United States
Department of
Agriculture

Forest Service

Pacific
Northwest
Region

**Deschutes
National Forest**

Final Environmental Impact Statement

Appendices A-I

Land and Resource Management Plan

Deschutes National Forest

APPENDIX A

APPENDIX A
ISSUE, CONCERN, AND OPPORTUNITY IDENTIFICATION PROCESS

Purpose of Issues and Concerns

The National Forest Management Act of 1976 (NFMA) was enacted to resolve issues concerning the benefits that people want in the form of goods, services, uses, and environmental conditions. The planning philosophy was to focus around the capabilities of the Forest to resolve the major issues and concerns which are directly related to the development and use of the National Forest. Therefore, identification of issues and concerns was a key step in the planning process The issues and concerns identified early in the process changed as planning developed and new issues were added. The degree of concern about some issues also changed during the process. For example, the firewood program gained public concern, while concerns about common mineral materials decreased.

Process Steps

A list of public issues and management concerns was developed in the following sequence of events. Additional information is available in planning process records at the Supervisor's Office Headquarters.

The scoping process, which has its basis in NEPA, was actually done twice, once for a Draft Environmental Impact Statement (DEIS) published in 1982, and again for the DEIS published in 1986. The second scoping process resulted in the final list of issues which were addressed in the planning process.

The following sequence of events was followed in arriving at a list of public issues and management concerns Documents and letters pertinent to the development of the issues are in planning process records

Screening Criteria

Screening criteria were developed to indicate whether the issue or concern was resolvable *within the scope of the Forest Plan. They are* shown below:

Criteria and Description

Scope. The geographic Forest area involved. The larger the Forest area involved the more likely a proposal will be to appear on the final list. Scarce resources such as old growth, although perhaps not large in area, are also candidates.

Duration Over what time span will the issue/ concern continue? Issues of long duration may carry more weight than those of short duration

Intensity. How much of the public is involved and *aware of the proposed issue? The larger the* affected public, the more likely a proposal will become an issue
Future Options What, if any, future options are threatened if no change in current Forest Service management or program occurs?

These criteria were agreed upon by the Interdisciplinary Team on October 17, 1978, and presented to the Forest Management Team in November 1978. The public was introduced to the screening criteria in the "Forest Plan Report" which was mailed on November 28, 1978.

Preliminary List of Public Issues and Management Concerns and Opportunities Developed

Preliminary issues and concerns were identified from two sources One was in-service from the Forest Management Team, comprised of the Forest Supervisor and his Staff, and the Ranger Districts The other was from the public Brainstorming sessions were held within staff groups and Ranger Districts to identify preliminary management concerns. These concerns were then presented at a Forest Management Team meeting where they were reviewed and approved. Correspondence from the public received during Land Management Planning which resulted in the 1978 Land Management Plan, the RARE II process, Environmental Analysis Reports, and through the normal course of business was analyzed and used to compose a list of preliminary issues. The issues were then combined by resource area so *they could be addressed more effectively when* tested against the screening criteria

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Draft Writeups

An ad hoc team comprised of a member from each of the Ranger Districts and two members from the Planning Team was formed This team tested the preliminary issues and concerns against the screening criteria and prepare draft writeups.

Review of Draft Issues

Draft issues were presented to the ad hoc team and the Interdisciplinary Team for review The issues were then presented to the Forest Management Team for approval at their November 20, 1978 meeting

Preliminary Issues and Concerns

Preliminary issues and concerns, approved by the Forest Management Team, were mailed to the public in the "Forest Plan Report" on November 28, 1978. The public was given until December 31, 1978, to respond and was given a response guide to aid them The "Forest Plan Reports" of November 22, 1978 and November 28, 1978, also announced seven workshops to review the list and to suggest any changes or additions that should be made.

Public Workshops

In December 1978 the Forest conducted a series of seven workshops in LaPine, Crescent, Sisters, Bend, Eugene, Portland, and Redmond. A total of 109 people attended the workshops The April 9, 1979, "Forest Plan Report" summarizes attendance by interest groups

Content Analysis

All public comments, both those received at workshops and in writing were analyzed and used to evaluate and revise the list of 28 issues. No new issues were identified. Individual comments were coded so they can be traced back to the original input and were categorized by·

Type of response (workshop, response form, personal letter, etc).

Origin of the response.

Interest group.

Issues receiving the most public interest

As a result of public comment, 11 of the 28 issues initially prepared by the Forest Management Team were revised.

Management Approval

The revised list of issues and concerns was presented to the Management Team after they had been reviewed by the Interdisciplinary Team on January 16, 1979. The Forest Management Team approved the issues on January 19, 1979. The final list of issues was approved by the Regional Forester in February 1979

On April 9, 1979, the final list of issues was sent to the public in the third issue of the Deschutes National Forest "Forest Plan Report "

Additional Concerns

Thirty-nine people responded to the April 9 "Forest Plan Report." Additional concerns were also identified after reviewing the Regional issues and the RPA policy issues.

This input was analyzed and combined with the previous analysis The Interdisciplinary Team recommended that eight of the existing issues be changed and that two issues be added The Forest Management Team reviewed, revised, and approved the issues at its meeting on December 10, 1979.

New Issues Added

A February 15, 1980, issue of the "Forest Plan Report" was sent to advise the public (1) that 8 issues had been modified and that (2) two entirely new issues have been added to the list, for a total of 30 issues.

Draft EIS Forest Plan Released

On October 17, 1982, copies of the DEIS, Proposed Forest Plan, and Summary were released to the

public. During the public comment period, over 350 people attended informal meetings held in Eugene, Portland, Crescent, Lapine, Bend, Redmond, Sisters, and Madras.

An analysis of written comments received showed that 10 to 12 issues received the bulk of the comments.

SELECTED ISSUES AND CONCERNS

Many of the original issues identified through the process previously described did not receive any public comment during review of the DEIS published in November of 1982. As a result of that, criteria were developed to screen the original list of issues and concerns that would be treated in the Alternatives The criteria that were used are listed below.

The issue must have a high public interest.

The issue could foreclose future options

Large parcels of land could be affected by the issue.

The issue is expected to attract long term public interest.

Some of the issues dealing with Special Uses (electronic sites, cinder pits,etc), facilities, coordination with private landowners, and the role of fire management when screened through the criteria were dropped and will not be addressed in the Alternatives. There is not high public interest, future options are not being foreclosed, small parcels of land are involved, and at present there is no long-term public interest The same holds true for recreation residences. Reasons for considering their elimination in some Alternatives, and not in other Alternatives, did not surface. Only limited areas of land are involved, and public interest was limited to the owners of recreation residences.

Public comments also indicated the need to approach treatment of a few issues in a different way. This was particularly true with the firewood issue Many people expressed the concern that a more definitive program which ensured a continuing supply of personal use firewood was needed. A new approach was developed and is discussed in the description of each Alternative.

Since there was virtually no response to the RPA IC0 following the publication of the 1986 DEIS, it was dropped from the Final EIS. A large number of people called for a stronger emphasis on uneven-aged timber management and an IC0 dealing with that was added. It is IC0 No. 3 in the Final EIS, which asks. What role should uneven-aged timber management play in future harvest plans?

These developments are discussed in Chapter I of the FEIS, which describes interactions with the public following the publication of the FEIS.

The following table shows how the issues are addressed in the Alternatives Eighteen issues are addressed either by land allocations, scheduling activities, or by Standards and Guidelines The issues received their final review in October and were approved by the Forest Supervisor in October 1984.

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HOW THE ISSUES WERE ADDRESSED IN THE ALTERNATIVES

Issues	Treated Same Throughout All Alternatives	Treated Differently in Design of Alternatives	
		Allocations	Scheduling
How should the Forest consider local and Regional economies, styles, and population levels in managing Forest lands?		X	X
How much timber should be harvested, and on what schedule, on the Deschutes National Forest?		X	X
How should the Deschutes, Fremont, and Winema National Forests manage the ponderosa and lodgepole pine stands infested with mountain pine beetles and stands susceptible to infestations?		X	X
How should the Forest plan to meet future demands for use of firewood?		X	X
How should the Deschutes National Forest provide for present and future developed recreation?		X	
How can the Forest keep pace with expanding demands for dispersed recreation?		X	X
How can the Forest maintain scenic beauty while providing goods and services from the National Forest?		X	X
How should the Forest allocate and manage roadless areas?		X	X
How should the Forest identify and protect its cultural (archeological and historical) resources?	X (S&Gs)		
How should the Deschutes National Forest manage habitat for "threatened and endangered wildlife and botanical species"?			X
What should wildlife populations be on the Deschutes National Forest?		X	X
What level of old growth should the Forest manage for?		X	X
Can the Forest meet the assigned Resources Planning Act targets?		X	X
What areas of the Forest should be made available for geothermal development?		X	
How should the Forest manage key roads, particularly those that cross the Cascade Crest?	X		
How should the Forest protect vegetation from damage by Forest pests?	X (S&Gs)		
How should the Forest manage its lakes, streams, and wetlands to prevent degradation?	X (S&Gs)		
To what extent should the Forest enhance or maintain soil productivity and control erosion?	X (S&Gs)		

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ISSUE NUMBER 1

HOW SHOULD THE FOREST CONSIDER THE LOCAL AND REGIONAL ECONOMIES, LIFESTYLES, AND POPULATION LEVELS IN MANAGING FOREST LANDS?

Looking at the Issue

To what extent should National goals and needs affect the local and Regional economies?

How will the level of Deschutes National Forest receipts affect the local tax base?

How will employment levels in industries that depend on the Forest be affected?

What are the tradeoffs within the local and Regional economies when one use of the Forest is emphasized over another?

Should the Forest be involved in efforts to manage or direct local growth and development?

How effective is Deschutes National Forest administration of Forest Service programs to aid the physically or economically disadvantaged?

How does the Deschutes National Forest maintain and improve Forest user relations?

Scope

Forest management decisions can affect the economic and social makeup of the Forest influence area.

Duration

This is an ongoing concern.

Intensity

Concern is high now, and as population and taxes rise concern will become even more intense.

Future Options

Certain management decisions, such as building roads into roadless areas, are irreversible; others can be changed.

Relationship to Other Issues

The economy and lifestyles of many local and regional people and businesses are tied to the Forest in many ways. Both tourists and permanent residents are attracted to the wide variety of recreation opportunities available on the Forest. Most often they come to hunt, fish, ski, camp, or boat. Some combine these activities with other recreation pursuits associated with recreation resorts.

The Forest provides wood for a significant forest products industry which provides jobs and contributes to a way of life for many people. Since many people use wood as their primary source of home heating, gathering firewood has become a part of the Central Oregon way of life. The issue concerning local and regional lifestyles and economies is at the center of all other issues. The way each of the following issues is treated has a bearing on this issue For example how the mature lodgepole pine is treated has a bearing on firewood and the forest products industry which in turn affects the economies and lifestyles.

ISSUE NUMBER 2

HOW MUCH TIMBER SHOULD BE HARVESTED AND ON WHAT SCHEDULE

Looking at the Issue

How much timber can the Forest produce on a sustained yield basis?

What methods of timber harvesting should be used?

Should the Forest increase investment in procedures that increase the rate of timber growth ("intensive management")? What does intensive management cost? How much additional timber is produced by intensive management? How would the Forest ecosystem be affected?

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If the amount of timber cut on the Forest is changed from the present level, how would the local economy be affected? Would the allocation of harvest among the four Ranger Districts change?

What are the tradeoffs between timber production and Forest uses?

How should the Forest manage areas that have commercial timber on them now, but may be difficult to reforest?

Should all highly productive commercial timber land be allocated to timber production?

What are the effects of departing from nondeclining even flow?

What wood products will the Deschutes National Forest be producing?

Scope

Timber harvest affects the whole Forest

Duration

Timber harvest planning will remain an issue for the foreseeable future.

Intensity

This is a large local, Regional, and National issue.

Future Options

Any decrease in the current annual harvest may result in a shortage of raw materials, causing decreased employment in the local timber industry in the near future But cutting more lumber than the Forest can grow will lead to a shortage of raw materials in the more distant future, resulting in decreased employment

Relationship to Other Issues

Many people are concerned that the Forest might be developed as a tree farm with regard only for monetary and commodity values. The other side of the issue is that too much area might be tied up for uses other than timber production, thus diminishing the base for the forest products industry. The schedule of timber harvesting is also a concern. How fast should the remaining mature and old growth Forests be harvested and converted to younger managed stands? This issue is directly linked to the lodgepole pine issue which follows

ISSUE NUMBER 3

HOW SHOULD THE DESCHUTES, FREMONT, AND WINEMA NATIONAL FORESTS MANAGE THE LODGEPOLE AND PONDEROSA STANDS WHICH ARE INFESTED WITH MOUNTAIN PINE BEETLES AND STANDS WHICH ARE SUSCEPTIBLE TO INFESTATIONS?

Looking at the Issue

How do we manage and protect the trees in important recreation areas from destruction by the mountain pine beetle?

How do we manage lodgepole pine in areas with high scenic values?

How rapidly could the mature stands be converted and still meet environmental and social concerns?

What standards and guidelines can be developed to provide for protection of soil, water, wildlife habitat, visual quality, etc?

How do we deal with the increased fire hazard associated with tree mortality caused by the mountain pine beetle?

How do we manage the lodgepole to prevent future epidemics?

How do we coordinate with adjacent land ownerships?

How do we utilize the material associated with lodgepole?

How do we sell material associated with lodgepole in light of uncertain markets and continually changing conditions within the lodgepole vegetative type?

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Scope

This involves all the mature lodgepole on the Deschutes Plateau and has potential to spread to other species.

Duration

The epidemic is predicted to continue for 10 to 15 years It started in 1980

Intensity

Most of the users of the Forests affected are concerned about the impacts of the epidemic and how the Forests will respond to it.

Future Options

Options to utilize the mature green lodgepole pine are decreasing annually. Much of the lodgepole may be dead and not usable in traditional markets.

Relationship to Other Issues

The three National Forests are coordinating the management of lodgepole pine stands on approximately 500,000 acres of land. The stands are mostly in a mature or old growth condition The older stands are infested with mountain pine beetles to the point that the situation is best described as an epidemic. Some stands are dead, some are dying, and others are susceptible to attacks It is predicted that 80 percent of the mature stands, covering approximately 225,000 acres on the Deschutes National Forest, will be destroyed by the beetle by 1995 [1]

The issue regarding lodgepole pine has strong ties to other issues and the treatment of it could create new issues. The lodgepole situation has created an abundance of firewood and has been one of the catalysts to the growth of wood burning stoves for home heating. The main question regarding this issue is how fast to treat the mature lodgepole pine and what to use it for. If industry uses a large amount of it, then less will be available for personal or commercial firewood.

If a large amount of lodgepole pine are harvested in the next 10 years, then how much ponderosa pine should be harvested? Ponderosa pine is the most important species for timber industry so the amount of ponderosa pine in relation to lodgepole pine is of concern. How rapidly the lodgepole pine is treated is also the source of a new issue that is beginning to develop As dying stands are harvested, hiding cover for big game is being reduced There is concern that this increases the vulnerability of deer during the fawning season and the hunting season. The thrust of this issue will be how to provide for the overall security of big game if hiding cover is reduced.

This issue is also related to recreation and visual quality Stands along heavily used roads and in campgrounds are being killed. If the stands are treated to protect them or start new stands the visual quality will be reduced as well as the recreation experience.

ISSUE NUMBER 4

HOW SHOULD THE FOREST PLAN TO MEET FUTURE DEMANDS FOR USE OF WOOD AS AN ENERGY SOURCE?

Looking at the Issue

How long will suitable wood be available for personal use in Central Oregon?

How long will the more desirable lodgepole pine firewood be available?

What kind of pricing strategy would we pursue?

How much commercial firewood would be made available which could potentially be removed from Central Oregon?

[1] Robert E Dolph and Gregory M Filip "Forest Insect and Disease Activity on the Deschutes National Forest and Guidelines for Preventing and/or Reducing Their Losses. Pacific Northwest Region, 1980

How much emphasis should be placed on administration and enforcement of the firewood program?

How much of the lodgepole supply, if any, should we allocate to the various firewood users?

Should we promote commercial use of mature lodgepole which could affect the supply that would be available for individual use?

Scope

This concern is Forestwide, especially adjacent to Bend, LaPine, and Sisters.

Duration

As the demand for alternate forms of energy increases, pressure on the Deschutes National Forest will also increase.

Intensity

Concern is high since a large segment of the public is involved. Traditionally, people have been allowed free firewood use on the Forest

Future Options

Options threatened or affected are: management of wildlife, prompt regeneration, and loss of revenues due to illegal cutting of saw logs. Holding fuels for additional time increases fire hazard.

Relationship to Other Issues

Nearly 60 percent of the homes in the central Oregon area are using wood to help heat their homes An estimated 60,000 cords of personal use firewood are being consumed annually Various commercial operations are using an additional 50,000 cords annually. These 110,000 cords equate to 9,000 loaded log trucks or enough lumber to build 3,900 single family homes per year Most of this fuelwood is lodgepole pine With the current use levels of firewood, regular timber sales, and the mountain pine beetle attacks, it is possible that the primary source of easy and accessible fuelwood as we know it today will be gone by 1995 to 1997. Several assumptions must be made in order to properly address this issue. One is that demand would remain near current levels and another is that firewood cutters would be willing to shift to sources other than lodgepole pine for firewood.

A part of the issue dealing with wildlife population levels is related to the firewood issue. A component of habitat for cavity dwelling species is dead trees. With the easy access on the Forest and high demand for firewood, this habitat can be affected.

ISSUE NUMBER 5

HOW SHOULD THE DESCHUTES NATIONAL FOREST PROVIDE FOR PRESENT AND FUTURE DEVELOPED RECREATION?

Looking at the Issue

Should the Forest encourage use of facilities during the off-season and weekdays?

Should the Forest provide "overflow" facilities during peak periods?

What are the conflicts between different recreation users?

Does the Forest have enough group reservation campgrounds?

Does the Forest have properly designed facilities in adequate numbers to accommodate the handicapped?

Are day-use parking facilities adequate?

How does the Forest determine the needs and wants of the Forest visitor?

How does the Forest monitor the quantity and quality of user experiences?

Is the Forest going to limit use to the level that does not exceed the carrying capacity of the site?

What are the "green space" requirements for camping in recreation complexes?

Is access to winter sports areas adequate?

Is the Forest providing recreational opportunities that should be provided by the private sector?

Does the Forest need additional overnight and day-use developed facilities?

What are the opportunities for the public to provide voluntary assistance in building campground facilities, etc?

What is the Forest's capability for developed winter sports, and how much area should be allocated for these uses?

What are the tradeoffs between developed recreation use and production of other goods and services from the Forest?

Is there a need to provide facilities for Forest recreation groups, i e , horse groups, backpackers, trailers, ORV, etc?

What are the future demands (and opportunities) for developed recreation?

Scope

Involves present and potential developed sites Forestwide.

Duration

This concern will continue to be a consideration as recreation use grows.

Intensity

Recreation is the biggest direct use on the Forest by the general public. The intensity varies with the fluctuation in use· more intense on long weekends, through summer and winter seasons

Future Options

Options for development will remain open, although they depend upon other land uses. Once a site is developed, the land it occupies remains committed for a long time.

Relationship to Other Issues

Developed recreation, i e , recreation occurring within a site or facility, takes on many forms, ranging from the Mount Bachelor Ski Area to small isolated picnic grounds Demand for more camping, boating, and other recreation pursuits requiring facilities and resulting in concentrations of people is continuing to grow. Destination resorts adjacent to the Forest also attract many recreationists to the area. Two questions need to be addressed--which areas should be managed as developed recreation sites and how many acres they should include Many of the attractive recreation areas are associated with lakes, rivers, and streams. Development may introduce potential for water pollution, could alter riparian or wildlife habitat, or result in structures which alter the natural beauty of an area An increase in developed recreation sites would allow more people to enjoy the Forest.

This issue is related to the issue regarding lifestyles since recreation is an important aspect of living in Central Oregon. It also makes contributions to revenues and employment There is also a relationship between this issue and habitat for some wildlife species Habitat for bald eagles and osprey often occurs in the same areas which could provide good developed recreation opportunities How the vegetation is managed, particularly trees, could affect the issue regarding the level of timber harvesting.

ISSUE NUMBER 6

HOW CAN THE FOREST KEEP PACE WITH EXPANDING DEMANDS FOR DISPERSED RECREATION?*

*Dispersed recreation refers to roaded and unroaded areas, activities including sightseeing, hiking, camping, fishing, hunting, etc., which does not utilize developed recreational facilities such as resorts, campgrounds, boat docks, and toilets. Use of trails and roads is considered dispersed recreation Dispersed recreational use is fairly widespread across the Forest, while developed recreational use tends to concentrate use in specific areas

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Looking at the Issue

Do we need a complete inventory of dispersed use, including winter recreation?

Can we differentiate between dispersed recreation campers and homesteaders?

What types of access are needed?

Can we manage to allow more intensive use of dispersed areas while maintaining their quality?

How many new facilities are needed?

What are the tradeoffs between dispersed recreation use and the production of other goods and services from the Forest?

How do we manage for special recreation groups, i.e., ORV, horse, snowmobile, cross-country skiing, etc?

What are the demands and their trends for the various dispersed recreational activities?

Where should the Forest provide areas and facilities for ORV (motorcycles, four-wheel drive vehicles, snowmobiles) use?

Scope

Some form of dispersed recreation takes place almost everywhere on the Forest.

Duration

As long as the public feels the need for dispersed recreation

Intensity

This concerns a large section of the recreation public.

Future Options

Options may be limited due to resource damage from unregulated use or compromised by other resource uses.

Relationship to Other Issues

Hiking, rafting, fishing, snowmobiling, sailing, hunting, driving for pleasure, caving, and mountain climbing, are all popular dispersed recreational activities Some recreational activities occur in exclusive areas of the Forest such as designated Wilderness. Others, such as cross country skiing and snowmobiling, occur in the same areas, and conflicts between users can and do occur. How to zone the Forest to provide for dispersed recreation activities while minimizing conflicts is the heart of this issue

An aspect of dispersed recreation is "undeveloped recreation." This is recreation without roads, campgrounds, or other developments. This type of recreation is currently available in existing Wilderness, the Oregon Cascade Recreation Area, and roadless areas. In this sense, the issue is related to the roadless area issue since development of roadless areas could reduce the opportunity for undeveloped recreation

ISSUE NUMBER 7

HOW CAN THE FOREST MAINTAIN SCENIC BEAUTY WHILE PROVIDING GOODS AND SERVICES FROM THE NATIONAL FOREST?

Looking at the Issue

What does the public consider as scenic beauty?

Are there places where scenic beauty needs to be restored?

Do current practices for growing and harvesting timber maintain or enhance scenic beauty?

How will the need to maintain beautiful scenery change as public use of the Forest develops?

Should the Forest maintain scenery on Forest land adjacent to private ownership?
What large expanses of scenery may require unified planning in order to maintain their appearance ("viewshed planning")?

Scope

The whole Forest provides some degree of scenic value, but concern over beautiful scenery is greatest where public use is heaviest.

Duration

The appearance of the Forest will remain an ongoing concern.

Intensity

Drastic changes in the natural scenery may easily provoke high-intensity public concern.

Future Options

As public use patterns change, the need to maintain beautiful scenery may also vary.

Relationship to Other Issues

The high recreational values of the Forest are directly linked to its beautiful scenery. Viewing volcanic peaks along the Cascade Crest, large ponderosa pine trees along major roads, and free flowing rivers are all part of the recreation experience. Views from lakes and campgrounds can affect the experience of the recreationist. Many people prefer to view natural appearing landscapes rather than ones where timber harvesting dominates. The key to this issue is to determine which areas should be managed for their natural beauty. Another aspect of the issue is how to manage areas with high visual values

ISSUE NUMBER 8

HOW SHOULD THE FOREST ALLOCATE AND MANAGE ROADLESS AREAS?

Looking at the Issue

How should roadless areas be managed to complement the total recreation opportunity on the Forest?

What influence should the current mountain pine beetle epidemic have on allocating roadless areas?

How much of the roadless areas should be designated as Wilderness?

How much of the roadless areas should we designate as motorized, dispersed recreation?

How much of the roadless areas should we designate as nonmotorized dispersed recreation?

How much of the roadless areas should we designate as developed recreation?

Is managing the roadless areas for wood production economically efficient?

How much emphasis should the potential for geothermal development have on allocating roadless areas to various uses?

Scope

Roadless areas throughout the Forest may require planning

Duration

Roadless areas will remain controversial for the foreseeable future.

Intensity

Debate over the future of roadless areas has been heated in the recent past and may continue.

Future Options

Realistically, building roads into an area is an action that would limit future wilderness options.

Relationship to Other Issues

The passage of the Oregon Wilderness Act in 1984 left the Forest with 145,142 acres of roadless areas The Act released these areas for multiple use management. The thrust of this issue is whether these acres should remain roadless. Public comments on individual roadless areas showed a high level of concern for keeping some areas in a roadless condition because of the unique values associated with them.

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The roadless areas are related to the other issues in that some have potential resources such as geothermal, timber, and motorized recreation, which would require roading to utilize or have access to these resources. A wide range of choices regarding the roadless area is presented in the alternatives.

ISSUE NUMBER 9

HOW SHOULD THE FOREST IDENTIFY AND PROTECT ITS CULTURAL (ARCHAEOLOGICAL AND HISTORICAL) RESOURCES?

Looking at the Issue

How does the Forest identify, protect, rehabilitate, or study cultural resources?

Scope

The scope of cultural resources on the Forest is unknown.

Duration

This will remain a concern until all cultural resources on the Forest have been located.

Intensity

This is of concern to the government and the public.

Future Options

This is a nonrenewable resource. Once it is destroyed, it is lost forever.

Relationship to Other Issues

Over 600 scientifically and historically valuable cultural resources are identified on the Forest Over 50 new sites, mainly comprising prehistoric Indian campsites, are found each year as a result of the Forest's cultural resource inventory program. Cultural sites located in project areas such as timber harvest units or recreation sites are usually protected by designing activities around them, though a few mitigation projects have occurred. Known sites are checked periodically in an attempt to prevent illegal artifact collecting and vandalism which is a serious problem on the Forest Cultural resources are an issue in the sense that many people, especially local residents, are concerned about how many and how adequately cultural sites are being preserved and protected in the face of all the ground-disturbing projects and cultural resource vandalism that occurs on the Forest.

This issue is directly related to the issue of how much timber should be harvested and on what schedule since that activity effects more area than other activities

ISSUE NUMBER 10

HOW SHOULD THE DESCHUTES NATIONAL FOREST MANAGE HABITAT FOR "THREATENED AND ENDANGERED WILDLIFE AND BOTANICAL SPECIES?"

Looking at the Issue

How much and where is habitat needed?

What will be the effect of habitat management?

Do we have the knowledge needed to manage these species?

Should management for threatened and endangered wildlife and botanical species override management for other kinds of Forest uses?

What are the population objectives for threatened and endangered species?

Scope

Known habitat occurs in scattered, localized areas on the Forest

Duration

As long as the Forest is habitat for threatened and endangered species, this will be a concern.

Intensity

This is an important issue to the general public

Future Options

Future options will be limited by present management decisions. New species may be designated and provisions made.

Relationship to Other Issues

The issue is how many pairs of eagles and owls we should provide old growth habitat for. The bald eagle, which is listed by the U.S Fish and Wildlife Service as threatened species, is present on the Forest. Fifteen to 20 pairs of bald eagles are currently nesting on the Forest The habitat could potentially support 50 pairs. Nesting and feeding areas are important habitat for eagles. The Forest also has habitat for the northern spotted owl which is classified as a sensitive species and is currently managing for 14 Spotted Owl Habitat Areas (SOHAs) (see the Final Supplement to the EIS for an Amendment to Pacific Northwest Regional Guide). Population and information surveys regarding owls and their habitats are ongoing. There are at present 20 to 25 pairs, as well as several individual owls, on the Deschutes National Forest. The peregrine falcon, which is listed by the U.S. Fish and Wildlife as endangered species, has been reported on the Forest, but no nest sites have been located.

There are 16 plants classified as sensitive species known to exist on the Forest, and the presence of 8 others is suspected.

ISSUE NUMBER 11

WHAT SHOULD WILDLIFE POPULATIONS BE ON THE DESCHUTES NATIONAL FOREST?

Looking at the Issue

How do Forest management practices affect wildlife?

What are the current wildlife populations?

How much wildlife habitat is there?

What areas are critical to maintaining wildlife populations? For example, where are the spring, summer, fall, and winter deer ranges?

How can the Forest provide an ongoing supply of habitat for cavity-nesting birds?

What is the potential fishery resource on the Forest?

Should the Forest manage its lands to meet wildlife goals set by other Federal and State agencies?

Scope

Virtually the entire Forest is inhabited by some kind of wildlife. Some areas may be very important to maintaining wildlife populations

Duration

Legislation and interested public groups and individuals make this an ongoing concern.

Intensity

The level of concern is variable, depending on the perception of wildlife population levels and cycles by public groups and government agencies.

Future Options

As long as residual populations remain large enough to perpetuate themselves, options to provide habitat will be kept open

Relationship to Other Issues

The public, the Forest, and the Oregon Department of Fish and Wildlife are concerned about several species which are listed below with their currently estimated populations They are: mule deer (20,300), elk (500 to 700), and osprey (125) pairs. Other species of concern include goshawks, pine martens, and woodpeckers. The question for all the species is what level of emphasis should the Forest place on maintaining or improving habitat for these species?

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This issue is related to the timber issue in that providing habitat can be done by using different techniques including timber management When the trees are manipulated to achieve the desired habitat conditions, timber yields can be reduced below their potential. This issue is also related to the recreation issue since wildlife is a source of recreation or it can restrict it in order to protect wildlife and its habitat

ISSUE NUMBER 12

WHAT LEVEL OF OLD GROWTH SHOULD THE FOREST MANAGE FOR?

Looking at the Issue

Diversity can be created by timber harvest methods and size of treatment areas What opportunities or limitations should apply to timber harvest activities?

Manage vegetation to promote diversity conflicts with growing timber on highly productive land What goal should the Deschutes National Forest try to emphasize?

What tree species, tree sizes, tree ages, and stand densities are needed on the Forest?

How much vegetation change should occur on a unit of land during the forthcoming 10-year planning period?

Fire can contribute to the creation and maintenance of diverse vegetation What are the opportunities or limitations to use prescribed fire or to allow unplanned fires to burn in order to promote diversity?

Are grazing activities affecting plant and animal diversity, particularly along streams and lakes?

Construction activities, such as roads, rockpits, campgrounds, reservoirs, and utility corridors all create a kind of manmade diversity How are these developments reducing or altering the Forest's abilities to manage for diversity?

How much emphasis should be placed on the introduction of non-native species?

How much old-growth area is enough, and how should it be managed?

What is the basis for the 3 percent old-growth allocation on the Forest?

How should the Forest define the term "old-growth area"?

How much old-growth area is needed to provide for wildlife and plant diversity and preservation of original gene pools?

Will management of old-growth require a special allocation of Forest land for replacement areas?

Scope

Diversity must be considered over the whole Forest, including lands held by others adjacent to the Forest

Duration

Short-range activities can cause long-range effects on the Forest's diversity

Intensity

Concern about diversity is increasing Both the Resource Planning Act and the National Forest Management Act establish the needs to determine and manage for diversity

Future Options

Today's activities can reduce or eliminate elements of diversity in the future

Relationship to Other Issues

Old growth is important to many people for reasons ranging from concerns about wildlife, genetics, and scenic quality. Just keeping some of the old growth is important to people as well as protecting future options. The thrust of this issue is how much old growth should be provided and how it should be distributed.

This issue relates to the issue regarding spotted owl and bald eagle. Habitat for those species is

old growth or old trees By providing for habitat for those species, some old growth will occur. The same is true for undeveloped recreation where natural processes are allowed to operate Providing for old growth affects the timber issue since harvesting of timber is normally not compatible with old growth goals.

ISSUE NUMBER 13

CAN THE FOREST MEET THE ASSIGNED RESOURCE PLANNING ACT TARGETS?

Looking at the Issue

If we cannot meet the targets, what criteria will be used to determine which targets will not be met?

Scope

Involves the entire Forest.

Duration

The RPA targets will be a continuous concern in Regional Planning.

Intensity

The intensity will probably increase when decisions are made on targets.

Future Options

Future options could be lost when targets are assigned

Relationship to Other Issues

The Regional Guide established targets for the Deschutes National Forest of 214 million board feet (MMBF) of timber, 36,000 animal unit months (AUMs) of domestic livestock grazing, 2050 thousand recreation visitor days (MRVDs) of developed recreation, 1930 MRVDs dispersed recreation, and 1275 acres of wildlife habitat improvement The Forest must determine if it is capable of producing these outputs within acceptable social and environmental limits

Meeting the Resources Planning Act targets is directly related to the timber, recreation, and wildlife issue. It is also indirectly related to some of the other issues such as firewood and roadless areas.

ISSUE NUMBER 14

WHAT AREAS OF THE FOREST SHOULD BE MADE AVAILABLE FOR GEOTHERMAL LEASING AND DEVELOPMENT?

Looking at the Issue

How much leasing should be allowed and in what locations?

What will be the effect of leasing on other Forest resources?

Scope

Exploration and development primarily affects areas with geothermal potential, such as Newberry Volcano, and areas along and near the crest of the Cascades.

Duration

In the event that geothermal energy becomes a viable energy resource, it will remain in demand until it is no longer feasible, or the resource is depleted

Intensity

The public has expressed serious concern about sensitive areas in previous planning input processes.

Future Options

If geothermal leasing takes place, there could be an effect on other resource values, particularly visual, water quality, and recreation. Leases will provide priority for geothermal development over other resources within the lease area

Relationship to Other Issues

The Deschutes National Forest is considered to have some of the greatest potential for geothermal

resources of any area in the Western United States Approximately 350,000 acres have already been leased Newberry Crater is designated as a Known Geothermal Resource Area (KGRA) It is also a National Natural Landmark. Hot fluids have been located near the surface within the Crater The interior of the Crater is an important recreation area with two large lakes known for their fishing. Campgrounds and resorts are located adjacent to the lakes The area is also a popular winter sports area with snowmobiling and cross country skiing. There is an active bald eagle nesting territory within the Crater. Numerous unique geological features are also found within the Crater such as world famous obsidian flows. There are also other areas on the Forest which could be leased that are currently not leased. The main thrust of this issue is where and under what conditions should leases be issued and how to protect recreation, visual, wildlife, water quality, and other resource values.

This issue is also related to the roadless area issue since some of the highest potential for geothermal development lies within some roadless areas.

ISSUE NUMBER 15

HOW SHOULD THE DESCHUTES NATIONAL FOREST MANAGE KEY ROADS, PARTICULARLY THOSE LOWER STANDARD ROADS THAT CROSS THE CASCADE CREST?

Looking at the Issue

Three fairly low standard roads crossing the Cascade Crest could be upgraded to provide for higher traffic use. They are the Irish-Taylor Road, the Waldo Lake-Charlton Lake Road, and Windigo Pass Road Should these roads be upgraded?

Should the Windigo Pass Road, which is a corridor between two portions of the Oregon Cascade Recreation Area, be upgraded and evaluated as a possible Forest Highway?

