture as to what can be expected from the U.S. Forest Service in the way of any financial or in-kind contribution.

Thank you for the opportunity to respond.

Sincerely,

Hugh H. Fowler
Hugh H. Fowler
Director

HMF:gv

370

JOHN PELLHAM
GovernorJANET WEN
Director

STATE OF WASHINGTON

WASHINGTON STATE PARKS AND RECREATION COMMISSION

7150 Chambers Lane, RY-17 • Olympia, Washington 98504 • (206) 753-5725

November 19, 1984

TO: Barbara Ritchie, NEPA Coordinator
Department of Ecology

FROM: Ron Effland, Environmental
Coordinator
SS-2650-1020

SUBJECT: Mount St. Helens' National Volcanic Monument
DEIS Comprehensive Management Plan

Revised by [Signature]

The staff of the Washington State Parks and Recreation Commission has reviewed the above document and we have the following comments.

We concur with the selection made by the USDA Forest Service for Alternative D in the Comprehensive Management Plan. This alternative will allow for reasonable recreational development within the National Volcanic Monument and provide better access to the area for a larger number of people, while still preserving areas for scientific research. The D alternative also provides for recreation sites along the three access corridors from the south, east and west.

Additionally, corrections are needed on page 91, Table 10 of the DEIS. Lines 14 and 15 in Table 10 should read as follows:

Sequest SR 504 B4 B3 Washington State Parks and Recreation Commission

Sequest SR 504 19* 54* Washington State Parks and Recreation Commission

Thank you for forwarding the DEIS to us. We were interested to learn of the ambitious plans of the Forest Service and hope the mountain cooperates so that the chosen alternative can be pursued. If you have any questions, we can be reached at 753-5769.

at

371/12

JOHN PELLHAM
GovernorMICHAEL THOMAS
Director

STATE OF WASHINGTON

OFFICE OF ARCHAEOLOGY AND HISTORIC PRESERVATION

111 West Trempealeau Avenue, RT-11 • Olympia, Washington 98504 • (206) 753-4011

October 16, 1984

RECEIVED

OCT 18 1984

MANAGEMENT OF ENVIRONMENTAL RESOURCES

Ms. Barbara Ritchie
NEPA Coordinator
Dept. of Ecology
Mail Stop PV-11
Olympia, WA 98504

Log Reference: 571-P-PS-07

Re: Mount St. Helens National
Volcanic Monument

Dear Ms. Ritchie:

A staff review has been completed of the environmental impact statement and comprehensive management plan for the Mount St. Helens National Volcanic Monument. The document considers cultural resources and potential impacts to them in a general sense and acknowledges that specific impacts associated with given alternatives cannot be accurately measured at this time.

Given the lack of specificity, we would recommend the development of a Programmatic Memorandum of Agreement (PMOA) to address compliance issues in the implementation of selected alternatives. In addition to addressing the issues of identification, evaluation, and mitigation, we would suggest the PMOA consider integrating the cultural resource studies into the larger framework of scientific research at the monument.

Finally, given that a focus of the monument is to preserve and protect cultural resources, we also hope that a component of the PMOA will have a strong emphasis upon development of a means to combat potential site vandalism.

Sincerely,

Robert G. Whitlaw, Ph.D.
State Archaeologist
(206) 753-4405

du

cc: Jeff Simon

UNIVERSITY OF WASHINGTON
14101, WASHINGTON, D.C.

Department of Biology, KB-15

December 5, 1984

Mr. Robert M. Williams
Forest Supervisor
Gifford Pinchot National Forest
500 West 12th Street
Vancouver, WA 98060

Dear Mr. Williams,

I am writing with regard to the Draft EIS for the Comprehensive Management Plan, Mount St. Helens National Volcanic Monument. After careful reading of the EIS and considering the alternative plans, I agree that Plan D, the preferred alternative is best. This provides public access to critical areas, yet protects important land-form features and critical research sites.

Some of my concerns include the following. It is essential to have a Monument Science Coordinator who has at least an M.S. degree, either in ecology or geology. The person must have funds to permit a computerized listing of research projects, published papers and reports, and funds to bring together the summer interpreters each year. In this way the interpreters can pass on to the public up-to-date information on the geological and ecological features and processes that they are seeing in the Monument. This person, with the help of the scientific community will be reporting yearly on the natural processes and features of the Monument that came within the protection scheme. Many decisions will need to be made that require a concerted scientific input and assessment.

A local committee of concerned scientists and lay people should serve as an advisory committee to the Scientific Advisory Board. This committee could provide ideas and issues that the Scientific Advisory Board will need to address. There will be many issues and problems that will need to be addressed and the Scientific Advisory Board will need help with them. The Committee should include lay people from the area (2-3) who have a strong interest in natural history and conservation; 2-3 people from the forest industry (preferably forest ecologists and hydrologists), 2-3 people from the U.S.G.S., and 2-3 ecologists from universities, preferably people who are or have conducted research within the Monument so that they are familiar with ecological issues and problems.

Telephone: (206) 543-1942

372/168

OLIVE BRIDGEMAN
Secretary



STATE OF WASHINGTON

DEPARTMENT OF TRANSPORTATION

Transportation Building • Olympia, Washington 98504 • (206) 753-6005

November 19, 1984

Ms. Barbara Ritchie
NEPA Coordinator
Department of Ecology
Mail Stop PK-11
Olympia, WA 98504

Re: U. S. Forest Service
Department of Agriculture
Draft Environmental Impact
Statement - Mount St. Helens
Volcanic Monument Comprehensive
Management Plan

Dear Ms. Ritchie:

The Department of Transportation, Project Development Office has reviewed the Mount St. Helens draft EIS.

We find it to be satisfactory in adequately addressing our concerns, and offer no comments. Thank you for the review opportunity.

Sincerely,

S. A. Moon

S. A. MOON, P. E.
Location/Design Engineer

SAM:ky
ZMD (EN)

cc: U. S. Forest Service, Vancouver
Keith Ahola

373

-2-

As a final point I am strongly opposed to establishing a horse trail that would go around the west, south and east side of the volcano, near the former treeline. This would lead to accelerated erosion, potential introduction of weedy species, accelerated grazing within the limited meadows, and impact people into areas of research.

I appreciate the opportunity to respond to the Draft Impact Statement and hope these comments will be helpful as they are intended to be.

Sincerely,



Lawrence C. Bliss
Professor of Botany

LCB/mv

380

Skamania Regional Planning Council

POST OFFICE BOX 152
STEVENSON, WASHINGTON 98648
Phone (509) 427-5418

December 7, 1987

Mr. Robert W. Williams, Forest Supervisor
Clifford Pinchot National Forest
500 West 12th Street
Vancouver, Washington 98660

Dear Mr. Williams:

The Skamania Regional Planning Council has reviewed your Mount St. Helens National Volcanic Monument Comprehensive Management Plan and Draft Impact Statement.

The economic impact of the Volcanic Monument on Skamania County is an important consideration. While Alternative D provides for the upgrading Forest Service Road 99, there is little opportunity for economic activity in the County. We favor the connection of SR 504 and PS Road 99 to encourage increased tourist interest and potential economic impact in the eastside of Mount St. Helens and other parts of Skamania County.

An on-going advisory committee should be established to monitor the economic and recreational impact of the monument on the affected counties. The committee should also develop proposals for additional recreational and visitor service facilities to meet the visitor needs and help assure a reasonable distribution of benefits from the monument to all counties involved and private enterprise.

Since the monument is under the management of the Forest Service, law enforcement and medical services within the monument should also be that agency's responsibility. Monument visitors also increase the need for law enforcement and medical services in the surrounding areas, and federal funding for the additional services needed should also be addressed.