Should the Irish-Taylor Road, which lies adjacent to the southern boundary of the Three Sisters Wilderness Area be improved or left in its present condition?

Should Waldo Lake-Charlton Lake Road be paved to improve access to Waldo Lake?

Should the road between Todd Lake and Three Creek Lake be closed, maintained in its present condition or improved?

Should snowmobiles be permitted on these roads?

Scope

This issue affects people from both the Central Oregon area and the Willamette Valley.

Duration

The issues surrounding these roads will continue into the foreseeable future.

Intensity

The issue is intense on a local level.

Relationship to Other Issues

The Windigo Pass, Waldo Lake-Charlton Lake, Irish-Taylor, and Todd Lake to Three Creek Lake roads have been the center of controversy in the past The primary issues have been whether the roads should be improved to provide additional vehicle use and more direct routes to points west of the Cascades All of the roads are currently adjacent to Wilderness, the Oregon Cascade Recreation Area, or roadless areas. Improving the roads could affect use levels in these areas. The Windigo Pass and Waldo Lake roads have been considered as possible future highways

ISSUE NUMBER 16

HOW SHOULD THE FOREST PROTECT VEGETATION FROM DAMAGE BY FOREST PESTS?

Looking at the Issue

How many acres on the Forest would benefit from the use of chemicals?

Are there alternatives to using pesticides on the Forest?

What effect will not using pesticides have on the Forest outputs?

What are the effects on other resource values if pesticides are used?

Scope

This is a Forest and Regional issue.

Duration

This appears to be an ongoing concern.

Intensity

The issue is very intense regionally.

Relationship to Other Issues

Pesticides currently used on the Forest include Big Game Repellent (BGR) and strychnine alkaloid. BGR is a deer repellent made of eggs to protect newly planted trees It is applied to approximately 5000 acres per year Strychnine is applied underground to reduce gopher populations in some plantations which receive heavy tree loss from gophers. This also is applied to about 5000 acres annually. Herbicides to control vegetation were applied to about 800 acres annually prior to the Court enjoining the Forest Service from the use of herbicides No insecticides have been used recently and are not being used to control the mountain pine beetle. Insects such as spruce bud worm and tussock moth are present both on National Forest land and on adjacent lands and could pose a future threat. The result could be an expanded need to consider the use of insecticides in the future. The thrust of this issue is whether use of pesticides to control pests is appropriate or whether alternatives treatments should be used.

ISSUE NUMBER 17

HOW SHOULD THE FOREST MANAGE ITS LAKES, STREAMS, AND WETLANDS TO PREVENT DEGRADATION?

Looking at the Issue

Is there a need to control streambank erosion on the Deschutes River?

Should streamside and lakeside zones be developed?

Is there a need for greenbelts along shores?

Are cattle and horses causing damage to streambanks and water quality?

Is recreational use of waters a problem?

Do motorized vehicles on shores, banks, and water cause damage?

Is pollution associated with recreation use?

Should access be controlled to protect some areas?

Is natural and manmade debris a problem in streams?

Are additional flood control measures needed?

What tradeoffs between water quality protection and production of goods and services from the Forest are acceptable?

Scope

Many streams and lakes are scattered throughout the Forest.

Duration

This will be an ongoing concern.

Intensity

This is a high-intensity concern because it covers a broad spectrum: recreation, wildlife, and water quality.

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Future Options

If degradation is not prevented, the quality of marshes, lakes, and streams may deteriorate to an irretrievable point

Relationship to Other Issues

Water quality monitoring conducted over the past 10 years by the U.S. Forest Service, Department of Environmental Quality, and the Department of Fish and Wildlife has shown the surface waters on the Deschutes National Forest to be well within the levels specified by the State water quality standards for the Deschutes River basin The guidelines and management policies which have been used in the past to guide management along streamsides have prevented significant damage and the riparian zones are in good condition. Past evaluations of channel stability on the Deschutes N.F. showed that the streams have small localized instability problems but are in good condition generally. This is an issue because people who live and visit the area place great value on the existing level of water quality and want to protect and maintain it

ISSUE NUMBER 18

TO WHAT EXTENT SHOULD THE FOREST ENHANCE OR MAINTAIN SOIL PRODUCTIVITY AND CONTROL EROSION?

Looking at the Issue

How productive is the soil in the Deschutes National Forest now?

Is the Forest fully using the available productivity of its soils?

Is soil productivity decreasing?

Should the Forest try to enhance the productivity of National Forest soils?

Are some activities causing soil erosion or soil compaction, leading to lower productivity or to lower water quality?

Are present timber harvesting methods damaging the soil?

What should the Forest do if fluctuating reservoir or river water levels cause shoreline or streambank erosion?

Should the Forest dispose of nonproductive problem soils through land exchange or sale?

Scope

The ability of the Forest to provide all goods and services depends on the productivity of its soil.

Duration

Soil productivity will remain an ongoing concern

Intensity

The degree of concern will depend on how people perceive that the Forest is maintaining the resource.

Future Options

Soils develop slowly, so most productivity losses cannot be repaired easily.

Relationship to Other Issues

Due to the volcanic origin of the soils on the Deschutes N.F. and the gentle terrain, there are very few of the traditional soil problems. The Soil Resource Inventory for the Forest shows that the majority of the area is rated as low to moderate in terms of surface erosion potential There are small localized instances of mass failure but these are isolated and very rare. Compaction is not a problem on most of the Forest due to an overburden of pumice There are compaction problems on the north portion of the Forest where the soils are more developed and weathered. Displacement of the surface soils is a problem due to the natural lack of cohesion of the coarse textured surface soil particles. Generally, the issue dealing with soils is tied to the protection of the surface soil and maintenance or improvement of productivity wherever possible

APPENDIX A
ISSUE, CONCERN, AND OPPORTUNITY IDENTIFICATION PROCESS

ISSUES WHICH VARY SIGNIFICANTLY *BETWEEN ALTERNATIVES*

The previously discussed issues are addressed in each of the Alternatives. Some, such as the issues related to soils and water, do not vary since they are treated with standards and guidelines equally in all Alternatives. Others vary greatly between Alternatives and become important in evaluating the Alternatives and overall net public benefits Issues which vary significantly and how they were quantified follow:

1. How can the Forest meet the assigned Resource Planning Act targets?

There are five specific RPA program areas which the Deschutes evaluated. Program levels for outputs of timber, range, wildlife habitat improvement, dispersed and developed recreation were established in the Regional Guide for the Pacific Northwest Region for the Deschutes National Forest Timber outputs are measured by millions of cubic feet per year. Range is measured by thousands of animal unit months per year. Wildlife habitat improvement is measured by acre equivalents of habitat improvement per year. Dispersed and developed recreation are measured by thousands of recreation visitor days of use per year

2 How should the Forest consider local and regional economies, lifestyles, and population levels in managing Forest lands?

Many things affect the lifestyles and economy which are related to the Forest. The key outputs and how they were quantified follow:

Jobs--as a measure of changes in the number of jobs compared to current direction.

Revenues to Counties--measured in millions of dollars per year.

Diversity of recreation opportunity--measured in acres available for different experiences with a focus on undeveloped recreation.

Personal use firewood--measured in thousands of cords available per year.

Visual quality--measured in acres of retention and partial retention protected.

3. How should the Forest plan to meet future demands for use of wood as an energy source?

As stated in the previous issue, cords of firewood available is the measure. Also linked to this is the question of whether personal use firewood users will be ensured of being able to get a specific amount or whether they must compete for the material in an open market.

4. How should the Forest provide for developed and dispersed recreation?

As discussed in previous issues this is quantified by RVDs and acres of opportunity available. Also linked to this is acres of visual quality.

5. How can the Forest maintain scenic beauty while providing goods and services?

As previously discussed, this is quantified by acres of retention and partial retention that would be protected. Where the acres are is possibly more important than the total number of acres.

6. What should wildlife populations be?

For mule deer this is quantified by numbers of deer the habitat provided can support For birds such as osprey and bald eagles it is quantified by the number of pairs the habitat can support.

7. What areas on the Forest should be made available for geothermal leasing and development?

This is quantified by the acres of high, moderate, or low potential areas available for leasing.

APPENDIX A
CONSULTATION WITH OTHERS

INTRODUCTION

A three-pronged approach to initiate and maintain close coordination with other government agencies, Indian tribes, local citizens and groups was used throughout the planning process. Numerous internal meetings were held with other National Forests; the Regional Office; and, at the Deschutes National Forest level, with the Ranger Districts and Supervisor's Office Management Staff. These were held to insure the production of a Forest Plan that is easy to understand, monitor, and implement.

FOREST PLAN REPORTS

During the process of formulating the issues and concerns list, names of those wishing to be kept informed and involved were gathered and incorporated into a mailing list. "Forest Plan Reports" were mailed during the various critical planning process steps and after the DEIS and Forest Plan were issued to report the results of public comment on those documents Many times their input was requested and used to aid in making better decisions.

PUBLIC OUTREACH PROGRAM

This program was designed to obtain public input for the formulation of alternatives step on a "one on one" basis in the summer of 1979. Local business owners, representatives of timber industry, special interest groups, and landowners were interviewed by Deschutes National Forest staff members.

Many of these people were involved from that date on through special informational meetings with Chamber of Commerce members, The Group (members representing local businesses), and timber industry Involvement was also continued through periodic "Forest Plan Reports" and telephone communications. These are documented in planning process records.

OTHER GOVERNMENTAL AGENCIES AND INDIAN TRIBES

To insure involvement and coordination with other governmental agencies and the Confederated Tribes of Warm Springs Indian Reservation, Interdisciplinary Team members composed a list of activities and areas of concern to be coordinated. Meetings were scheduled to accomplish these tasks. Interdisciplinary Team members maintained contact with most of the agencies throughout the planning process The nature of the planning step determined whether agencies wanted to be involved to a great extent In many cases, information was given and requested through the "Forest Plan Report" medium The list of agencies and topics follows.

Comments on the DEIS and Forest Plan issued in October 1982 indicated that we should have maintained better coordination with the Oregon State Department of Forestry. That coordination was achieved during the preparation of the 1986 DEIS, the Supplement, and this Final EIS

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COORDINATION OF PUBLIC PLANNING EFFORTS

Forest ID Team Interviewer/Public Organization Participants	Topics
Bend Parks and Recreation Deschutes County Planning Department Oregon State Parks Department	1. Overview of planning process 2. Coordinate activities
U.S. Fish and Wildlife Service, Endangered Species Branch	1. Population objectives for TE Species 2. Management of critical habitat for TE species, timber management, recreation management, transportation management, etc. 3 Planning process and regulations **Subjects Discussed** 1. Their population objectives for deer and elk 2 Fish management 3 Habitat management and coordination 4. Data they have on fish and wildlife resources 5 Transportation planning 6. Relationship between wildlife resources and recreation 7. Habitat improvement opportunities
Oregon Fish and Wildlife Department	1. County roads impacted by resource activities 2. Forest highways impacted by resource activities
Bureau of Land Management	1. Monitoring 2. Inventory 3 Capability and suitability 4. Analysis of the management situation 5. Establish what impacts all resource activities will have on the road system
U.S. Soil Conservation Service	1. Overall planning process. 2 Coordinated use plans for grazing allotments

APPENDIX A

COORDINATION OF PUBLIC PLANNING EFFORTS (continued)

Forest ID Team Interviewer/Public Organization Participants	Topics
Department of Environmental Quality, Environmental Protection Agency	1. Water quality monitoring 2. 208 planning--water quality standards 3. Pesticide use
State Marine Board	1. Boating regulations 2. Deschutes River update
Oregon Department of Water Resources (Watermaster)	1. Reservoir management 2. Responsibilities
U.S. Bureau of Reclamation U.S. Corps of Engineers	1. Power potential 2 River basin studies
West Central District Oregon State Forestry Department Walker Range Forest Protection Association Bureau of Land Management, Prinville District B.I.A. Brooks Scanlon Gilchrist	1. Suppression action (fire) 2. Fire Management Policy
Planning Staff Willamette National Forest Umpqua National Forest Winema National Forest Ochoco National Forest	1. Planning process 2 Coordinate activities along boundaries
Confederated Tribes of Warm Springs, Bureau of Indian Affairs (Ken Englebrtson)	1. Planning process 2. Activity coordination 3. Establish what impacts all resource management activities will have on road system

COORDINATION OF PUBLIC PLANNING EFFORTS (continued)

Forest ID Team Interviewer/Public Organization Participants	Topics
County Commissioners Deschutes Jefferson Lake Klamath	1. Planning process 2. County roads that will be effected by resource activity 3 State highways affected 4. Forest highways affected 5. Co-op roads managed with other agencies or private company 6 What impacts all resource management activities in our area will have on the road system 7 Potential for new wood products industry 8 Direction towards change in appearance of the Forest property 9 Any major change in direction logs move 10. County Weed Control District
County Road Departments Deschutes Klamath (1, 2, & 3) Lake Jefferson Oregon State Highway Dept. (5 & 3) Federal Highway Administration (5) Brooks Scanlon Gilchrist Timber Co (4 & 5) Sunriver, Inc. Camp Sherman Road Committee (3)	1. County roads that will be affected by Forest Service resource activities 2. Forest highways affected by resource activities 3. Roads under cooperative management with government agency or private company affected by resource activities 4. Establish what effects all resource management activities in our area will have on the road system, including other road users as will as Forest Service 5. State highways affected by resource activities 6. Pesticide use
State Forestry Bureau of Land Management	1. Wood policy 2. Christmas tree policy 3 Other miscellaneous products - cones, seedlings, etc. 4. Diversity and visual objectives along common boundaries 5. Insect and disease advice and assistance to public coordinated effort and lines of responsibility
Occupational Health and Safety Administration	1. Snags, pit development, logging methods

APPENDIX A

COORDINATION OF PUBLIC PLANNING EFFORTS (continued)

Forest ID Team Interviewer/Public Organization Participants	Topics
City Commissioners	1. Allowable harvest 2. Stumpage values which eventually become part (30 to 90%) of 25% funds 3 Projected use of salvage sale fund which impacts receipts
Central Oregon Intergovernmental Council	1. Planning process 2 Coordinated activities
County Planning Directors Deschutes Jefferson Klamath Lake	1. Planning process 2. Coordinate activities

Public Participation Appendix

See Appendix I for a write up pertaining to comments received on the 1986 DEIS and Proposed Forest Plan.

APPENDIX B

APPENDIX B
INTRODUCTION

DESCRIPTION OF THE ANALYSIS PROCESS

Planning Problem

The Forest Service is responsible for determining how best to manage National Forest lands based on public desires and land capabilities.

The Deschutes National Forest is a 1.6 million acre wonderland of sculptured peaks, tumbling waterfalls, crystal clear lakes and rivers, hundreds of species of wildlife and fish, five designated wildernesses and a specially classified recreation area, and possibly the best variety of volcanic formations anywhere on this continent.

The Cascade Range on the western edge of the Forest provides a scenic backdrop for the flat, desert areas on the eastern fringe of the Forest. Elevations range from 2000 feet at Lake Billy Chinook to 10497 feet at Mt Jefferson, the second tallest peak in Oregon. Diamond Peak, Mt Washington, Mt. Jefferson, Three Sisters, and Mt Thielsen Wildernesses cover 181,300 acres The Oregon Cascade Recreation Area covers 42,700 acres.

Two major rivers, the Deschutes and Metolius, flow through the Forest There are over 300 lakes, and several reservoirs Each year, over 130 million board feet of timber are harvested from ponderosa and lodgepole pine and mixed conifer timber stands which cover 71 percent of the Forest land. Juniper and other non-forested lands make up the other 29 percent Of the usable rangeland, 32 percent is used to graze 29,000 animal unit months of cattle and sheep Nearly 350 species of fish and wildlife, including several threatened and endangered species of birds and mammals, live on the Forest.

Volcanic activity occurred as recently as 1300 years ago when obsidian flowed from Newberry Volcano. Newberry Volcano, 500 square miles in area, collapsed to form Newberry Crater during the ice age It is the largest such volcano in Oregon Other areas of special interest are Lava Cast Forest, where tree molds or casts were formed by molten lava flowing through a timber stand. It is one of the finest cast collections in the western hemisphere. Lava River Cave is a mile long lava tube and one of the longest in the northwest.

The sunny, dry climate and clean air and the rich diversity of recreation opportunities attract over 2 5 million visitor days each year People come from all over the world to fish and hunt; hike and mountain climb; camp and picnic, sail, canoe, and water ski; explore caves, and cut firewood in the summer. They come to downhill ski nearly year round on 9,065 foot Mt Bachelor at one of the largest ski areas in the Pacific northwest. Cross country skiing and snowmobiling are popular winter sports.

The Forest lies mostly in Deschutes County but extends into Jefferson County on the north and into Klamath and Lake Counties on the south. Over 1.85 million acres lie within the Forest boundary; of these, 1.6 million acres are National Forest lands

The mainstays of the economy are recreation and timber. The largest cities in the area are Bend and Redmond. Madras, Sisters, LaPine, Crescent, Sunriver, and Gilchrist are other important population centers. Forest headquarters and two Ranger District offices are located in Bend. Ranger District offices are also located in Sisters and Crescent. The Redmond Air Center, located at the Redmond Airport, and the Bend Pine Nursery are also part of the Deschutes National Forest organization

Principal highways serving the area are U.S 97, a north-south route, and U.S. 20, an east-west route. Other forms of transportation access include a commercial busline and Roberts Air Field near Redmond, which accommodates commercial airline services. A railroad serves the area, but passenger service is only provided at Chemult, 70 miles south of Bend.

Public interest includes divergent viewpoints about the use of market commodities such a timber, grazing, energy, and nonmarket commodities such as wilderness, unroaded recreation, scenery, wildlife, old-growth, and habitat diversity. The

APPENDIX B
INTRODUCTION

Forest's major planning goal is to provide enough information to help decisionmakers determine which combination of goods, services, and land uses will maximize net public benefit (This concept is further discussed in the section on Economic Efficiency Analysis of this Appendix) The National Forest Management Act (NFMA) and the regulations developed under NFMA (36 CFR 219) provide the analytical framework to address this objective; they also state that the requirements of the National Environmental Policy Act (NEPA) and its regulations (40 CFR 1500-1508) must be applied in this analysis process

The planning process described in the NFMA regulations consists of ten steps oriented towards a systematic analysis of the complex problems associated with multiple-use Forest management This 10-step process is listed in Chapter 1 of the EIS and briefly summarized as follows:

Step 1 Identification of purpose and need· Issues, Concerns, and Opportunities (ICOs) - In any systematic approach to problem solving, the first step is to identify the problem In this step, the Interdisciplinary Team (ID Team) identifies and evaluates public issues, management concerns, and resource use and development opportunities What does the public want? What does the Forest Service want? What needs to be done?

Step 2. Planning Criteria - Criteria are designed to guide the collection and use of inventory data and information, the analysis of the management situation and the design, formulation, and evaluation of alternatives This step sets the guidelines for accomplishing the next 5 steps

Step 3. Inventory data and information collection - The type of data and information needed is determined in step 2 based on the ICOs. The data is then collected and assembled in a manner meaningful for answering planning problems

Step 4. Analysis of the management situation - This step is a determination of the ability of the planning area to supply goods and services in response to society's demands. This provides a basis for formulating a broad range of reasonable alternatives.

Step 5 Formulation of alternatives - A broad range of reasonable alternatives is formulated according to NEPA procedures. Alternatives are formulated in a manner which provides an adequate basis for identifying the one that comes nearest to maximizing net public benefits.

Step 6. Estimated effects of alternatives - The physical, biological, economic and social effects of implementing each alternative considered in detail are estimated and compared according to NEPA procedures

Step 7 Evaluation of alternatives - Significant physical, biological, economic and social effects of implementing alternatives are evaluated with respect to the planning criteria

Step 8. Preferred alternative recommendation - The Forest Supervisor reviews the ID Team's evaluation and recommends a preferred alternative to the Regional Forester who then selects one from the group that is provided. This is identified in the Draft Environmental Impact Statement and displayed as the proposed plan

Step 9. Plan approval and implementation - The Regional Forester reviews the proposed plan and Final Environmental Impact Statement and either approves or disapproves the plan

Step 10 Monitoring and evaluation - The plan establishes a system of monitoring at established intervals to determine how well objectives have been met and how closely management standards and guidelines have been followed Based on these evaluations, the plan will be revised or amended as necessary

Planning Process

The planning and environmental analysis process brings a new outlook and a new technology to National Forest land management, principally (1) processes formerly used to make individual resource decisions are now combined to help make integrated resource management decisions, and (2) new mathematical modeling techniques are used to assist in the proposed land use problem, including identifying the most cost-efficient pattern of land management The 10-step

planning process is discussed in the NFMA regulations, Chapter 1 of the EIS. Appendix B describes the analysis phase of this process covering steps 3, 4, 5, and 6 The judgment phase, steps 1, 2, 7, and 8, is described in Chapters I, II, and in Appendix A of the FEIS The execution phase, steps 9 and 10, is presented in the Forest Plan

Public issues and management concerns are key to all steps Included with each issue in Appendix A there is a statement regarding the the relationships between the issues These sections are presented so one can understand some of the background for analysis and the formulation of Alternatives

The analytical elements discussed in Appendix B are as follows:

Inventory Data and Collect Information (Planning Step 3)

The ID Team determined what data were necessary based on the issues and concerns. The analysis of the management situation, formulation of alternatives, and monitoring require data on resource capabilities, existing supply and demand, expected outputs, benefits, and costs. Existing data were used whenever possible but were supplemented with new data to help resolve sensitive issues or management concerns. Data are on file in the Forest Supervisor's Office

Analysis of the Management Situation (Planning Step 4)

This analysis examines resource supply and market conditions and determines suitability and feasibility for resolving issues A land use designation model (FORPLAN) was used to address a number of specific requirements, including benchmarks. Requirements include: (a) the projection of the Forest's current management program; (b) determining the Forest's ability to produce a range of goods and services from the minimum management to maximum production; (c) evaluating the feasibility of reaching the National production goals (RPA targets) and social demands identified as issues and concerns, and (d) identifying monetary benchmarks which estimate the output mix which maximizes present net value (or minimizes the cost) of resources having an established market or assigned value and meeting other departure analysis requirements. The analysis of the management situation AMS document is on file in the Forest Supervisor's Office.

Formulation of Alternatives (Planning Step 5)

The information gathered during the first four planning steps is combined and analyzed to formulate alternative management plans The alternatives reflect a range of resource management direction. Each major public issue and management concern was addressed in one or more alternatives. Management prescriptions and practices were formulated to represent the most cost efficient way of attaining the objectives for each alternative. Both priced and nonpriced outputs are considered in formulating the alternatives. See Forest Planning Record Analysis of Management Situation and Alternatives.

Estimation of Effects of Alternatives (Planning Step 6)

The physical, biological, economic, and social effects of each alternative were estimated and analyzed to determine how each responds to the range of goals and objectives assigned by the RPA program. FORPLAN was used to estimate some of the economic and physical output effects, while other methods were used for remaining effects The analysis included (a) direct effects; (b) indirect effects, (c) conflict with other Federal, State, local, and Indian tribe land use plans, (d) other environmental effects; (e) energy requirements and conservation potential; (f) natural or depletable resource requirements and conservation potential; (g) historic and cultural resources; and (h) means of mitigation

APPENDIX B
INVENTORY DATA FOR INFORMATION COLLECTION

Forest Data Base

Inventory data was collected for many resources so that issues could be addressed, limitations defined, and capabilities determined Some of the data was necessary to develop the Forest Planning Model and to determine capability and analysis areas

Capability Areas

A Soils Resource Inventory[1] and an Ecoclass Inventory[2] were completed in 1976 for the Deschutes National Forest The two were done as separate inventories; so, while there was quite a bit of correlation, it was not precise. Since soils are not a serious or complex problem on the Forest, we used the Ecoclass Map as the basis of the Capability Areas Sixty-eight capability areas were used to describe the Forest and were broken into the following stratification

Ponderosa Pine
Mixed Conifer
Lodgepole Pine
Mountain Hemlock
Juniper
Sagebrush
Grassland
Water
Rock

Analysis Areas

One of the first steps in the development of FORPLAN (Forest Planning Model) was to divide the Forest into analysis areas For this task, the R2MAP computerized grid mapping system and the TRI (Total Resource Inventory) System 2000 data base were used extensively. Analysis areas are tracts of land with relatively homogeneous characteristics in terms of the outputs and effects that are being analyzed within the FORPLAN model. They serve as the basic unit of land in the model for which a range of prescriptions are developed to achieve various multiple use objectives Their delineations were intended to capture the significant social, biological, and economic differences in the way the land responds to alternative management strategies, and yet keep the model size to a minimum so that it was quicker and less expensive to perform analysis Of course, the focus of delineating analysis areas was upon addressing certain issues, concerns, and opportunities identified at the outset of the planning process.

The ID Team began developing the FORPLAN model during March 1980 Since then, and as the planning process has evolved, several different analysis area stratifications and model formulations have been explored The land stratification divided the 1 62 million acres of the Deschutes National Forest into 309 analysis areas Of these, 277 account for the 1.15 million acres of suitable and available forested land from which FORPLAN can schedule timber harvesting In general, most analysis areas are larger than 200 acres. The largest is 82,000 acres They are not often contiguous The following discussion presents the rationale behind the identification and delineation of the analysis areas according to the six FORPLAN levels of analysis area identifiers

Level One

Level One of the analysis area identifiers was used to incorporate some geographic and administrative specificity into the FORPLAN solution Originally this consisted of 47 geographical locator areas which were intended to help address the issues, concerns, and opportunities, and help ensure the feasible implementation of the Forest Plan. However, this resulted in several times the number of analysis areas that the FORPLAN matrix generator would accept

[1]Daniel H Larsen, Soil Resource Inventory, Deschutes National Forest, Pacific Northwest Region, 1976
[2]Leonard A Volland, Plant Communities of the Central Oregon Pumice Zone, 1976

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After several rounds of reconsideration, and since the Forest is not easily divided into natural delineations (i e , watersheds, roadsheds, etc.), the ID Team decided to use the four Ranger Districts as the Level One identifiers.

LEVEL ONE IDENTIFIERS:

1 Bend RD
2 Crescent RD
3 Fort Rock RD
4. Sisters RD

While not as geographically detailed as might be desirable, this delineation did prove useful. It provided a better means for constraining the model for spatially feasible solutions than at the Forest level as a whole It also facilitated communications with Ranger Districts regarding the implications of a FORPLAN solution for their programs. In addition, the costs of doing business for many activities that were modeled in FORPLAN were easily assimilated at the Ranger District level. In some cases there was a need to stratify the economic data in the model by District due to such factors as travel time, soil type, and working group composition differences.

Level Two

Level Two of the analysis area stratification identified whether the area was inventoried as being roadless or not. Since Level Three identifies the individual roadless areas, this delineation served merely as a convenience for tracking and controlling activities in the 362,000 acres of wilderness and nonwilderness roadless areas as a whole

LEVEL TWO IDENTIFIERS

1. Roaded
2. Roadless

Level Three

Level Three was used to identify special geographic areas of the Forest that were tied to the planning issues, concerns, and opportunities. Specifically, these included the 230,000 acres of inventoried deer winter ranges, 137,000 acres of individual roadless areas, and 225,000 acres in wilderness areas and the Oregon Cascade Recreation Area.

LEVEL THREE IDENTIFIERS:

1 Deer Winter Range
2 Waldo Roadless Area (6106)
3. Charlton Roadless Area (6107)
4 North Paulina Roadless Area (6196)
5 Mt. Jefferson Roadless Area (6198)
6 Bear Wallow Roadless Area (6193)
7. Bend Watershed Roadless Area (6194)
8. West & South Bachelor RA (6195)
9. Maiden Peak Roadless Area (6108)
10 South Paulina Roadless Area (6197)
11. Metolius Breaks Roadless Area (6191)
12. Oregon Cascade Recreation Area
13. Wilderness
14. Areas not included in the above

In addition to helping the ID Team evaluate the outputs and effects on specific tracts of land, these delineations also served as stratifications for yield and cost related data. The winter ranges carry less standing inventory and are generally less productive plant communities. Regeneration is generally more expensive due to the animal damage protection measures that are needed. In addition, thermal cover constraints were applied to timber harvesting in these areas when they were allocated to the Deer Habitat Management Area

The roadless area delineations indicated areas that would have to incur up front road construction costs before any timber management activities could be scheduled in them. Different roadless areas had different roading costs based on the slope of the terrain involved. Their delineations also facilitated the tracking of scheduled activities in each and every roadless area.

Working Group Identifiers

The Deschutes National Forest timber inventory is categorized into working groups. Each stand on the Forest is assigned to a working group based on its species composition.

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WORKING GROUP IDENTIFIERS

1. Ponderosa pine
2. Lodgepole pine
3 Mixed conifer
4 Mountain hemlock
5. Meadows, brush, juniper, nonvegetated land
6. Aggregated unsuitable Ponderosa pine, lodgepole pine, mixed conifer, mountain hemlock

The working group delineation was key to addressing many of the planning issues Both the mountain pine beetle infestation and the firewood issues are tied to the harvesting of lodgepole pine The species mix issue is related to the amount of ponderosa pine and other valuable commercial species that are proposed for sale as opposed to lodgepole pine and mountain hemlock whose market values are weaker and more volatile The working group stratification also better enabled the ID Team to evaluate the effects of alternative harvest schedules on the habitat needs of certain identified indicator species

In addition, since each working group is composed of different species, each also had its own set of multiple use silvicultural prescriptions, and growth and yield tables Many of the costs and values used in FORPLAN were stratified according to the working groups. Stumpage values were based on a statistical analysis of the 2400-17 timber sale data, and cut and sold reports These values were specific to each working group by diameter class. The cost of regeneration, site preparation, timber stand improvement, sale preparation and logging were also tied to the working groups

However, some of the cost were by necessity averaged within or across the working groups when it would have been more desirable to have a finer level of economic detail. Regeneration costs are a good example. In some plant communities we have documented success of natural regeneration while in others we have to plant in order to achieve our silvicultural objectives While we know approximately how many acres of each plant community compose each working group, we do not have the communities mapped so we were not able to use them to spatially locate analysis areas Therefore, regeneration costs for each working group were based on a weighted average of planting versus natural regeneration.

Land Class

The Land Class analysis area identifiers were used to categorize the land into the following suitability classifications.

LAND CLASS IDENTIFIERS·

1 Suitable
2 Suitable with Gopher Problems
3. Suitable with 20-80% Rocky Soils
4. Technically and/or Administratively Unsuitable

The suitable classifications were intended to capture significant timber yield and costs differences on forested lands available for scheduled timber harvesting Of the 1 15 million acres of suitable and available forested lands, 20,000 acres involved stands in which gopher control costs would have to be incurred in order to achieve satisfactory regeneration An additional 49,000 acres involved rocky soils on which (1) natural regeneration could be achieved only after 15 years, (2) managed stands could not be fully stocked, and (3) additional logging costs would have to be incurred Because of these additional costs, FORPLAN often decided to not schedule any harvesting on some of these acres if it did not need them to meet the objectives of a particular alternative.

In earlier versions of the Deschutes FORPLAN model, slope was also included as a land class identifier due to its effect on logging costs Less than two percent of the commercial Forest land on the Deschutes prior to the Oregon Wilderness Bill of 1984 was steep enough to require cable logging systems. Most of the Forest could be logged by tractor or FMC The Oregon Wilderness legislation pulled some of the higher elevation steeper and less valuable lodgepole pine and mountain hemlock stands out of the suitable and available timber base. Many of the remaining cable logging stands were more valuable lower elevation ponderosa pine and mixed conifer. Earlier FORPLAN runs had shown these types of stands to be economically viable. In the interest of keeping

the model size down, slope was dropped as an analysis area identifier

Existing Condition Class

The sixth and last level of FORPLAN identifiers used to define analysis areas was the existing condition class. This level was used to help describe the current status of both vegetated and nonvegetated lands It was used primarily to identify which silvicultural options were appropriate to consider on suitable and available forested lands. It was also used to help monitor the effects of alternative harvest schedules on the vegetative successional stages as related to wildlife habitat requirements. Lands which were either not vegetated (i.e., lava, water) or vegetated but with no outputs or effects being tracked in FORPLAN (i.e., brush, juniper) were aggregated into one "catch all" identifier.

CONDITION CLASS IDENTIFIERS:

1. Forest land in an underproductive status
2. Seedlings and saplings - low stocking level
3. Seedlings and saplings - medium to high stocking levels
4. Poletimber
5. Immature small sawtimber
6 Mature or overmature small sawtimber
7 Large sawtimber
8 Multi-storied stands without a seedling understory
9 Multi-storied stands with a seedling understory
10. Unsuitable Ponderosa pine, lodgepole pine, mountain hemlock, and mixed conifer
11. Uninventoried lands in wilderness, meadows, brush and juniper, lava, water and other non-forested lands.

Production Coefficients

The ID Team developed coefficients for timber, range, wildlife, recreation, water, and costs. Attempts were made to use most of the resource coefficients in the planning model but problems were encountered with model size and reliability of the coefficients. Most of the coefficients other than timber were calculated outside the model, using information from some of the reports from the model.

Suitable Lands

NFMA Regulations state that timber production and harvesting may take place only on lands classified as suitable lands Lands are declared unsuitable if:

1. The land is not Forest land as defined in NFMA.

2. Technology is not available to ensure timber production from the land without irreversible resource damage to soils productivity, or watershed conditions.

3. There is not reasonable assurance that such lands can be adequately restocked as provided in NFMA

4 The land has been withdrawn from timber production by an Act of Congress, the Secretary of Agriculture, or the Chief of the Forest Service.

The Deschutes has lands that are (1) not forested, (2) withdrawn lands, and (3) where regeneration could not be ensured No lands have been withdrawn because of irreversible resource damage. The process used to identify lands where reforestation could not be assured and a figure showing the results follows.

The Regeneration Difficulty Screen

Skills

Persons from the Supervisor's Office who were on the ID Team included a Soil Scientist, Timber Planner, and Wildlife Biologist At the District level expertise was provided by the District Ranger and Foresters, Silviculturists, and Reforestation people

Step 1 - Soil Resource Inventory (SRI) Maps

The first step was to review and map all soils mapping units which identified a potential problem with reforestation because of droughty or stony soil conditions The ecoclass maps were also reviewed for Plant Community information which

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implied difficulty with reforestation. This was all mapped on the SRI soils map which are one inch to the mile scale

Step 2 - Reforestation Techniques

The next step was to identify which reforestation techniques would be considered in making the evaluation. The acceptable and proven techniques included the following.

1. Hand planting
2. Auger planting
3 Machine planting
4. Containerized stock
5. Site preparation - burning, discing, scalping
6. Caging, fencing, tubing
7. Releasing with herbicides
8. Shading

Natural regeneration was also considered but the primary emphasis was placed on planting.

Step 3 - Regeneration Problems

The next step was meeting on individual Districts using the positions and expertise previously noted. The procedure was to start with the original map of lands with potential regeneration difficulty and revise it based on more accurate, site specific data and experience or knowledge of the field people During the reviews, aerial photos, plantation records, more accurate plant community maps (when available), TRI data and general knowledge were used to refine boundaries. A map of the lands considered not suited because of droughty soils developed though this process.

With regard to reasonable assurance of regeneration, the question of animal damage also surfaced. Within some plant communities, gophers present serious problems with regeneration. These areas were reviewed using the same expertise involved in the droughty soil conditions. Also consulted was a representative of the U S. Fish and Wildlife Service who was conducting a research program to determine feasible ways to reforest areas on the Forest susceptible to gopher damage. It was felt that most communities could be regenerated within 5 years by using vexar tubes, planting immediately following harvest and modifying prescriptions somewhat Some areas where gopher populations were very high were an exception.

In October, 1983, the lands classed as not suited because of gopher problems were reevaluated and 4,700 acres were reclassed as suitable. The following figure summarizes timber suitability. More detailed information is available in the Forest Planning records.[3]

[3]See Determination of Not-Suited Lands, Deschutes National Forest, 1983

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Figure B-1 Determination of Lands Suitable for Timber Production (M Acres)

Classification	Acres
1. *Non-Forest Land (includes water)*	190.9
2 Forest Land	1430.0
3 Forest land withdrawn from timber production	176.3
4 Forest land not capable of producing crops of industrial wood[1]	10 2
5. Forest land physically unsuitable·	
--irreversible damage likely to occur	0.0
--not restockable within 5 years	92.6
6 Forest land--inadequate information[2]	0 0
7 Tentatively suitable forest land (item 2 minus items 3, 4, 5, and 6)	1150.9
Total National Forest Land - (item 1 and 2)	**1620.9**

1 Dedicated roads

[2] Lands for which current information is inadequate to project responses to timber management Usually applies to low site lands

The 176 3 thousand acres of forested lands which were withdrawn from timber production because of designations of either Wilderness, Research Natural Areas, Experimental Forest, or Oregon Cascade Recreation Area. These acres were not available to the FORPLAN model for scheduling timber harvesting activities

Proposed Land Uses

The condition classes of existing vegetation were used to schedule management activities over time for the various benchmarks and alternatives

Allocation and Scheduling Alternatives

The development of maps of lands with an eye towards specific considerations created the opportunity to allocate areas as a whole or not at all to a particular management objective. This was a way to efficiently satisfy the planning process *issues, concerns and opportunities and meet* assigned Forest output targets.

The basic use of inventory data was to accurately reflect the land base and provide the basis for scheduling activities and estimating costs, outputs and effects through the development of production coefficients. Inventories of potential land allocations or management areas were used as a basis for assigning prescriptions in each alternative.

Monitoring

At intervals established in the Forest Plan, management practices will be evaluated to determine how well objectives have been met, how accurate efforts and cost projections are, and how closely management standards and guidelines have been applied. The results of monitoring and evaluation may be used to analyze the management situation during review and revision of the Forest Plan in future years.

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The Forest Planning data base will provide a means by which changes in resource production rates, differences in inventory data, etc , can be measured and will also be used to monitor implementation activities

Plan Implementation Programs

The data base provides biological and physical data that will help develop subsequent programs for Plan implementation. As more information becomes available, the data base will be updated and improved. This will all be keyed to subparts of the Forest. These subparts will become the backbone for monitoring and implementation as well as data management. Refer to the Forest Plan for more details on implementation.

Sources of Data

Ecoclass mapping which was done in the mid-1970s and identified 55 total ecoclasses of which 41 are forested Within each ecoclass are plant communities[4] which are described in terms of their capability and production and growth potential. These were used to help define capability areas.

The soils on the entire Forest are mapped and classified. Slopes, even though not a problem, were also mapped This information is available in a publication "Soil Resources Inventory"[5] with accompanying maps.

The streams and rivers were inventoried and "Stream Side Management Units" identified. These describe the condition of the stream or river and classifies it by its relative importance

In 1985 a new vegetative inventory was conducted for the Forest in which all of the tree stands which met the definition of forested land were mapped and described. Much of the designated wilderness on the Forest and areas within the Oregon Cascades Recreational Area were not inventoried. The inventory provided much of the information used to identify analysis areas along with existing timber volumes.

All of the mule deer winter and transition ranges were mapped and habitat conditions described. Forage condition and thermal cover were measured. This inventory was then correlated with the timber stand inventory.

Each of the timber stands in 4 were classified into a plant successional stage which when combined with the Ecoclass map became an inventory of plant diversity.

[4]Volland, 1976.
[5]Larsen, 1976

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"Wildlife Habitat Relationships for South Central Oregon" (USDA Forest Service 1976) was also a source of information and was used in association with Plant Diversity inventory

Timber data regarding existing volumes and growth were based on a 1985 timber inventory

The Forest's recreation potential was identified through the Recreation Opportunity Spectrum inventory.

The visual resources of the Forest were inventoried prior to starting the Planning process. It was updated in 1978 and 1979.

A fuel types inventory and map were made available.

General information was made available regarding geothermal potential. Limited data is available on the magnitude and economic implications of geothermal development (see DOGME Report reference).

Information from range analysis and Plant Communities was used to determine areas suitable for livestock grazing and areas which could be used as transitory range.

Wetlands, floodplains and riparian areas were inventoried and mapped

Habitat for Bald Eagle and Northern Spotted Owls was mapped and habitat conditions described in general. Bald Eagle habitat has been the focus of some research but the data is not yet available

Land status information was used and continually updated as conditions changed It included private land, County, Ranger Districts, BLM, and Wilderness.

Transportation Planning Areas were available and used to evaluate the implications of Alternatives to transportation efficiency and cost

Economic data was derived from RPA, Regional Direction, or Forest statistics

Information was available on Wild and Scenic Rivers based on an inventory conducted by the Park Service in 1980.

APPENDIX B
THE FOREST PLANNING MODEL

Overview

Forest Planning is a very complex process in which an enormous amount of information and interdependent decisions must be considered before an alternative management plan can be recommended as the one which best addresses the issues, concerns, and opportunities which were identified at the outset of the planning problem Because of this, several inter-related computer models and analytical tools have been developed and utilized to help determine the decision space within which alternatives can be developed and to evaluate their associated outputs and effects

One of these models is called FORPLAN The name is an acronym for Forest Planning Model FORPLAN is a computerized linear programming model which has its roots in RAM (Resource Allocation Model) and Multiple-Use Sustained Yield Calculations (MUSYC) It is composed of a matrix generator, a linear programming solution system (FMPS, most recently Lindo) and a report writer Within the bounds of the matrix generator and the FMPS solution package, the user is allowed a great deal of latitude in formulating the mathematical representation of the Forest planning problem to be analyzed. The Deschutes Planning Team played a large role in debugging and testing the early versions of the FORPLAN software system Since then, several releases of two different versions of the model have been developed. The bulk of the early modeling analysis was performed with Version I, Release 14 The system is maintained and operated on the Univac computer at Fort Collins, Colorado

Recent modeling analysis was performed using Version 2 FORPLAN The program was modified to run on local micro comprters by the Rocky Mountain Experiment Station of the Forest Service

The Deschutes FORPLAN Model was specifically designed to help the Interdisciplinary Planning Team analyze the economic and production tradeoffs associated with the recreation, timber, visual, and wildlife resources, and to help evaluate the extent to which various alternative management scenarios were able to address and resolve the identified planning issues One key step in the development of the FORPLAN Model was to divide the total Forest into "analysis areas " Analysis areas are tracts of land with relatively homogeneous characteristics in terms of the outputs and effects that are being analyzed in the FORPLAN Model. Their delineations were intended to capture the significant social, biological, and economic differences in the way the land responds to alternative management strategies And, of course, the focus of the delineations was upon the planning issues.

In the FORPLAN model, analysis areas were allocated to management emphases in order to achieve the resource management objectives of a particular benchmark analysis or alternative. "Management emphasis" is a FORPLAN term and is directly related to the "management areas" described in the FEIS Each management area contains a set of standards and guidelines concerning how the resources in that allocation are to be managed in order to meet the multiple use objectives of that management area From one to twenty-one different management emphases were available to each analysis area depending upon its resource production opportunities

In turn, "management prescriptions" were developed to achieve the multiple use objectives of each management area In FORPLAN these are referred to as combinations of management emphases and intensities Management prescriptions are combinations of scheduled activities and practices, and their associated outputs and effects. The management prescriptions and their range of timing choices are represented as decision variables in FORPLAN The outputs and effects associated with the prescription choices are represented as mathematical coefficients in the respective decision variables FORPLAN had from one to six prescriptions to choose from for each management emphasis for each analysis area. In general, each analysis area contained from one to twenty-one prescription choices The average was over ten

Which prescriptions FORPLAN selected depended upon the objective function and the set of constraints used to represent a particular benchmark or land management plan alternative The objective

function was usually to maximize present net value or maximize the production of timber. These were subject to first satisfying all the specified constraints. The constraints were designed to guarantee the spatial and temporal feasibility of land allocation and harvest scheduling choices in order to achieve the multiple use objectives of a benchmark or alternative. Once the model had determined that a feasible solution existed by satisfying all of the constraints, it would then search for the set of prescriptions and timing choices which permitted it to optimize the solution according to the specified objective function.

The Analysis Process and Analytical Tools

As directed in the Planning Regulations (36 CFR 219.12(f)(8))·

"Each alternative shall represent to the extent practicable the most cost efficient combination of management prescriptions examined that can meet the objectives established in the alternative."

The ID Team analyzed economic efficiency at several stages of the planning process in order to be reasonably assured that the alternatives developed and displayed in the FEIS complied with the intent of this direction. The discussion of the analytical process and tools used will follow this general outline.

1. Analysis prior to FORPLAN
2. How FORPLAN was used in the analysis
3. Any analysis done in addition to FORPLAN model analysis

Once the issues, concerns, and opportunities were identified, and the planning criteria were developed, the ID Team began to formulate management areas and their associated standards and guidelines This step was probably one of the most difficult and laborious, and possibly the most important tasks of the interdisciplinary planning process Management areas coupled with their respective standards and guidelines provide specific direction for implementation, and serve as a framework for how to use, develop, and protect the Forest's resources in a manner consistent with the goals and objectives of the Plan.

Since the standards and guidelines provide general, rather than site or project specific, direction on how to implement the Forest Plan, there was little opportunity to calculate a present net value or benefit/cost ratio for many of them. However, economic efficiency was a strong consideration throughout their development. For example, from a silvicultural standpoint, clearcutting and planting is more desirable in terms of control over species mix than is natural regeneration However, natural regeneration is often more cost effective and we have had documented success with it in various plant communities.

Another example concerns the determination of which trees are to be left after a regeneration harvest in order to meet the cavity nester habitat needs for snags Several alternatives were considered including artificial killing. Many options were eliminated either because they did not have documented success, were not pragmatically implementable, or were not cost effective. The resulting snag management plan specifies the number and size of trees that are to be left as future snags in such a way as to have minimum impact on the timber volumes forgone from harvest

Finally, evidence of the concern for cost efficiency can also be found in the stated goals for the management areas. For example, the goal for Timber Management in the Plan is worded·

To provide for the optimum production of wood consistent with various resource objectives, environmental constraints, and economic efficiency.

This type of consideration for cost effectiveness was carried throughout the development of the management area standards and guidelines.

Concurrently with the formulation of management areas and the standards and guidelines, the ID Team also began to identify the analysis areas that would be used in the FORPLAN model. For this task, the R2MAP computerized grid mapping system and the Total Resource Inventory (TRI) Systems 2000 (S2K) Forest data base were used

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extensively to analyze different analysis area combinations that could be used to model and evaluate the production and economic tradeoffs between the recreation, timber, visual, and wildlife resources on the Forest. The objective of this exercise was to delineate the analysis areas in such a way as to capture the important variations in the biological, social, and economic characteristics of the land and yet keep the FORPLAN model size to a minimum so it was quicker and less expensive to run.

Once the final analysis area delineation was settled upon, the next step was to develop the prescriptions for the FORPLAN model This included the development of timber yield tables (discussed later in this section), other resource yield coefficients, and the economic costs and benefits (See the section on Economic Efficiency Analysis) associated with each FORPLAN prescription. These prescriptions were designed to enable FORPLAN to analyze the timber related outputs and effects associated with alternative land allocations and multiple use objectives

To provide FORPLAN with the harvest scheduling flexibility it needed to satisfy the multiple use objectives of each alternative, a wide range of timber yield tables was developed for each management area and working group combination

The development of empirical yield tables was based upon the use of the Stand PROGNOSIS model to project future stand development resulting from various forest management intensities. Input to the PROGNOSIS model consists of a stand inventory, including sample tree records, and a set of option selection instructions These empirical tables predict the growth and development of actual stand conditions that have been measured by the Forest via a 1985 Vegetative Resource Survey, stand examinations, and stocking surveys In contrast, the managed yield tables were constructed for future forest stands. The PROGNOSIS model was used to simulate replacement stands and their development with different management intensities Both sets of yield tables were then adjusted to result in net cubic foot volumes per acre for each decade in the planning horizon The use of various extensions within the PROGNOSIS model greatly aided the yield table development. These extensions provided estimates on the effects of forest pests in both the empirical and managed yield as well as predicted the levels of big game cover available from different management intensities Calibration of the PROGNOSIS model was based on collected forest data. The resulting output tables have been reviewed by natural resource specialists from a Forest, Regional, and National level.

A soil expectation value was calculated for each yield table. In some cases prescriptions were dropped if another prescription achieved the intended objectives equally as well but had a higher present net value. But for the most part, if FORPLAN had the room and the prescriptions contributed to the range in scheduling choices, they were included in the model so it had the option of whether to use them or not to satisfy its objective function and constraints.

Timber stumpage values and logging costs were based on a statistical analysis of timber sale (2400-17 Forms)[3], Cut and Sold Reports, and some time motion studies for the Pacific Northwest Costs for reforestation, site preparation, timber stand improvement, sale preparation and other timber management related activities were developed by the Timber Staff and Silviculturists based on recent experiences and anticipated future technology.

The development of recreation output coefficients was based on an analysis of the Forest Recreation Inventory Management (RIM) data base Capital investment and operation and maintenance costs were based upon recent budgets and use figures along with professional judgment about how recreation consumption patterns would react to alternative levels of capital investment and O&M expenditures.

FORPLAN was used to analyze the production and economic tradeoffs between the recreation, timber, visual, and wildlife resources on the Forest. The model was utilized to analyze the most economically efficient timber related outputs and effects associated with the achievement of the multiple use objectives of an alternative. Which prescriptions FORPLAN selected depended upon the objective function and the set of constraints

used to represent a particular benchmark or land management plan alternative. The objective function was usually to maximize present net value or maximize the production of timber. These were subject to first satisfying all the specified constraints. The constraints were designed to guarantee the spatial and temporal feasibility of land allocation and harvest scheduling choices in order to achieve the multiple use objectives of a benchmark or alternative.

[1]Forest Planning. Empirical Yield Tables, Deschutes National Forest, R6-DNF 001-85, 1985
[2]Forest Planning. Managed Yield Tables, R6-DNF 001-85, 1985
[3]Cut and Sold Reports, Deschutes National Forest, 1976-1983.

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The following is a list of some of the types of constraints used

1 Constraints on harvest flow, rotation length, and ending inventory;

2 Dispersion and wildlife MR constraints,

3 Constraints on the amount of analysis areas available to certain management area prescription sets,

4. Amounts of timber lands in an open condition in scenic views

5. Constraints for thermal cover in deer winter range allocations; and

6. Other miscellaneous constraints such as accelerated lodgepole pine harvesting, species mix, and the appropriate amount of uneven-aged management.

Once the model had determined that a feasible solution existed by satisfying all of the constraints, it would then search for the set of prescriptions and timing choices which permitted it to optimize the solution according to the specified objective function

Several other steps in the analysis process were implemented before the evaluation of a benchmark or alternative were considered complete The outputs and effects associated with the recreation and range programs for the respective benchmark or alternative were analyzed outside of FORPLAN with the use of electronic spread sheets During this step, alternative capital investment, and operations and maintenance strategies were examined to determine which resulted in the most efficient prescriptions to meet the objectives of the particular benchmark or alternative

Another step in the analysis process consisted of loading the FORPLAN solution onto the transportation network model (Transship) in order to determine the most cost efficient capital investment, and operations and maintenance program, and the associated transportation system needed to move the projected timber and recreation traffic around the Forest.

Next, an electronic spreadsheet was used to determine the total Forest budget that would be required to implement each alternative or benchmark The budget estimates were based on the various resource output levels, capital investment, and operation and maintenance programs that were developed in the previous analysis steps. The budget levels were tracked by resource, appropriated versus allocated funds, and capital investment versus operations and maintenance costs

Finally, all market plus assigned priced benefits associated with the timber, recreation, range, and special use outputs, and the associated Forest budget for the first five decades were entered into a spreadsheet which calculated the total present net value of the particular benchmark or alternative being evaluated.

Which land allocation and resource management investment options resulted in the most economically efficient solution was determined through iterative model and spreadsheet analyses For example, the Maximum Present Net Value (PNV) Benchmark (market plus assigned values) was arrived at by first examining the solution to the Maximum PNV Benchmark (market values only) and adding the associated recreation and range present net values to it A per acre PNV analysis indicated that the total Forest PNV could be increased by allocating intensive recreation management areas in the FORPLAN model These allocations resulted in higher combined timber and recreation discounted values then if they had been managed for timber alone The other recreation allocations excluded the harvesting of timber and their discounted values were less than if they had been allocated to timber production FORPLAN was run again with the appropriate intensive recreation allocations added in and the resulting timber PNV was added to the PNV for the recreation and range resources to arrive at the maximum present net value (market plus assigned) for the Forest.

The other Benchmarks were analyzed with FORPLAN through combinations of different objective

functions (maximize timber or maximize present net value) and constraints on harvest flow, rotation length, management requirements (MRs), and discretionary constraints needed to achieve the respective multiple resource objectives (Refer to the section on Analysis prior to Development of Alternatives). Again, the FORPLAN analyses were augmented with a spreadsheet analyses of the recreation and range resource management options

Once the Benchmark analyses were completed, the ID Team proceeded to evaluate the range of alternatives that were developed to address the issues, concerns, and opportunities. (Refer to the section on Formulation of Alternatives) Each issue, concern and opportunity was addressed in the alternatives either through land allocations, harvest scheduling, standards and guidelines, or policy statements. Alternatives were modeled through the specification of an objective function and a set of constraints that were necessary to achieve the intent of a particular alternative

The economic analysis of each alternative with FORPLAN, Transship, and the various spread sheets were followed up by several other analytical steps before the evaluation of an alternative was considered complete Each FORPLAN solution file was used to generate a flatfile containing information about the alternative analysis. The flatfile was then loaded into a data base that was easily queried to further evaluate the feasibility and consequences of implementing the alternative being modeled Information provided included the number of acres harvested by various geographical locators (such as management areas or particular characteristics of the land such as ponderosa pine with rocky soils) along with the schedule of the harvest and harvest methods employed. This made it much easier for personnel on the districts to understand the implications of each alternative in terms of where, when, and how they were to implement the alternative if it were selected as the preferred

Sometimes the results from any one of these additional analyses indicated the need to do more FORPLAN runs in order to improve upon the overall evaluation of the outputs and effects of a particular alternative. Sometimes the need was apparent to develop another alternative and proceed through the analysis process with it. Once the ID Team was satisfied with the outputs and effects of the alternatives, their implications with regards to income and jobs in the local economy were analyzed with the IMPLAN input/output model After all of this was done to satisfaction, the ID Team along with the Forest Management Team and district personnel then evaluated how well each alternative addressed the issues, concerns, and opportunities that were identified at the outset of the planning process Based on this analysis, a preferred alternative was recommended to the Regional Forester.

Identification of Analysis Areas

One of the first steps in the development of FORPLAN (Forest Planning Model) was to divide the Forest into analysis areas For this task, the R2MAP computerized grid mapping system and the TRI (Total Resource Inventory) System 2000 data base were used extensively Analysis areas are tracts of land with relatively homogeneous characteristics in terms of the outputs and effects that are being analyzed within the FORPLAN model They serve as the basic unit of land in the model for which a range of prescriptions are developed to achieve various multiple use objectives. Their delineations were intended to capture the significant social, biological, and economic differences in the way the land responds to alternative management strategies, and yet keep the model size to a minimum so that it was quicker and less expensive to perform analysis with. Of course, the focus of delineating analysis areas was, upon addressing certain issues, concerns, and opportunities, identified at the outset of the planning process

The process of developing FORPLAN analysis areas is discussed in detail in the section on Inventory Data and Information.

Identification of Prescriptions

Overview

The National Forest Management Act (NFMA) regulations define management prescriptions as "management practices selected and scheduled

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for application on a specific area to attain multiple use and other goals and objectives" (36 CFR 219.3). Management prescriptions consist of a goal statement which establishes the purpose of the prescription and a compatible set of management practices designed to develop and/or protect some combination of resources, and create or perpetuate a desired condition. Prescriptions were constructed within the requirements specified in 36 CFR 219 27 These requirements guide the development, analysis, approval, implementation, monitoring and evaluation of Forest Plans with regard to: a) Resource protection, b) vegetative manipulation, c) silvicultural practices, d) even-aged management, e) riparian areas, f) soil and water, g) diversity.

The process of identifying and subsequently developing management prescriptions began with an ID Team review of the issues, concerns, and opportunities (ICOs). Prescriptions were then identified which would help address those ICOs which were related to decisions regarding standards and guidelines, scheduling, or land allocations. There were other ICOs which were to be addressed through policy statements for which it was not appropriate to develop prescriptions.

Standards and guidelines represent the necessary mitigation and resource coordination measures that are required by existing laws, regulations, and policies. Essentially, they provide the guidelines for how prescriptions are to be implemented on the ground. Scheduling and land allocation related ICOs were addressed with the FORPLAN model. For this purpose, coefficients of outputs and effects were constructed for the appropriate management prescriptions. These were then cast in terms of FORPLAN prescriptions The model was then used to evaluate the implications of alternative scheduling and land allocation choices with regard to addressing the relevant ICOs.

Once the need and purpose for certain types of prescriptions were identified, goal statements for each management prescription were designed to respond to the questions raised by the ICOs. The ID Team then used professional judgment, evaluated existing policy, legislative direction, and research for guidance in developing multiple resource management prescriptions. The list of references below depicts a summary list of some of the more important research that was consulted for this purpose. The resulting set of prescriptions represents a broad range of resource management emphases, practices, and capital investment levels. General policies, standards, and guidelines were also written by the ID Team to cover practices common to all prescriptions and resource management situations that are Forestwide in scope.

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In addition to addressing ICOs, the process of designing management prescriptions was also guided by the following criteria. (1) prescriptions should be achievable and contain realistic practices, (2) they are to be general enough to accommodate the variable site specific conditions on the ground, (3) they should be specific enough for the ID Team to develop accurate resource and economic output and effects coefficients, and (4) to the extent practicable they should be the most cost effective means of achieving the intent of the prescription.

In order to explore a wide range of alternative ways to manage the Forest for its multiple uses, the ID Team identified the capability of each analysis area to produce certain goods and services that were being analyzed within the FORPLAN model. All prescriptions which were related to the production of goods and services capable of being produced from an analysis area were then assigned to it. The assignment criteria focused primarily on the geographical, physical, and biological characteristics of the analysis area as related to its ability to provide different types of recreation, visual, wildlife, and wood outputs. Which prescriptions and schedule of activities the model selected depended upon the multiple use objectives and constraints of the alternative being analyzed

Purpose, Criteria, and Assumptions for Prescription Categories

The framework for use, development, and protection of the Forest's resources is provided by the multiple-use standards and guidelines, and the prescriptions for each management area. The standards and guidelines provide direction on how to implement practices common to all prescriptions and resource management situations that are Forestwide in scope. Basically, there are three categories of standards and guidelines. These categories and their respective sets of standards and guidelines are presented below:

Category I - Overall Forest Program

1 Human Rights
2. Land Adjustments
3. Fire & Fuels Management
4 Transportation System
5 Fuelwood
6 Cultural Resources

Category II - Ground Disturbing & Vegetative Management Activities

1. Riparian Areas and Fish Habitat
2. Soils
3. Wildlife
4. Threatened, Endangered, and Sensitive Plant Species
5 Timber Management

Category III - Specific Forest Uses

1. Special Uses
2. Energy Resources (Oil, Gas, and Geothermal)
3. Energy Resources (Newberry Crater KGRA)
4. Minerals

Prescriptions were developed for each of the twenty-eight management areas to which different parts of the Forest could be allocated. For each management area, a resource management goal and the general objectives to achieve a desired future condition are described. Management practices are implemented within each prescription according to the resource management goals of the prescription and the standards and guidelines. A map of the land allocation to each management area is available for each alternative. This map in conjunction with the associated prescriptions, and the standards and guidelines identify what activities will take place, where, and when during the implementation of any one alternative. Eighteen management areas were displayed in the DEIS Ten additional management areas were added since then to address the special issues and resulting management goals in the Metolius River Basin.

The twenty-eight management areas are:

1 Special Interest Areas
2. Research Natural Areas
3. Bald Eagles
4. Northern Spotted Owl
5. Osprey
6. Wilderness
7. Deer Habitat

8 General Forest
9 Scenic Views
10 Bend Municipal Watershed
11 Intensive Recreation
12 Undeveloped Recreation
13 Winter Recreation
14. Oregon Cascade Recreation Area
15 Old Growth
16. Experimental Forest
17. Wild and Scenic Rivers
18 Front Country
19 Metolius Heritage Area
20 Metolius Wildlife/Primitive
21. Metolius Black Butte Scenic
22 Metolius Special Forest
23. Metolius Special Interest
24 Metolius Research Natural Area
25 Metolius Spotted Owl
26. Metolius Scenic Views
27 Metolius Old Growth
28 Metolius Wild & Scenic Rivers

Cost efficiency was an overriding consideration for the development of all prescriptions For example, if a prescription involved timber harvesting, the goal statement for the timber management standard and guideline called for the optimum production of wood consistent with various resource objectives, environmental constraints, and economic efficiency. Therefore, prescriptions were developed with enough implementation flexibility to permit one practice to be selected over another if it proved to be more cost effective in achieving the objectives of the prescription.

Pursuant to the intent of 36 CFR 219.14(b) and (c), economic efficiency was also considered in the development of the FORPLAN prescriptions for each management area which permitted scheduled timber harvesting. The analysis is also known as the "Stage II suitability analysis", and is documented in the planning records, "Stage II Analysis" In many cases a wide range of alternative silvicultural regimes was developed and made available to FORPLAN for a particular management area These represented different schedules of management practices, outputs and effects, and economic consequences. The model could then select which prescriptions most efficiently achieved the objectives of the alternative. In some instances it was necessary to reduce the number of FORPLAN prescriptions in the model. For this purpose, a soil expectation value was calculated and the prescription with the smallest present net value was dropped. More detail on the development of the timber harvesting prescriptions for each management area is presented at the end of this section

An abbreviated discussion of the prescription categories follows A more detailed presentation of the management area prescriptions, and the Forestwide standards and guidelines can be found in the Forest Plan Additional background information that went into their development is available in the following process documents entitled:

1. Diversity and Old Growth
2. Empirical Yield Tables
3. Managed Yield Tables
4 Range Resource
5 Recreation Resource
6. Spotted Owl Inventory
7 Visual Resource
8. Water Resource
9. Wildlife Resource

The prescriptions will be presented by the twenty-eight management area categories The purpose of specific prescriptions within each category is to provide a realistic range of management intensities to respond to the pertinent issues and concerns, and to prescribe management activities that either are currently, or are anticipated to be, practiced on the Forest.

Management Area Prescriptions

Management Area 1 - Special Interest Areas

Purpose

The Forest has numerous geological and botanical features that are unique and contribute to the wide range of recreation opportunities found on the Forest. Several different types of Special Interest Areas exist Some have been designated by the Secretary of Agriculture while others are administra-

tively designated. Prescriptions were needed to protect, enhance, and interpret the areas.

Goal Statement

To preserve and provide interpretations of unique geological, biological, zoological, and cultural areas for education, scientific, and public enjoyment purposes.

General Theme and Objectives

Unusual geological or biological sites and areas are preserved and managed for education, research, and to protect their unique character Facilities and opportunities may be provided for public interpretation and enjoyment of the unique values of these sites and areas. The primary benefiting uses of these areas will be for developed and dispersed recreation, research, and educational opportunities. These areas will be designated by Regional Forester authority.

Fire Management - All suppression entries should use lighthanded, low impact methods.

Prescribed fire may be used to attain the desired *characteristics of the area and reduce fuels to* their natural conditions

Minerals and Energy Development and Leasing - According to Forest-wide S&Gs

Pest Management - Take immediate suppression action utilizing techniques which protect and prevent future pest outbreaks.

Range - Domestic livestock will be permitted to utilize the existing forage without changing the overall natural characteristics or conflicting with the purpose of the area

Recreation - *Facilities may be provided for* protection of the resource values, visitor use, environmental interpretation, or safety of visitors.

These areas will provide the recreation setting and experience opportunities for the ROS categories of Roaded-Natural or Rural.

Soils and Water - According to Forest-wide S&Gs.

Special Uses - According to Forest-wide S&Gs.

Timber/Vegetative Management - Timber harvesting will not be scheduled in FORPLAN. However, timber harvesting and vegetative management will be allowed in catastrophic situations and when necessary to meet the objectives of the area.

Transportation System - Trails can be provided. Road density will be low.

Visual - Management activities viewed from the roads and trails may be visible, but subordinate to the surrounding landscape.

Wildlife - Manipulation of the game and fish habitat will be allowed as long as it maintains a natural appearance and does not conflict with the purpose *or objective of the area*

Management Area 2 - Research Natural Area Prescription

Goal Statement

To preserve examples of naturally occurring ecosystems in an unmodified condition for research and education.

General Theme and Objectives

In Research Natural Areas (RNAs) natural features are preserved for scientific purposes and natural processes are allowed to dominate. The main purposes of Research Natural Areas are to provide *Baseline areas against which effects of human* activities can be measured, Sites for study of natural processes in undisturbed ecosystems, and Gene pool preserves for all types of organisms

Forest-type RNAs will preferably be old-growth or virgin stands and offer the best available site or growing conditions for a given tree species When old-growth stands or optimum sites are not available, younger age classes or less productive sites may be an acceptable substitute. Nonforested

type RNAs will be sites with good to excellent range conditions.

Fire Management - Unless plans approved by the Chief provide for letting natural fires burn, aggressive containment using low impact methods should be used.

Prescribed fire will be used only in conjunction with approved research projects.

Minerals and Energy Development and Leasing - Research Natural Areas will be recommended for withdrawal from mineral entry. Mineral leasing will be denied or done through "no surface occupancy."

Pest Management - Reintroduction of fire should be considered to reduce possible insect epidemic conditions.

Suppression action should be taken when the damage has the potential to modify ecological processes to the point that the area has little value for observation and research

Range - Grazing will only be allowed when the Regional Forester and Director of the Pacific Northwest Forest and Range Experiment Station authorize such a practice to preserve some representation of the vegetation for which the natural area was originally created

Recreation - No physical improvements for recreation purposes will be permitted.

These areas will be closed to all off-road vehicles.

Recreation uses will be allowed as long as they do not modify the area to the extent that such uses threaten impairment of research and educational values. The relevant ROS categories are Semiprimitive Nonmotorized, Semiprimitive Motorized, and Roaded-Natural.

Soils and Water - According to Forest-wide S&Gs.

Special Uses - According to Forest-wide S&Gs.

Timber/Vegetative Management - Timber harvesting is not allowed in a Research Natural Area. No control for insect and disease should be instituted.

Transportation System - No roads or trails should be permitted at the boundaries or within these areas, except those considered essential to research or educational uses.

Visual - Research facilities installed within the areas will blend with the natural surroundings.

Wildlife - According to Forest-wide S&Gs.

Management Areas 3,4,5 - Bald Eagle, Spotted Owl and Osprey

Goal Statement

To protect and manage habitat to enhance the carrying capacity of bald eagles, northern spotted owls, and osprey.

General Theme and Objectives

Habitat will be managed for bald eagles, northern spotted owls, and osprey. Nesting habitat and foraging areas will be protected and enhanced Suitable nesting sites will be provided on a continuing basis Old-growth stands with large trees will be emphasized for bald eagles and northern spotted owls Osprey habitat will contain numerous trees and snags suitable for nesting. Stands will be managed so that suitable nesting sites are available on a continuing basis and spaced to minimize territorial competition. Human disturbance will be minimal during the nesting season

Fire Management - According Forest-wide S&Gs.

Ospreys - Protection of nest trees and adjacent perch trees is the highest priority.

Maximum low intensity burn acre objectives are 10 acres per year and 5 acres per occurrence.

High intensity fires should be aggressively controlled. Maximum high intensity burn acre objectives are 1 acre per year and 1 acre per occurrence

Prescribed fire will not normally benefit this resource.

Bald Eagles - Protection of nest trees and adjacent trees will be the highest priority in this area

Low intensity fires outside the nesting season do not conflict with the habitat objectives. Maximum low intensity burn acre objectives are 10 acres per year and 1 acre per occurrence Maximum high intensity burn acre objectives are 5 acres per year and 1 acre per occurrence

The use of prescribed fire will be appropriate in ponderosa pine stands, but not other working groups.

Northern Spotted Owls - Maximum annual low intensity burn acre objectives for each area are 1 percent.

Maximum high intensity burn acre objectives for each area are .3 percent.

Prescribed burning may be used to treat slash.

Minerals and Energy Development and Leasing - According to Forest-wide S&Gs.

Pest Management - Suppress Forest pests when they are adversely affecting that component of the vegetation which is essential for nesting and rearing habitat.

Range - Range management practices can be programmed and planned in these areas.

Recreation - These areas will be managed to provide dispersed recreation opportunities such as hiking, bird watching, and hunting that are compatible with maintaining desired populations of these wildlife species The appropriate ROS categories are Semiprimitive Nonmotorized, Semiprimitive Motorized, or Roaded-Natural

Soils and Water - During extended and severe drought the USFS will work closely with the Water Master to maintain minimum pool levels in Crane Prairie and Wickiup Reservoirs which are important nesting and food sources for bald eagles and spotted owls.

Special Uses - According to Forest-wide S&Gs.

Timber/Vegetative Management

Ospreys - Timber harvest will be scheduled in FORPLAN. Even-aged silviculture can be applied with inclusions of small areas where two to four dominant trees per acre are left. However, small group selection may be used as an alternate where stand conditions, topography, or other factors indicate 5 to 10 large trees per acre need to be left.

In general, stands can be available for regeneration harvest after CMAI is reached.

Bald Eagles - Timber harvest will be scheduled in FORPLAN. Emphasis will be on managing ponderosa pine and Douglas fir

Small group selection or even-aged management will be applied to produce an average of eight trees per acre that are 300 to 350 years old with open crowns and large limbs. A maximum of 3.8 percent of the area can be scheduled for harvest in each decade

Northern Spotted Owls - Programmed timber harvest will not occur in this Management Area. Management should be directed to developing a two or three storied stand containing 8 to 10 old growth trees per acre

Transportation System - Road networks will be designed to facilitate easy control of access during the nesting season. Road closures can be used to limit disturbing human activity.

High voltage electric lines are not acceptable unless specifically designed to prevent electrocution of large birds.

Visual - Artificial osprey nesting structures must blend into the surrounding area.