Sincerely,



Robert Tichenor
Chairman



United States Department of the Interior

OFFICE OF THE SECRETARY

PACIFIC NORTHWEST REGION
500 N.E. Multnomah Street, Suite 1802, Portland, Oregon 97232

December 24, 1984

ER 84/1A47

Mr. Robert W. Williams
Forest Supervisor
Gifford Pinchot National Forest
500 W. 12th Street
Vancouver, Washington 98660

Dear Mr. Williams:

The Department of the Interior has reviewed the Draft Environmental Statement for Mount St. Helens National Volcanic Monument, Gifford Pinchot National Forest, Washington. The following comments are provided for your consideration.

Recreation

We believe this is an opportunity to witness recovery of an area following a violent volcanic eruption. Because of the uniqueness of the opportunity, and the scientific research and learning opportunities the emphasis should be placed on natural recovery of the ecosystem, and on scientific study. The Act which established the Monument provides a strong charge "...to protect the geologic, ecologic, and cultural resources...allowing geologic forces and ecological succession to continue substantially unimpeded." We believe this is the cornerstone of the Act and other uses of the monument follow in the priority as listed in the Act: scientific study and research, recreation and interpretation, hunting and fishing. Visitor use of the Monument should emphasize seeing and learning about volcanic phenomena. The Act states roads and facilities are generally to be limited to those existing prior to the eruption, except for additions needed to provide access for recreation, research and access to interpretation of unique post eruption features. A comparison of the pre- and post-eruption facilities and roads should be made within the FEIS and justification provided for any new roads and facilities and upgrading of roads or facilities. In terms of recreation, a strong emphasis on interpretation vs mechanized recreation should receive very high priority in order to take full advantage of the unique resources and the dynamic ecosystem found at Mount St. Helens.

Train and bus travel are the best alternatives to minimize human impacts on the fragile ecosystem and an air traffic restriction of 7,000 feet should be considered. There is no mention of the kind of organization or number of employees required to operate the Monument, and no mention of the potential impact of the Monument upon visitor use of other recreation sites in the Pacific Northwest.

Fish and Wildlife

Hunting, trapping, and fishing within the monument is specifically permitted and encouraged; we interpret this to mean as fish and wildlife species recover to support this use. This issue is, however, controversial, as evidenced by discussions leading to the decision to institute a five-year moratorium on species reintroduction. We believe considerable discussion, in a public forum, will be needed in order to determine whether artificial reintroduction of fish and wildlife species is consistent with the intent of the Act. The DEIS should indicate this issue is still to be resolved and indicate how and when this issue will be evaluated.

A significant omission within the statement is a discussion on the future management of fish and wildlife populations and fish and wildlife oriented recreation within the monument. Without this information the reader (particularly hunters, anglers, and other fish and wildlife oriented recreational users) would be unable to fully evaluate the proposed alternatives. We believe an addendum which describes impacts of the alternatives on fish and wildlife management and associated recreation is needed.

Further, the Washington Department of Game (WDG) and the Forest Service (FS) should develop a fish and wildlife management plan which outlines expected changes in fish and wildlife habitat and outlines how fish and wildlife populations will be managed. The plan should be formalized through a joint memorandum of understanding between the Director of WDG and the Regional Forester, and submitted to Congress as part of the overall Management Plan.

Consideration should be given to development of protection categories for biological and physical features within the monument similar to those categories presently used for research protection.

Although not included in Alternative D, some public interest exists for a cross-monument road. The U.S. Fish and Wildlife Service states that it would not support the construction of a cross-monument road. The disadvantages associated with destruction of wildlife habitat and disruption of wildlife movements does not offset the advantages of increased access. A sufficient array of access routes exist under the preferred alternative.

Vegetation should remain undisturbed along transportation routes throughout the monument. Cutting, mowing, and herbicide application should be minimal.

A method for monitoring effects of development features on fish and wildlife and their habitats should be developed.

Specific Comments

Page vii, Table 2, in comparing alternatives, support for scientific research varies with the level of development. Full support for scientific research should be implemented regardless of the alternative selected.

Page 16, Castle Lake/Sheep Canyon Management Concept Area, Castle Lake is the largest lake within the monument which is relatively unimpacted by motor activities. In order to protect the area, we recommend the proposed road be eliminated and access be obtained by trail.

Cave Basalt/Goat Marsh Management Concept Area - We are concerned about the proposed developments under Alternative D in the Cave Basalt Area and expected adverse impacts on the Larch Mountain salamander, Townsend's big-eared bat and general cave ecology. We would prefer cave management proposed under Alternative B, with Kolama Springs as an interpretive site rather than a picnic area. All caves should be closed during bat hibernation. All caves, other than Ape Cave, should have no general public entry.

Page 17. We question the advisability of permitting horses within the monument. Although the area was used in this capacity in the past, environmental conditions have changed sufficiently so that horse traffic could have significant adverse effects on biological recovery (e.g. soil erosion and/or compaction, introduction of exotic plant species, overgrazing of vegetation). Horse use should be reconsidered only after the vegetation and land surface has developed the capacity to absorb this use.

Road 99/Spirit Lake Management Concept Area. The planned upgrade of the road from Windy Ridge to Spirit Lake should be reevaluated. Maintenance of this road and bus transportation could damage sensitive areas and hinder biological recovery.

Page 18. Other Management Direction, Research - The preferred alternative provides for adequate administration of research, documentation, and coordination within the scientific community. However, some modifications may be needed within this alternative to more fully protect the biological aspects of the debris avalanche, the pyroclastic flow, Goat Marsh, Butte Camp, Spirit Lake and Castle Lake. We would suggest obtaining additional guidance on these areas from the Scientific Advisory Committee and scientific research community.

Page 16, 17, 18. All Concept Areas. The preferred alternative recommends reconstruction and extension of many trails within the monument. We believe some of the suggested trails should be reevaluated for impacts to fish and wildlife and their habitats. For example, Mountain Trail 216.9 transverse the active north slopes. Deep canyons and unstable vertical walls make this route impractical. Delayed construction or moving the trail to the north should be considered. Trails to Grizzly Lake and Ryan Lake are also proposed. These areas have been specifically identified by the Mount St. Helens Scientific Advisory Board for protection and could be adversely affected by increased use. Saint Charles Lake is a very shallow lake with high amphibian use and no fish predation. This provides a unique opportunity for scientific study which could be adversely affected by increased public use. Proposed trails at Goat Marsh (on elk calving, rutting, and feeding area) suggest potential conflicts between recreational use, research needs and biological processes. In other instances some trails have been planned to provide access by researchers. Consideration should be given to closing these trails to the general public. Information is needed on if and how trails will be monitored for overuse.

Page 35, Figure 11. A graph is needed to allow comparison of various alternatives on fish and wildlife.

Page 50. Effects of the proposed alternatives are evaluated with mitigation measures implemented. Therefore full funding of appropriate mitigation is needed for development to proceed. In the event mitigation cannot be implemented, for any reason, monument development should be modified to attain an equal level of protection.

Page 52, item 3. We believe this measure should be strengthened by adding removal of woody vegetation from streams and lakes should be evaluated on a case-by-case basis to prevent adverse impacts to fish and other aquatic species.

Page 126. Lake and Wetland Wildlife Habitat. Information is needed on the limnological status of lake eco-systems and expected impacts from increased use.

Information is needed on how hunting and fishing will be accommodated with visitor restrictions to trail use only.

Page 139 Figure 26. We disagree that hunting and fishing visitor use days will not vary between alternatives. Varying degrees of access are provided to the monument under proposed alternatives which would also affect use by the recreational users.

Page 301. Appendix K indicates wild fire will be suppressed if greater than 10 acres. For optimal benefit to wildlife habitat, we believe the minimum should be 40 acres.

The U. S. Fish and Wildlife Service is available to assist you in developing this proposal. Please contact:

Charles A. Dunn
Fish and Wildlife Service
Ecological Services
2623 Parkmont Lane S.W., Bldg. B-3
Olympia, Washington 98502

Minerals

The Draft Environmental Impact Statement (DEIS) for the Mount St. Helens National Volcanic Monument is inadequate in its appraisal of the mineral resources within the boundary of the Monument. It treats the patented mines within the Monument (figure 3b) as land acquisition problems and ignores the major problem of assessing the mineral natural resource.