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Regeneration units will be arranged to provide long term habitat requirements and minimize adverse impacts on the visual resource

Wildlife

Osprey - Protect all existing nest site and associated perch trees.

Manage the timber to provide for some trees with dead and dying tops

With many nest sites being lost to natural causes, an artificial nesting structure program may be required

Bald Eagles - Protect all existing nesting, roost, and perch trees

Trees on the average should exceed 110 feet in height and be 20 inches or greater d.b.h.

Northern Spotted Owls - A 1,000 to 1,300 acre area per nesting pair will be managed to provide suitable nesting habitat.

The area should be characterized by mature and overmature tree stands with a fairly dense understory.

Management Area 6 - Wilderness

Goal

To preserve the benefits of Wilderness values for the public, in accordance with the Wilderness Act of 1964

General Theme and Objectives

Wilderness areas will provide environments that are:

Essentially unaltered and undisturbed by humans. Primeval in character.
Places where natural ecological processes (including the natural role of fire) can operate with a minimum of interference by humans.

The Forest manages the eastern portions of the Mt. Jefferson, Mt. Washington, Three Sisters, Mt. Thielsen, and Diamond Peak Wildernesses. Management jurisdiction of the remaining portions of these Wilderness areas is held by the Willamette, Mt Hood, and Umpqua National Forests

Fire Management - Wildfire will be considered an inherent part of all or portions of the general wilderness ecosystem.

Suppression actions may not be necessary or only require partial implementation in order to meet wilderness management objectives.

Minerals and Energy Development and Leasing - The Forest will review valid leasing and mining proposals and make recommendations to the BLM. The Forest may impose reasonable conditions which will not interfere with the mining operation or the statutory rights of the claimant.

Pest Management - Monitor pest populations so that early detection of threats to adjacent areas is possible.

If adjacent areas are threatened, suppression techniques favoring biological control should be used if available and practical.

Range - Domestic livestock grazing, other than for recreation purposes, will be permitted in those areas where grazing had been established prior to the area's Wilderness designation

Recreation - Recreation is an appropriate use of Wilderness areas to the extent that it does not degrade values for which the Wilderness was established.

Wilderness will be managed to provide the setting, activities, and experiences for the ROS categories of Primitive and Semiprimitive Nonmotorized

Soils and Water - Naturally occurring erosion processes will be allowed to continue unless they intolerably impact other Wilderness resources or resources outside the Wilderness.

Wilderness use which is accelerating loss of surface soils and degrading water quality will be controlled or eliminated

Special Uses - Commercial special use permits can be issued for outfitter guide type activities, but will be managed to meet the objectives of Wilderness management

Timber/Vegetative Management - These areas will not be managed for commercial timber production.

Transportation System - Roads are not permitted. Existing roads will be restored to natural conditions

Visual - Visual quality will be preserved in a natural setting.

Wildlife - Traditional and current fish stocking may continue.

Emphasis will be placed on maintaining native species with particular emphasis on the habitat requirements of threatened and endangered species.

Management Area 7 - Deer Habitat

Purpose

Deer habitat and population levels are an important component of the issues. Prescriptions were needed to provide optimum deer winter range conditions on appropriate portions of the Forest Thermal cover and foraging areas are important elements of the deer winter range habitat. Prescriptions were necessary which grew trees and resulted in different quality and amounts of thermal cover. It is also necessary to schedule timber harvesting in such a way as to create an appropriate mosaic of forage and cover areas Much of the bitterbrush community is old and decadent, and of little forage value. It is necessary to implement a prescribed burning program to improve the forage values in these areas.

Goal

To manage vegetation to provide optimum habitat conditions on deer transition ranges while providing for domestic livestock forage and wood products.

General Theme and Objectives

Vegetation will be managed to provide optimum habitat. Herbaceous vegetation will be managed to provide a vigorous forage base with a variety of forage species available. Forage conditions will be improved where conditions are poor. Foraging areas will be created where forage is lacking. Cover will be developed where lacking, maintained when in proper balance, or reduced when over-abundant and more foraging areas are needed.

Livestock grazing, both sheep and cattle, will be permitted with associated range improvements such as fences and water developments.

Fire Management - High intensity burns can help to maintain diversity. Maximum high intensity burn acre objectives for the area are 1 percent and 500 acres per occurrence.

The prescribed use of fire will be necessary to maintain diversity within the plant communities. Burning prescriptions should provide for the reestablishment of bitterbrush within 20 years. Approximately 2.5 percent of the Management Area could be burned over annually

Minerals and Energy Development and Leasing - According to Forest-wide S&Gs.

Pest Management - Suppression action should be taken when pests are adversely affecting forage production or cover

Range - Forage utilization by livestock will be maintained at a level so that sufficient forage is available to support the desired number of deer.

Grazing systems will be compatible with or complementary to the habitat objectives for deer.

Recreation - The area will provide various dispersed recreation opportunities primarily for the activities of viewing wildlife, hunting, gathering

forest products, and roaded camping. This will be consistent with the ROS category of Roaded-Natural

Soils and Water - According to Forest-wide S&Gs

Special Uses - Special uses which do not have constant human activities will be acceptable

Timber/Vegetative Management - Timber harvest will be scheduled in FORPLAN subject to cover constraints Timber management activities will be applied to meet the wildlife habitat objectives. Timber harvesting will be scheduled in such a way as to maintain an approximate 40/60 cover to forage ratio throughout time.

On suitable lands, small group selection or even-aged silvicultural systems will be the norm and will include precommercial and commercial thinnings

In ponderosa pine suited lands, stands will generally be available for harvest after CMAI is reached to retain thermal cover Shorter rotations are permissible to help meet the forage/cover objectives

Stocking levels will be based on site-specific conditions A crown cover greater than 40 percent with trees 30 feet high is recommended for thermal cover Prescribed burning is recommended for site preparation where soil conditions and fuels permit.

Due to the mountain pine beetle epidemic, the stands in lodgepole pine suited lands are to be converted in 10 to 20 years while maintaining 25 percent of an area in cover The cover requirements should be based on areas of 4,000 to 10,000 acres

In unsuitable ponderosa pine, the objective is to produce cover Regeneration is primarily by shelterwoods Some slash will be left to protect the site and provide shade for the seedlings. No commercial thinnings will occur

Transportation System - Unneeded roads will be obliterated Local roads may be closed on a seasonal basis in coordination with the Oregon Department of Fish and Wildlife.

Visual - Along major roads, wildlife habitat improvement projects should be located, shaped, and timed to reduce adverse visual impacts

Wildlife - Habitat should be managed to provide for an average of 40 percent thermal and hiding cover through time.

Maintain or improve forage conditions with an emphasis on increasing the variety of plants available for forage and a mixture of age classes of shrubs.

Foraging areas created through timber harvesting should be irregularly shaped and no more than 600 feet from cover from any point. Maintain thermal cover immediately adjacent to foraging areas.

Management Area 8 - General Forest

Purpose

Several aspects of the ICOs tie to the production of timber. Timber sold off of National Forest lands is important to the jobs and income of local and regional economies. How much of each species is to be harvested and on what schedule is a concern. How stands are to be managed in the future is also an issue. Tree stand manipulation is also necessary to meet objectives other than timber production. So numerous prescriptions were prepared to represent various intensities of timber management for the types of timber stands present on the Forest. The selection of prescriptions and the amount of land they applied to resulted in different levels of capital investments, ranges of timber outputs, and different mixes of species harvested

Goal

To provide optimum and sustainable levels of timber while providing forage production and opportunities for public use and enjoyment.

General Theme and Objectives

The primary objective of this management area is to optimize the production of wood fiber through the conversion of unmanaged stands to managed stands. The intent is to utilize to the extent practicable the full potential of the site to grow wood given the multiple-use objectives associated with it

For this purpose, a wide range of management prescriptions were developed for regenerating, growing, and harvesting stands of timber. A variety of age classes, tree sizes, and stocking levels are currently present on the Forest due to past management activities and natural events In addition, the timber resource on the Forest is composed of a mix of species, the most important of which are ponderosa pine, lodgepole pine, mixed conifers, and mountain hemlock. The prescriptions were developed based upon the unique silvicultural and ecological characteristics of the stands to which they were to apply. Economic efficiency will be used to guide the development and implementation of many of the silvicultural prescriptions

Forage within this Management Area will be available for use by cattle, sheep, and big game Some lands have no available forage so there will be no grazing On other lands there will be need for coordination between timber and range management. On some areas grazing will be an emphasized use Range structural improvements such as fences and water troughs may be constructed and maintained to meet range and timber management objectives. Range improvement projects such as prescribed burning or seeding may be utilized to improve the forage base.

There are opportunities for dispersed recreation activities, particularly those associated with roads Informal camping and hunter camps are important uses of the area Developed site recreation opportunities such as camping or picnicking occur on a limited basis throughout the area.

This Management Area also provides key habitat for deer and elk on their summer ranges.

Fire Management - Suppression practices will be designed to protect against losses of large acreages to wildfire.

Prescribed fire may be used to protect, maintain, and enhance timber and forage production.

Minerals and Energy Development and Leasing - According to Standards and Guidelines in the Forest Plan.

Pest Management - Monitoring and vegetative management will emphasize prevention of damage or loss due to pests

Range - Allotments will be managed to achieve or maintain a forage condition rating of fair or better or to the site's capability.

Timber harvesting should accommodate grazing systems when necessary

Transitory range will be managed in conjunction with timber management to achieve higher levels of forage production and the desired level of forage utilization.

Recreation - This Management Area will be managed to provide the recreation activity, setting, and experience of the ROS category of Roaded-Natural

Soils and Water - According to Forest-wide S&Gs.

Special Uses - According to Forest-wide S&Gs

Timber/Vegetative Management - Timber harvesting will be scheduled in FORPLAN.

Even-aged silviculture will be emphasized in the lodgepole pine and mountain hemlock working groups. Uneven-aged silvicultural systems will be emphasized in the ponderosa pine and mixed conifer working groups. Uneven-aged management will be applied where compatible with other land management objectives and not prohibited by insect and disease conditions.

A wide range of timber management investment options will be provided through applications of natural versus artificial regeneration, timber stand

improvements, thinnings, and regeneration practices

The suitable and available timber resource was divided into ponderosa pine, lodgepole pine, mixed conifer, and mountain hemlock working groups. These, in turn, were stratified within themselves by productivity. Silvicultural prescription options were based on the ecological characteristics of the average plant community compositions for each working group strata

Regeneration harvest units should not exceed 40 acres in size and have at least one logical harvest between them Up to 58 percent of an analysis area can be harvested in a decade and still leave a 220 foot leave strip between units

Stands will generally be available for regeneration harvest after achieving 95 percent CMAI

Economic efficiency will be a major consideration in the development of silvicultural prescriptions.

Transportation System - Roads constructed within this Management Area will generally be planned to accommodate a larger timber volume than other areas

Visual - Visual quality will be provided to the extent possible, but without reducing timber outputs Created openings will be shaped and blended to the natural terrain to the extent practicable when necessary.

Wildlife - In elk and deer summer range a minimum of 25 percent of the area should be maintained in a condition that will provide hiding and/or thermal cover

Timber harvesting and/or thinning will provide screening between treatment areas and roads with continuous vehicle use.

Management Area 9 - Scenic Views

Purpose

Due to the importance of recreation and visual quality in general on the Deschutes, maintaining or enhancing visual quality is a key issue. A series of prescriptions were needed to direct management depending on whether the area was viewed by a lot of people from very close or fewer people from farther away A wide range of silvicultural prescription options were also needed since tree stands can be managed to improve their appearance and open up vistas of meadows and peaks.

Goal Statement

To provide Forest visitors with visually appealing scenery.

General Theme and Objectives

Landscapes seen from selected travel routes and use areas will be managed to maintain or enhance their appearance To the casual observer, results of activities either will not be evident or will be visually subordinate to the natural landscape.

Timber stands, which have remained unmanaged in the past because of their visual sensitivity, will begin receiving treatment to avoid loss of the stand to natural causes. Landscapes containing negative visual elements, such as skid roads, activity residue, or cable corridors, will be rehabilitated Landscapes will be enhanced by opening views to distant peaks, unique rock forms, unusual vegetation, or other features of interest The desired condition for ponderosa pine is to achieve and maintain visual diversity through variations of stand densities and size classes Large, old-growth pine will remain an important constituent, with individual specimen trees achieving 30 inches in diameter and having deeply furrowed, yellowbark characteristics

For ponderosa pine stands managed using uneven-aged silvicultural systems, stands will be managed to a large tree diameter of 36 inches at which time they may be harvested For ponderosa pine and mixed conifer managed using even-aged

silvicultural systems, large trees will generally exceed 40 inches in diameter before final harvest in retention foreground and 25 inches in diameter in partial retention foreground.

For other species, the desired condition requires obtaining visual variety through either spatial distribution of age classes and species mixes, through density manipulation, or through a mixture of age classes within a stand.

Fire Management - Suppression efforts in the immediate foreground should utilize low impact methods. In middleground and background areas, fires can be suppressed using standard techniques

Low intensity fires should not exceed 300 acres per occurrence and should have no long lasting impacts on the visual resource

Prescribed fire is acceptable

Fuel treatments in foreground areas should be planned and timed to avoid being highly visible. In middleground and background areas, fuels may be treated using standard techniques.

In foreground areas slash should be cleaned up to a higher standard than in the middleground and background.

Minerals and Energy Development and Leasing - According to Forest-wide S&Gs.

Pest Management - Monitoring and vegetative management will emphasize prevention of damage by pests

Suppression action will be taken immediately utilizing methods which will provide for the long-term protection of the visual resource.

Range - Livestock grazing will be allowed. Grazing may be encouraged to complement and add to the scenic variety

Recreation - This Management Area will provide the setting and experience opportunities of the ROS category of Roaded-Natural.

Soils and Water - According to Forest-wide S&Gs

Special Uses - Utilities and electronic sites may be located in these areas if the facilities and associated improvements are located, designed, and maintained so as to meet the Visual Quality Objectives.

Timber/Vegetative Management - Even-aged management will be applied to small units to achieve diversity in adjacent stands of different ages

Uneven-aged management will be emphasized in the ponderosa pine and mixed conifer working groups In practice, opportunities to apply uneven-aged silvicultural systems will be limited, especially in the mixed conifer working group, by disease conditions.

A stand should not be treated until adjacent stands which were harvested are no longer considered an opening Stands are considered an opening until trees are at least 10 feet tall on slopes less than 30 percent and 15 feet tall on slopes greater than 30 percent.

In retention foreground areas, no more than 5 percent of a seen area can be in harvest created openings at any one time. In partial retention foreground areas, no more than 10 percent of a scene area can be in harvest created openings at any one time In middleground, up to 7 percent of an area can be in harvest created openings

Rotation lengths vary by the working group and the Visual Quality Objective. In retention foreground, ponderosa pine and mixed conifer stands are held well beyond culmination, 340 years and 330 years respectively. In partial retention foreground, ponderosa is held for 170 years and mixed conifer is held for 160 years In these areas, lodgepole pine is allowed to be harvested at culmination age, or 95 percent thereof

Transportation System - New roads and trails will be located and designed to meet adopted Visual Quality Objectives for the area.

Visual - In retention, the results of activities may not be visually evident.

In partial retention, the results of activities may be visually evident, but remain visually subordinate to the characteristic landscape.

Wildlife - Emphasis will be on habitat improvement for watchable wildlife. Consideration should be given to minimizing the risks of vehicle-deer collisions when managing stands along major highways through deer migration corridors

Management Area 10 - Bend Municipal Watershed

Purpose

The City of Bend and nearby areas depend on the Bend Watershed for abundant high quality water. A prescription was needed for the Bend Municipal Watershed which would protect and enhance the continued flow of water for this resource. Vegetative management is necessary to prevent a dangerous build up of fuels or insect epidemics

Goal Statement

To provide water at a level of quantity and quality which will, with adequate treatment, result in a satisfactory and safe domestic water supply

General Theme and Objectives

The Bend Municipal Watershed will be managed to provide healthy timber stands that are growing at a moderate rate Stands will be in a condition which provides a minimum threat for catastrophic fire and which will retard insect infestation Existing water quality will be maintained Stream channels will be in stable conditions throughout the watershed. Access into the watershed for administrative and dispersed recreational activities will be allowed at a level which is compatible with the water quality goals of the Management Area

Fire Management - Fire protection will be a high priority. Fires within or which threaten the watershed will be aggressively controlled and mopped up.

An aggressive low intensity prescribed fire program will be necessary in portions of the watershed to treat natural fuels accumulation.

The watershed will be given high priority for fuel treatment (in addition to prescribed burning) to keep fuel loadings at levels which will minimize the risk of catastrophic fires.

Minerals and Energy Development and Leasing - According to Forest-wide S&Gs.

Pest Management - The emphasis will be to minimize conditions which are conducive to disease or insect attack In the event of increased insect or disease occurrences within this area, high priority will be given to treatment of the affected stands

Range - No grazing by domestic livestock will be allowed

Recreation - The area will be managed to provide recreation opportunities for the ROS category of Semiprimitive Nonmotorized.

Soils and Water - Where feasible, channels with poor stability characteristics will be treated either structurally or vegetatively in order to stabilize them and enhance water quality.

Debris jams will be removed where this will prevent loss of bank or channel stability

Special Uses - According to Forest-wide S&Gs.

Timber/Vegetative Management - Timber harvesting will not be scheduled in FORPLAN However, timber may be harvested (1) in the event of a catastrophe, (2) to reduce fuel levels, and (3) to create vigorous stands which contribute to the overall health and stability of the watershed

Transportation System - Helispots will be strategically located and constructed to provide rapid access in the event of fire

Any new roads or trails constructed will be located, designed, and maintained to protect water quality. It may be necessary to close some roads to the public.

When timber is harvested, specialized logging equipment which results in a minimum of ground disturbance will be used.

Visual - Management activities will either be subordinate to the surrounding landscape, or visually not evident

Wildlife - According to Forest-wide S&Gs.

Management Area 11 - Intensive Recreation

Purpose

The Deschutes ranks among the top Forests in the Nation for recreation use and opportunity To a large extent, the local economy is dependent upon outdoor recreation and tourism related expenditures. In addition, outdoor recreation is an integral component of the Central Oregon way of life. Therefore, both developed and dispersed recreation are key ICOs and are also affected by other issues As such, a prescription was needed which directs the development and management of recreation facilities, resorts, and lodges and prescribes vegetative treatments to provide for higher levels of quality recreation opportunity experiences.

Goal Statement

To provide a wide variety of quality outdoor recreation opportunities within a Forest environment that can be modified for visitor use and satisfaction or to accommodate large numbers of visitors.

General Theme and Objectives

This Management Area will provide a wide variety of recreation opportunities including, but not limited to, activities dependent upon developed sites. Sophisticated facilities and sights and sounds of man will be evident and often essential to provide the desired recreation experience. Generally, high concentrations of visitors will occur around developments Fewer numbers will occur outside developments, but encounters between visitors can be frequent Visitors with little knowledge of outdoor skills will be able to enjoy the area. Activities will often, but not always, involve a widespread use of motorized vehicles and boats.

Fire Management - All wildfires should be aggressively controlled using lighthanded methods as much as practical

Prescribed fire may be used to reduce hazardous fuel concentrations and to form fuel breaks adjacent to high use areas

Minerals and Energy Development and Leasing - According to Forestwide Standards and Guidelines.

Pest Management - Monitoring and vegetative management will emphasize prevention of damage or loss by pests

Aggressive suppression techniques should be used to protect the higher valued resources.

Range - Grazing allotments will exclude livestock use from developed sites.

Recreation - This Management area will generally provide recreation setting, activity, and experience opportunities for the ROS categories of Rural and Urban

Soils and Water - According to Standards and Guidelines in the Forest Plan

Special Uses - According to Standards and Guidelines in the Forest Plan.

Timber/Vegetative Management - There will be no programmed harvest in this Management Area. However, some harvest may occur to enhance the objectives of the area.

Timber management should maintain age class diversity, stand vigor, and overall stand condition for recreation purposes.

Timber management should maintain or improve visual quality of scenery associated with the recreational setting

Transportation System - A wide spectrum of transportation facilities from high standard, double lane roads to Forest local roads and trails can be constructed as needed Good access for standard passenger and RV-type vehicles will be provided for major attraction and development areas.

Visual - Within existing or future developed areas, facilities and management activities may dominate the landscape However, the natural appearance of the environment will be emphasized. Vegetative management will generally achieve the standards of retention foreground.

Wildlife - Emphasis will be on habitat improvements for watchable wildlife and maintaining or improving fish habitat

Management Area 12 - Dispersed Recreation

Purpose

The Deschutes ranks among the top Forests in the country for recreation use and opportunity. Both the Central Oregon lifestyle and economy are dependent upon the recreation opportunities offered by the Forest Areas outside of Wilderness which provide an opportunity for recreation in an undeveloped environment are limited yet there is an increasing demand for it There is also demand for primitive roads and camping facilities This prescription was developed to provide that opportunity. Within the prescription are options to permit both motorized and nonmotorized recreational experiences.

Goal Statement

To provide a range of quality recreation opportunities in a dispersed (primarily undeveloped) forest environment

General Theme and Objectives

This Management Area will provide an environmental setting producing the kinds of recreation experiences that are attainable in large undeveloped areas. It will provide a feeling of vastness and remoteness and will have no irreversible evidence of humans It will be in a predominately unmodified or natural state. The environmental setting will often include a wide diversification of vegetation, terrain, and visible landform

It will be managed to provide limited social contact and interaction among visitors. Primitive facilities, such as shelters and small camps, signing, and a transportation system for visitor access and use may be established. Management will provide recreation opportunities that occur in a primitive environment, but restrictions will be less than in Wilderness areas. Motorized activities could be permitted in some areas. Low-standard roads and trails could be utilized for motorized activities.

Fire Management - Generally, containment, control, and confinement are all acceptable suppression tactics depending on existing and forecasted weather conditions Normally, low impact suppression methods will be used.

Prescribed burning may be used to meet recreation and wildlife objectives

Minerals and Energy Development and Leasing - According to Forest-wide S&Gs.

Pest Management - Monitor pest populations so that early detection of threats to adjacent areas is possible. If adjacent areas are threatened, suppression techniques favoring biological control should be used if available and practical.

Range - Outfitter guides using recreation stock will be allowed permits Grazing of domestic livestock will be permitted to utilize existing forage if the overall characteristics of the area will remain unchanged.

Recreation - The area will be managed to provide the recreation settings, activities, and experiences for the ROS categories of semiprimitive motorized and semiprimitive non-motorized.

Soils and Water - According to Forest-wide S&Gs

Special Uses - Permits will be allowed for structures if they existed prior to the allocation of lands to this management area.

New structures must blend into the unmodified environment.

Large facilities and transmission corridors are normally not compatible with the objectives of this prescription.

Timber/Vegetative Management - There will be no FORPLAN scheduled timber harvesting.

Unregulated timber harvesting will be permitted in catastrophic situations

Transportation System - Trails or any roads will be designed, constructed, and maintained to the minimum of standards needed. A limited number of helispots may be constructed.

Visual - Management activities will either be subordinate or not visually evident.

Wildlife - Fish stocking is permitted.

Management Area 13 - Winter Recreation

Purpose

A need was identified for a prescription to address one of the aspects of the recreation issue, namely winter recreation. Conflicts occur between cross country skiers and snowmobilers. There is also an opportunity to utilize some of the roadless areas for winter recreation if access and trails are available A prescription was needed which provided for the development of roads and trails and management of the vegetation to minimize conflicts between users and to enhance the overall winter recreation experience

Goal Statement

To provide quality winter recreation opportunities within a forest environment that can be modified for visitor use and satisfaction

General Theme and Objectives

This Management Area will provide opportunities for winter recreation activities. Facilities and evidence of man will be present. Roads, vegetation management, and other development activities will be designed and located to enhance the winter recreation opportunities. Social contact will vary but high social contact could be expected in some areas and during some portions of the winter use season. Facilities for tubing and sledding can be developed

Fire Management - Suppression practices will be designed to prevent losses of large acreages to wildfires

Prescribed fire may be used to remove concentration of material that hinder winter recreation and reduce hazardous fuel loadings.

Minerals and Energy Development and Leasing - According to Forest-wide S&Gs.

Pest Management - Take immediate suppression action utilizing principles and techniques that reduce damage and losses and prevent future pest problems.

Range - Allotments in this area will be managed to provide for a forage rating of fair or better Transitory range that results from vegetative manipulation can be used.

Recreation - The emphasis is to manage the area for winter-type recreational activities. Dispersed recreation use in the summer is compatible but not emphasized.

The area can be zoned to minimize conflicts between motorized and nonmotorized winter uses.

Soils and Water - According to Forest-wide S&Gs.

Special Uses - According to Forest-wide S&Gs.

Timber/Vegetative Management - Timber harvesting will not be scheduled in FORPLAN.

Unregulated timber harvesting will be designed to provide suitable conditions for winter recreation. Clearcuts are permissible to provide openings for snow play areas and visual vistas.

Firewood cutting is permissible.

Transportation System - Local and low standard roads will be located to support the winter recreation activities

Visual - Vegetation will be managed to create a pleasing variety of views to enhance the winter recreation activity.

Wildlife - According to Forest-wide S&Gs.

Management Area 14 - Oregon Cascade Recreation Area

Purpose

The Oregon Wilderness Act of 1984 created the Oregon Cascade Recreation Area. A prescription was needed which would provide guidance concerning how the area should be managed to achieve its legal mandate Within the context of the prescription, several different strategies needed to be considered regarding the level of development and to determine where motorized use could occur Strategies were also needed regarding how to manipulate vegetation to enhance recreation, improve wildlife habitat, and salvage dead and dying lodgepole pine

Goal Statement

To conserve, protect, and manage, in a substantially unmodified condition, areas for their unique character and values according to the Oregon Wilderness Act of 1984

General Theme and Objectives

This Management Area will provide an environmental setting producing the kinds of recreation experiences that are attainable in large undeveloped areas. It will provide a feeling of vastness and remoteness and will have no irreversible evidence of man It will be in a predominantly unmodified or natural state. The environmental setting includes a wide diversification of vegetation, terrain, and visible landforms.

It will be managed to provide limited social contact and interaction among visitors. Primitive facilities, such as shelters and small camps, signing, and a transportation system for visitor access and use may be established. Management will provide recreation opportunities that occur in a primitive environment, but restrictions will be less than in Wilderness areas. Motorized activities could be permitted in some areas Roads and trails could be utilized for motorized activities.

Fire Management - Generally, containment, control, and confinement are all acceptable suppression tactics, depending on the forecasted weather conditions. Normally, low impact suppression methods and natural barriers will be used.

Prescribed fire may be used to meet recreation and wildlife objectives.

Minerals and Energy Development and Leasing - The area will be withdrawn from entry or leasing on January 1, 1989.

Pest Management - Monitor pest populations so that early detection is possible. If adjacent areas are threatened, suppression techniques favoring biological control should be used if available.

Range - Grazing of domestic stock will be permitted to utilize excess forage not needed to meet wildlife objectives. Livestock will be managed to minimize conflicts with recreationists.

Recreation - The Recreation Area is zoned for the ROS Category of Semiprimitive Motorized and Semiprimitive Nonmotorized use.

Primitive facilities, constructed of native materials, may be installed to protect resources, provide for safety, and distribute recreation use.

Use of motorized vehicles will be restricted to designated roads and trails. Snowmobiling will be allowed when the depth of continuous snow cover is adequate to protect other resources from adverse impacts.

Soils and Water - According to Forest-wide S&Gs.

Special Uses - New permits for small devices and structures may be allowed where necessary for resource protection and management or visitor safety and comfort Transmission corridors are not compatible with the objectives of this area.

Timber/Vegetative Management - There will be no scheduled harvest in FORPLAN. Unregulated timber harvesting will be permitted in catastrophic situations such as fire or insect salvage. Restoration of such an area will be designed to return it to a natural state.

Timber harvesting can be used to manipulate vegetation for wildlife habitat improvement and enhance recreation opportunities

Commercial or personal use fuelwood gathering may be permitted when needed to meet recreation and wildlife objectives.

Transportation System - Trails and roads will be designed, constructed, and maintained to the minimum standard needed to achieve the goals of the Recreation Area

A limited number of helispots may be constructed where natural openings are available.

Visual - Management activities will either be subordinate to the surrounding area or not visually evident.

Wildlife - Wildlife habitat improvement should be designed to enhance the recreation experience. Created small openings, use of salt, blinds, or interpretive trails are acceptable Fish stocking and fish habitat improvement is permissible.

Management Area 15 - Old Growth

Purpose

Old growth is an issue which centers around how much and where it is distributed. Some of the other prescriptions, such as those for undeveloped recreation and spotted owls, contribute to the old growth resource. If the amount and distribution of old growth resulting from these prescriptions was not adequate, then an old growth prescription was needed to fill in the holes

Goal Statement

To provide old-growth tree stands for (1) preservation of natural genetic pools, (2) habitat for plants and wildlife species associated with overmature tree stands, and (3) contributions to the diversity spectrum.

General Theme and Objectives

Vegetation will be managed to provide mature or overmature tree stands having large trees, snags, dead downed material, and in many cases, two or more canopy levels Such stands would vary in size and be located so that a wide variety of plant communities and conditions are represented. Other Management Areas will also provide old growth.

Resource Management Criteria and Assumptions

Fire Management - In mountain hemlock, mixed conifer, and lodgepole pine, aggressive suppression will be emphasized.

In ponderosa pine, low intensity fires may be appropriate. High intensity fires will be suppressed.

Prescribed fire is not appropriate except for ponderosa pine where it may be used to maintain species and abundance of plants which would occur with fire as part of the ecosystem.

Minerals and Energy Development and Leasing - According to Forest-wide S&Gs.

Pest Management - Utilize sound pest management principles while recognizing that some level of pest activity is associated with old-growth systems. Retain as much of the old-growth character as possible during suppression.

Range - Livestock grazing is permitted at levels which maintain the desired plant composition associated with old growth.

Forage utilization will be limited to that needed to maintain indigenous plant and animal species. Exotic plants cannot be introduced.

Recreation - Developed recreation is not compatible Off-road vehicles are not permitted

This Management Area generally provides recreation opportunities for the ROS categories of Semiprimitive Nonmotorized, Semiprimitive Motorized, or Roaded-Natural

Soils and Water - According to Standards and Guidelines in the Forest Plan.

Special Uses - According to Standards and Guidelines in the Forest Plan

Timber/Vegetative Management - The timber resource is managed to retain the old growth characteristics and prolong the life of the stand

Timber harvesting is not scheduled in FORPLAN However, timber may be harvested to perpetuate or enhance old growth characteristics

Transportation System - Road and trail access will be limited to minimum-standard, intermittent use roads, or temporary roads.

Visual - This prescription will not significantly impact the visual quality. Any timber harvesting will be arranged and shaped to mitigate visual impacts.

Wildlife - Emphasis on habitat conditions will be to provide (1) large trees, (2) standing and down dead trees, and (3) in appropriate plant communities, vertical structure within stands

Management Area 16 - Experimental Forest

Purpose

The Forest has one Experimental Forest for which the primary purpose is research. A prescription was needed for the area which did not deter the research thrust but did incorporate some other resource objectives and broadened the base for research projects.

Goal Statement

To provide an area where field research activities can be conducted while considering other resource values.

General Theme and Objectives

The Pringle Falls Experimental Forest is within the Forest boundary and is administered by the Pacific Northwest Forest and Range Experiment Station The Experimental Forest serves as a field laboratory for research. Experiments are conducted to evaluate the effects of silvicultural practices on growths and yield of ponderosa and lodgepole pine. The effects of harvesting on soil moisture and other resources are also being evaluated The role of fire in natural ecosystems is being investigated.

Fire Management - Suppression should be aggressive and aimed at minimizing acres burned and trees damaged. Low impact methods should be utilized whenever possible.

Prescribed fire will be used only in conjunction with approved research projects.

Minerals and Energy Development and Leasing - According to Forest-wide S&Gs.

Pest Management - According to Forest-wide S&Gs.

Range - According to Forest-wide S&Gs

Recreation - These areas will emphasize recreation opportunities appropriate for and commensurate with Forest research including casual observation and interpretation of experimental activities, environmental education, and hunting

Generally, these recreation experiences will fall into the ROS category of Roaded-Natural.

Soils and Water - Bank erosion control using natural vegetation along the Deschutes River can be implemented.

Special Uses - According to Forest-wide S&Gs.

Timber/Vegetative Management - Timber harvesting is not scheduled in FORPLAN, but can be managed on an unregulated basis if determined as necessary by the Station Director's Reprsentative.

Transportation System - According to Forest-wide S&Gs.

Visual - Inventoried Visual Quality Objectives should be met in the foreground areas along the Deschutes River.

Wildlife - Where possible, research activities will protect active nests of raptors.

1.35 snags per acre will be left for cavity nesters.

Two dead and down logs per acre should be left after research activities are completed. Such logs should be greater than 12 inches in diameter on the small end and a minimum of 20 feet long.

Management Area 17 - Wild and Scenic Rivers

Purpose

To ensure that the values which qualified each river or stream segment for inclusion in the National Wild and Scenic River System are preserved until the management planning is completed for each designated waterway

Goal

To protect and enhance those outstandingly remarkable values that qualified segments of the Deschutes, Little Deschutes, and Metolius Rivers and Big Marsh, Crescent, and Squaw Creeks for inclusion in the National Wild and Scenic Rivers System.

General Theme and Objectives

The primary objectives will be to protect outstanding features and maintain the free-flowing characteristics of designated waterways while providing recreation settings close to Bend that feature a relatively natural environment emphasizing day use and minimal development

Mineral/Energy - According to Forest-wide S&Gs.

Pest Management - Dead and dying trees will be evaluated for their value as wildlife and fishery habitat as well as safety and disease control risks they may pose

Range - Vegetation will be managed to appear relatively natural and management will emphasize protection of riparian plant communities Grazing activity will be minimal.

Recreation - Provide for recreational experiences while not exceeding the carrying capacity, appropriately using the land, and providing access that will ensure the continued desirability of these areas

Soil and Water - According Forest-wide S&Gs.

Special Uses - According Forest-wide S&Gs.

Timber/Vegetative Management - Timber harvest was not scheduled by FORPLAN Timber harvest might take place once boundaries are agreed to Harvest that does take place will be done to enhance the scenic, recreational and/or wildlife values and not solely for the commercial value of the timber

Transportation System - OHV use will not be emphasized Future Planning will define areas that may be used. Generally, access will be limited.

Visuals - Maintain shorelines in a largely primitive and undeveloped condition to promote a natural-appearing forest environment.

Wildlife - Emphasize maintenance or enhancement of habitat for wildlife. Improvements should be natural appearing and compatible with other values of the riverine setting.

APPENDIX B
THE FOREST PLANNING MODEL

Management Area 18 - Front Country

Purpose

To provide high quality scenic views from significant viewer locations along the Three Creeks Road, from Highway 20 between Bend and Sisters, the Redmond-Sisters Highways (126), and from the Old McKenzie Highway (242) just west of Sisters.

Goal

To provide and maintain a natural appearing forested landscape on the slopes northeast of the Three Sisters and Tam MacArthur Rim while providing high and sustainable levels of timber production.

General Theme and Objectives

Provide for a visual quality standard of Partial Retention while sustaining high levels of timber production

Mineral/Energy - According to Forest-wide S&Gs.

Pest Management - Due to the pine beetle epidemic direction from the Pacific Northwest Regional Guide of May 1984 allows created openings to exceed 40 acres in Lodgepole working group.

Range - Livestock grazing will be allowed. Structural improvements will be located so they are not visible from significant viewer locations.

Recreation - New recreational development and changes to existing development are permitted as long as they are consistent with the desired visual condition. Dispersed uses such as camping and hunting will be allowed

Soil and Water - According to Forest-wide S&Gs

Special Uses - According to Forest-wide S&Gs.

Timber/Vegetative Management - There will be timber production in this Management Area but it will remain subordinate to the overall visual strength of the landscape.

In seen areas of the Front Country (previously defined under purpose), no more than 10% of a seen area can be in harvest created openings at any one time. Stands are considered an opening until trees are at least 10 feet tall on slopes less than 30 percent and 15 feet tall on slopes greater than 30%

Transportation System - Roads and landings may be visible, but will remain visually subordinate to the overall landscape seen from significant viewer locations Long-term local roads for timber access will be planned, constructed, maintained and operated to economically efficient.

Visuals - Areas not seen from the significant viewer locations will be managed using General Forest practices. Otherwise follow natural topographic features, avoid geometric shapes and straight lines to simulate natural openings

Wildlife - Habitat for wildlife will be maintained but not at the optimum levels found in some other areas

Management Area 19 - Metolius Heritage Area

Goal

To perpetuate a unique ecosystem represented by large yellow-belly ponderosa pine and spring-fed streams; one that is part of Oregon's heritage. Significant historical character is found in this area and should be perpetuated. This ecosystem is an integral part of the Metolius Basin as a whole, and should be managed with that consideration.

General Theme and Objectives

The goal of this Management Area is to provide peaceful, park-like forests of ponderosa pine and western larch in a sustained, healthy condition Generations of families have come here in search of the peace and solitude afforded by the forest beauty, to watch wildlife, and to participate in recreation activities. This historical experience will be perpetuated.

The visitor will see mature and overmature forests having large trees, snags, and dead downed material. Stands with two or more canopy levels will be seen, but will highlight the largest trees in the stands.

Recreational activities have generally been of a dispersed nature. Opportunities for participation in a broad range of outdoor recreation activities will be available. Support facilities for dispersed recreation activities, such as developed campgrounds and day use areas, may be located here in order to sustain the overall integrity of the basin.

Mineral/Energy - This Management Area is currently open to mineral entry for locatable minerals. New geothermal leases will not be granted. Existing leases for geothermal which are withdrawn or otherwise relinquished will not be reissued. No new quarries or pits for common variety materials will constructed

Pest Management - According to Forest-wide S&Gs.

Range - Grazing will be permitted but not increased

Recreation - Intensive and dispersed recreation are permitted, and will be managed to prevent degradation of the Heritage resource

Soil and Water - According to Forest-wide S&Gs.

Special Uses - Existing special uses are permitted. New special uses may be authorized if they are compatible with the objectives of this Management Area

Timber/Vegetative Management - There will be no programmed harvest in this Management Area Treatments will be designed to sustain a large-tree ponderosa pine forest.

Transportation System - Roads and trails will be managed to encourage recreation Restrictions or closures will be used to reduce conflicts with recreation activities.

Visuals - A continuous forest canopy will be maintained. Visual changes will not be noticeable to the casusal forest visitor.

Wildlife - Emphasis will be on habitat improvement for watchable wildlife and maintaining or improving fish habitat.

Management Area 20 - Metolius Wildlife/ Primitive

Goal

To protect and perpetuate a predominantly unmodified natural environment where natural ecological process can continue. To provide habitat for a wild variety of wildlife species, and to specifically maintain or enhance habitat for bald eagle and deer. To provide an opportunity for primitive dispersed recreation within this undeveloped forest environment

General Theme and Objectives

This Management Area will provide nesting and foraging areas for a variety of wildlife species. Bald eagles are known to inhabit a portion of this Management Area. Suitable nesting and foraging habitat for this species will be provided on a continuing basis. Portions of the Management Area are identified as deer winter range and key elk habitat. Species which require large expansive home ranges, such as cougar and bear are also known to inhabit the area. The predominantly unmodified character of the majority of this Management Area will provide habitat for these species.

This environmental setting will provide an opportunity for primitive recreational opportunities that are attainable in large undeveloped areas It will provide a feeling of vastness and remoteness and will have no irreversible evidence of humans. It will be in a predominantly unmodified or natural state. The environmental setting will often include a wide diversification of vegetation, terrain, and visible landform.

This area will be managed to provide limited social contact and interaction among visitors. Primitive facilities, such as shelters and small camps, signing, and a transportation system for visitor access and use may be established Management will provide

recreation opportunities that occur in a primitive environment, but restrictions will be less than in Wilderness areas

Mineral/Energy - The area is open to mineral entry for mining claims for locatable minerals. Geothermal leases will be issued with No Surface Occupancy. Seasonal operation restrictions may be placed on mining activities in pits and quarries

Pest Management - According to Forest-wide S&Gs

Range - Range management practices are allowed in this Management Area.

Recreation - Visitor use and activities will be managed to prevent degradation of the wildlife/ primitive resource

Soil and Water - According to Forest-wide S&Gs.

Special Uses - Are allowed if they do not negetively affect the wildlife values in this Management Area.

Timber/Vegetative Management - There will be no programmed harvest. Harvest will be allowed for the purpose of meeting wildlife objectives

Transportation System - Roads will be managed to promote the objectives of this Management Area

Visuals - Management activities and facilities will meet Partial Retention or a higher objective.

Wildlife - Enhancement of Bald Eagle habitat is empasized Enhancement opportunities for other wildlife may be approved if they support the wildlife values of this Management Area

Management Area 21 - Metolius Black Butte Scenic

Goal

To perpetuate the unique scenic quality of Black Butte

General Theme and Objectives

Black Butte is a unique and dominant landform in the Central Oregon landscape. The Butte is seen from many travel routes and from many residential areas throughout Central Oregon. It's dominant shape and color have been recognized by travelers and local inhabitants, dating back to pre-historic times. Landscapes in this Management Area will be managed to protect and perpetuate the unique and widely recognized appearance of Black Butte. To the casual observer, results of activities will not be evident or will be visually subordinate to the natural landscape.

Vegetation will be managed to maintain or create a continuous forest canopy of mature or overmature tree stands having large trees, and in many cases two or more canopy levels to provide for replacement trees. Where possible, the emphasis will be on perpetuating or increasing the component of ponderosa pine. Areas in which white-fir and other coniferous species are replacing ponderosa pine due to the elimination of fire, will be managed to emphasize ponderosa pine. Areas that are true mixed conifer stands will be maintained in that species composition.

A range of recreational and interpretive opportunities will be available within this Management Area.

Mineral/Energy - The area is currently open to mineral entry for mining claims for locatable minerals Geothermal leases will be issued with No Surface Occupancy Stipulations.

Pest Management - Vegetative management will emphasize the control or prevention of major insect and disease problems.

Range - Grazing is permitted Range improvements must remain subordinate to the overall strength of the landscape viewed, or designed to compliment scenic quality.

Recreation - New developments and changes to existing developments are permitted as long as they are consistent with the objectives of this Management Area.

Soil and Water - According to Forest-wide S&Gs

Special Uses - Special uses are allowed if they are compatible with other uses.

Timber/Vegetative Management - Programmed harvest is allowed to achieve the desired future condition of the area.

Transportation System - New roads will be located and designed to meet the objectives for the area. Management will emphasize creation of a pleasant visual experience.

Visuals - A continuous forest canopy will be maintained Diversity of species is desirable. Visual changes will not be noticeable to the casual forest visitor.

Wildlife - The focus will be on watchable wildlife.

Management Area 22 - Metolius Special Forest

Goal

To rehabilitate and sustain a healthy forest with an emphasis on timber production, while maintaining a near-natural appearance, and providing a range of recreational opportunities for public use and enjoyment

General Theme and Objectives

Promoting healthy and vigorous forest stand conditions will be the highest priority management goal. Timber management activities will be conducted in a manner which provides a sustained yield of wood products, while minimizing disruption of a continuous forest canopy The aim of a managed forest is to have stands in a variety of age classes with all stands utilizing the site growth potential. This is achieved through stand treatments which address forest health issues, emphasizes uneven-aged management as a preferred silvicultural treatment where appropriate, emphasizes stocking sites with ponderosa pine either by planting openings or utilizing existing large trees, and requiring reduced size of created openings.

Opportunities for dispersed recreation activities will be emphasized, particularly those associated with roads, trails, and streams. Dispersed camping is an important use of this area Developed site recreation opportunities such as camping or picnicking occur on a limited basis throughout the area Several roads within the management area provide access to the Mt Jefferson Wilderness trailheads.

Mineral/Energy - The area is generally open for mineral entry for mining claims for locatable minerals.

Pest Management - Emphasis will be prevention of damage or loss of resource production because of pests.

Range - Allotments will be managed to achieve or maintain a forage condition rating of fair or better or to the site's capability.

Recreation - Dispersed recreation is emphasized. Developed sites will be limited

Soil and Water - According to Forest-wide S&Gs

Special Uses - Permits will be allowed if they are compatible with other uses in the area

Timber/Vegetative Management - Timber harvest is scheduled in FORPLAN Uneven-aged management is preferred

Transportation System - Management will emphasize economic efficiency Selective closures will be conducted.

Visuals - The highest inventoried visual quality level will be provided unless it requires a reduction of timber outputs.

Wildlife - According to Forest-wide S&Gs.

Management Area 23 - Metolius Special Interest

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Goal

To preserve and provide interpretation of unique geological, biological, and cultural areas for education, scientific, and public enjoyment purposes

General Theme and Objectives

Unusual geological or biological sites and areas are preserved and managed for education, research, and to protect their unique character Facilities and opportunities may be provided for public interpretation and enjoyment of the unique values of these sites and areas. The primary benefiting uses of these areas will be for developed and dispersed recreation, research, and educational opportunities These areas will be designated by Regional Forester authority

The Black Butte Special Interest Area and the Castle/Cathedral Rocks Special Interest Area are included in this Management Area

Mineral/Energy - Mining must remain compatible with preserving the values of this Management Area

Pest Management - According to Forest-wide S&Gs

Range - Allotments will not be approved

Recreation - Management will emphazize prevention of degradation to the special interest resource.

Soil and Water - According to Forest-wide S&Gs

Special Uses - They may be authorized if they do not detract from the values for which this Area is managed

Timber/Vegetative Management - There will be no programmed timber harvest

Transportation System - Roads will be constructed only as needed to serve the objectives of this Management Area

Visuals - The mapped Visual Quality Objective will be met, to the extent possible.

Wildlife - Emphasis will be on habitat improvement for watchable wildlife

Management Area 24 - Metolius Research Natural Area

Goal

To preserve an example of a naturally occurring ecosystem in an unmodified condition for nonmanipulative research and education.

General Theme and Objectives

Research Natural Areas (RNAs) are managed to preserve the natural ecological succession. All Establishment Reports for these areas must be approved by the Chief of the Forest Service.

Research on the Metolius Research Natural Area must be essentially nondestructive in character; destructive analysis of vegetation is generally not allowed nor are studies requiring extensive forest floor modification or extensive soil excavation. Collection of plant and animal specimens should be restricted to the minimum necessary for provision of vouchers and other research needs and in no case to a degree which significantly reduces species population levels Such collection must also be carried out in accordance with applicable State and Federal agency regulations. In consultation with the Forest Supervisor and District Ranger, the Director of the Pacific Northwest Forest and Range Experiment Station is responsible for approving management implementation plans and for overseeing and coordinating approved research on all research natural areas. The District Ranger administers, protects, and manages the Metolius Research Natural Area and reports through the Forest Supervisor to the Station Director any planned activities on, or immediately adjacent to, Metolius Research Natural Area

The purpose of the Metolius RNA is to provide:

1. Baseline areas against which effects of human activities can be measured

2. Sites for study of natural processes in undisturbed ecosystems.

3 Gene pool preserves for all types of organisms

Mineral/Energy - The area will be withdrawn for mineral entry for mining claims.

Pest Management - Monitoring will be done to detect pest problems and action will be taken when the damage has the potential to modify ecological processes that would diminish the value of the area.

Range - Grazing may be allowed to preserve some representation of the vegetation for which the natural area was originally created

Recreation - Physical improvements such as campgrounds or buildings will not be permitted. Public uses will be allowed but not encouraged as long as they do not modify the area to the extent that such uses threaten impairment of research or educational values.

Soil and Water - According to Forest-wide S&Gs

Special Uses - They will be allowed if they support the management objectives of the Area and are approved by the Experiment Station Director and Forest Supervisor.

Timber/Vegetative Management - Timber harvesting is not allowed.

Transportation System - The system will be managed to meet the needs of the RNA

Visuals - Meet the visual quality level on the Visual Quality Map

Wildlife - According to the Regional Forester and Director of the Pacific Northwest Forest and Experiment Station.

Management Area 25 - Metolius Spotted Owl

Goal

Manage habitat to enhance the carrying capacity for Northern Spotted Owls.

General Theme and Objectives

Nesting habitat and foraging areas will be protected and enhanced. Suitable nesting sites will be provided on a continuing basis and spaced to prevent territorial competition. Old growth stands with large trees will be emphasized. Human disturbance will be minimal during the nesting season.

This Management Area contains 4 spotted owl habitat areas Ten SOHAs, which are also part of the Forest Network, are addressed in Management Area 4, Spotted Owls.

Mineral/Energy - Management will emphasize withdrawal for mineral entry, No Surface Occupancy for geothermal, and no pits or quarries.

Pest Management - Suppress forest pests when they threaten essential nesting and rearing habitat.

Range - Existing grazing will be allowed as long as it remains compatible with the primary objectives of the Spotted Owl Habitat Areas.

Recreation - Dispersed use is emphasized over developed use. Existing sites may continue to operate, but will not be expanded.

Soil and Water - According to Forest-wide S&Gs.

Special Uses - Special uses will be allowed if the spotted owl can be protected

Timber/Vegetative Management - There will be no programmed harvest.

Transportation System - The road network will be designed to facilitate easy control of access.

Visuals - Activities may be visible, but will blend in with the natural surroundings.

Wildlife - Empasize spotted owl habitat

Management Area 26 - Metolius Scenic Views

Goal

To provide Forest visitors with high quality scenery that represents the natural character of the Metolius Basin

General Theme and Objectives

Landscapes seen from selected travel routes, such as Forest Roads 12, 1230, 1234, and 1292, and visitor use areas will be managed to maintain or enhance their appearance. To the casual observer, results of activities either will not be evident or will be visually subordinate to the natural landscape.

Landscapes will be enhanced by opening views to distant peaks, unique rock forms, unusual vegetation, or other features of interest Timber harvest is permitted, but only to protect and improve the visual quality of the stands both now and in the future. Landscapes containing negative visual elements, such as skid roads, activity residue, or cable corridors, will be rehabilitated

The desired condition for ponderosa pine is to achieve and maintain visual diversity through variations of stand densities and size classes Large, old-growth pine will remain an important constituent, with trees achieving 30 inches in diameter or larger and having deeply furrowed, yellow bark characteristics

For other species, the desired condition requires obtaining visual variety through either spatial distribution of age classes and species mixes, through density manipulation, or through a mixture of age classes within a stand.

Mineral/Energy - Mineral developments may be allowed if the facilities and associated improvements are located, designed, and maintained to blend with the characteristic landscape. Geothermal leases will be issued with Conditional Surface Use restrictions.

Pest Management - Management will emphasize the control or prevention of major insect and disease problems

Range - Grazing and range improvements are permitted as long as they remain consistent with the Desired Visual Condition.

Recreation - New developments and improvements are permitted if they are consistent with the Desired Visual Condition.

Soil and Water - According to Forest-wide S&Gs.

Special Uses - They are allowed with some restrictions regarding visuals.

Timber/Vegetative Management - Timber harvest will be scheduled in FORPLAN. A mosaic of various tree sizes is desired Large-diameter, yellow-barked Ponderosa pine will be emphasized

Transportation System - New roads will be located and designed to meet the Visual Quality Objectives of the area Popular routes will be designed and maintained to enhance the Forest's scenic qualities

Visuals - This resource will be the main emphasis of management in the area.

Wildlife - The focus will be on watchable wildlife. Improvements must be consistent with the Desired Visual Condition.

Management Area 27 - Metolius Old Growth

Goal

To provide naturally evolved old growth forest ecosystems for (1) habitat for plant and animal species associated with old growth forest ecosystems, (2) representations of landscape ecology, and (3) public enjoyment of large, old-tree environments.

This Management Area will also contribute to the biodiversity of the Forest.

General Theme and Objectives

This old growth forest will be managed to provide (1) large trees, (2) abundant standing and downed dead trees, (3) single canopy old growth stands, and where appropriate (4) vertical structure (multiple vegetative canopy heights).

Two old growth stands are included in this Management Area. The Lower Black Butte Old Growth Area will emphasize the scenic and social value of Ponderosa pine old growth. The Glaze Meadow Old Growth Area is identified as part of the Forest-wide network of old growth areas designated to be managed for the habitat requirements of indicator species, and will therefore emphasize the wildlife values associated with ponderosa pine old growth as a primary objective. Because the Glaze Meadow Old Growth area is larger than required for the indicator species network, a secondary objective will be management for the scenic and social values of Ponderosa pine old growth, where they do not conflict or interfere with the wildlife values

Mineral/Energy - The area is open to mineral entry. Geothermal leases will be issued with No Surface Occupancy Stipulations.

Pest Management - Pests normally associated with old growth ecosystems will be monitored to prevent unacceptable damage to adjacent areas.

Range - Grazing is generally not compatible with old growth areas. Vegetative manipulation is restricted.

Recreation - Concentrated activity is not compatible with the area. Dispersed use is generally accepted.

Soil and Water - According to Forest-wide S&Gs.

Special Uses - They may be authorized if they do not detract from the values of the Management Area.

Timber/Vegetative Management - There will be no programmed harvest or wood removal during this planning period unless it is done to perpetuate or enhance old growth characteristics.

Transportation System - New roads will be discouraged. Some roads will be closed.

Visuals - Management activities will meet or exceed the inventoried visual quality objective.

Wildlife - Snag levels will be maintained at high levels. Dead, down trees will be managed to maximize biological diversity.

Management Area 28 - Metolius Wild and Scenic River

Goal

To protect and enhance those outstandingly remarkable values that qualified segments of the Metolius River for inclusion in the National Wild and Scenic Rivers system

General Theme and Objectives

The following S&Gs will ensure that the values which qualified the river for inclusion in the National Wild and Scenic River System are preserved until the management planning is completed for the Metolius River. These S&Gs will serve as interim management direction, in conjunction with current interim management direction provided through Regional Policy, until the formal river corridor management plan is completed and the Forest Land and Resource Management Plan is amended to include the appropriate direction

The primary objectives for managing waterways which are components of the National Wild and Scenic Rivers System will be to protect the outstandingly remarkable values identified for the river and maintaining the free-flowing nature of the river. The difference between a wild, scenic, or recreational section of river is measured by the degree of development, appropriate types of land use and ease of accessibility by roads and trails.

Mineral/Energy - Activities may be allowed if conducted in a manner that minimizes surface disturbance, sedimentation and pollution, and visual impairment.

Pest Management - According to Forest-wide S&Gs

Range - According to Forest-wide S&Gs

Recreation - Some types of development are allowed Management varies depending on the river classification.

Soil and Water - According to Forest-wide S&Gs and river classification

Special Uses - Restrictions apply depending on the river classification.

Timber/Vegetative Management - Activities will be confined to those which protect the immediate river environment, and it outstandingly remarkable resource values.

Transportation System - Motorized travel on land or water may be permitted, prohibited or restricted as necessary to protect the identified river values

Visuals - According to Forest-wide S&Gs.

Wildlife - The emphasis will be on maintenance or enhancement of habitat of for watchable wildlife especially in the riparian zone. Improvements should be natural appearing and be compatible with other important values of the riverine setting

DEVELOPMENT OF TIMBER OPTIONS

Introduction

The section above describes the twenty-eight Management Areas and their associated prescriptions It also discussed the relationship between the Management Area Prescriptions and the Forest-wide S&Gs This section will summarize the development of FORPLAN timber prescriptions and their relationship to the Management Area Prescriptions A more detailed documentation of the process can be found in the Forest Planning documents titled "Empirical Yield Tables" and "Managed Yield Tables," and the FORPLAN "PNV With Detail" (Stage II) analysis.

Overview of Process

Once the Management Area Prescriptions were identified which were needed to address the Planning ICOs, the ID Team determined which of them could have their objectives achieved through scheduled (regulated) timber harvesting Of the twenty-eight Management Area Prescriptions depicted above nine of them include programed timber harvesting prescriptions which were analyzed within the FORPLAN model.

1 Bald Eagles
2 Osprey
3 Deer Habitat
4. General Forest
5 Scenic Views
6. Front Country
7. Metolius Black Butte Scenic
8 Metolius Special Forest
9. Metolius Scenic Views

None of the other Management Areas required the development of harvest scheduling prescriptions for FORPLAN

Some FORPLAN terminology should probably be explained here The FORPLAN prescriptions are identified and described in terms of "management emphases" and "management intensities " In most cases, the management emphasis name in FORPLAN is the same as the Management Area Prescription name used in the DEIS and Forest Plan For example, "General Forest" is the name of a Management Area Prescription and a FORPLAN management emphasis. This is also true for the Deer Habitat, Bald Eagle Management Areas, and Metolius Special Forest However, the Scenic Views Management Area is composed of three different management emphases in FORPLAN. These are (1) Retention Foreground, (2) Partial Retention Foreground, and (3) Middleground Retention and Partial Retention. For modeling

convinience, and to keep the size of the model within physical limitations created by computer software and hardware some management area prescriptions were combined into a single management emphasis. Combinations were made in the model where it was predicted that S&Gs were similar enough to apply the same harvest prescriptions. For example, the Osprey prescription for the Osprey Management Area was modeled as partial retention, seen areas of the Front Country Management Area were assigned the same prescriptions as middleground partial retention, and Metolius Black Butte Scenic Views Management Area was modeled as retention The list below depicts these relationships

Figure B-2

Management Area	Management Emphasis [1]	Emphasis Abbreviation
General Forest	General Forest	GF
Scenic Views	Middleground (R & PR) Retention Foreground Partial Ret. Foreground	MD RR PR
Deer Habitat	Deer Habitat	WR
Bald Eagles	Threataned & Endangered	TE
Osprey	Partial Retention Frgnd.	PR
Front Country (seen areas)	Middleground (R. & P.R.)	MD
Metolius Black Butte Scenic	Retention Foreground	RR
Metolius Special Forest	Metolius Special Forest	SF
Metolius Scenic Views	Retention Forground Partial Retention Forgr. Middleground (R & P.R.)	RR PR MD

[1] Both even-aged and uneven-aged harvest methods were available for timber prescriptions.

The silvicultural options that were developed for each of these management emphases are referred to as "management intensities" in FORPLAN. They reflect the different combinations of practices, and the different timing choices for implementing those practices. In essence, they represent alternative investment levels in timber management to achieve the objectives of a management area. The list below depicts some of the management practice terms we will use to help describe the various management intensities considered for each management emphasis. Not all practices that will be implemented as part of a prescription are included in this list

Management Practices--Practice Abbreviation

Natural Regeneration--NR
Plant--PLT
Precommercial Thin--PCT
Commercial Thinning--CT
Overstory Removal--OR
Shelterwood--SW

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Final Harvest (Clearcut or Shelterwood)--FH
Final Harvest (Individual Tree Selection)--IT
Final Harvest (Group Selection)--GS

The next step was to develop and analyze a range of silvicultural prescriptions for each working group and management area combination This included the development of both empirical and managed yield tables. The empirical yield tables are used to portray alternative silvicultural treatment options for existing mature and immature stands They are called empirical because they are based on actual average stand conditions. The managed yield tables apply both to future managed stands which result from the regeneration harvesting of existing natural stands The silvicultural prescriptions and their associated yield tables were developed based on the silvicultural characteristics of each working group and the stand management objectives for each individual Management Area

Once the vegetative management objectives were identified for each Management Area, the appropriate ID Team members would work together to develop a range of harvest scheduling options The overriding criteria in this process was that the silvicultural prescription and its associated yield table achieve the vegetative management objectives for the Management Area. However, other criteria were also considered. One of them was that a range of scheduling timing choices, rotation ages, and investment levels were examined, and whenever possible made available to the FORPLAN model. For example, the Model was given seven different silvicultural regimes to choose from when deciding how to manage lodgepole pine plantations in the General Forest Management Area Each had different schedules of silvicultural practices, spacing arrangements, and rotation lengths. All of them achieved the intent of the General Forest Management Area

However, in some cases it was necessary to reduce the number of prescriptions included in the Model in order to keep it within acceptable size limits. For this purpose, the range of available prescriptions for a particular management area were examined. Present net values (or soil expectation values for managed stands) were calculated for each. Those which were less efficient and/or did not contribute significantly to the range of reasonable harvesting options were dropped

Finally, there were situations in which the vegetative management objectives for a Management Prescription were so specific that the range of silvicultural regimes that could achieve those objectives was very limited.

YIELD TABLE DEVELOPMENT

Yield tables are necessary in the Forest planning process to provide the basis for estimating timber harvest levels and the stand conditions which may result from implementation of management alternatives and application of various silvicultural practices

Two sets of yield tables were developed to analyze the various silvicultural management intensities modeled in FORPLAN The first set is referred to as "Empirical Yield Tables" They are based upon projecting the data collected from existing forest stands. The other set is referred to as "Managed Yield Tables". These tables apply to future stands which occur after an existing stand receives a final harvest

New yield tables were developed for the Final Environmental Impact Statement alternatives. The procedures, results, and documentation are described in this section There were several reasons for the need to develop new and additional yield data for analyzing final plan alternatives

1 New data became available from a 1985 forest inventory after the 1986 Draft Environmental Impact Statement (DEIS) was published. The empirical yield tables developed for the DEIS were based upon plot data collected in the 1971 Continuous Forest Inventory. Forest stand conditions since that inventory have significantly been altered by both management activities and forest insects and diseases

2. The Deschutes National Forest's ability to more accurately predict the affects of forest pests on future yields was greatly improved

after the DEIS was prepared The development of computer models that simulated pest activity during stand projection also provided the Forest with another tool for the refinement of its silvicultural prescriptions

3. New yield tables were created to respond to specific public comments on the DEIS. For example, the DEIS contained only even-age management alternatives, whereas the Final Environmental Impact Statement required estimation and analysis of both even-aged and uneven-aged management alternatives.

4 The availability of new computer programs and field data provided the Forest with the tools to re-examine the yield table adjustments made in the DEIS.

Yield table development is accomplished through the use of computer models. Data from forest surveys are used in the models to project yields resulting from various silvicultural treatments The forest stand projection model employed is briefly described below. The reader is referred to the references cited for more detailed information

The Forest employed the Stand PROGNOSIS Model (Stage, 1973) to construct the new empirical and managed yield tables The Stand PROGNOSIS Model is a computer program that projects the development of forest stands Thinning options allow for simulation of a variety of management strategies. Input consists of a stand inventory, including sample tree records, and a set of option selection instructions. Output includes data normally found in the stand, stock, and yield tables and details on selected sample trees. PROGNOSIS facilitates the estimate of stand growth and forest yields, which is one of the primary bases for comparison of alternatives and eventual investments in silviculture (Wykoff, et al, 1982).

PROGNOSIS is an individual tree, distance independent growth and yield model which was developed for use in the Inland Empire area of Idaho and Montana. New "variants" of PROGNOSIS result when Stage's 1973 model is calibrated for different geographic areas. Geographic variants of PROGNOSIS have been developed for many areas in the western United States.

A PROGNOSIS variant was developed to be specific to south central Oregon and northeastern California forest vegetation (Johnson, et al, 1986). The variant, referred to as SORNEC, is applicable to a variety of local species, forest types and stand structures. Local data from forest inventory, benchmark plantations, and spacing studies on the Deschutes National Forest, et al, were used to develop the SORNEC variant (op.cit 3 p).

PROGNOSIS/SORNEC is an individual tree model as compared to stand models. The DEIS utilized stand models for yield calculations. Individual tree models have advantages in that they better represent the inventory data upon which they are based and rely less on averaging than do stand models. In SORNEC, localized data was used to construct growth and yield relationships. In addition, the model includes methods for predictions on growth, mortality, forest pest effects (most notably root rot and mountain pine beetle), and potential to compare management strategies on forest stands with a wide selection of output comparisons possible. The individual tree model is also essential in the determination of yield for uneven-age management where the implications of tree diameter and species at the time of harvest for stand type on yield must be evaluated.

EMPIRICAL YIELD TABLES

The data used to create empirical yield tables is obtained through surveys and actual field measurements A brief summary of some of the kinds of sampling data and surveys which were utilized is briefly outlined below.

A "Vegetation Resource Survey" (VRS) was conducted in 1985 which involved establishments of new plots as well as resurvey of the "Continuous Forest Inventory" plots established in 1971 (USDA Forest Service, 1985).

Forest stand types were mapped from aerial photos prior to the gathering of field data. Stand mapping stratified the forest into four major working groups: 1) ponderosa pine, 2) lodgepole pine, 3) mixed conifer, and 4) mountain hemlock. Further stratification within the working groups was done based

upon stand characteristics, such as: age, canopy structure, and the presence of understory. These stratifications are referred to later as "model components"

Stand examination and stocking survey information were used to describe the stand conditions occurring on the seedling and sapling model components which were not sampled in the 1985 survey. Further discussion may be found in the planning records, Empirical Data - District Input on Seedling and Sapling Stands, November, 1989

Plant Associations of the Central Oregon Pumice Zone (Volland, 1988) provided ecological data needed for the development of stockability. The plant association guide also furnished the site index values used in the yield table development. Much of the field sampling conducted prior to publication of the guide was conducted on or near the Deschutes National Forest.

Description of the Model Components

Each vegetative condition or model component is identified using a four digit code. The first two digits identify the stand characteristics while the last two digits identify the working group or species composition. The following matrix identifies the coding used to stratify the the Forest's timber types

Figure B-3 DESCHUTES STRATIFICATION MODEL

Stand Characteristic		Working Groups									
Description	#	Ponderosa Pine-PP			Lodgepole Pine-LP			Mixed Conifer-MC			Mt. Hemlock-MH
Under-productive	01	0101	0102	0103	0104	0105	0106	0107	0108	0109	0110
Single-storied seedlings, saplings low stocking	02	0201	0202	0203	0204	0205	0206	0207	0208	0209	0210
Single-storied seedlings, saplings medium or high stocking	03	0301	0302	0303	0304	0305	0306	0307	0308	0309	0310
Single-storied immature poles, medium or high stocking	04	0401	0402	0403	0404	0405	0406	0407	0408	0409	0410
Single-storied immature small sawtimber	05	0501	0502	0503	0504	0505	0506	0507	0508	0509	0510
Single-storied mature and overmature small sawtimber	06	0601	0602	0603	0604	0605	0606	0607	0608	0609	0610
Single-storied large sawtimber	07	0701	0702	0703	0704	0705	0706	0707	0708	0709	0710
Multi-storied nonviable understory	08	0801	0802	0803	0804	0805	0806	0807	0808	0809	0810
Multi-storied viable understory	09	0901	0902	0903	0904	0905	0906	0907	0908	0909	0910

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Each block in the preceding matrix is referred to as a model component. A collapsed model component occurs when three model components share a common working group and stand description (e.g., 0401, 0402, 0403 combined make up the collapsed model component for pole-sized stands of ponderosa pine).

The preceding stratification served as the basis for empirical yield table development. The sampling design for the 1985 Vegetative Resource Survey (VRS) was based on the collapsed model components. The VRS sampled pole-sized and larger model components (04's and greater) as well as the under-productive lodgepole pine component (0104-0106). Stand examination and stocking survey information was used to describe the stand conditions occurring on the other under-productive working groups and on the seedling and sapling model components (02's and 03's). The following table summarizes some of the stand attributes in the collapsed model components.

Figure B-4 **MODEL COMPONENT COMPARISON**

Description - Work.Group	Collapsed Model Component	Acres 1/	Volume 2/	TPA 3/	BA 4/	Percent Species Composition PP	LP	Other Pine	DF	TF	MH	Other Spec
Under-productive												
-PP	0101-0103	11,800	5	96	13	100						
-LP	0104-0106	18,700	650	1,896	62	10	88			2		
-MC	0107-0109	4,700	0	672	34	17	68			15		
-MH	0110	2,800	- - - - - - - - - -			NO	DATA	- - - - - - - - - -				
Seedling and Sapling - Low Stocking												
-PP	0201-0203	74,900	0	192	4	97	2			1		
-LP	0204-0206	43,100	0	626	5	6	94					
-MC	0207-0209	4,900	0	483	4	33			33	34		
-MH	0210	2,800	0	374								
Seedling and Sapling - Medium to High Stocking												
-PP	0301-0303	10,900	0	253	3	87	13					
-LP	0304-0306	16,800	0	1,032	26	5	95					
-MC	0307-0309	1,400	0	573	9	33	33		34			
-MH	0310	1,300										
Immature Pole Stands												
-PP	0401-0403	57,900	1,141	68	55	79	12	1	6	2	0	1
-LP	0404-0406	128,300	1,263	95	52	8	78	2	0	8	3	1
-MC	0407-0409	24,100	2,982	105	104	14	16	2	9	20	11	27
-MH	0410	9,700	- - - - - -		- -	NO	PLOTS	- - - - - - - - - -				
Immature Small Sawlog Stands												
-PP	0501-0503	47,700	1,284	53	54	75	20	0	0	4	0	1
-LP	0504-0506	20,200	1,964	115	75	7	77	0	0	15	1	0
-MC	0507-0509	23,300	3,032	123	112	17	22	6	8	42	2	4
-MH	0510	12,500	3,835	117	144	0	7	4	0	31	58	0
Mature Small Sawlog Stands												
-PP	0601-0603	10,500	1 901	45	63	78	18	2	1	0	0	0
-LP	0604-0606	34,600	1,670	99	63	18	80	0	0	1	0	0
-MC	0607-0609	14,500	3,727	133	136	13	25	3	2	27	32	0
-MH	0610	25,900	7,515	127	260	0	3	3	0	4	90	0
Mature Large Sawlog Stands												
-PP	0701-0703	10,400	1,862	42	64	88	7	0	1	5	0	0
-LP	0704-0706	800	- - - - - - - -		- -	NO	PLOTS	- - -	- - - - - - - - -			
-MC	0707-0709	10 000	3,967	85	127	29	4	2	21	27	14	2
-MH	0710	5,600	7,419	132	261	0	0	0	0	1	99	0
Multi-storied Stands with Nonviable Understory												
-PP	0801-0803	14,800	2,178	69	74	70	27	0	0	4	0	0
-LP	0804-0806	5,500	1,682	93	67	55	38	1	0	6	0	0
-MC	0807-0809	4,500	4,312	98	134	28	5	3	31	28	2	4
-MH	0810	2 500	6,854	123	221	0	3	3	19	29	42	4
Multi-storied Stands with Viable Understory												
-PP	0901-0903	194,200	1,904	52	66	79	12	1	2	5	0	0
-LP	0904-0906	69,600	1,900	94	70	37	54	0	0	4	2	3
-MC	0907-0909	123,100	3,363	94	115	20	8	6	27	20	17	3
-MH	0910	11,700	4,518	126	172	0	5	4	0	10	82	0

1/ These acreage estimates exclude Wilderness and the Oregon Cascade Recreation Area, but do include other designations which do not involve scheduled timber harvesting. Also included are acres unsuitable for timber management due to regeneration difficulties These acreage figures are shown only to provide a relative measure of the significance of each model component.