The DEIS lists 25 or so mine cabins as cultural resource sites (figure 3c) but omits mention of the related numerous mines of the St. Helens Mining District and their mineral resource value. The geologic resources (figure 2d) discussed are the "Materials Sources" which are limited to sand and gravel, and riprap. Thus, the study is unacceptable with regard to its treatment of the impact the Monument will have on the mineral resources and their development within the Monument boundary.

381

Personnel from the Bureau of Mines were investigating the area north of Mount St. Helens prior to its explosive eruption. They have accumulated a large amount of historical data, investigated some of the mines, and had taken and analyzed 250 samples from mines and prospects within the Monument boundary. A substantial number of mines and prospects are within the boundary.

As a result of the Mount St. Helens eruption, additional information must be acquired for those mineral properties already investigated. This would include on-site studies to determine 1) depth of burial of the mines or prospects by rock and debris, and 2) investigation of the land surface to determine if new outcrops of mineral-bearing rocks were exposed by the eruptive forces. This information plus mineral resource information of the mines and prospects not yet studied are a necessary part of the Environmental Impact Statement. The determination of beneficial and adverse impacts on the mineral natural resources being removed from the Nation's mineral resource base must be addressed satisfactorily.

The Bureau of Mines Office in Spokane has the personnel, the experience, and much of the background information to complete this critical aspect of the EIS, if the Forest Service desires their help.

Volcano Monitoring and Research

The Geological Survey notes few conflicts between the plan, especially the preferred Alternative D, and the U.S. Geological Survey's (USGS) volcano monitoring and research activities carried out by the staff of the David Johnston Cascades Volcano Observatory.

Under preferred Alternative D, the USGS building/antenna is to be removed from Harry's Ridge (p. 239). This site has been the prime measuring site for deformation of the north flank of the volcano and of the breach since 1980. Alternative A makes no mention of Harry's Ridge, Alternatives B, E, F, and G will "reconstruct USGS antenna/building," and Alternatives C and D will "remove USGS building/antenna." USGS prefers the plan for Harry's Ridge under Alternatives B, E, F, and G. It is suggested that this plan be adopted for C and D, inasmuch as those two options fall between those of B and E-G.

Harry's Ridge occupies a fundamental position for monitoring the crater. Data have been acquired from there since late June 1980, and this long history provides us with an unparalleled background for comparison and evaluation of measured changes in the crater and on the north flank of the volcano. Many critical targets in the crater cannot be seen from anywhere except Harry's Ridge (this includes from the proposed observation post on Johnston Ridge). Snow accumulation and strong winds frequently make measurements difficult from Harry's Ridge when made from outside the building. During the first two years of deformation studies from Harry's Ridge, measurements were made from outside. Measurements for the last two years, however, have been made from inside the building through a window and a remarkable improvement in quality of data has been the result. We can now reliably measure apparent changes in distance and angle that are less than half those in the past; this means that our capability to detect deformation of the north flank of the volcano -- critical in evaluating whether the entire edifice is swelling in response to intrusion of a fresh batch of magma as before May 18, 1980 -- has improved more than twofold. The building on Coldwater Peak is an unacceptable alternative because of frequent winds and cloud cover, dangerous winter conditions, and unacceptable long distance from the crater for our instruments. The building on Harry's Ridge is thus a necessary part of our monitoring. Its removal would severely damage our

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381

monitoring capabilities. Also, if a video system is reinstalled, Harry's Ridge is the site with the best view of the crater and a building will be needed to house it.

The antenna at Harry's Ridge, in conjunction with facilities at Coldwater Peak, is necessary for all electronic monitoring carried out in the crater. The proposed Johnston Ridge observation post/visitor facility is not an alternative site for reception because its location will not receive direct line telemetered tiltmeter and other data from the west side of the crater and most of the dome. Some of the telemetry equipment at Harry's Ridge is duplicated at Coldwater Peak; however, our Coldwater equipment is not as reliable owing to the severe winter weather and inaccessibility of the site for parts of the winter.

Under Alternative D, and several other of the alternatives, power and telephone lines will be extended to the observation post/visitor center building on Johnston Ridge. Utilization of our site on Harry's Ridge would be markedly improved by having the power and telephone line extended (buried) to it. This would allow more sophisticated and reliable electronics to be utilized and could help provide a more thermally stable environment for the electronics.

For all the reasons discussed above USGS believes that it is essential to maintain the building, antenna, and helicopter landing site at Harry's Ridge. The structures can be modified to suit the Forest Service requirements, such as to make them more visually attractive or safer from potential vandalism. Their removal, however, would seriously impact the volcano monitoring program which is required, in addition to serving other purposes, to reduce risks to monument visitors.

We find no mention of seismic hazards in the DEIS, even under the discussion of Public Safety Hazards, which includes discussions of Hydrologic Risk and Volcanic Hazards. In addition to seismicity associated with Mount St. Helens, which has included events as large as 5 on the Richter Scale, numerous earthquakes have also been recorded for the area near Elk Lake, near many of the proposed facilities. Recorded earthquakes with epicenters in that area are as large as magnitude 5.5 and conceivably future earthquakes could be larger. Larger than normal impacts could be expected from large seismic events owing to the nearby lakes (such as Coldwater Lake) impounded by debris avalanche deposits and to the low strength of the deposits when saturated with water.

The following suggestions are offered for clarification of the discussion of volcanic risks (p. 106-107):

1. Combine the two tables of legend into one. Draw a box around the new single table, but have a dividing line across base of the matrix. Insert into the box the following text: "Letters A - J (in squares/boxes) show the estimated annual risk of death from volcanic eruptions, in specified time periods (rows) and specified hazard zones and occupancy cases (columns). Letters A - J refer to annual risks respectively of: "An arrow should be drawn from the end of the last sentence to the set of letters and probabilities at the bottom right of the table. Change caption of the bottom right from Risk Probabilities to "Risk of death, per year." Highlight the letter "G" in the Column Case 3-Visitor and Row Quiet in order to correspond to the example listed below.
2. Change the title from Public Safety Levels of Volcanic Risk to: "Estimates of Volcanic Risk, for various hazard zones (5), patterns of exposure (3), and time periods (7)."

6

1. Change text to read as follows:

How to use this Map and Legend

1. Determine the Hazard zone of Concern (Zones I-V) on Figure 37.
2. In the matrix, find the column that corresponds to that Hazard Zone and to the appropriate level of exposure (Cases 1-3), based on the amount of time an individual may be exposed to volcanic hazards in a year:

- Case 1 - Resident, 100%
- Case 2 - Worker, with 2-way radio, 20%
- Case 3 - Individual Visitor, 1%

3. Find the row for the appropriate time period and volcanic eruption state.
4. The letter in the chosen row and column represents the annual risk of death, from the volcano, for the specified conditions.
5. Translate the letter level of risk into a numerical level of risk, as shown.
6. Compare the estimated volcanic risk (from Step 4 or 5) with familiar risks (Table 12).

Examples: Determine the risk to a one-time visitor on the south shore of Spirit Lake during a quiet period. Hazard Zone B, Exposure case 3, and Quiet indicate risk level G, highlighted as an example in the matrix. The letter G corresponds to a risk of between 1 in 10,000,000 and 1 in 1,000,000 of being killed in a given year, or about the same risk of death as from floods, tornadoes, or earthquakes worldwide.

In regard to the site protection part of Appendix C, we wonder why the crater and north flank of the volcano are not included in Protection Class I.

We believe that the three basic parts of the research administration structure (Scientific Advisory Board, In-House Science Coordinator, and a panel of active researchers) discussed in Appendix C potentially provide reliable means of protecting and coordinating research activities and for translating research findings into interpretive and other management information. However, success will depend upon the qualifications of the science coordinator and the research panel members. It could be beneficial to have the Scientific Advisory Board exercise some oversight on the selection of these key individuals as well as their responsibilities and terms of office.