2/ Volume is shown in merchantable cubic feet per acre in 1985 for all live trees. Merchantability standards are based on 9" diameter at breast height (DBH) to a 6" top utilization standard for all species except lodgepole pine where 7" DBH to a 4" top utilization standard applies

3/ TPA is trees per acre.

4/ BA is basal area per acre measured in square feet.

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Calibration of Model

Height growth, maximum stand density, and volume equations within PROGNOSIS/SORNEC model were calibrated to match empirical data specific to the Deschutes National Forest prior to yield table development In addition, data from the Forest was used to calibrate the root rot extension and the mountain pine beetle extension included in the stand projections All calibration of the model was accomplished in conjunction with the biometricians responsible for the development of the SORNEC variant Testing and calibration of the two pest extensions was accomplished with Forest Pest Management entomologists and pathologists.

Height Growth Calibration

Height growth was calibrated by using published height and site index curves by species. The following species height growth functions were calibrated

ponderosa pine - Meyer,1938; Barrett, 1978, Barrett, 1979
Douglas-Fir - Cochran, 1979
white fir - Cochran, 1979
lodgepole pine - Dahms,1964; Alexander, et al, 1967,
mountain hemlock - Johnson, 1980; Seidel,1985; Means, 1988

Calibration of height growth was dependent in part upon the site index used as a determinant of growth potential The site indices identified for the most frequently occurring plant associations identified by the VRS were used during calibration The selection of the plant association guide to serve as the source of the site index values is described in *Empirical Yield Table Development Site Index Documentation*, Deschutes National Forest Planning records, August 26, 1988. The documentation for the height growth calibration was computer generated in 1988. These printouts exist as working papers in Deschutes National Forest Planning records.

Maximum Stocking Levels

The PROGNOSIS/SORNEC model uses maximum stand density index to determine potential maximum stocking and predict mortality. A maximum stand density index (Max SDI) was determined for each inventory plot based on its identified plant association and related growth basal area (Hall,1987) The relationship developed between growth basal area (GBA) and Max SDI was based on stocking of undisturbed VRS plots and the GBA of the plant association on those plots For more information on the derivation of Max SDI refer to the Forest's planning records.

Stand Volume Equations

Calibration of the volume equations within the PROGNOSIS/SORNEC was attained by using the same volume equations developed from the 1985 VRS within the model Volume comparison was based on gross cubic feet. Merchantable standards were 9 inch diameter at breast height (DBH) to a 6 inch top for all species except lodgepole where volumes were based upon 7 inch DBH to a 4 inch top. This calibration effort was necessary to have the initial stand volumes portrayed within PROGNOSIS match the volume per acre figures developed from the VRS. Minor differences remained after the equations were inserted in the model The PROGNOSIS volumes were later adjusted to match the VRS volumes prior to use as yield tables

Root Rot Extension Calibration

The PROGNOSIS model together with the western root disease extension, (Stage et al, 1990) was used to construct empirical and managed yield tables for working groups containing mixed conifer stands. The root disease extension (RRMOD) of PROGNOSIS was developed by root rot disease experts at a series of workshops. Details on the model development and the logic of the model can be found in Shaw et al 1985, Eav and Shaw, 1987 and McNamee et al, 1985 Detailed information on the use of PROGNOSIS model variants with the western root disease model extension, to project stands with known levels of root disease through unique management scenarios, is found in Stage *et al*, 1990.

Silvicultural harvest systems evaluated included even-aged and uneven-aged silvicultural systems Group selection cutting methods were used when uneven-aged management scenarios were project-

ed in the Mixed Conifer Working Group Individual tree selection scenarios were not simulated in these stands. Root disease, stem decay, and dwarf mistletoe impacts are typically quite severe when individual tree methods are used in mixed conifer stands containing white fir, grand fir, and Douglas-fir (Petersen, 1989; Schmitt, 1984; Hadfield et al, 1986, Goheen and Hagle, 1988; Filip and Goheen, 1984, Filip and Goheen, 1982, Goheen and Filip, 1980; Lane and Goheen, 1979; Filip and Schmitt, 1979; Schmitt, Goheen, Hessburg, and Gregg, 1990; Goheen and Goheen, 1989). Group selection methods, in contrast, provide a *nearly full set of silvicultural tools to promote tree* species that are resistant to root disease, stem decay, and dwarf mistletoe

Recent analyses of partially harvested mixed conifer stands on the Sisters Ranger District indicated *that yields may be reduced by 30 to 40 percent* or more over one rotation when initial stump infection levels by *Heterobasidion annosum* are as low as 2-percent and individual tree selection methods are used (Petersen, 1989). However, when mixed conifer stands with low, moderate, or high initial levels of root disease (2, 5-10, and 20 percent, respectively,) are regenerated with disease resistant tree species, severe impact of root disease is ameliorated and a broader range of cutting methods may be implemented in subsequent rotations.

Based on these assumptions, several silvicultural strategies were modelled within the mixed conifer collapsed model components to refine the modeling of specific cutting methods and associated levels of root disease damage.

The 1985 Vegetative Resource Survey on the Deschutes National Forest was not designed to accurately measure the distribution or severity of root disease in mixed conifer stands. Other substitute comprehensive inventories of pest damages on the Forest were also lacking. Therefore, estimates of incidence and severity were distilled from 15 years of field observations by Forest Pest Management (FPM) pathologists in Deschutes stands and those of adjacent Forests. *Estimates were also partly based on sensitivity* analyses (Hessburg, Goheen, and Gregg, FPM) using the SORNEC variant of PROGNOSIS with the western root disease extension, some recent stand exam data, and inferences drawn from biological evaluations written over the years by pest managmement specialists (Filip, 1980, Schmitt and Goheen, 1983; Schmitt and Kanaskie, 1982; Filip and Schmitt, 1978; Filip and Aho, 1978; Filip, 1983; Schmitt et al, 1984; Filip, 1977, copies of unpublished biological evaluations on file in the Pacific Northwest Regional Office-FPM). The root rot modeling assumptions came from these sources about the present level and distribution of root disease in the mixed conifer stands on the Deschutes.

The root disease extension has the capacity to simulate both the effects of Armillaria and Phellinus; equations for Annosus root disease have not been developed (Stage et al 1990). The Phellinus option was used to build the yield tables because *simultaneous infestation by more than one root* disease is not yet possible with the model in its current form Since FPM pathologists at the time of the request for assistance had most experience with running Phellinus in stand projections, and Phellinus produced impacts representative of damage by most root diseases, it was chosen for the root disease impact projections. The proportion of the area of the "average" stand affected by root disease (10%) is assumed to be an estimate of area for all root diseases combined.

Accuracy of impact projections generated by PROGNOSIS/RRMOD was evaluated by FPM pathologists. Yield summary outputs were compared with data from several stand exams where root disease severity was comparable and height and diameter growth, age, and volume were reported for root diseased and non-diseased portions of the stand tables. Comparisons were based on professional judgement derived from field experience on the Forest by the pathologists. Further discussion concerning the Forest's use of the Root Rot Extension is on file in the planning records.

Mountain Pine Beetle Extension Calibration

The Mountain pine beetle (*Dendroctonus ponderosae Hopk*) *is a major pest in lodgepole pine* The Forest's lodgepole stands have been subject to widespread mountain pine beetle caused

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mortality during the past decade. The Forest evaluated future mountain pine beetle impacts to increase the accuracy of its growth and yield predictions Cole and McGregor (1983) described a predictive deterministic computer model which estimates annual tree and volume losses and longevity of infestation based on existing stand conditions This model is linked to PROGNOSIS and was used to address potential impacts of the mountain pine beetle

The mountain pine beetle model was originally calibrated with data from the Intermountain region of the United States. It was necessary to check the calibration and validation of the mountain pine beetle when applied to central Oregon. This task was completed by the Methods Application Group, Quantitative Techniques Program, USDA Forest Service Forest Pest Management, in Ft. Collins, Colorado The estimated correlation was 1 0, .90, .85, .84, and 84 for numbers of trees, basal area, and total, merchantable, and net volumes respectively when model estimates were compared with observations from the 1985 VRS (Gillespie, et al, 1990)

Comparisons Between VRS Plots and Prognosis Projections

The PROGNOSIS model is periodically updated as new information becomes available These updates often affect past calibration efforts, so the PROGNOSIS/SORNEC model used in calibration was retained for the Forest's exclusive use for yield projections.

Comparisons between VRS plot data and PROGNOSIS projections of the collapsed model components were made prior to yield table development Comparisons were based on ranges of basal area, average dominant heights, decadal growth, and cubic foot volumes observed in the plots with those same parameters when their highest values were observed during PROGNOSIS modeling The comparisons were made with and without use of the root rot and mountain pine beetle extensions. When both extensions were employed, PROGNOSIS results depict stand growth over time that appear to be realistic and is supported to a significant extent by empirical plot observations.

Pooling of Inventory Plot Data

Initially, the Forest had pursued the development of empirical yield tables by modeling individual VRS plots through the PROGNOSIS model. The output files from sets of individual plots were then averaged to project the future conditions on a collapsed model component basis Running PROGNOSIS on individual plots across a collapsed model component had drawbacks, most notably high costs and modeling inefficiencies. The costs incurred were a result of the large amount of computer processing time required and the inefficiencies encountered with handling extremely large runstreams and output files. The modeling inefficiencies were caused by having only one set of modeling parameters available to deal with the variability encountered in the plots across a collapsed model component.

In May, 1989, the Forest in concurrence with Regional Office and Washington Office staff decided to pool similar plots within a collapsed model component prior to submitting them for PROGNOSIS projection The objectives of pooling plots were as follows:

Attain greater efficiency in conducting PROGNOSIS projections,

Maintain a high degree of the measured variability from the VRS,

Reduce the costs of the PROGNOSIS projections,

Maintain the statistical validity of the inventory by pooling from within the collapsed model components

Pooling of plot data was accomplished based similar tree species composition, susceptibility to forest pests and levels of potential productivity. Similarity in tree species composition and susceptibility to forest pests was checked by referring to the plot data collected in the VRS Plot productivity was determined from the plant association identified at each plot location. Bill Hopkins, Area Ecologist, for the Deschutes, Ochoco, Winema and Fremont National Forests, had previously grouped the plant associations based on similar

productivity index values and forest types (i.e ponderosa pine, lodgepole, and mixed conifer). This grouping of plant associations served as the basis upon which VRS plots were pooled. Additional pooling was accomplished by grouping similar pools after PROGNOSIS projection. The following productivity pools were established from the VRS: three productivity pools were identified within the Ponderosa Pine Forest Type, three pools were identified within the Lodgepole Pine forest type, two pools were identified within the Mixed Conifer forest type and one pool was identified for the Mountain Hemlock forest type.

These pooled plots were then modeled separately by PROGNOSIS using the appropriate pest extensions, e.g., the mountain pine beetle extension with lodgepole pools and the root rot extensions within the mixed conifer pools After PROGNOSIS projection, the pool outputs were merged back to the collapsed model component basis. This process is further described in the following section Additional information on the rationale and procedures for pooling is contained in planning records, 1989, *Combination of Inventory Plots Empirical Yield Table Development*

Event monitor/"hardwiring"

Extensive use of the Event Monitor (Crookston, 1985) occurred within PROGNOSIS modeling for yield table development. For example, a number of stand conditions were specified within the Event Monitor to identify situations when harvests would be appropriate within a particular stand (pool of inventory plots) and management areas The resulting harvest entry cycle predicted by PROGNOSIS often varied between pools within the same collapsed model component. This resulted in merged yield tables for a collapsed model component that were difficult to use within the FORPLAN model (primarily with economic analysis) and to conceptualize in practice. Therefore, use of the Event Monitor in modeling each pool was dropped Instead, the Event Monitor was used to predict the harvests that occurred in the pool that contained the most plots within each model component. Once the timing of the harvests was identified for the major pool, then this became the timing for all harvest entries within the PROGNOSIS runs for the minor pools. This step was referred to as "hardwiring". The output tables from these separate model runs were merged to predict stand development for the entire collapsed model component. The merged tables utilized weighted average values based upon the number of inventory plots within the pool.

Range of Timber Management Options Considered

The DEIS yield tables were based on an even-aged silvicultural system and the intensity of management and length of rotation was based upon the objectives of the management area. The silvicultural prescriptions and resulting yield tables developed between the 1986 draft and the 1990 final Forest Plan are based upon both even-aged and uneven-aged silvicultural systems. The selection of harvest cutting methods within each working group and management area is further described in Appendix G.

Even-aged Prescription Development

Even-aged silvicultural scenarios were developed by analyzing various thinning regimes The following discussion relates specifically to intensive timber management on lands without special constraints for other resource emphasis.

Possible thinning regimes were examined for the medium and high site immature pools. Successive iterations of Prognosis modeling were used to search for the regimes that would maximize the cubic volume MAI per acre. Recently developed stocking level curves for ponderosa and lodgepole pine were used to identify upper stocking limits (Cochran, 1990) The stocking level curves are based upon tree vigor and its relationship to attacks by mountain pine beetle

A number of constraints and variables need to be considered in the selection of rotation lengths and thinning regimes. It is Forest Service policy to manage the National Forests for sawtimber size and quality trees (FSM 2420.3). The Pacific Northwest Region has recommended a target tree size at final harvest of 17 inches DBH. This is not a fixed constraint, but rather a goal to strive for along with consideration of other variables and objectives. Another consideration is the

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constraint placed on early harvests by Congress The National Forest Management Act of 1976 requires that, "prior to harvest, stands of trees throughout the National Forest System shall generally have reached the culmination of mean annual increment of growth " Generally, as used here, is interpreted to mean approaching culmination, or 95 percent of culmination (FSM 2412.54). It is also important to relate the projected harvest regimes to the Forest-wide picture in terms of available timber, age distribution, and harvest scheduling. The major constraint used to limit early or uneconomical commercial thinnings was in minimum harvest volume of 1000 board feet per acre Tables to represent the short rotation were made in addition to the longer regimes with higher MAI so the full range will be available for the Forest-wide analysis.

The interrelationships of tree size and the age at culmination of mean annual increment (CMAI) with the number and timing of commercial thinnings are key elements in the development of regimes to provide the best solution to the Forest scheduling problem. Thinning will increase the tree size, but also extends the CMAI creating a longer minimum rotation length. The effect of the thinning volume on the harvest level will generally not offset the volume falldown created by extending the rotation.

Uneven-aged Prescription Development

Uneven-aged management is the Deschutes National Forest's response to public input received during review of the Forest's 1986 Draft Environmental Impact Statement and Proposed Land and Resource Management Plan. Several comments were received that expressed concern over the Forest's widespread reliance upon even-aged management. Several respondents also expressed the desire to see the forest managed for large diameter trees, particularly old yellow-bark ponderosa pine After reviewing the comments received, the Deschutes revised it's silvicultural strategy to increase the use of uneven-aged management. The major objectives of uneven-aged management on the Forest were identified as:

- Maintain three or more canopy levels including large diameter ponderosa pine.

- Maintain forest stands of good health and vigor Harvests will emphasize removal of high risk, poor quality trees as opposed to their retention simply to fill a need in the desired diameter distribution.

- Overall stocking level control in all tree sizes will be attained with each silvicultural entry.

- Natural regeneration will be favored when reforestation is part of the silvicultural prescription

- Silvicultural treatments will be designed to maintain or improve the existing stand diversity and uneven-aged structure. Emphasis, however, would be given to managing the existing growing stock rather than cutting against it to create the ultimately desired uneven-aged diameter distribution during the initial harvest entries.

Primary constraints to uneven-aged management include. steep slopes, compactable soils, and existing forest stand health problems (e g. dwarf mistletoe, root rots, etc) Given these constraints, about three quarters of the Forest's ponderosa pine and 30 percent of its mixed conifer stands were considered appropriate for uneven-aged management.

Major considerations in the development of uneven-aged management strategies included: existing stand structure, productive capability, potential insect and disease problems, management standards and guidelines, and economic feasibility. Uneven-aged cutting methods were varied by major tree species and management area. Individual-tree selection was modeled in ponderosa pine on lands managed to emphasize timber production, provide scenic views, and provide habitat for osprey and bald eagle. Individual-tree selection cutting is the removal of trees in several or all diameter classes on an individual tree basis. The ultimate objective is to provide a stand of trees of different sizes and age classes intermingled on the same site. Group selection cutting was modeled in mixed conifer stands in all management areas where timber harvests are scheduled and in ponderosa pine stands occurring in lands managed to provide optimum deer habitat. In group selection cutting,

tree groups ranging in size from a fraction of an acre up to 2 acres are removed Group selection was favored in the mixed conifer stands to maintain or enhance the distribution of intolerant trees Group selection was favored for ponderosa in deer transition ranges to provide islands of big game cover

The following is a summarization of the management strategies modeled by major species working group and management area

Ponderosa Pine

Individual tree selection to attain an uneven-aged stand structure was modeled by managing the existing stands toward a target diameter distribution. The target distribution of diameter classes was determined by a "q-value" of 1.2, an identified maximum tree diameter (varied by management area), and a desired residual stand basal area Q-value refers to the ratio between the numbers of trees in succeeding diameter classes Q-values between 1.2 and 1.4 are recommended for ponderosa pine (Alexander, 1986) and the lower the Q-value, the more large trees are retained The maximum tree size used to determine target diameter distribution is 24 inches diameter at breast height (DBH) within stands where timber production is emphasized (General Forest) and 36 inches DBH within areas managed for scenic views (Retention Foreground and Partial Retention Foreground) and those managed to provide osprey and bald eagle habitat Silvicultural treatments were scheduled only when the gross volume harvested (merchantable-sized) exceeded 1500 board feet per acre

The target basal area was varied by existing stand structure and ranged from 70 to 100 square feet per acre The majority of the Forest's multi-story ponderosa pine have a surplus of large diameter trees (24"+ DBH) but a deficit in the mid-sized diameter classes (12"-24" DBH) when compared with the uneven-aged target diameter distribution Modeling uneven-aged management within this stand structure was accomplished by removing various amounts of the surplus large trees based on the stand's existing stocking. In General Forest, if the stand's basal area was 110 square feet or more, a third of the surplus trees were removed. If the basal area was 100 to 110 square feet, then a quarter of the surplus trees were removed. And if the stand's basal area was less than 100 square feet, 10 percent of the surplus large trees were harvested (the ten percent removal in these stands is similiar to sanitation/salvage type harvest in that the cutting cycle is approximately 20 years in length). This modeling approach was designed to meter out the removal of the surplus large trees through time while not removing those which contribute significantly to the stands stocking.

A different approach toward management of the surplus large trees was modeled in the areas managed for scenic views and bald eagle and osprey habitat. In areas managed for Retention Foreground and Bald Eagle Habitat, five percent of the surplus large trees (trees over the maximum tree size) were removed per harvest entry. During the first hundred years of the stand projection, a tree size of 24 inches was used to determine the target diameter distribution and surplus tree size. Between years 100 and 140, the tree size was increased to 30" DBH After year 140, the tree size was increased to 36" DBH. A different set of timeframes were modeled in Partial Retention and Osprey Habitat areas. A 24" DBH tree size was used for the first 40 years, 30" DBH in years 40 to 120, and 36" DBH after year 120. Within these two management areas, ten percent of surplus large trees were removed per harvest entry These approaches were designed in conjunction with landscape architects to gradually increase the number of large trees through time Ingrowth into these diameter classes exceed the removal rate while eventually attaining uneven-aged diameter distribution.

In all of the ponderosa pine stands managed toward an uneven-aged stand structure, management of tree size classes less than the maximum tree diameter is accomplished during each harvest entry through a combination of commercial and precommercial thinning when surplus stocking occurs within a diameter class. The diameter classes used in modeling are: 1.0-4.9" DBH, 5 0-10 9" DBH, 11.0-18 9" DBH, 19.0-24.9" DBH, and (if needed) 25.0-30.9" DBH and 31.0-36.9" DBH. Surpluses are determined by comparison with the levels identified for each diameter class in the target diameter distribution

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Reforestation is simulated if the crown competiton factor is 85 or less in the residual stand as a result of timber harvest Crown competition factor is a measure of stand density and was used in modeling to determine if suitable conditions existed in the post-harvest stands for potential reforestation. Species composition of the reforestation consisted of ponderosa and lodgepole pine

Group selection in ponderosa pine is modeled only for areas managed to provide optimum big game habitat Individual tree selection harvests result in tree stocking levels that did not meet the Forests definition of acceptable cover. Group selection, however, with limited entry into the regenerated stand provides acceptable cover conditions for extended periods of time. The management of the regenerated stands includes precommercial thinning and may or may not include a later commercial thin. The rotation length of the groups is 160 years. By that time they have attained an average diameter of 24 to 26 inches DBH.

Mixed Conifer

The Forest's mixed conifer stands host a wide variety of pathogens, often occur on steep slopes, and generally have understories that are questionable in terms of potential for future management For these reasons, uneven-aged management within the Forest's mixed conifer stands is not applicable in a majority of the forest type. Modeling uneven-aged management is based on a group selection harvesting scenario. Harvested groups are two acres in size Reforestation will generally be by planting and will favor ponderosa pine. The rotation lengths of the regenerated stands varies by management area. In the General Forest, the rotation length is 80 to 110 years by which time the average diameter ranges from 20 to 24" DBH. In Partial Retention, rotation length is 160 years at which time the average diameters range from 25" to 26" DBH Retention and Middleground scenic areas as well as areas managed for bald eagle and osprey habitat have long rotations ranging from 300 to 320 years Stand diameters at that time are projected to be in the 40" DBH range. Within the Retention and Middleground areas, these extended rotations are a result of constraints on created openings and the amount of time required before openings are no longer readily apparent The extended rotations for the bald eagle and osprey habitat are intended to provide suitable nesting sites.

Comparison between Even-aged and Uneven-aged Management

In terms of initial harvest amounts, the short term consequences of uneven-aged as opposed to even-aged management represents a decrease of 80 percent on half the Deschutes ponderosa pine stands Half of the Forest's pine stands qualify for an overstory removal if managed in an even-aged scenario. The projected harvest volume from this type of entry is 12 MBF per acre. This amount is compared with the 2 MBF per acre that is harvested from these stands in the same decade if uneven-aged management is applied. This disparity in harvested amounts decreases with time. After 150 years, the harvested amounts in ponderosa pine from uneven-aged managenment are 50 percent of the even-aged harvested amount The disparity in amounts harvested per acre is never eliminated as uneven-aged management typically harvests only 15 to 20 percent of the inventory while even-aged management periodically harvests the entire inventory More acres are treated each year if uneven-aged management is practiced instead of even-aged.

Long term productivity comparisons of even and uneven-aged management are complicated by other factors The long term sustained yield (LTSY) contribution of uneven-aged management is about 60-70 percent of the LTSY contribution of even-aged management on lands managed to emphasize timber production However, uneven-aged management has a higher LTSY value than even-aged on lands managed for scenic values where limits on the amount of openings result in extended rotation lengths. Even-aged management maximizes the productive advantage of juvenile growth. At the culmination of this growth period, the stand is harvested and the cycle is repeated with a new stand This period of great growth is relatively suppressed in uneven-aged management due to the competitive effects of an overstory of slower growing larger trees. Research suggests that in ponderosa pine, overstory trees have a cumulative weakening effect on seedlings beneath them (McDonald, 1976). Primary limitations include

the reduced availability of soil moisture, nutrient and light availability.

Management Intensity

The prescriptions included in the FORPLAN model included a wide range of management intensities. Management intensity as used here refers to a detailed description of how the goals of each management area are accomplished. When those goals include scheduled timber harvest, a silvicultural prescription is modeled resulting in a yield table. The range of silvicultural prescriptions modeled vary with the goal of the management area. For example, for the General Forest Management Area, several yield tables were developed with varying levels of management intensity. However, for the Bald Eagle Management Area, relatively few intensities were modeled and all of those portray only light harvest entries with extended rotations. The following list describes the array of silvicultural prescriptions that were developed. After the list is Figure B-5 showing the management areas, species working groups, and which silvicultural prescriptions were developed into empirical yield tables for each.

DESCRIPTION OF CODES

Code	Silvicultural System	Description
FH	Even-aged	No entry until final harvest
FHX	"	Final harvest after an extended rotation
1CT-FH	"	One commercial thin - final harvest
2CT-FH	"	Two commercial thins - final harvest
PCT-1CT-FH	"	Precomm thin - one commercial thin - final harvest
PCT-2CT-FH	"	Precomm thin - two commercial thins - final harvest
OR-PCT-1CT-FH	"	Overstory Removal-Precomm thin-1 comm thin-FH
OR-PCT-2CT-FH	"	Overstory Removal-Precomm thin-2 comm thins-FH
IT-18	Uneven-aged	Individual tree selection - 18" DBH large tree
IT-24	"	Individual tree selection - 24" DBH large tree
IT-30	"	Individual tree selection - 30" DBH large tree
IT-36	"	Individual tree selection - 36" DBH large tree
GS-FH	"	Group Selection - final harvest
GS-PCT-FH	"	Group Selection - Precommercial thin-final harvest
GS-PCT-1CT-FH	"	Group selection-precomm thin-1 comm thin-FH
GS-1CT-FH	"	Group selection-one commercial thin-final harvest
GS-2CT-FH	"	Group selection-two commercial thins-final harvest

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Figure B-5 Management Intensities of Empirical Yield Tables

Management Area	Working Group-Stand Maturity*	Silvicultural Prescriptions Even-aged	Uneven-aged
General Forest	Ponderosa-Immature	FH 1CT-FH 2CT-FH PCT-1CT-FH PCT-2CT-FH	IT-18 IT-24 IT-30
	Ponderosa-Mature	FH OR-PCT-1CT-FH OR-PCT-2CT-FH	IT-18 IT-24 IT-30
	Lodgepole-Immature	FH PCT-FH PCT-1CT-FH PCT-2CT-FH	-
	Lodgepole-Mature	FH	-
	Mixed Conifer-Immature	FH PCT-FH PCT-1CT-FH 1CT-FH 2CT-FH	GS-FH GS-PCT-FH GS-1CT-FH GS-1CT-FH GS-2CT-FH
	Mixed Conifer-Mature	FH	GS-FH
	Mountain Hemlock-Immature & Mature	FH	-
Retention & Black Butte Scenic and Metolius Scenic Views	Ponderosa-Immature	1CT-FHX 2CT-FHX PCT-1CT-FHX PCT-2CT-FHX	IT-36
	Ponderosa-Mature	FH OR-PCT-2CT-FH	IT-36
	Lodgepole-Immature	FH PCT-FH PCT-1CT-FH PCT-2CT-FH	-
	Lodgepole-Mature	FH	-

Figure B-5 Management Intensities of Empirical Yield Tables (continued)

	Mixed Conifer-Immature	PCT-1CT-FHX 2CT-FHX	GS-PCT-1CT-FHX GS-2CT-FHX
	Mixed Conifer-Mature	FH	GS-FHX
	Mountain Hemlock-Immature & Mature	FH FH	- -
Partial Retention & Metolius Special Forest	Ponderosa-Immature	1CT-FHX 2CT-FHX PCT-1CT-FHX PCT-2CT-FHX	IT-18 IT-24 IT-30 IT-36
	Ponderosa-Mature	OR-PCT-2CT-FH	IT-36
	Lodgepole-Immature	FH PCT-FH PCT-1CT-FH PCT-2CT-FH	-
	Lodgepole-Mature	FH	-
Y	Mixed Conifer-Immature	PCT-1CT-FHX 2CT-FHX	GS-PCT-1CT-FHX GS-2CT-FHX
	Mixed Conifer-Mature	FH	GS-FH
	Mountain Hemlock-Immature & Mature	FH	-
Deer Habitat	Ponderosa-Immature	FH 1CT-FHX 2CT-FHX PCT-1CT-FHX	GS-FHX GS-1CT-FHX GS-2CT-FHX GS-1CT-FHX
	Ponderosa-Mature	FHX OR-PCT-1CT-FHX OR-PCT-2CT-FHX	GS-OR-PCT-1CT-FHX GS-OR-PCT-FHX
	Lodgepole-Mature	FH	-
	Mixed Conifer-Immature	FH PCT-1CT-FHX 2CT-FHX	GS-PCT-1CT-FHX GS-2CT-FHX
	Mixed Conifer-Mature	FH	GS-FH

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Figure B-5 Management Intensities of Empirical Yield Tables (continued)

	Mountain Hemlock-Immature & Mature	FHX	-
Bald Eagle and Osprey	Ponderosa-Immature	1CT-FHX 2CT-FHX PCT-1CT-FHX PCT-2CT-FHX	IT-36
	Ponderosa-Mature	OR-PCT-2CT-FH	IT-36
	Lodgepole-Immature	FH PCT-FH PCT-1CT-FH PCT-2CT-FH	-
	Lodgepole-Mature	FH	-
	Mixed Conifer-Immature	PCT-1CT-FHX 2CT-FHX	GS-PCT-1CT-FHX GS-2CT-FHX
	Mixed Conifer-Mature	FH	GS-FH
	Mountain Hemlock Immature & Mature	FHX	-

*Maturity based on model component descriptions - 01-05 are immature, 06-09 are mature

The following adjustments were made to the yield tables after PROGNOSIS projections had been completed. These are further described in the planning records in a notebook titled Yield Table Adjustments

Root Rot in Uneven-aged Tables modeling Individual Tree Selection (UE-ITS)

An adjustment was made to the uneven-aged tables that modeled individual tree selection (UE-ITS). The PROGNOSIS root rot extension used by the Forest was designed to model stands with 500 tree records or less. This limit was consistently exceeded during the UE-ITS PROGNOSIS projections when natural regeneration was simulated after a harvest entry Natural regeneration introduced 1000 seedlings per acre Attempts to work around the limitation failed so the production falldown due to root rot in the UE-ITS tables was made after the projections were completed and the pool outputs were merged

The basis for the adjustment was made by comparing PROGNOSIS projections made with and without the root rot extension on the collapsed model component in question without any silvicultural management The ratios resulting from the different volumes per acre projected for each decade were the source of adjustments. For example, if the without root rot projection predicted 2000 cubic feet per acre in the fifth decade and the with root rot projection predicted 1900 cubic feet in that decade, then the adjustment ratio was 0.95 (1900/2000). A ratio was developed for each decade in each collapsed model component projection. After the UE-ITS yield tables were developed without the use of the root rot extension, the harvest and inventory volumes predicted were multiplied by the appropriate ratio.

Genetic Gain in UE-ITS Tables

The Forest is committed to tree improvement and substantial investments have been made in parent tree selection and initial testing. The volume gain from using open pollenated seed from phenotypically selected parents is expected to be a ten percent increase (Theisen, 1980) However, little gain on the Deschutes National Forest will be realized until seedlings from seed orchards are produced in 2 to 4 decades. Therefore, the assumed positive 10 percent effect of using genetically improved stock has been reduced to 8.67 percent to reflect that these benefits would only be realized for the last 13 of 15 decades in the FORPLAN planning horizon.

A majority of the reforestation occurring after individual tree selection harvest is planned to be accomplished by natural regeneration. However, the Forest's District Silviculturists predicted planting would be required 36 percent of the time in order to attain satisfactory reforestation. When planting does occur, it would only occur on a third of the acres treated. This results in a potential for genetic gain to occur on 12 percent of the UE-ITS treated acres Thus with 8.67 percent increase in yields occurring on 12 percent of the UE-ITS acreage, the resulting increase in production is estimated to be 1 percent Therefore, future harvest and inventory volumes in the UE-ITS tables have been increased by 1 percent to account for genetic improvement.

Matching Yield Table Volumes to VRS Volumes

Small differences existed between the gross volumes shown in the 1985 VRS and the 1985 volumes displayed in the merged PROGNOSIS projections A ratio resulting from the different volume per acre figures (VRS/PROGNOSIS) was developed for each collapsed model component. The PROGNOSIS inventory and harvest volumes were then multiplied by the appropriate ratio so that the yield table volumes were consistent with the VRS volumes.

Gross to Net

The yield tables produced from PROGNOSIS were gross volumes. The volumes were adjusted from gross to net prior to use within the FORPLAN model. Net volume represents only the volume in trees which can be manufactured into forest products. The Forest used historic timber sale data to develop factors to adjust the gross volumes to net for the diffent model components. The difference between gross volume and net volume represents a composite of three types of adjustments: visible defect or cull, hidden defect and

breakage, and scaling defect. These three adjustments were combined into one factor that was used to adjust harvest and inventory volumes in the yield tables. The process used to derive the gross to net volume adjustment is described in "Total Defect Documentation - 1985 Vegetative Resource Survey" letter to the records 2410/1920, January 2, 1990.

Wildlife Trees - Future Habitat for Cavity Nesters

A set of yield table volume adjustments was made to account for the unharvested trees that are retained to provide future habitat to cavity dependent wildlife. The volume reductions represent the adequate number and size distribution of trees needed to provide habitat for specified percentages of the cavity nester population potential. The wildlife tree management goals were based on the concept of maximum population potentials (Thomas, 1979) for primary excavator species (e g. woodpeckers). The volume adjustments made to the empirical tables were for the even-aged silvicultural prescriptions and group selection uneven-aged prescriptions The volume deductions were applied to inventory volumes at the culmination of mean annual increment No volume adjustments were made in the individual tree selection uneven-aged tables. Projected mortality by the PROGNOSIS model was adequate to future habitat needs.

Yield Table Adjustments for Large Tree Retention

The prescriptions for Metolius Special Forest, Black Butte Scenic, Metolius Scenic Views and Partial Retention management areas retain trees 24 inches in diameter and greater except in specified situations. In the ponderosa working group, these situations were assumed to affect 5 percent of the trees over 24 inches in retention, Black Butte and Metolius Scenic, and 10 percent of the trees in partial retention and Metolius Special Forest. In the mixed conifer working group, 50 percent of the trees over 24 inches were expected to be removed in retention, Black Butte, Metolius Scenic, and partial retention. Therefore, the volume in trees over 24 inches retained in each collapsed model component was determined and reduced from the inventory available for final harvest in the even-aged and uneven-aged group selection empirical yield tables.

MANAGED YIELD TABLES

The managed yields for the Forest Plan alternatives were developed utilizing the concepts previously discussed consistent with the procedures used in the preparation of the Forest's empirical yield tables In addition, the variation that occurs between forest types and conditions between Ranger Districts was treated in the final determination of the managed yields. The process has been described in *Managed Yield Table Development, Deschutes National Forest*, July, 1989, 20 pp. unpublished Planning records.

Attention should be paid to the following details when the tables are used in the forest analysis:

Rotation Length· Several of the tables are multi-purpose; the only differences between projections for various emphases are the constraints on minimum rotation ages CMAI and 95% CMAI are indicated on the even-aged tables developed for the General Forest Management Area. Unless further constrained by the prescription, final harvest can be scheduled at the age of 95% CMAI and beyond. Rotation lengths applied within the other management areas were based upon the goals and objectives for each area Even-aged rotation lengths are a function of the amount and duration of created openings within the management areas managed for scenic character: retention, partial retention, middleground, Black Butte Scenic, Metolius Scenic Views, Front Country and Metolius Special Forest.

Regeneration Lag: A 5-year regeneration period will be added to the stand age to account for the time between harvest of the mature stand and establishment of regeneration. This will allow time to accomplish slash treatment and site preparation and also account for occasional reforestation failures that require replanting and result in lost time. A 15-year regeneration period will be added to the stand age for those tables developed for areas with extremely rocky soils or very high pocket gopher populations. A 20-year regeneration period will be added to the yield tables for high elevation mountain hemlock which are extremely slow and expensive to regenerate.

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MANAGEMENT ASSUMPTIONS INCORPORATED INTO THE MANAGED YIELD TABLES

Adjustments by District

Adjustments by District for regeneration, species composition, mean site index by species, stand density index by working group, and stocking level control were programmed into the model to develop managed yield tables for each District. The assumptions and adjustments involved in this process are documented in **Managed Yield Table Development** (op. cit.) working papers on file at the Deschutes National Forest headquarters

District Aggregation by Working Group

Based upon the data collected in the 1985 VRS, District specific site index and stand density index values, and reforestation data provided by the Districts led to aggregation of the Districts for the purposes of managed yield table development as shown in Figure B-6 The site index and maximum stand density index values displayed are weighted averages.

Figure B-6 Aggregation of the Districts for Managed Yield Table Development Based Upon 1985 VRS

Working Group	District Stratification, (SI - SDI)
Ponderosa Pine	Bend and Sisters (79-380), Crescent and Fort Rock (75-317)
Lodgepole Pine	Bend and Sisters (76-484), Fort Rock and Crescent (64-342)
Mixed Conifer	Bend and Crescent (85-528), Fort Rock (77-480), Sisters (90-656)
Mountain Hemlock	All Districts combined (57-657)

Range of Options Developed for Managed Yields

Intensities of management analyzed which follow that of the DEIS are:

Plant or natural regen plus final harvest (PLT/NR-FH)
Plant or natural regen plus PCT plus final harvest (PLT/NR-PCT-FH)
Plant or natural regen plus two CT's plus final harvest (PLT/NR-2CT-FH)
Plant or natural regen plus PCT plus two or more CT's plus final harvest (PLT/NR-PCT-2+CT-FH)

Many of the same management intensities used in the previous managed yield tables were replicated in the PROGNOSIS generated managed yield tables. One exception was when natural regeneration is used, precommercial thinning was also included in the stand's future management. The rationale for this change is that, without precommercial thinning, stand stagnation will occur (Hopkins, 1989). Additional management intensities were developed for the General Forest and Deer Winter Range Management Areas These intensities were based upon fewer commercial thins following a precommercial thinning.

In General Forest, yield tables were developed with one or two commercial thins following the precommercial thin. In the previous managed yields, precommercial thins were followed by either no commercial thins or by three or more. The additional yield tables provided a full range of intensities for FORPLAN to select from

In Deer Winter Range, PROGNOSIS analysis of managed yield tables with the COVER extension (Moeur, 1985) identified greater amounts of big game cover provided when fewer commercial thins are implemented than the three commercial thins that occur in previous managed yield tables for Deer Winter Range. Based on wildlife biologists' review of the cover outputs resulting from various management intensities, the two silvicultural prescriptions developed in managed yield tables

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for deer winter range were PLT-PCT-FHX and PLT-PCT-1CT-FHX

The range of managed yields developed for the Final Forest Plan alternatives are given in Figures B-7a-7f All volumes shown are gross figures taken directly from the PROGNOSIS outputs and do not reflect the various adjustments made to yields.

TABLE 7a - MANAGED YIELD TABLE SUMMARY FOR THE DESCHUTES NATIONAL FOREST PONDEROSA PINE WORKING GROUP

STRATA	MANAGEMENT EMPHASIS	YIELD TABLE NO.	SILVICULTURAL ACTIVITY SEQUENCE[5]	95 CMAI ROTATION		CMAI[1] or EXTENDED ROTATION[3]			
				Age	MAI[2]	Age	MAI[2]	Tot.Prod.[4]	d b h
Crescent, and Fort Rock Even-aged	General Forest	MY1A	PLT-PCT-1CT-FH	65	39 7	85	41 2	3,503	17 4
		MY1I	PLT-PCT-2CT-FH	65	39 7	85	41 3	3,508	17.7
		3	PLT-2CT-FH	75	38 1	105	38 8	4 071	20 9
		5	PLT-PCT-FH	55	39 4	65	39 7	2,583	13 6
		7	PLT-FH	65	36 7	75	37 4	2,807	14 4
	Middleground	MD1A	PLT-PCT-1CT-FH	-	-	325	21 0	6,838	37.8
		MD1I	PLT-PCT-2CT-FH	-	-	325	21 7	7,052	37 5
		MD3	PLT-2CT-FH	-	-	325	22 9	7,413	37 9
		MD5	PLT-PCT-FH	-	-	325	18 5	6,014	36 1
		MD7	PLT-FH	-	-	325	18.9	6,144	37 3
	Retention	9	PLT-PCT-4CT-FH	-	-	335	23 5	7,861	40 9
	Partial Retention	11	PLT-PCT-3CT-FH	-	-	165	33 1	5,468	27 4
	Deer Habitat	13	PLT-PCT-1CT-FH	-	-	155	32 6	5,053	24 9
		14	PLT-PCT-FH	-	-	155	27 5	4,256	23 1
	Eagle and Osprey	15	PLT-PCT-6CT-FH	-	-	315	23 3	7,338	42 2
Crescent, and Fort Rock Uneven-aged	General Forest and Middleground	91-18	IT-18	-	-	-	27 3*		
		91-24	IT-24	-	-	-	24 1*		
		91-30	IT-30			-	22 4*		
	Retention, Partial Retention, and Eagle, Osprey	91-RT	IT-36			-	23 0*		
		91-PR	IT-36			-	21 1*		
	Deer Habitat (Group Selection)	GS13	PLT-PCT-1CT-FH			155	32 6	5,053	24 9
		GS14	PLT-PCT-FH			155	27.5	4,256	23 1

[1]Culmination of Mean Annual Increment
[2]Mean Annual Increment (CF/A/YR)
[3]100 percent of culmination in General Forest Even-aged, MAI at end of extended rotations in other management areas
[4]Merchantable volume production, CF/A, 7-inch DBH, 4-inch top
[5]Natural regeneration is planned in rocky and gopher suitable acres
*MAI is the average over the last five decades in the Prognosis projection

TABLE 7b - MANAGED YIELD TABLE SUMMARY FOR THE DESCHUTES NATIONAL FOREST PONDEROSA PINE WORKING GROUP

STRATA	MANAGEMENT EMPHASIS	YIELD TABLE NO.	SILVICULTURAL ACTIVITY SEQUENCE[5]	.95 CMAI ROTATION		CMAI[1] or EXTENDED ROTATION[3]			
				Age	MAI[2]	Age	MAI[2]	Tot.Prod.[4]	d.b.h.
Bend & Sisters Even-aged	General Forest	17 C	PLT-PCT-1CT-FH	65	47 7	95	49 3	4,683	18 4
		17 J	PLT-PCT-2CT-FH	65	47.7	95	48 9	4,646	18 9
		19.	PLT-2CT-FH	95	45.9	135	47 8	6,448	24.0
		21	PLT-PCT-FH	55	45.8	65	46.4	3,017	13.5
		23	PLT-FH	65	43.9	75	46.0	3,451	15.4
	Middleground, Front Country	MD17C	PLT-PCT-1CT-FH	-	-	325	25 7	8,352	37 2
		MD17J	PLT-PCT-2CT-FH	-	-	325	26 3	8,536	37 0
		MD19	PLT-2CT-FH	-	-	325	28 2	9,162	38.8
		MD21	PLT-PCT-FH	-	-	325	22 9	7,440	35 5
		MD23	PLT-FH	-	-	325	23 9	7,777	37.6
	Deer Habitat	24 A	PLT-PCT-1CT-FH	-	-	155	39 7	6,150	24 7
		24 B	PLT-PCT	-	-	155	34.5	5,340	22.8
	Retention, Black Butte Scenic, Metolius Scenic Views	25	PLT-PCT-5CT-FH	-	-	335	28 2	9,460	41.0
	Partial Retention	27	PLT-PCT-4CT-FH	-	-	165	41 2	6,800	41.2
	Metolius Special Forest	SF27	PLT-PCT-4CT-FH	-	-	135	44 6	6,026	24.4
	Eagle and Osprey	29	PLT-PCT-7CT-FH			315	28 5	8,981	42.2
Bend & Sisters Uneven-aged	General Forest and Middleground	91-18	IT-18	-	-	-	27 3*	-	
		91-24	IT-24	-	-		24 1*		
		91-30	IT-30	-	-	-	22 4*		
	Retention, Partial Retention, and Eagle, Osprey	91-RT	IT-36			-	23.0*		
		91-PR	IT-36			-	21 1*		
	Deer Habitat (Group Selection)	GS13	PLT-PCT-1CT-FH			155	39 7	6,150	24 7
		GS14	PLT-PCT-FH			155	34 5	5,340	22 8

[1]Culmination of Mean Annual Increment
[2]Mean Annual Increment (CF/A/YR).
[3]100 percent of culmination except where management emphasis requires extended rotation.
[4]Merchantable volume production, CF/A, 7-inch DBH, 4-inch top
[5]Natural regeneration is planned in rocky and gopher suitable acres
*MAI is the average over the last five decades of Prognosis projection

TABLE 7c - MANAGED YIELD TABLE SUMMARY FOR THE DESCHUTES NATIONAL FOREST LODGEPOLE PINE WORKING GROUP

STRATA	MANAGEMENT EMPHASIS	YIELD TABLE NO.	SILVICULTURAL ACTIVITY SEQUENCE[5]	.95 CMAI ROTATION		CMAI[1] or EXTENDED ROTATION[3]			
				Age	MAI[2]	Age	MAI[2]	Tot.Prod.[4]	d b h.
Crescent and Fort Rock Even-aged	General Forest, Middleground, Scenic Views, Retention, and Partial Retention and Deer	31 A	NR-PCT-1CT-FH	95	27.4	115	28 7	3,297	11 0
		31 H	NR-PCT-2CT-FH	115	26 7	135	28 0	3,777	12.7
		31 U	NR-Delay Pct-FH	95	24.6	115	25 9	2,981	11 7
		35	NR-PCT-FH	135	23 2	145	24 0	3,473	13.9
		36	NR-FH	95	28 8	125	29 8	3,722	11.8
Bend & Sisters Even-aged	General Forest, Middleground, Retention, Part.Ret., Black Butte Scenic, Metolius Scenic Views & Metolius Special Forest	37 A	NR-PCT-1CT-FH	115	36.4	125	37 9	4,733	12 0
		37 H	NR-PCT-2CT-FH	125	33 6	155	34 9	5,408	14 5
		37 S	NR-Delay Pct-FH	105	40 7	115	41 5	4,771	11 5
		41	NR-PCT-FH	145	26 5	165	27 4	4,519	15 2
		42	NR-FH	105	37 8	115	39 5	4,538	11 4

[1]Culmination of Mean Annual Increment.
[2]Mean Annual Increment (CF/A/YR).
[3]*100 percent of culmination except where management emphasis requires extended rotation*
[4]Merchantable volume production, CF/A, 7-inch DBH, 4-inch top

TABLE 7d - MANAGED YIELD TABLE SUMMARY FOR THE DESCHUTES NATIONAL FOREST MIXED CONIFER WORKING GROUP

STRATA	MANAGEMENT EMPHASIS	YIELD TABLE NO.	SILVICULTURAL ACTIVITY SEQUENCE[5]	.95 CMAI ROTATION		CMAI[1] or EXTENDED ROTATION[3]			
				Age	MAI[2]	Age	MAI[2]	Tot Prod.[4]	d b h.
Bend & Crescent Even-aged or Uneven-aged (Group Selection)	General Forest	43D	PLT-PCT-1CT-FH	75	60 4	95	62 7	5,958	17 8
		43J	PLT-PCT-2CT-FH	75	60	105	62 2	6,526	19.4
		44	PLT-2CT-FH	75	63 4	85	63 4	4,756	14 1
		45	PLT-PCT-FH	75	58 7	85	60 2	5,115	16 4
		46	PLT-FH	75	63 4	75	63.4	4,756	14.1
	Middleground and Front Country	MD43D	PLT-PCT-1CT-FH	-	-	325	22 3	7,751	32 5
		MD43J	PLT-PCT-2CT-FH	-	-	325	24 2	7,857	33 0
		MD44	PLT-2CT-FH	-	-	325	23 3	7,577	36 3
		MD45	PLT-PCT-FH	-	-	325	21 4	6,9971	32 4
		MD46	PLT-FH	-	-	325	20 7	6,720	32 9
	Retention	47	PLT-PCT-3CT-FH	-	-	315	23 9	7,528	35 4
	Partial Retention	48	PLT-PCT-3CT-FH	-	-	155	46 9	7,264	26.3
	Eagle and Osprey	49	PLT-PCT-5CT-SW	-	-	315	23 1	7,261	39 7
Fort Rock Even-aged or Uneven-aged (Group Selection)	General Forest	50 E	PLT-PCT-1CT-FH	75	48 9	95	51 0	4,849	17 5
		50 J	PLT-PCT-2CT-FH	75	37 1	115	50 3	5,785	19.8
		51	PLT-PCT-FH	75	48 7	85	49 7	4,223	16 0
		52	PLT-FH	75	49.7	85	51 6	4,388	15 0
	Middleground	MD50E	PLT-PCT-1CT-FH	-	-	295	22 4	6,622	30 9
		MD50J	PLT-PCT-2CT-FH	-	-	295	24 0	7,089	31 0
		MD51	PLT-PCT-FH	-	-	295	21 3	6,282	30 5
		MD52	PLT-FH	-	-	295	22 2	6,559	31 1
	Retention	53	PLT-PCT-4CT-FH	-	-	315	17.5	5,506	38 9
	Partial Retention	54	PLT-PCT-2CT-FH	-	-	155	44 2	6,854	23 0

[1] Culmination of Mean Annual Increment
[2] Mean Annual Increment (CF/A/YR)
[3] 100 percent of culmination except where management emphasis requires extended rotation
[4] Merchantable volume production, CF/A, 7-inch DBH, 4-inch top
[5] Natural Regeneration is planned for rocky and gopher suitable acres

TABLE 7e - MANAGED YIELD TABLE SUMMARY FOR THE DESCHUTES NATIONAL FOREST MIXED CONIFER WORKING GROUP

STRATA	MANAGEMENT EMPHASIS	YIELD TABLE NO.	SILVICULTURAL ACTIVITY SEQUENCE[5]	.95 CMAI ROTATION		CMAI[1] or EXTENDED ROTATION[3]			
				Age	MAI[2]	Age	MAI[2]	Tot Prod.[4]	d.b.h
Sisters Even-aged and Uneven-aged (Group Selection)									
Sisters	General Forest	55 C	PLT-PCT-1CT-FH	75	79 3	95	82 2	7,810	17 2
Even-aged &		55 J	PLT-PCT-2CT-FH	75	78 3	115	82 4	9,472	19 7
Uneven-aged		56	PLT-3CT-FH	65	71 4	65	71 4	4,638	13 0
(Group		57	PLT-PCT-FH	55	76 7	65	80 2	5,210	13 1
Selection)		58	PLT-FH	65	77 3	75	80 7	6,049	13 8
	Middleground and	MD55C	PLT-PCT-1CT-FH	-	-	295	35 0	10,312	30 8
	Front Country	MD55J	PLT-PCT-2CT-FH	-	-	295	36 6	10,810	31 7
		MD56	PLT-3CT-FH	-	-	295	34 5	10,185	34 6
		MD57	PLT-PCT-FH	-	-	295	31 4	9,251	30 0
		MD58	PLT-FH	-	-	295	31 9	9,412	30 6
	Retention, Black Butte Scenic,								
	Metolius Scenic	59.	PLT-PCT-3CT-FH	-	-	315	30 3	9,530	36 0
	Partial Retention	60	PLT-PCT-3CT-FH	-	-	155	62 3	9,651	25 1
	Deer Winter Range	D55C	PLT-PCT-1CT-FH	-	-	155	65 1	10,090	22 3
	Eagle and Osprey	61	PLT-PCT-5CT-SW			315	30.4	9,574	38 0

[1] Culmination of Mean Annual Increment
[2] Mean Annual Increment (CF/A/YR)
[3] 100 percent of culmination except where management emphasis requires extended rotation
[4] Merchantable volume production, CF/A, 7-inch DBH, 4-inch top
[5] Natural Regeneration is planned in the rocky and gopher suitable acres

TABLE 7f - MANAGED YIELD TABLE SUMMARY FOR THE DESCHUTES NATIONAL FOREST MOUNTAIN HEMLOCK WORKING GROUP

STRATA	MANAGEMENT EMPHASIS	YIELD TABLE NO.	SILVICULTURAL ACTIVITY SEQUENCE[5]	.95 CMAI ROTATION		CMAI[1] or EXTENDED ROTATION[3]			
				Age	MAI[2]	Age	MAI[2]	Tot.Prod.[4]	d.b.h.
All Districts	*General Forest*	62	NR-SW-FH	115	43 7	135	45 6	6,158	13 4
	Middleground, Retention, Partial Retention, Threatened and Endangered Species	62X	NR-SW-FH	-	-	315	20 5	6,463	25.0

[1] *Culmination of Mean Annual Increment*
[2] Mean Annual Increment (CF/A/YR)
[3] 100 percent of culmination except where management emphasis requires extended rotation
[4] Merchantable Volume production, CF/A, 7-inch DBH, 4-inch top

Adjustments to the Managed Yield Tables

After PROGNOSIS projection, the following adjustments were made to the managed yields prior to use within FORPLAN modeling They are described in further detail in Yield Table Adjustments, Deschutes National Forest, Planning Records.

Fertilization - The managed yield tables were not adjusted for fertilization because of soil and climactic conditions on the Forest and the high price and uncertainty of future fertilizer supplies. This decision is consistent with the guidelines followed in the previous set of managed yield tables developed for the DEIS.

Rocky Ground - District personnel mapped their respective districts outlining areas where tentatively suitable forested acres were interspersed with rock outcrops, lava pressure ridges, etc. These areas were mapped during the planning process and designated as suitable-rocky. Yield reductions were made to the managed yield tables that developed for the suitable rocky areas These deductions are based on a weighted average percent of unstockability for each district grouping used to construct the managed yields. The percents are displayed in the following figure These reductions apply only to the suitable rocky managed yield tables.

Figure B-8

WORKING GROUP	DISTRICTS	PERCENT UNSTOCKABLE ON SUITABLE ROCKY
Ponderosa	Crescent - Ft. Rock	46 0
	Bend - Sisters	30 3
Lodgepole	Crescent - Ft. Rock	36.0
	Bend - Sisters	30.0
Mixed Conifer	Crescent - Bend	30 0
	Ft Rock	0
	Sisters	25.8
Mountain Hemlock	All	0

Planting with Genetically Improved Stock. The choice of planting versus natural regeneration was based on District input on working group, silvicultural system, and land class For the ponderosa pine and mixed conifer working groups, planting was assumed on all areas except those with gophers and rocky soils For lodgepole pine, the decision to plant versus natural regeneration depended upon site specific plant communities. In general, about 95 percent of the lodgepole working group could be regenerated naturally. In gopher or rocky areas, it was assumed lodgepole would regenerate naturally. It was also assumed that mountain hemlock would regenerate naturally.

In light of limited empirical data regarding the effects of genetically improved stock on the growth and yield of managed stands in Central Oregon, Regional direction was to assume an across-the-board increase in yield of 10 percent for all planted stands However, little gain on the Deschutes National Forest will be realized until seedlings from seed orchards are produced in 2 to 4 decades. Therefore, the assumed positive 10 percent effect of using genetically improved stock has been reduced to 8 67 percent to reflect that these benefits would only be realized for the last 13 of 15 decades in the FORPLAN planning horizon. As a result, the following adjustments have been made to the ponderosa pine, lodgepole pine, and mixed conifer yield tables in areas with no gopher or rocky soil

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problems These adjustments include the effects of a delay in seed orchard production as well as limited planting in lodgepole pine. See Figure B-9.

Figure B-9 ADJUSTMENTS FOR GENETICALLY IMPROVED STOCK

Working Group	Percent Adjustment
PPN	+8 67%
LPP	+1 73%
MC	+8.67%

Nonstockable or Inoperable Openings. Since the PROGNOSIS base managed yield tables reflect 100 percent, or full stocking, it was necessary to make adjustments to account for small, unmapped nonstockable areas such as wet areas, rock outcroppings, landings, etc. For analysis areas which do not reflect special problems such as rocky areas, 5 percent was deducted from all yield table harvest entries to reflect nonstockable openings.

Wildlife Trees - Reduction for Snag Replacements Wildlife tree management goals are based on the concept of maximum potential population for primary excavator species Managed yield volume reductions represent the volume reserved from managed stands to provide adequate wildlife tree numbers and sizes until the replacement stand is able to provide this habitat These volume reductions were applied to the available standing inventory at culmination of mean annual increment and beyond

Competitive Effects of Residual Overstory Trees on Future Stands - The presence of live, overstory trees upon the growth of understory seedlings is significant. Height growth is held back in the overstory trees (McDonald, 1976). PROGNOSIS projection of future stands for managed yield tables did not include the effects of an overstory upon newly established plantations Therefore, to more accurately portray the effects of an overstory in those situations where overstory retention is part of the silvicultural prescription, the amount of the competitive effects on future volume production was predicted using PROGNOSIS. The adjustment factors developed from this analysis were used to reduce the managed yield tables developed for the scenic management areas and those where residual trees are retained for wildlife habitat.

After a final harvest occurs, there is a period of time that the replacement stand does not provide trees of a suitable diameter distribution which provide habitat for cavity dwellers Therefore, to provide habitat, a portion of the existing stand is not harvested. The competitive effect of these live wildlife replacement trees upon the future stand was modeled with PROGNOSIS. Future replacement stands were grown under the numbers and size classes of wildlife trees needed for the 0, 20, 40, 60, and 100 percent maximum potential population (MPP) levels The wildlife trees were removed from the projections a different points in time to simulate their mortality The resulting stand projections were then compared based on mean annual increment to derive the competitive effect of leaving trees to meet the various MPP levels. Reductions to the yield tables were based upon grouping wildlife trees (clumps or scattered individuals) and therefore their competitive effect, on a percentage of the harvested area For example, the competitive effect of leaving trees to provide 40 percent MPP was based on leaving trees necessary for the 100 percent MPP level on 40 percent of the acre. Competitive effect adjustment for uneven-aged group selection managed yield tables were based upon the entire acre, e.g. 60% MPP competitive effect on 100% of the acre, due to the relatively small sizes of the areas treated (2 acres)

Retention of large ponderosa and mixed conifer stands overstory trees (24 inch plus diameter) is an objective in managed for scenic character The adjustment factors developed for the scenic managed yield tables were based on the comparison of future volume produced with and without retention of the overstory trees. A weighted average adjustment factor was then determined which combined the competitive effects of wildlife trees on a portion of the acre with the competitive effects of large overstory trees on the other portion of the acre.

Defect - All thinning and final harvest volumes in the managed yield tables were reduced by the same gross to net figures developed to adjust the harvest volumes in the immature model components. The Forest and the Regional Office biometricians agreed that these existing stands provide the best source available for estimation of the gross to net adjustments for future managed stands.

Loss Due to Wildfire

A deduction to the Forest's Allowable Sale Quantity was made to reflect the anticipated timber volume loss due to wildfires. The data source for the losses are historical records compiled by the Forest's Fire Management Staff (Suppression Table 2, from the 1984 Fire Planning Notebook.) The reduction was made only to the Allowable Sale Quantity (ASQ) developed from the preferred alternative. The ASQ values developed for the other alternatives do not include this deduction. The ASQ loss to wildfire in the preferred is 303 thousand Cubic feet (1.7 million board feet). The deduction is based on the amount of land allocated to management areas which contributed to the ASQ. Alternatives with more lands allocated to ASQ contributing management areas, would have a higher ASQ loss to wildfire. See *Deduction to Allowable Sale Quantity due to Wildfire*, June, 1990, in the Forest's planning records for further details.

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Recreation Supply and Consumption Coefficients

Estimates of both recreation supply (carrying capacity) and consumption were developed for each benchmark and alternative analyzed for the FEIS. The projected supply and consumption trends were presented for each Recreation Opportunity Spectrum (ROS) category and Management Area. The estimates for these categories were also combined and summarized in terms of developed and dispersed recreation opportunities This section will summarize the process used to develop the carrying capacity coefficients and consumption trends A more detailed discussion can be found in the Forest Planning Document titled "Recreation Resource," and other process records in the Supervisor's Office

The carrying capacity coefficients for each Management Area and ROS category were developed based on information from the 2309 13 Recreation Planning Handbook, the Recreation Inventory Management (RIM) data base, and the code-a-site inventory data From this information, it was possible to arrive at some theoretical per acre carrying capacities in terms of PAOTs/acre for each category (PAOT stands for People At One Time). These were then converted to Recreation Visitor Days (RVDs)/acre based upon information concerning season of use, pattern of use, and current relationships between RVDs and PAOTs. The general form of the equation was:

RVDs/acre = (PAOTs) * (Pattern and Season of Use) * (RVD/PAOT)

These coefficients multiplied times the number of acres in each respective Management Area allocation resulted in the derivation of the total Forest carrying capacity, or supply, for each Management Area and ROS category. These categories were then combined and summarized in terms of developed and dispersed recreation

[5]F P. Keen, "Longevity of Ponderosa Pine, Journal of Forestry," 38.597-598, 1940

[6]Tony Smith, "Longevity of Ponderosa Pine," Deschutes National Forest Technical Report, 1983

Also, a low and a high range of per acre carrying capacity coefficients were developed for each Management Area so that alternative levels of investment and their effects on recreation supply could be examined. However, the addition of these alternative recreation investment options created too many prescriptions for the FORPLAN Model Instead of restricting the recreation options considered in order to fit within the FORPLAN model, the ID Team decided to analyze recreation supply and consumption outside the Model with an electronic spread sheet

The projections of recreation consumption trends were done somewhat differently Historical and current use levels as portrayed by the RIM data base were examined The consumption trends generally appeared to be tied to the local and regional population trends. Based on this the Team decided to assume that future use trends would continue to reflect population trends projected by different organizations around the state (currently about 2 percent per year) Therefore, the supply coefficients and their respective acreage allocations were used to calculate a theoretical carrying capacity ceiling for each of the Management Areas and their respective ROS categories. The consumption trends for each category would be projected forward from current use levels until they reached the respective supply ceiling, at which time they would flatten out. One final assumption was made in making these projections It was assumed that high levels of capital investment would also affect the slope of the projected consumption trends by enabling the Forest to capture a somewhat larger share of the recreation market, so that future use might increase by 2 5 percent per year instead of just 2 percent

Wildlife Coefficients

Many of the wildlife related outputs and effects, such as projected species population levels, for each alternative were tracked outside the FORPLAN model. However, most of these estimates were based upon information derived from FORPLAN solutions For example, a software program was developed to read a FORPLAN report file and generate special reports which portrayed the Forest inventory by working group and successional stages throughout the planning horizon From these reports, estimates of population levels for each key indicator specie could be developed. However, wildlife thermal cover in winter and transition range was tracked within FORPLAN. It is summarized in this section. For a more comprehensive understanding of the overall wildlife analysis process, refer to the Forest Planning Document titled "Wildlife Resource," and other process records in the Supervisor's Office

Coefficients were developed for FORPLAN which were used to track the number of acres of thermal cover in deer winter ranges.

On acres which were allocated to the Deer Habitat Management Area, each timber stand which had the necessary crown closure characteristics was credited as an acre of thermal cover. The Stand Prognosis Model was used to project timber stand development over time An extension to the PROGNOSIS Model "Cover" was used to track a timber stand's ability to meet thermal cover requirements as the stand developed or was treated with timber harvest Several management intensities were screened for their ability to produce thermal cover Intensities which provided the most thermal cover for the longest duration were assigned to Deer Winter Range prescriptions. The FORPLAN Model was used to schedule harvesting in such a way as to maintain the desired thermal cover requirements.

Analysis showed that desired thermal characteristics could not be achieved in the early part of the planning horizon because of existing stand conditions. It then became necessary to determine the amount of thermal cover that would be provided in a natural condition over time and to constrain the model to meet these cover minimums.

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This section describes the costs and benefits, as well as some concepts, involved in economic efficiency analysis, how they were derived, and how they were used in the Forest Planning process. Economic efficiency analysis is required by the National Forest Management Act Regulations (36 CFR 219) and played an important role in the development and evaluation of Forest Planning Benchmarks and Alternatives Specifically, the Regulations (36 CFR 219 12(f)) state that

"The primary goal in formulating alternatives, besides complying with NEPA procedures, is to provide an adequate basis for identifying the alternative that comes nearest to maximizing net public benefits "

They follow up in 36 CFR 219 12(F)(8) by stating that

"Each alternative shall represent to the extent practicable the most cost efficient combination of management prescriptions examined that can meet the objectives established in the alternative "

Descriptions of Some Concepts Related to Efficiency Analysis

Before we get into the specifics of how economic efficiency analysis was used in the development of the Deschutes National Forest FEIS and Forest Plan, a few concepts and terms related to efficiency analysis in general need to be explained

Priced Outputs (Benefits)

Priced outputs are those that are or can be exchanged in the market place. Their quantitative values are determined by actual market transactions or by estimation methods that produce prices commensurate with those determined by market transactions Timber, forage, and minerals are examples of commodities which are bought and sold in the market Their values are determined through the interaction of buyers and sellers based on the supply and demand conditions in the market at the time of the transaction. RVDs, on the other hand, are not normally exchanged via market transactions Their market values are estimated by using some market transaction data in combination with various theoretical techniques Conceptually, these assigned values should be consistent and comparable to those values which were actually derived via market transactions[1] Therefore, both assigned and market values for priced outputs are appropriate to use for calculating quantitative measures of efficiency such as present net value

Non-priced Outputs

Non-priced outputs are those for which there is no available market transaction evidence and no reasonable basis for estimating a dollar value commensurate with the market values associated with the priced outputs In these cases, subjective non-dollar values must be attributed to their production. These values are qualitatively rather than quantitatively described. They may be either positive or negative In fact, what may be considered to be a benefit to someone may represent a cost to someone else Examples of nonpriced outputs include the maintenance or enhancement of threatened and endangered species, natural and scientific areas, historical and anthropological sites, visual quality, and clean air.

Discounting

Financial analyses of alternative investment options usually involves cash flows over different periods of time in the future. Inherently, there is a time value associated with money Due to human propensity to consume now, a dollar today is worth more than a dollar 10 years from now Discounting is a process for adjusting the dollar values of costs and benefits which occur at different periods in the future to dollar values for a common time period so that they may be compared Usually the common time period is the present In which case, the discounted cash flow is referred to as the present value.

[1]Donald H Rosenthal and Thomas C Brown, Comparability of *Market prices and Consumer Surplus for Resource Allocation* Decisions Journal of Forestry, pp 105-109, Feb 1985

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Present Net Value (PNV)

Present net value is the difference between the discounted value (benefits) of all outputs to which monetary values or established prices are assigned and the total discounted costs of managing the planning area. The maximization of present net value was the criterion used to help ensure that each alternative was the most economically efficient combination of outputs and activities needed to meet the objectives established for that alternative Present net value calculations consider only the benefits for which market prices exist or can be assigned. On the Deschutes, the priced benefits included timber, recreation, wildlife, special uses, and range. These were compared against all Forest Service fixed and variable costs associated with managing the planning area, regardless of whether they were incurred for the production of either priced or non-priced outputs, or as overhead expenses for general maintenance of the organization Therefore, PNV is an estimate of the current market value of the priced Forest resources after all costs of producing both priced and non-priced outputs and meeting other multiple-use objectives have been considered.

Opportunity Costs

Opportunity costs are defined as the value of a resource's foregone net benefit in its most economically efficient alternative use (FSM 1970.5). In relation to the economic analysis performed for Forest Planning, it represents the decrease in maximized PNV of an alternative or benchmark when some alternative level of resource outputs are forced into solution Therefore, opportunity costs measure the change in PNV for priced resource outputs, and can be used to measure the relative value traded off in order to produce the non-priced benefits included in net public benefits.

Net Public Benefits (NPB)

The maximization of net public benefits is a goal of the Forest Planning process. Net public benefits is the overall value to the nation of all outputs and positive effects (benefits) less all the associated Forest Service inputs and negative effects (costs) whether they can be quantitatively valued or not

Net public benefits cannot be expressed as a numeric quantity because it includes qualitatively valued nonpriced outputs.

Conceptually, net public benefit is the sum of the present net value of priced outputs plus the full value of all non-priced outputs. The full value of non-priced benefits is used because the costs associated with their production is accounted for in the calculation of PNV. It is only necessary to identify the marginal values of non-priced outputs when management inputs are increased in order to provide these outputs at levels above current standards or legal requirements. In such cases, it is important to depict the physical, biological, and social dimensions of the non-priced outputs, as well as who will benefit and who will suffer from their production. Account should also be taken of any changes that may occur among the other non-priced outputs as a result of providing a particular non-priced output In assessing the net public benefits of a particular alternative, it is necessary to judge whether the subjective value to society of its non-priced outputs exceeds the opportunity costs associated with their production.

Welfare Distribution Effects and Impacts

There is another level of effects which are also a concern of National Forest Policy and Management. These are the welfare distribution effects influenced by the mix and level of outputs produced by the National Forest. They can be either positive or negative Their impacts can also be local, regional, or national in scope. Some distributive effects such as changes in consumer prices or taxpayer costs have national level impacts. Others, such as induced jobs and income, or payments in lieu of taxes are more local or regional in nature. They are more related to questions of equity (i.e., who pays and who benefits) rather than efficiency. They are not assessed in the context of the efficiency criteria associated with the PNV and net public benefit concepts. However, these positive and negative distributive effects need to be assessed in conjunction with the net public benefit measures since equity objectives often influence efficiency objectives and vice versa. These will be discussed in more detail in the section on SOCIAL AND ECONOMIC IMPACT ANALYSIS, Appendix B

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Parameters and Assumptions Used For Economic Efficiency Analyses

In order to calculate the present net value for each alternative, several assumptions had to made regarding discount rates, demand curves, real dollar adjustments, and real price and cost trends This section will summarize these decisions and their resulting parameters. A more detailed discussion can be found in various process records in the Supervisor's Office.