We note a very few inadvertent errors and minor deficiencies. Figure 4 (p. 8) and many other figures which utilize the same map base do not show the location of the North Fork Toutle River, whereas they do show other rivers and creeks of the rivers discussed in the text, the North Fork Toutle is the most important. North Fork Toutle and South Coldwater drainages are not shown on figure 5 (p. 10). Figure 23 (p. 57) has incorrect

tables on bias? effects and area of heavy Tephra deposition (tables are transposed). On figure 25 (p. 67) the explanation needs to be modified so as to indicate that the dark orange color also includes mudflow deposits in addition to pyroclastic flow and debris avalanche deposits.

Thank you for the opportunity to comment.

Sincerely,

Charles S. Polityka
Charles S. Polityka
Regional Environmental Officer

Appendix O

REFERENCES

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Appendix P

GLOSSARY

Aggradation--The process of building up of a stream channel by deposition of sediment.

Alluvial--Particulate matter (e.g., sand, gravel, etc.) deposited by flowing water.

Andesite--An extrusive volcanic rock of intermediate chemical composition between a quartz rich rock such as rhyolite and a rock rich in ferromagnesian minerals such as basalt. It has very fine grain size with possible occasional larger crystals.

Ash--Uncemented pyroclastic material consisting of particles under 4 mm in size.

Background--The landscape beyond the middle ground, i.e., landscapes usually greater than 5 miles from the observer.

Basalt--An extrusive volcanic rock rich in ferromagnesian minerals commonly darker in color and of a higher density than andesite.

Basic Industries--Industries that produce goods for markets outside the region and bring in income. These industries are primary sources of regional growth since they create jobs in other (nonbasic) sectors.

Biophysical Areas--Contiguous land areas within the Monument with significant biological and physical features and processes that are relatively homogeneous. Also called subcharacter landtypes.

Biophysical Carrying Capacity--The maximum level of human impact possible while remaining within the intent of the Monument Act for "preservation of the natural geologic and ecologic processes and integrity of the resources" (Section 4(1)(1)).

Biophysical Sensitivity--The likelihood for potential levels of disturbance to significantly impede natural processes or to significantly impact features.

Braided Stream Channels--An intricate network of interlacing channels and sediment bars caused by more sediment being delivered to the channel than the stream can remove. Drainage pattern characterized by two or more shifting channels, interwoven channels, and tributaries.

Characteristic Landscape--The naturally established landscape within a scene or scenes being viewed.

Cinders--Volcanically highly porous fragments ejected explosively from a volcanic vent.

Clastic--Pertaining to or being a rock or sediment composed of rock fragments or minerals that have been transported individually from their place of origin.

Collapse Pits--A term used to describe collapsed tumuli (dome shaped circular solid or hollow surface feature) in a lava flow.

Cover--Vegetation used by animals for hiding from humans, predators, and harassment from other animals and climatic (thermal) relief.

Cultural Resources--The remains of sites, structures, or object used by humans in the past. They may be historic, prehistoric, archaeological, or architectural in nature.

D.E.I.S.--Draft Environmental Impact Statement.

Dacite--An extrusive volcanic rock containing a higher percentage of quartz and related minerals than andesite, usually very fine grained or glassy with occasional larger crystals.

Debris Avalanche or Flows--The very rapid and usually sudden sliding and flowage of masses of initially incoherent unsorted mixtures of soil and rock material.

Decision Criteria--Standards developed for appraising alternatives.

Degradation--The lowering of a stream channel by the removal of sediment through erosion and transportation by flowing water.

Developed Site--A land allocation designation for managing forest environments substantially modified for campgrounds, ski areas, administrative sites, etc.

Development Categories--Refer to maximum development categories.

Dispersed Recreation--A general term for recreation used outside a developed recreation site; includes such activities as scenic driving, hunting, backpacking, and recreation activities in primitive environments.

Endangered Species--Life forms (birds, fish, mammals, plants) found on the U.S. Department of the Interior's list and published in the Federal Register. Their presence on the list implies that their continued existence as a species is questionable.

Environmental Impact Statement--A detailed written statement as required by Section 102(2)(C) of the National Environmental Policy Act.

Evapotranspiration--A combination term referring to that portion of the precipitation returned to the air through direct evaporation or that transpired by vegetation.

F.A.A.--Federal Aviation Administration.

Fire High Hazard Area--Areas in the NVM where fuel loading, topography, access, and visitor use may combine to create severe fire behavior and a threat to public safety or resources adjacent to the Monument during certain times of the year.

Floodplains--Lowland and relatively flat areas adjoining inland and coastal water including as a minimum, that area subject to one percent or greater chance of flooding in any given year. Floodprone wetlands and sinkholes, and sheet flow or shallow flooding areas such as debris cones or alluvial fans built up by material carried by mountain streams, are special floodplain areas.

Fluvial--Produced by river action such as a fluvial plain.

Forb(s)--Plants, other than grasses, having little or no woody material. Often used the same as herb, herbaceous.

Foreground--The landscape encompassed within approximately 0-1/2 mile from the observer.

Fuel Loading--Level of accumulation on the ground of dead and down woody debris, measured in tons per acre.

Fumaroles--A hole or vent in the ground from which vapors and gases arise.

Geomorphic--Pertaining to the figure of the earth or the form of its surface and the changes that take place in the evolution of landforms.

Geothermal--Resources having to do with the heat of the earth's interior.

Groundwater--Water found beneath the earth's surface in the zone of saturation within soil and rock deposits.

Grylloblatid--A small, beetle-like insect, of the genus *Grylloblatta*, also known as a rock crawler or ice crawler, Mount St. Helens *Grylloblattid*, a rock crawler; *Grylloblatta chirurgica*, found only in the Mount St. Helens cave basalt flow.

Guano--Excrement of birds or bats.

Habitat--The place where a plant or animal naturally or normally lives and grows.

Hydrothermal Ecosystems--Plant and animal communities whose habitat is adjacent to hot water.

Irretrievable--Applies to losses of production or use of renewable natural resources.

Irreversible--Applies primarily to the use of nonrenewable resources, such as minerals or cultural resources, or to those factors which are renewable only over long time spans, such as soil productivity. Irreversible also includes loss of future options.

Interpretation--An educational activity which aims to reveal meaning and relationships through the use of original objects, by first hand experience, and by illustrative media.

Issue--A point, matter, or question to be resolved.

Jettystone--Stone comprising a wall built out into the water to restrain currents and reduce bank erosion.

Kiosk(s)--A small structure open at one or more sides with displays of information used to direct and inform visitors entering the Monument.

Kipuka--An Hawaiian term referring to an "island" of vegetated, undisturbed ground surrounded by a lava flow. Such an island occurs within the cave basalt flows.

Lahar(s)--A landslide or mudflow of pyroclastic material on the flank of a volcano or the deposits produced by such a landslide. Lahars, such as those at Mount St. Helens, are described as wet if they are mixed with water, such as that produced by melting snow. This term is commonly applied to a broad range of volcanic mudflows and debris flows.

Lapilli--Volcanic ejecta ranging from 4 to 32 mm in diameter.

Lava Dome--If the eruptions at a volcanic vent exude lava of high viscosity, a mountain of solid rock results which is a lava dome.

Lithic--Refers to sediments and rocks in which rock fragments are more important proportionally than mineral grains.

Littoral Zone--An area, along a lakeshore, extending from shoreline to a water depth where rooted vegetation disappears. Great species diversity and high annual biological production characterize this area.

Mass Failure--Movement of a mass of rock, soil, and debris downslopes under the direct influence of gravity, usually aided by the presence of water.

Maximum Development Categories--Descriptions of the maximum levels of developments within a Biophysical Area (subcharacter landtype) allowable in order to remain within the intent of the Monument Act.

Maximum Modification--The least restrictive objective allowing man's activities to dominate. They must present a natural-appearing composition only when viewed from a distance.

Management Concept Area(s)--Groupings of biophysical landtypes that present opportunities for similar and compatible types of recreation, interpretation, and research, based on the areas' natural attributes.

Middle Ground--The landscape beyond the foreground but less than the background, i.e., approximately 1/2-5 miles from the observer.

Modern-Urban ROS Class--Areas characterized by substantially urbanized environment, although the background may have natural elements. Renewable resource modification and utilization practices are common. Vegetative cover is often exotic and manicured. Sights and sounds of humans are pre-dominant. Large numbers of visitors can be expected both on-site and in nearby areas.

Modification--Man's activities may dominate, but only as a natural-appearing composition when viewed from any distance.

Modified Suppression--Fire suppression forces, techniques, or strategy may be adjusted to meet specific management objectives. Examples include firelines only where necessary, little or no heavy equipment use, snags left standing unless they pose a safety hazard, etc. The intent is to minimize adverse environmental effects caused by suppression actions.

Monument Act--The Act designating the Mount St. Helens National Volcanic Monument (Appendix A).

Mudflow--A flowage of heterogeneous debris, lubricated with a large amount of water. This general term describes flows in which sand and finer sized particles are abundant, as opposed to volcanic debris flows, which is the preferred term for those flows consisting of dominantly coarser material.

National Register of Historic Places--A list of cultural resources significant to our National, regional, or local heritage. Eligibility is determined by a set of criteria (36 CFR 60.6)

Natural Fire Rotation--The time necessary for fires with a given frequency to burn over and reproduce a given area.

Natural Impoundments--New lakes formed as a result of deposits resulting from the May 18, 1980, eruption of Mount St. Helens.

Omnivorous Feeders--Animal species which feed on a wide variety of plant and animal foods.

PAOT--In recreation, PAOT means people at one time, a measure of the capacity of an area.

Pahoehoe (or Ropy Flow Texture)--An Hawaiian term for basaltic lava flows typified by smooth, billowy, or ropy surface occurring when smoothly flowing fluid lava, most viscous at the smooth cooler surface, is commonly dragged into striking "ropy" forms.

Partial Retention--Management activities remain visually subordinate to the natural appearance or the landscape.

Patented Claim--A patented claim is one that has been purchased from the U.S. Government and to which an individual has exclusive title to the locatable minerals and in most cases full title to the land surface and all other resources.

Phreatic Explosive Pits--Craters created by stream explosions caused by sudden heating of ground water by deposition of hot pyroclastic flows.

Plant Community--A group of plants that can be recognized on the ground and have limited variability in species composition and productivity.

Pluton--Igneous material emplaced and crystalized below the earth surface.

Portals--An information station positioned along a primary access route to the Monument for the purpose of providing visitor orientation.

Potable Water--Suitable for human consumption.

Prescribed Natural Fire--A naturally occurring fire that is allowed to burn in a specific area under specific environmental conditions and intensity levels, in order to accomplish pre-determined management objectives.

Preservation--One of six measurable standards for the visual management of the landscape. It allows only ecological changes. Management activities, except for very low visual impact recreation facilities, are prohibited. This objective applies to specially classified areas including Wilderness.

Pressure Ridges--Surface structure on a lava flow related to internal pressure within the flow; due to mechanics of downslope flow or lava tube inflation.

Primitive ROS Class--Generally includes those areas out of sight and sound of people's activities and greater than 3 miles from roads and trails with motorized use. Opportunity exists for a high degree of interaction with the natural environment, challenge, risk, and the opportunity to use outdoor skills. Because of the area's remoteness, users of these areas are normally required to stay overnight.

Propagules--Bud, shoot, or other plantpart (other than seed) capable of reproducing a plant.

Pumice--Highly porous (containing air voids) glassy lava which has a specific gravity bulk unsaturated approaching or less than that of water.

Pumiceous--Referring to a deposit containing a high percentage of pumice.

Pyroclastic--A general term applied to fragmented volcanic materials that have been explosively or aerially ejected from a volcanic vent. Also, a general term for the class of rocks made up of these materials.

Pyroclastic Flow (or Cloud)--A volcanic flow of hot gas and fragmental material which usually is confined to topographic lows (drainages) and is capable of moving at speeds of 30 to in excess of 100 miles per hour.

ROS--See Recreation Opportunity Spectrum.

RVD--See Recreation Visitor Day.

Recreation Opportunity Spectrum (ROS)--Land delineations which identify a variety of recreation experiences in six classes along a continuum from primitive to modern-urban. Each class is defined in terms of the degree to which it satisfies certain recreation needs based on area size, the extent to which the natural environment has been modified, the type of facilities developed and the degree of outdoor skills needed to enjoy the area. The six classes are: (1) primitive--representing the most remote, undeveloped and inaccessible opportunities, (2) semi-primitive non-motorized, (3) semi-primitive motorized, (4) roaded natural, (5) rural, and (6) modern-urban--representing the most developed, accessible and convenience-oriented experience available.

Recreation Visitor Days (RVDs)--The recreational use of an area for a total of 12 hours by one person. An overnight stay usually results in two RVD.

Refugia--The development of numerous small, closely-spaced channels caused by uneven removal of surface soil by running water. Organisms survived the 1980 eruptions of Mount St. Helens in these areas.

Research Natural Areas (RNAs)--Designated areas of land, usually over 300 acres in size, with characteristics of scientific or educational interest about the ecological processes which will be of value of observation and research on plant and animal succession, habitat requirements of species, insect and fungus deparadations, soil microbiology, phenology, and related phenomena.

Responsible Official--The Forest Service line officer who has been delegated the authority to approve or adopt policies, plans, programs, or projects.

Retention--The most restrictive visual quality objective wherein management activities are not evident to the casual forest visitor.

Rill Erosion--An erosion process in which numerous small channels of only several inches in depth are formed.

Riparian Vegetation--Vegetation growing on and near the banks of streams, lakes, other bodies of water, or in other wet areas.

Road Prism--A collective term reforming to the road subgrade, subbase and base course, and road surfacing including road turnouts and shoulders but excluding cut and fill slopes.

Roaded Natural ROS Class--Includes areas less than 1/2 mile from roads better than primitive; railroads, major powerlines, and within resource modification areas. Areas in this class vary in size from 100 to over 2,000 acres and are characterized by predominately natural environments, with moderate evidence of sights and sound of humans. Such evidence usually harmonizes with the natural environment. Concentration of users is moderate to low.

Rotation--The period of years required to establish and grow tree crops to a specific size or condition of maturity.

Rural ROS Class--Includes those areas within small communities, developed campgrounds, developed ski areas, and administrative sites. The areas are generally smaller than 500 acres in size and are characterized by substantially modified natural environments. Modifications are primarily to enhance specific recreation activities. Sights and sounds of humans are readily evident. Concentration of users is moderate to high.

Scheduled Prescribed Fire--A fire that is ignited by fire managers at a pre-determined time in a specific area under specific environmental conditions, in order to accomplish pre-determined management objectives.

Scientific Advisory Board--The Board of scientists and research administrators created by the passage of the Monument Act (Appendix A) to provide advice and recommendations concerning the protection, management, and administration of the Monument.

Sedimentation--Erosion, transport, and deposition of particular matter by flowing waters.

Seen Area--Total area observed and may be measured in terms of foreground, middle ground, and background. See Foreground, Middle Ground, and Background.

Semi-Primitive Motorized ROS Class--Includes areas greater than 1/2 mile from system roads, and less than 1/2 mile from primitive roads or trails. Areas are generally larger than 500 acres in size and characterized by a predominantly unmodified natural environment with minimum evidence of sights and sounds of humans. Concentration of users is normally low. Road access is not maintained in these areas.

Semi-Primitive Non-Motorized ROS Class--Generally includes those areas greater than 1/2 mile and less than 3 miles from system roads and ORV trails open to public travel. Limited opportunity exists for isolation from the sight and sounds of humans. Opportunity exists for a high degree of interaction with the natural environment. A moderate challenge and risk factor and the opportunity to use outdoor skills are factors in this environment.

Sensitive Species--Those species which (1) have appeared in the Federal Register as proposals for classification and are under consideration for official listing as endangered or threatened species, (2) are on an official State list, or (3) are recognized by the Regional Forester as requiring special management in order to prevent the need for their placement of Federal or State lists.

Solitude--A recreational experience in which people may enjoy the surroundings in a natural setting generally undisturbed by unnatural sounds or sights.

Speleologists--People who explore caves for recreation and/or study.

Spotted Owl Management Unit--An area on the Forest set aside for management of the Northern Spotted Owl, a Region 6 Forest Service sensitive species, and listed as threatened by the State of Washington.

Subcharacter Landtypes--Refer to Biophysical Areas.

Talus--Fragments of rock and other soil material accumulated by gravity at the foot of cliffs or steep slopes.

Tephra--A collective term for all clastic volcanic materials which, during an eruption, are ejected from a crater or from some other type of vent and transported through the air, includes volcanic dust, ash, cinders, lapilli, scoria, pumice, bombs, and blocks.

Thermophillic Microorganisms--Organisms which find their optimum environment in hot sites (plus 40 C).

Total Resource Inventory (TRI)--A user oriented system for storage and retrieval of information on the resources of a specific area.

Tree Casts and Wells--Also known as tree molds, formed when a lava flow engulfs trees which subsequently decay, leaving hollow cavities in the flow oriented in different directions (vertical molds being called wells).

Tumulus--A dome shaped circular or semi-circular solid or hollow surface feature in a lava flow caused by internal pressure within the flow often associated with lava tubes.

Visitor Day--Refer to Recreation Visitor Day.

Visual Absorption Capability (VAC)--The relative measure of the physical ability of a tract of land to withstand management manipulations without adversely affecting its visual character. High VAC suggests that greater landscape modification is possible while meeting visual objectives. The process used in determining VAC is based on four physical factors: slope; vegetative pattern and screening ability; the ability of a site to recover or resiliency; and soil color contrast.

Visual Quality Objective (VQOs)--Goals that describe acceptable degrees of visual alteration allowed in the natural landscape.

Visual Resource--The composite of basic terrain, geologic features, water features, vegetative patterns, and land use effects that typify a land unit and influence the visual appeal the unit may have for visitors.

Visual Resource Management System--A Forest Service system used to provide direction for managing the scenic qualities of the landscape. This system is described in two volumes: National Forest Landscape Management, Volume 1, U.S. Department of Agriculture Handbook No. 434, and Volume 2, Handbook No. 462. These documents are available for review at most Forest Service offices or they may be obtained from the Superintendent of Documents, Washington, D.C.

Vitric Ash--Volcanic ejecta of ash size (less than 4 mm) composed of volcanic glass shards.

Volcanic Bomb--Pyroclastic ejecta consisting of fragments of lava that were liquid or plastic at the time of ejection, and having forms, surface markings, or internal structures acquired during flight through the air or at the time of landing. They range in size from several mm to several meters in length.

Volcanic Plug--A monolithic mass of solidified igneous rock.

Volcanic Vent--An opening or channel in the earth's crust through which magmatic materials are transported and out of which volcanic materials (lava, pyroclastic detritus) are erupted at the surface.

Waterbars--Cross drain on a road or trail designed to carry accumulated run-off to a designated area.

Wetlands--Areas that are inundated by surface or ground water with a frequency sufficient to support a prevalence of vegetation or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, and similar areas such as slough, potholes, wet meadows, river overflows, mud flats, and natural ponds.

Wildfires--Fires which do not conform to the pre-determined criteria of a prescribed fire or those which would not meet any specified resource objective. They are suppressed.

Appendix Q

INDEX

- Access--5, 55, 63, 109, 125, 168, 189, 191
- Access Alternatives, Coldwater Lake to Johnston Ridge--293
- Achieving Desired Views--7, 44, 50, 160-165
- Additional Roads Not Analyzed--11, 34
- Advisory Council on Historic Preservation, Federal--15, 59
- Aerial Tram--293
- Affected Environment--67
- Air Quality--15, 39, 94, 131
- Air Traffic by Alternative--14, 26, 27, 29, 31, 309
- Air Traffic Hazards--54, 116, 168, 179
- Air Traffic Restrictions--116, 309
- Alternatives--11, 13, 243
- Alternative Access, Coldwater Lake to Johnston Ridge--293
- Alternative Formation Process--7, 221, 239
- Alternatives by Management Concept Areas--13, 243
- Alternatives Considered But Not Analyzed in Detail--11
- Alternative Responses to Issues--vi-xv
- Alternative Standards--7
- Andesite Lava Flows--75
- Ape Cave--7, 18, 75, 91, 103, 148, 247, 249, 255, 262, 268, 275, 282
- Aquatic and Streamside Habitats--143
- Appendices--209
- Architectural Styles--15, 37
- Army Corps Planning--3, 82, 137
- Ash Cover and Revegetation--181

- Backcountry Management Concept Area--22, 25, 26, 27, 29, 30, 32, 245, 247, 251, 257, 265, 271, 279, 285
- Bats--59, 91, 92, 148
- Bear Meadow--20, 104, 247, 250, 256, 263, 269, 277, 284
- Beetles--91, 94
- Big Creek Falls--248, 252, 259, 266, 272, 280, 287
- Biological Effects, Caves--59, 148
- Biological Processes and Features--42, 59, 62
- Biophysical Carrying Capacity--7, 41, 62, 221
- Blast Effects--70
- Blue Lake Noble Fir Grove--255, 262, 268, 276, 283
- Boundary Trailhead--23, 252, 258, 266, 272, 280, 286
- Boy and Girl Scout Camps--112
- Breached Crater--74
- Bridges--109, 137, 170, 318
- Bridge Costs and Scheduling, Alternative D (Modified)--318

- Camping Permits--19, 22, 29, 30, 32, 33, 52, 143, 161, 162, 164, 165
- Capital Investment--57, 83, 313
- Cascade Peaks--20, 247, 250, 256, 264, 270, 278, 284
- Castle Lake--17, 85, 138

- Castle Lake/Sheep Canyon Management Concept Area--17, 25, 26, 27, 28, 30, 31, 33, 243, 249, 253, 261, 267, 275, 282
- Caves--15, 18, 19, 25, 26, 27, 30, 31, 33, 38, 59, 70, 148
- Cave Basalt Area--15, 18, 25, 27, 30, 31, 33, 59
- Cave Basalt Area Management Plan--15, 18, 25, 26, 27, 30, 31, 33, 38, 59, 65
- Cave Basalt/Goat Marsh Management Concept Area--15, 18, 25, 26, 27, 30, 31, 33, 38, 59, 65, 148, 244, 247, 249, 255, 262, 268, 275
- Cave Basalt Habitat--60, 65, 148
- Cave Ecosystems--60, 65, 77, 148
- Cave Exploration--77
- Cedar Creek--21, 250, 256, 264, 270, 273, 284
- Cedar Flats Research Natural Area--24, 248, 252, 258, 266, 272, 280, 286
- Channel Migration and Development--136
- Cispus Environmental Learning Center--24, 99, 105, 259, 272, 280, 287
- Clearwater Creek--80
- Clearwater Overlook--23, 248, 252, 258, 266, 272, 280, 286
- Climate--94
- Coldwater Ridge--116
- Coldwater/Johnston Ridge Management Concept Area--15, 25, 26, 27, 28, 30, 31, 32, 243, 248, 253, 259, 267, 273, 281
- Common Management Practices--13, 36
- Common Variety Minerals--78, 131
- Comparison of Alternatives--40
- Concession Opportunities--21, 168, 183
- Construction Related Economic Effects--60, 186
- Contents of this FEIS--1
- Controls on Visitors--19, 22, 29, 30, 32, 52, 143, 161, 162, 164, 165
- Convenience of Visitors--48, 49, 160, 161, 162, 163, 164, 165
- Cooperating Agencies--5
- Copies Sent to Agencies, Organizations, and Persons--199-208
- Cost Effectiveness--57, 183
- Cost of the Visit--44, 49, 160, 161, 162, 163, 164, 165
- Crater and Dome--74
- Critical Viewing Areas--7, 48, 49, 50, 160, 161, 162, 163, 164
- Cross-Country Skiing and Snowplay--106
- Cross-Monument Highway--9, 11
- Crowding--49, 160, 161, 162, 163, 164, 165
- Cultural Effects, Caves--60
- Cultural Resources--15, 38, 65, 110, 179, 191
- Curly Creek Falls--25, 26, 27, 29, 30, 32, 33, 248, 252, 259, 267, 272, 281, 287
- Current Environment--67

- David A. Johnston Cascade Volcano Observatory--95
- Debris Avalanche--71, 78, 80, 107, 133
- Deer and Elk Habitat--56, 89, 146
- Definitions--431

Demand--44, 95, 327
 Description of the Alternatives--13, 243
 Determining Carrying Capacities--7, 221
 Development Schedule and Costs, Alternative D (Modified)--313
 Dispersed Use Management by Alternative--17-24, 247-251, 253-258, 261-265, 268-271, 275-283, 285-286
 Diversity of the Recreational Experience--48, 49, 160-165
 Dome--73, 117
 Donneybrook--21, 250, 256, 264, 270, 278, 284
 Douglas-fir Beetle--94

 East Entrance--20, 250, 256, 263, 270, 278, 284
 Economic Factors--60, 125, 185
 Effects--40, 131
 Effects on Visitor Experiences--49, 159
 Elements of the Issues--vi-xiv, 40-61
 Employment--60, 125, 185
 Energy--61, 190
 Entrance Fees--39
 Environmental Consequences--40, 131
 Erosion--43, 81, 136, 311
 Eruptions--67
 Existing Situation--67

 Facility Design--15, 37
 Facilities Outside the Monument--23, 25-27, 29-34, 246-247, 252, 258-259, 266-267, 272-273, 280-281, 286-287
 Federal Aviation Administration--14, 26, 27, 29, 31, 54, 116, 179, 309
 Federal Highway Administration--5
 Ferns--92
 Fir-root Bark Beetles--94
 Fire Hazards--122, 180
 Fire Management--14, 25-27, 29, 31-32, 34, 38, 325
 Fisheries--13, 38, 56, 85, 139-144
 Fishing, Hunting, and Trapping--13, 38, 56, 87, 89, 139, 143, 145
 Floodplains and Wetlands--43, 82, 87, 138-139
 Forest Insects and Disease Management--13, 38, 55, 94, 131
 Forest Planning--3
 Forest Service Plans Related to the Monument--3
 Forest Service PNW Experiment Station--95, 99
 Fringed Pinesap--92
 Fuel Loading--122, 180
 Fuel Types Related to Recreational Development--182
 Fumaroles--42, 72
 Fungi--94

 Gasoline Consumption--61, 190
 Gathering Forest Products--106
 General Coniferous Forest--42, 89
 Geologic Features, Conditions, and Processes--41, 67, 131
 Geologic Hazards--180
 Geologic Effects, Caves--59, 131
 Geothermal Resources--78
 Glossary--431
 Goat Marsh--19, 87, 138, 255, 262, 268, 276, 283
 Goat Mountain--77
 Green River Fish Passage--13, 38
 Green River Road--11
 Green-fruited Sedge--92
 Grizzly--250, 257, 264, 270, 278, 285

 Groundwater--78, 132
 Grylloblattid--91

 Habitat--56, 87, 89, 91, 139, 143, 144, 148
 Harmony Creek--20, 256, 265, 270, 278, 284
 Harmony Falls Lodge--112
 Harrys Ridge--17, 118, 26-28, 30-32, 243, 248, 253, 261, 267, 273
 Harry Truman's Lodge--111
 Heavy Tephra--72, 80, 133
 Horse Use--15, 106, 149
 Human Activities--95, 153
 Hydrologic Monitoring--80, 84
 Hydrologic Risks--54, 116, 180
 Hydrothermal Ecosystems--42

 Implementation Schedule, Alternative D (Modified)--313
 Independence Pass--20, 25-28, 247, 250, 256, 264, 270, 278, 284
 Influence Area--125
 Information Stations--23-24, 104, 248, 252, 255, 258, 262, 266, 272, 277, 280, 283, 287
 Insects and Diseases--13, 38, 55, 94, 131
 Interdisciplinary Team Members--191
 Interdisciplinary Planning Process--7, 40
 Interpretation, 3, 15, 44, 160-165
 Interim Interpretation and Development Program--3, 36
 Iron Creek--23, 25-27, 29-30, 32-33, 104, 248, 252, 258, 266, 272, 280, 286
 Isolated Non-federal Lands--174
 Issues, Concerns, and Opportunities--1, 3, 40

 Jobs--60, 125, 185
 Johnston Ridge--71

 Kalama River--80
 Kalama Springs--18, 103, 247, 249, 255, 262, 268, 276, 282

 Lahars--73
 Lahar Viewpoint--105
 Lake Cave--91
 Lakes, Wetlands, and Meadows--42, 82, 85, 87, 138-144
 Lance-leaved Grape Fern--92
 Land Acquisition--23, 39, 174-175
 Land Uses, Plans, and Zoning--129
 Landers Creek Road--11
 Landownership--39
 Landslides--72, 82, 132
 Larch Mountain Salamanders--91
 Lava Canyon--19, 247, 249, 255, 263, 269, 277, 283
 Lava Cast--18, 103, 247, 249, 255, 262, 268, 276, 282
 Lava Dome--73, 117
 Lava Flows--117
 Lava Tubes--112
 Law Enforcement--15, 37
 Lewis River--24, 246, 259, 267, 272, 281, 287
 Lifestyles and Values--61, 128, 189
 Lightning Risks--181
 List of Agencies, Organizations, and Persons to Whom Copies Sent--199-208
 List of Preparers--193
 Local Area--125
 Locatable Minerals--78, 131
 Lodgepole-bearberry Community--42

Logging Equipment--116
 Lower Falls--24, 105, 248, 252, 259, 272, 280, 287
 Lower State Route 504 Corridor--34

 Major Road Corridors--125
 Management Approaches Considered But Not Analyzed In Detail--11
 Management Concept Areas--13, 243
 Management Practices Common To All Alternatives--13, 36
 Management Steering Committee Members--193
 Marble Mountain--77, 256, 263, 269, 277, 284
 Maximum Development Categories--7-9, 221
 McBride Lake--268, 276, 282
 Meta Lake--20, 105, 247, 250, 256, 263, 270, 278, 284
 Minerals--78, 111, 131
 Minimum Alternative Standards--7
 Mining Activity--111
 Minnie Peak--248, 275, 281
 Minorities, Women, and the Economically Disadvantaged--191
 Mitigation Measures Included In The Alternatives--62
 Models Used--311
 Monitoring--62, 80, 97
 Monument Act--211
 Moratorium on Fish Stocking--13, 38
 Mount St. Helens Cave--19, 92
 Mount St. Helens Land Management Plan--1, 3, 67
 Mount St. Helens Management Concept Area--23, 25-33, 246, 247, 251, 258, 265, 271, 280
 Mount St. Helens Recreation Demand--327
 Mount St. Helens Research Demand--100
 Mount St. Helens Visitor Center--103
 Mountain Climbing--15, 23, 106
 Mt. Margaret Management Concept Area--15, 22, 25-33, 245, 247, 251, 257, 265, 271, 279, 285
 Muddy River--19, 21-33, 74, 104, 248, 252, 258, 266, 272, 280, 286
 Mudflows--73, 78, 117, 132
 Mudflow Management Concept Area--19, 21-33, 244, 247, 249, 255, 263, 269, 277, 283

 National Science Foundation--95
 Natural Features and Processes--41, 67, 131, 152, 176
 Natural Impoundments--82
 Natural Fire Rotation--123
 Nature of Impacts--152, 191
 New Lava Dome--73, 117
 Nonforest Plant Communities--42
 North Fringe--22, 257, 265, 271, 279
 North Information Station--23, 266, 272, 280, 285, 286
 Northern Grape Fern--92
 Norway Pass--21, 247, 250, 257, 264, 270, 278, 285

 Off Road Vehicles--9, 14, 37, 106
 Old Growth Coniferous Forests--42, 89
 Ole's Cave--112, 131, 149, 268, 276, 282
 Operation and Maintenance Costs--57, 184, 313
 Other Plans--3-5
 Outlaw Ridge--24, 104, 252, 259, 267, 273, 281, 287

 Panhandle Lake--88, 141
 Parker Car--111, 247, 250

 Personal Income--60, 125, 185
 Phreatic Pit--72
 Pine Creek--24, 248, 252, 259, 266, 272, 280, 287
 Plains of Abraham Road--11
 Planning Context--1
 Polar Star--257, 279, 285
 Population--60, 125, 185
 Potential Fire Behavior--122, 128
 Preparers--193
 Primary Succession--43
 Private Land Parcels--23, 39, 174-175
 Process Used To Form Alternatives--7, 239
 Projected Visitor Ues--327, 335
 Protection of Scientific Values--13, 239
 Ptarmigan Habitat--148
 Public Access Task Group Report--5
 Public Issues, Management Concerns, and Opportunities--1-3, 40
 Public Safety--13, 38, 54, 116, 179
 Public Use Controls--19, 22, 29, 30, 32, 52, 143, 161, 162, 164, 165
 Pumping Station--83
 Purpose and Need For Actions--1, 83
 Pyroclastic Flows--72, 80, 117, 133,

 Quality of the Recreation Experience--48, 49, 160-165
 Quartz Big Tree--22, 251, 257, 265, 271, 279, 285

 Rainfall--93
 Recreation and Interpretation--44, 63, 100, 157, 191
 Recreation Demand--44, 95, 327, 335
 Recreation Experience--44, 49-53, 157
 Recreation Facilities--105
 Recreation Opportunity Spectrum--48, 102, 165, 295, 332
 Recreation Supplies--47, 159
 References--425
 Relationship of This Plan To Other Plans--3-5
 Research and Science--9, 13, 25-34, 37, 54, 95, 153, 239
 Research Access--99
 Research Administration--13, 54, 153, 239
 Research Alternatives--25-34, 37, 239, 247-287
 Research Alternative Formation--9-11, 239
 Research Conditions Requiring Management Direction--99
 Research Opportunities--95
 Research Site--13, 54, 153, 239
 Research Demand--95
 Research Records--13, 25-34, 37, 99, 239
 Resource Specialists--193
 Restricted Zone--13, 37, 38
 Riparian Habitat--56, 87, 143
 Rivers and Streams--42, 80, 136
 Road and Bridge Costs and Scheduling, Alternative D (Modified)--317
 Road 25 Corridor--24, 246, 248, 252, 259, 267, 273, 281, 287
 Road 99/Spirit Lake Management Concept Area--20, 244, 247, 250, 256, 263, 269, 277, 284
 Roads and Bridges--109, 168, 317
 Roads and Trails by Vegetative Condition--145
 Rooding by Alternative--15-24, 55, 168, 247-287
 Road Corridors Considered But Not Analyzed In Detail--11
 Rockfall--78
 Ryan Lake--22, 251, 257, 265, 271, 279

Scheduling and Costs, Alternative D (Modified)
 --313
 Science and Research--13, 25-34, 54, 95, 153,
 239, 243
 Science and Research Alternative Formation--
 9-11, 239
 Scientific Advisory Board--156, 239
 Scientific Importance--95
 Secondary Succession--43
 Sedimentation--13, 81, 136, 311
 Sewage Effluent--137
 Silver Fir Beetles--94
 Silver Lake--104
 Slides--78, 82, 137-139
 Slope Stability and Failures--82, 132, 152
 Socioeconomic Conditions--60, 125, 185
 Social Effects By Road Corridors--189
 Soil Conservation Service--81
 Soils and Sedimentation--43, 81, 137, 311
 South Information Station--18, 247, 249, 262,
 269, 277, 283
 Smith Creek--256, 264, 270, 284
 Smith Ridge--257, 264, 278
 Snowfall--94
 South Fork Toutle River Mudflow--73
 Spiders and Insects--92
 Spirit Lake--264, 270, 278, 284
 Spirit Lake Outlet--3, 82, 137
 Spirit Lake Pluton--77
 Spotted Owl Management Units--89
 Standing Dead Tree Areas--42, 123, 144
 State Route 504--5, 34, 55, 111, 175
 Strawberry Mountain--21, 247, 250, 257, 264, 270,
 278, 285
 Streams--43, 56, 80, 136, 143
 Subcharacter Land Types--7-9, 221
 Subalpine Meadows--89, 144
 Succession--43
 Sugar Bowl--75
 Summary of the Nature of Impacts--152, 191
 Supply/Expected Use (Demand) Comparison--32,
 44, 327
 Supportive State and Private Recreational
 Developments--105

 Tephra--72, 80, 117, 133
 Terrestrial Wildlife--56, 89, 144, 178
 Threatened, Endangered, or Sensitive Plant
 Species--93
 Threatened, Endangered, or Sensitive Wildlife
 Species--89, 92
 Timber and Other Commercial Haul--172
 Total Resource Information (TRI)--13, 37, 99, 239
 Toutle-Cowlitz Watershed Management Plan--3-5

 Townsend's Big Eared Bat--59, 91, 149
 Traditional Recreation Experience--44, 101, 159,
 327
 Traffic Congestion--44, 160-165
 Trails and Trailheads--18-24, 171, 247-287
 Trail Construction Costs and Scheduling,
 Alternative D (Modified)--313
 Transportation--55, 109, 168

 US Army Corps of Engineers--82, 137
 US Geological Survey--13, 37, 67, 81, 82, 95,
 97, 99, 118
 Upper State Route 504 Corridor--34, 55, 176
 User Freedom--48, 49, 160-165

 Valley Floor State Route 504 Corridor--34, 55,
 176
 Vegetation--14, 36, 92, 150, 176
 Viewing Areas--7, 44, 50, 104, 160-165
 Visitation Along Major Road Corridors--61, 190,
 335
 Visitation Projections--44, 95, 327, 335
 Visitor Center--36, 103
 Visitor Industry Development Program--5
 Visitor Industry Potential--44, 61, 95, 327
 Visitor Services--44, 47, 61, 95, 327, 335
 Visual Resources--15, 37, 48-53, 106, 160-165
 Volcanic Blast--68, 117
 Volcanic Deposits--75, 80, 117, 133
 Volcanic Hazards and Associated Risks--13,
 38, 54, 116, 179
 Volcanic Monument Recreation Experience--44,
 101, 159, 327

 Washington State Department of Game--13, 38, 65
 Washington State Department of Transportation--5
 Washington State Historic Preservation
 Officer--15, 38
 Washington State Implementation Plan for Air
 Quality (SIP)--15 39
 Water Quality--116, 179
 Waterfowl Habitat--148
 Watershed and Soils--43, 63, 80, 136, 152, 176,
 311
 Weyerhaeuser Corporation--95
 Wildlife and Fisheries Habitat--13, 38, 56, 64,
 89, 136, 177
 Windy Ridge--21, 104, 256, 264, 270, 278, 284
 Winter Recreation By Alternative--19-24, 245,
 256, 261, 262, 263, 264, 267, 269, 270, 273,
 275, 277, 279, 281, 283, 284, 285, 287

 Yale Information Station--104, 255
 YMCA Camps--112