Discount Rates

Discounting requires the use of a discount rate which is an interest rate that represents the cost or time value of money in determining the present value of future costs and benefits Two discount rates were used to calculate the present net values for each benchmark and alternative. Both of them were real discount rates meaning that they were adjusted to exclude the effects of inflation (Real dollar adjustments will be discussed more below) According to FSM 1971 71·

For evaluations of long-term investments and operations in land and resource management in the 1980-1985 planning period, a 4-percent real discount rate shall be used Evaluations should also discount benefits and costs at the real discount rate used in the most recent RPA to determine sensitivity of alternatives to variations in the discount rate

The 4-percent rate approximates the "real" return on corporate long-range investments above the rate of inflation [2] The 4 percent rate was used to solve FORPLAN and calculate the PNV for each benchmark and alternative. The 1985 RPA program used a real discount rate of 7-1/8 percent. An analysis of the sensitivity of the Preferred Alternative to the discount rate was performed by solving FORPLAN using both the 4 percent and the 7-1/8 percent discount rates. For all other Benchmarks and alternatives, the present net values were merely recalculated using this second discount rate (FSM 1971 71) Finally, all costs and benefits were discounted from the midpoint of the decade in which they were incurred.

Demand Curves and Real Price Trends

As specified by the Washington Office (1920 letter to Regional Forester, "Downward Sloping Demand Curves," 2/3/81) and in keeping with FSM 1971 65, horizontal demand curves for timber and nontimber resources were used to analyze the Benchmarks and alternatives for the FEIS. Many factors can influence the demand for stumpage off of any one Forest [3] Some of these factors include trends in (1) interest rates, (2) the species and products mix of forest products consumption, (3) use of wood for energy, (4) forest products exports, (5) the cost of wood in Canada, (6) the rate of technical improvements in wood and fiber processing, and (7) the levels of harvests in other National Forests All of these contain some degree of uncertainty regarding their future states of nature. Neither the empirical nor the theoretical bases have been well enough developed to derive reasonable estimates of the demand functions for the resources offered at the Forest level. Evidence does exist, however, that suggests that the elasticity in the portion of the timber demand curve for which the Forest can influence output levels is such that prices would be relatively insensitive to some "reasonable" range of quantity offerings. In other words, it appears that the timber demand curve for the range of output levels analyzed during the development of alternatives is nearly horizontal.

As a surrogate for resource demand curves, real price trends were developed and used to represent the rate at which resource values will change over time as a result of anticipated supply and demand interactions in the market place As specified by the Regional Office (1920 letter to Forest Supervisors, "Timber Price Trends, Values, and Costs," 9/25/84), a 1 percent per year real price trend for stumpage was used for FORPLAN harvest scheduling analyses

[2] Clark H Row, Fred Kaiser, and John Sessions, "Discount Rate for Long-Term Forest Service Investments " 1981
[3] Darius M Adams and Richard W Haynes, "Changing Perspectives on the Outlook for Timber In the United States," Journal of Forestry, January 1985

These were applied for the first 50 years, and then a 0 percent price trend was assumed for the remaining 100 years of the harvest scheduling planning horizon. These imply that nominal stumpage prices (i e , those which include the effects of inflation) will increase during the next 50 years at a rate of 1 percent greater than the rate of inflation, and equal to rate of inflation from there on after.

Since price trends are reflections of expected futures, there is an inherent uncertainty involved with making such projections In recognition of this uncertainty, we performed a sensitivity analysis by rerunning RUN-3 of the Benchmarks using alternative stumpage price trends of 0, 2, and 3 percent. The results of these runs are quite complex and are discussed in detail in the Forest Planning Document titled "A Summary of the Analysis of the Management Situation " Generally, higher price trends make silvicultural investments economically more attractive, but they also tend to result in the substitution of lower valued species for higher valued species in sale offerings during the early decades since it pays to hold the higher valued timber on the stump as far as maximizing PNV is concerned

Based on Washington Office direction, a 0 percent real price trend for all other resources was used during the development of the Benchmarks and the alternatives. In other words, their future nominal values will change at rates equal to inflation.

Real Cost Trends

Based on Washington Office direction, 0 percent real cost trends were used for all future costs used in the development of the Benchmarks and alternatives. In other words, the costs of labor, fuels, materials, and all other factors of production involved with managing the Forest are assumed to change at a rate equal to the rate of inflation.

Real Dollar Adjustments

Future prices and costs can be expressed in both nominal and real terms The projection of nominal values includes the effects of inflation on these values. The projection of real values does not. For example, assume that the future prices for commodity XYZ are projected to increase annually by 8 percent Also assume that the rate of inflation is anticipated to be 5 percent. In real terms, the prices are increasing by only 3 percent per year above and beyond the rate of inflation Real value changes are the result of the interactions of supply and demand forces in the market place They do not include the effects of inflation.

All future values and costs used in the Forest Planning process were expressed in real 1982 dollars, consistent with the 1985 RPA program The GNP implicit price deflator index was used to convert both historical and future nominal prices and costs to this common base (FSM 1971.32b).

Costs Used for Economic Efficiency Analyses

This section describes the costs used to perform economic efficiency analysis for each of the Benchmarks and alternatives considered during the development of the FEIS

All Forest Service costs were included for purposes of estimating budgets and calculating present net values for each alternative. These costs were identified by their Management Information Handbook (MIH) codes as described in FSH 1309 11. The MIH activity descriptions and their associated codes were useful for identifying how different costs would be treated during the planning process. At the outset, each cost was categorized as either a fixed or a variable cost. If it was identified as a variable cost, decisions were made as to whether it would be analyzed in FORPLAN, TRANSHIP, or some form of electronic spread sheet. Costs were determined by examining. (1) the PAMARS data base, (2) Advent RPA budget planning files, (3) historical records and contracts, and (4) the results of time-motion studies. Professional judgement was also an important factor when it came to making assumptions regarding what bearing historical costs had on anticipated future costs All costs were developed and reviewed by the Forest Economist and the appropriate staff and sub-staff personnel In the following discussion, we will summarize the cost breakdowns and how they were incorporated into the efficiency analyses for each alternative. A more detailed presentation

of the specific costs and their functions in the analytical tools can be found in the process records at the Supervisor's Office

Costs Considered to be Fixed Across Alternatives

A cost was classified as "fixed" if it: (1) was not expected to vary significantly over the range of alternatives considered, (2) could not be tied to specific activities within any of the prescriptions, (3) represented a very small and insignificant amount of the Forest budget, (4) had insufficient cost records to support assumptions about when or how much it would vary as different prescriptions were implemented, and (5) was not related to the production of outputs and effects which were relevant to addressing the Forest Planning ICOs. Fixed costs were a component of the budget estimates and present net value calculations for each alternative.

Table B-10 following lists the MIH codes and their associated activities that were considered as "fixed" costs across all alternatives developed for the FEIS. These costs may vary over time, but they do not vary between the alternatives The "percent of budget" calculations were based on the tentative 1986 budget proposal.

FIGURE B-10 MIH Codes and Activities Considered as Fixed Costs

MIH CODE	MIH ACTIVITY DESCRIPTION	% of ESTIMATED 1986 BUDGET
A01/312	Visual Condition Inventory	02
B01	Wilderness Planning	.02
D04	Range Non-Struct Improvement Maintenance	.02
D08	Ecosystems Description & Inventory	.27
E00	Timber Resource Planning & Inventory	.41
E08	Nursery Management	.33
E10	Nursery Expansion	.00
F01	Soil and Water Inventory	.09
F02	Soil and Water Planning	12
F03	Soil and Water Improvements	13
F04	Soil and Water Admin and Management	.20
F08	Soil and Water Resource Improvement/Maint	.08
G01	Gen Technical Inventory and Evaluation	.02
G07	*Contest, Hearings, and Appeals*	.01
G08	Reserved and Outstanding Rights	.01
H07	Other Human Resource Programs	.39
J02	Rights-of-Way-Grants for Roads & Trails	.05
J03	FERC License & Permits	02
J04	Withdrawals, Modifications, Relocations	02
J09	Other Land Title Claims	02
J10	Encroachment	02
J11	Land Ownership Planning	.00
J12	Land Adjustment Planning	01
J14	Land Exchange-Cash Equalization	03
J16	Land Transfers	00
J17	Landsales, Grants, Selections	03
J22	Land Management Planning	49
L24	FA&O Construction and Reconstruction	1.31
L25	FA&O Facility Maintenance	.33
P01	Fire Management Planning & Analysis	11
P03	Fire Detection	.29
P04	Primary Attack Forces	5.23
P05	Secondary Attack Forces	03
P14	Fuel Treatment Area Maintenance	01
P19	Aerial Transportation of Persons	3 87
P20	Aerial Transportation of Goods	03
P21	Aerial Application of Materials	.90
P22	Aerial Platforms	33
P25	Coop Law Enforcement	.20
T01	Line Management	.99

Total Fixed Costs as a % of Estimated 1986 Budget = 16.48%

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Costs Considered to be Variable Across Alternatives

All other costs were classified as "variable." These costs were tied to the implementation of activities within a Management Area Prescription, and were expressed as costs per acre or costs per unit of output (i e , dollars per MCF, dollars per RVD, etc.). Variable costs were analyzed either in FORPLAN, TRANSHIP, or some form of spread sheet.

In general, FORPLAN contained all of the variable costs associated with implementing multiple use vegetative management activities, and the initial collector road construction costs incurred to access roadless areas It also contained some non-federal logging costs for those analysis areas requiring more expensive logging methods than the average tractor logging costs which were used to derive the stumpage values for the Model These non-federal costs were included in FORPLAN's PNV calculations, but did not influence the Forest Service budget estimates Figure B-11 depicts the variable Forest Service costs that were included in FORPLAN and contributed to its calculation of PNV for alternative multiple use timber harvest scheduling solutions.

Figure B-11 Variable Costs

MIH CODE	MIH ACTIVITY DESCRIPTION	% OF ESTIMATED 1986 BUDGET
AZ9	Recreation Support to Other Resources	32
CZ9	Wildlife Support to Other Resources	51
DZ9	Range Support to Other resources	.19
E03	Field Data Collection	1.14
E04	Reforestation	13.67
E05	Timber Stand Improvement	4.72
E06	Timber Sale Prep	5.98
E07	Timber Harvest Administration	3 24
FZ9	Soil, Water, and Water Support	.22
GZ9	Lands Support to Other Resources	01
L01-L50	Arterial, Collector, & Local Road Const.	* 15 59
P11	Treatment of Fuels	6.82
P24	Law Enforcement	27

FORPLAN Variable Costs as a % of Estimated 1986 Budget = 37.09-52.69%

* These costs pertain to the total Forest The cost in FORPLAN would be less than this since it only includes the new construction costs for inventoried roadless areas This is reflected in range of totals presented for this table

Figure B-11 lists the MIH activity codes for which costs were developed and entered into FORPLAN. Many of these elements were combined into broader FORPLAN cost categories. These costs were usually expressed in terms of dollars/acre or dollars/MCF. The costs which were expressed in units of volume were also developed by diameter classes. This was true for both the marginal non-federal logging costs, and the sale preparation/ administration costs For each FORPLAN cost category, a range of costs were entered into the model based on the Management Prescriptions, and the characteristics of the analysis areas to which they applied.

Figure B-12 FORPLAN Cost Categories

FORPLAN General Cost Category	Units	Cost Range
Site Preparation	Per Acre	$140 - $335
Reforestation	Per Acre	$ 5 - $660
Brush Release	Per Acre	$ 16 - $ 70
Precommercial Thinning	Per Acre	$ 70 - $300
First Entry Road Construction	Per Acre	$ 93 - $335
Sale Prep. & Admin (Thinnings & UE-aged)	Per MCF	$ 26 - $394
Sale Prep. & Admin (Final Harvest)	Per MCF	$ 7 - $202

Figure B-12 presents some broad FORPLAN cost categories, the units for which the costs were based, and the range of costs included in the Model

Experience on the Forest is limited with regard to deriving costs associated with uneven-aged management. Even-aged treatment costs served as the basis for uneven-aged costs and adjustments were made to them where deemed appropriate For example, sale preparation and administration costs for uneven-aged management used thinning costs, increased by 15 percent to reflect increased complexity necessary to accomplish these activities Logging costs for rocky ground and stumpage values use the same diameter dependent costs for even and uneven-aged management. Site preparation, release and reforestation costs use even-aged costs prorated over uneven-aged entries. More complete documentation on how these adjustments were made can be found in the Planning Records.

The TRANSHIP model was used to determine the least cost transportation network needed to serve the timber and recreation traffic loadings for each alternative. It was run with five decades worth of timber and recreation traffic loadings on its network nodes and a least cost objective function. TRANSHIP dealt primarily with the costs associated with the L01 through L50 MIH activity codes. Since FORPLAN contained the initial capital investment costs for new road construction in the inventoried roadless areas, TRANSHIP was primarily used to analyze the truck and car traffic patterns, and the associated operations and maintenance costs for the network as a whole. The discounted costs from TRANSHIP were a component of the present net value calculations for each alternative.

All of the other identified variable costs were analyzed outside of these two models with the use of spread sheets In the case of recreation, the capital investment, and the operations and maintenance costs were directly related to the resulting recreation allocations and projected RVD consumption trends for each alternative. The electronic spread sheet did what FORPLAN would have done but could not due to its size limitations and the ID Team's desire to examine a wide range of prescription choices for both the timber and the recreation resources With recreation being evaluated outside of FORPLAN, efficiency analysis was a little more cumbersome, sometimes requiring iterative examinations with both analytical tools. But the spread sheet gave the ID Team more flexibility to examine alternative recreation management options for each alternative

The range capital investment, and operations and maintenance costs were a function of the amount of outputs and emphasis a particular benchmark or alternative was designed to provide for this resource, rather than a result of a particular land allocation. Range was dropped from FORPLAN due to its relative insignificance to the Forest's present net worth (less than 1 percent), and the increased model size that would have been necessary to carry the range allotments as analysis area identifiers. When range was included in our earlier FORPLAN formulations, it appeared to have little effect on the timber harvest scheduling

solutions. With or without range in the model, the timber prescriptions selected usually included intensive silvicultural regimes

The remaining identified variable costs that were not related to the range and recreation programs were also evaluated outside of the model. It was evident that these costs should vary between alternatives. Generally, it appeared that these activities and their associated costs should vary as a function of land allocations, timber management activities, resource output levels, or road and facility development activities. However, due to the very soft data regarding the per unit costs of many of these activities, and the uncertainty as to the exact nature of their production relationships, the Team decided to examine them outside of FORPLAN. Basically, the costs associated with these activities were estimated by comparing the amounts of relevant allocations or activity levels in a particular alternative to the current direction and indexing the projected costs based on those relationships.

Figure B-13 Other Variable Costs

MIH CODE	MIH ACTIVITY DESCRIPTION	% of ESTIMATED 1986 BUDGET
A01	Recreation Planning	.18
A02/308	Cultural Resource Inventory	.47
A03	Cultural Resource Evaluation	.02
A03	Cultural Resource Protection & Enhancement	.11
A05	Facility & Site Reconstruction	.66
A06	Facility & Site Construction	.38
A07	Facility & Site Management	4.82
A08	Use Administration	.43
A10	Trail Reconstruction	.13
A11	Trail Construction	.10
A12	Trail Operation & Maintenance	.36
B03	Wilderness Use Administration	.27
C01	Surveys, Planning, Prescriptions, Monitoring	.34
C02	Non-structural Habitat Improvements	.56
C03	Structural Habitat Improvements	.03
C04	Structural Habitat Improvements Maintenance	.11
D01	Range Resource Planning	.06
D02	Range Resource Inventory	.08
D03	Range Non-Structural Improvements	02
D05	Range Structural Improvements	.18
D07	Range Administration & Management	.35
E09	Genetic Tree Improvement	1 02
F09	Monitoring	.14
G02	Site Specific Technical Investigations	.14
G03	Processing of Exploration Proposals	.04
G04	Processing of Lease Applications	.04
G05	Processing of Site Specific Dev Proposals	15
G06	Administration of Operations	13
J01	Special Use Management	24
J06	Property Boundary Locations	1 28
J07	Property Boundary & Corner Maintenance	03
J13	Land Exchange	15
J15	Land Acquisition	1 32
J18	Rights-of-Way Acquisition	04
J19	Rights-of-Way Cost Share Agreements	05
P02	Fire Prevention	.11
P06	Fire Reinforcements	.07
P07	Forest Fire Support & Facilitating Services	3.43
P10	Fuels Management Inventory	.02
P12	Treatment of Natural Fuels	.11
P24	Law Enforcement	27
T02	Program Support	3.96
T03	Common Services	1.69

Other Variable Costs as a % of Estimated 1986 Budget = 30.83%

APPENDIX B
ECONOMIC EFFICIENCY ANALYSIS

Benefits Considered for Economic Efficiency Analyses

This section describes both the priced and non-priced benefits which were incorporated in the economic efficiency analyses for each benchmark and alternative considered during the development of the FEIS.

Resource outputs to which dollar values were assigned constitute the priced benefits included in the present net value calculations. Like all of the costs included in the analyses, only those benefits incurred during the 50 year RPA planning horizon were incorporated in the PNV calculations The economic efficiency analysis for each alternative also considered non-priced benefits These are outputs for which there is no available market transaction evidence and no reasonable basis for estimating a dollar value commensurate with the market values associated with the priced outputs In these cases, a subjective qualitative value must be attributed to their production. Conceptually, the addition of the non-priced benefits to PNV is used to derive the net public benefits associated with each alternative. Both priced and non-priced outputs and their associated values will be summarized below More detailed documentation of the specific values and the process used to develop them can be found at the Supervisor's Office

Priced Benefits Considered for Economic Efficiency Analysis

Priced benefits fall into one of two categories· market and nonmarket (assigned). The market values constitute the unit price of an output normally exchanged in a market after at least one stage of production, and are expressed in terms of what people are willing to pay as evidenced by market transactions. Nonmarket values constitute the unit price of a nonmarket output not normally exchanged in a market at any stage before consumption, and thus must be imputed from other economic information (FSM 1970 5). They are valued in terms of what reasonable people would be willing to pay (above participation costs) rather than go without the output In either case, their values are theoretically commensurate and appropriate for inclusion in PNV calculations The resources for which dollar values were estimated on the Deschutes consisted of timber, range, special uses, and developed, dispersed, and wildlife oriented recreation

Timber was the only resource to which market prices were assigned in FORPLAN. These values were expressed in terms of dollars/MCF paid at time of harvest The stumpage prices were developed for both existing natural and future managed stands, and were working group (ponderosa pine, lodgepole pine, mixed conifer, and mountain hemlock) and diameter class (4 inch DBH intervals) specific

The process for calculating the stumpage values was quite complex We will summarize it here. All calculations were performed in terms of constant 1982 dollars. Also, since most of the source data was expressed in terms of dollars/MBF, it was necessary to convert these to dollars/MCF at different steps in the process. The stumpage values were first calculated for each individual species, and then converted to working group stumpage prices based on the species composition of each working group modeled in FORPLAN. Also, since none of the source data was diameter specific, assumptions had to be made regarding the average diameter of trees sold for each species during the period for which the data sources covered. The diameter specific values and costs were then developed based on diameter class relative indices for lumber selling values, logging and manufacturing costs

The first step was to calculate the stumpage price at time of harvest by examining Cut & Sold Report data files for the years 1977 through 1982 Next, logging and manufacturing costs were estimated based on a statistical analysis of 2400-17 Timber Sale Report data files for the years 1972 through 1982. The resulting logging and manufacturing costs, and the profit margin were then added to the average stumpage price in order to arrive at the average lumber selling value All of this was done for the average diameter class of trees sold for each species during the period of time covered by the source data.

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Based on work done at the Pacific Northwest Forest and Range Experiment Station, lumber selling price diameter relationships were used to develop diameter specific lumber selling values. Logging cost diameter relationships based on available time-motion studies done in the Pacific Northwest were then used to develop the diameter specific logging costs Manufacturing costs and profit margins were also calculated for each diameter class for each species. The remaining step was to then derive the stumpage values for each diameter class by deducting the respective diameter specific profit margins and processing costs from the selling values.

After converting these species stumpage prices to working group stumpage prices, the next step was to enter them into FORPLAN. One final adjustment needed to be made. The logging costs used to derive the stumpage values pertained to tractor logging. For the less than 10 percent of the analysis areas which required more expensive logging shows, the stumpage values were adjusted to reflect the higher marginal logging costs.

Figure B-14 below presents the diameter specific working group stumpage values based on tractor logging systems:

Figure B-14, Working Group Stumpage Values ($/MCF)

DBH Class	PPN	LPP	MC	MH
8.0- 9.9	30	31	35	30
10 0-11 9	37	43	45	35
12.0-13.9	295	212	180	38
14.0-15.9	604	413	423	119
16.0-17.9	733	470	541	159
18 0-19.9	881	532	657	191
20 0-21 9	981	na	746	222
22 0-23 9	1113	na	840	240
24.0-25.9	1197	na	901	257
26.0-27.9	1257	na	944	na
28 0-29 9	1315	na	982	na
30.0+	1391	na	1028	

All other priced benefits were analyzed with electronic spread sheets outside of FORPLAN As discussed earlier, this sometimes required some iterative analyses between FORPLAN and the spread sheets to ensure that in fact the solution for an alternative reasonably approximated the most economically efficient set of prescriptions and outputs to achieve the objectives of a particular alternative. A description of the other priced outputs follows

The range outputs represent the amounts of forage permitted to be grazed and is measured in units of animal unit months (AUMs). AUM values were calculated as the value of the marginal product of an AUM in the production of a marketable animal The Forest Service entered into a cooperative agreement with the USDA Economic Research Service to develop livestock enterprise budgets for each National Forest. The Range Budget Approach was used for this analysis. Because Forest AUMs are not actually priced in a free competitive market, the calculated price is an estimate of market value. First, returns from all ranch products were determined. Then, all costs of production were subtracted The remaining returns plus the cost of the Forest Service permits became the residual value of the AUM This residual value of an AUM to ranch livestock production is comparable to conversion surplus timber values.

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Based on the information provided in the RPA 1985 Program analysis for the DEIS, and a Regional Office Memo (2340, 9/30/83), the AUM value for the Deschutes National Forest in 1982 dollars is $10.73.

The non-wildlife related recreation and wilderness outputs represent the amount of use consumed on the Forest and are measured in terms of recreation visitor days (RVDs) The wildlife related recreation use is measured in terms of wildlife and fish user days (WFUDs) The values used for these priced outputs were derived directly from the 1985 RPA program assessment. This discussion is a summary of the write-up found in Appendix F the 1985 RPA DEIS

The development of recreation, wilderness, and wildlife values for the 1985 RPA Program analysis consisted of two steps· (1) development of recreation and wildlife benefit values by activity per RVD or WFUD; and (2) adjustment of values to reflect standard and less than standard levels of management

The Resource Evaluation Group at the Rocky Mountain Forest and Range Experiment Station conducted an extensive literature search to develop the 1985 activity values for recreation. Benefit values for recreation, wilderness, and wildlife activities were developed from recent travel cost models and contingent valuation research.[4] In-service and academic specialists reviewed the research and activity values and adjusted the initial values to achieve methodological consistency to apply them to regional conditions. The values represent total willingness to pay for an additional recreation site, herd unit, or wilderness area The RVD values by recreation activity that were generated by this study can be found in Table F 4 of the 1985 RPA DEIS

For program evaluation purposes, these values were subsequently adjusted downwards because·

-- The travel cost method represents a total willingness-to-pay Other resource values in the RPA evaluation represent market price or value of the marginal product. Consequently, the willingness-to-pay values were adjusted in an effort to make the recreation values more compatible with values used for other resource outputs.

-- The travel cost method estimates values on a site-by-site basis. The method does not address the question of whether regionally or nationally a given quantity of RVDs will, in fact, be consumed if that price were changed.

-- It is believed that the travel cost studies are typically done at higher quality sites, do not take into account substitutes to individual sites, and do not accurately measure trip length; consequently, values from these studies may be on the high side when applied to average situations on a region-wide basis

In response to the first concerns, the values were adjusted based on the relationship between the proportion of recreation provided by the Forest Service and estimates of an average nationwide demand elasticity for outdoor recreation It is estimated that nationally, roughly a 5 percent increase in price will result in a 1 percent decrease in quantity demanded.[5] It is also estimated that in 1982 the Forest Service provided 7 5 percent of all outdoor recreation. Consequently, it is roughly estimated that there will be a 5 percent decrease in price for each percent of the 7 5 percent Forest Service market share or a total decrease of 37.5 percent for clearing the market. Therefore, the initial willingness-to-pay values were reduced 37 5 percent for use in comparing resource allocation choices

[4] John Loomis and Cindy Sorg ***A Critical Summary of Empirical Estimates of the Values of Wildlife, Wilderness, and General Recreation Related to National Forest Regions*** Rocky Mountain Forest And Range Experiment Station, USDA Forest Service, 1982

[5] Robert C Lewis 1977, "Policy Formation and Planning for Outdoor Recreation Facilities " Pages 62-69 of ***Outdoor Recreation - Advances in Application of Economics*** by Jay M Hughes and R Duane Lloyd, USDA, Forest Service, General Technical Report WO-2

In response to the quality factor, the concept of standard and less-than-standard service was introduced, and the resulting impact on the value of the experience to the recreationist was estimated. If recreation facilities are not fully maintained, the quality of the experience will be lowered. Two different sets of values were developed to account for the standard and less-than-standard outputs A special study showed that on the average the less-than-standard RVDs are valued at about 53 percent of the value of standard RVDs. Accordingly, different capital investment, and operations and maintenance costs were developed for the standard and less-than-standard recreation outputs. Depending in the theme of an alternative, assumptions had to be made as to which standard the recreation resources would be managed to provide.

Finally, these values were expressed in terms of the recreation opportunity spectrum (ROS) activity categories in accordance with the way they were developed and tracked during the process of analyzing alternatives. The resulting values are depicted in Figure B-15:

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Figure B-15 1985 RPA RECREATION BENEFIT VALUES (1982 $)

Recreation	Value($/RVD)
Primitive (STD)	11.25
Primitive (LSTD)	5.96
Semi-Primitive Non-Motorized (STD)	13 25
Semi-Primitive Non-Motorized (LSTD)	7 02
Semi-Primitive Motorized (STD)	12 13
Semi-Primitive Motorized (LSTD)	6.43
Roaded Natural (STD)	9.38
Roaded Natural (LSTD)	4.97
Rural (STD)	8 47
Rural (LSTD)	4 49
Urban (STD)	11.38
Urban (LSTD)	6.03

Wilderness	Value($/RVD)
Primitive (STD)	17.50
Primitive (LSTD)	9 28
Semi-Primitive Non-Motorized (STD)	17 50
Semi-Primitive Non-Motorized (LSTD)	9 28

Wildlife & Fish	Value($/WFUD)
Big Game	30 00
Nongame	25.00
Resident Fish	15 00
Other Game	19 00
WL/F REC (STD)	21.00
WL/F REC (LSTD)	14 00

Finally, both recreation and non-recreation special uses were included as priced outputs for the calculation of PNV The receipts for these activities were based on the actual cash transactions for the years 1980 through 1984 While the recreation uses account for the bulk of the special use fees, these receipts in general are a very small percentage of the total Forest revenues. For each alternative, their projections are a function of estimated downhill skiing use at Mt. Bachelor since this is the primary contributor to special use revenues.

Non-Priced Outputs Considered in Economic Efficiency Analysis

The calculation of PNV enables the comparison of alternatives with regards to their output levels for priced resources, and their efficiency in producing them. However, other factors also influence the decisionmaking process In some cases, the importance of non-priced benefits for which it is impossible to assign monetary values can outweigh the advantages of producing higher levels of priced outputs The importance of the need to consider these subjectively valued benefits in Forest management decisionmaking is addressed in the NFMA Regulations which charge the Forest Service with identifying the alternative which comes nearest to maximizing net public benefits (36 CFR 219 12(F)).

Net public benefits (NPB) represent the overall value to the nation of all outputs and positive effects (benefits) less all associated inputs and negative effects (costs), whether they can be quantitatively valued or not (36 CFR 219.3). Net public benefits include both priced and nonpriced resource outputs, less all costs associated with managing the area. As stated earlier, all priced outputs and all costs associated with managing the Forest are included in the calculation of PNV. To this, the net subjective values of the non-priced outputs must be added in order to arrive at the overall NPB of an alternative Some of the most important non-priced benefits addressed during the Deschutes National Forest planning process revolve around maintaining and enhancing the following:

Lifestyles
Diversity and Quality of Recreation Opportunities
Suitable Habitat for Threatened & Endangered Species
Ecosystem Diversity
Visual Quality
Historical and Cultural Resources
Water Quality
Air Quality

These are all outputs and effects which are influenced to a large degree by decisions regarding how to manage the Forest. They are all the topic of one or more issues and concerns which were identified at the outset of the planning process. So they are important, but it is not possible to measure their importance in dollar terms which are comparable to market values Their values must be subjectively determined.

The provision for many of the non-priced benefits is achieved by applying constraints to the production of priced outputs (i.e., such as timber harvesting constraints in FORPLAN). These constraints usually result in a decrease in the PNV of the priced outputs to which the constraints were applied Subjective judgments are then necessary in assessing whether the benefits of producing the non-priced outputs exceed the opportunity costs associated with producing fewer priced outputs If a PNV tradeoff induced by the provision of a non-priced output is judged acceptable, then a positive contribution to NPB has resulted, and the alternative is overall more efficient

The non-priced outputs considered during the development and evaluation of alternatives are discussed below While the quantitative dollar values of each can not be determined, they can generally be evaluated by examining such quantitative indicators as acres of appropriate allocations, resource inventories, or timber production related activities and outputs.

Lifestyles - Surveys of the Central Oregon populus have shown that many people are attracted to the area for the outdoor lifestyles it can offer them. While this is not to say that jobs and income are not important, many have indicated that their choice to live here was made at the expense of economic interests A Forest with a broad recreation

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base in a pleasing environment could be an asset to the Central Oregon area while still providing goods and services necessary for stable Forest based economies

Central to maintaining and enhancing the Central Oregon lifestyle is the provision of diverse recreation opportunities, and clean air and water to enjoy them The freedom and ability to cut personal use firewood is also important To the extent that an alternative results in reduced or less diverse recreation opportunities, lower quality water, smokier air, or more restrictive access to personal use firewood, the alternative will be less desirable from a lifestyle point of view Many of these effects are directly related to land allocations and resource management goals which emphasize the production of wood at the expense of amenity values.

The stability of jobs and income in the area is also an element of the concern about lifestyles. For this purpose, each alternative was analyzed with regards to its potential impacts on jobs and income in Deschutes County (Refer to the section on Social and Economic Impact Analysis). Any indications that the implementation of an alternative would result in fewer jobs and less income would be considered disruptive of the current lifestyles

Diversity and Quality of Recreation Opportunities - The number of recreation visitor days and their associated priced values are included in the PNV calculations for each alternative However, the assigned dollar values per RVD do not reflect the value of providing a diversity of recreation opportunities and settings The Forest currently provides adequate recreation diversity as indicated by the reasons many people choose to live and recreate in the area However, some aspects of the recreation opportunity spectrum are becoming more difficult to retain For example, as remaining roadless areas are either designated as wilderness, or roaded and developed for other uses, there are fewer opportunities for the semi-primitive and primitive recreation experiences outside of wilderness areas Related to this is the idea that as more and more roadless areas are either developed or designated as wilderness, future generations will have fewer options regarding how to best manage them to meet changing needs. To the extent that retaining roadless areas in undeveloped conditions does not overly restrict the efficient production of priced outputs, both the recreation diversity and the future options which they offer are considered a non-priced benefit For each alternative, the recreation allocations and projected carrying capacities are categorized according to the recreation opportunity spectrum This will be used to assess the recreation diversity which an alternative provides.

Suitable Habitat for Threatened & Endangered Species - The threatened, endangered, and sensitive wildlife species managed on the Forest include bald eagles and northern spotted owls Each alternative provides for at least enough habitat to satisfy the Management Requirements (MRs) for each of these species However, some alternatives provide habitat for these species in excess of the MRs Any provision of suitable habitat in excess of the MRs is considered to be a non-priced benefit.

Ecosystem Diversity - Maintaining plant and animal ecosystem diversity over time is also considered as a non-priced component of net public benefits. Benefits generally associated with ecosystem diversity are gene pool maintenance, scientific research opportunities, and the reduction of insect and disease risks. Since animal diversity is to a large extent dependent upon plant diversity, attention is focused particularly on the number of acres for each working group in each successional stage The amount of old growth provided is especially important since this component would be the most difficult to replace once it disappears It serves as the focus for evaluating each alternatives impact on ecosystem diversity Timber harvesting and fire are the chief means of manipulating vegetative diversity. The effects of scheduled timber harvesting on vegetative diversity were evaluated through a combination of FORPLAN reports and some special software programs which were developed specifically for that purpose. The risks of wildfire were also examined for each alternative. To a certain extent, the more old growth provided for in a particular alternative, the higher the benefits associated with this non-priced output

Visual Quality - While the value of visual quality is not directly included in the PNV calculations, its value is indirectly represented through the consid-

eration of recreation as a priced benefit. It is safe to assume that the provision of positive visual experiences has a direct relationship to the quantity and quality of recreation on the Forest. However, a large number of people who benefit from the visually appealing scenery are not tallied as recreation users of the Forest For example, there are two principal highways which pass through the Forest. The people who drive on these pass through some quality scenic areas. Yet, they are not counted as RVDs There are also the people who live in or around the Forest who everyday enjoy scenic qualities associated with the forested mountain environment Again, these beneficiaries are not tallied as RVDs. These benefits are nonmeasurable

The alternatives each vary in their emphases to satisfy visual quality objectives This can be measured in terms of the percentage of all sensitive retention and partial retention visual quality objectives which are being met through the implementation of an alternative.

Historical and Cultural Resources - A large number of scientifically and historically valuable cultural resources are identified on the Forest. Over 50 new sites, mainly comprising prehistoric Indian campsites, are found each year as a result of the Forest's cultural resource inventory program. Cultural resources are an issue in the sense that many people are concerned about how many and how adequately these cultural sites are being preserved and protected in the face of ground disturbing projects and vandalism that occurs on the Forest The more areas that are opened up to development for road construction, timber harvesting, and minerals and energy development, the more difficult it will be to protect these resources.

Water Quality - The water quality and conditions along the shorelines of the lakes and streams on the Forest are good As discussed above, water quality is one of the components which contribute to the outdoor lifestyles of Central Oregonians. In general, sedimentation of streams and lakes on the Forest is not a serious problem. However, to the extent that an emphasis on wood production forces harvesting on sensitive steep areas, and riparian zones, water quality may experience some degradation

Air Quality - Air quality is another important aspect of the Central Oregon area. For the most part, air quality conditions are good except during certain times during the winter when temperature inversions create wood stove pollution problems, and certain times during the spring and summer when prescribed burning activities are going on

Most of the firewood supply utilized in the area comes off of the Forest, and is directly related to the amount of accessible beetle-killed lodgepole pine. Different approaches for making firewood available to the public were explored in each of the alternatives. These involved different pricing and allocation strategies, and different rates of using the desirable dead lodgepole pine materials. In the short run (i.e., 5 to 10 years), firewood burning and its related pollution problems will continue to exist After that, however, the supply situation changes from one alternative to another, and in some cases people may either be forced, or choose, to use some other energy source for heat. In which case, some benefits would be realized from improved air quality, even though the benefits of burning relatively inexpensive firewood as a way of life would be reduced.

Air quality degradation resulting from fuels treatment and prescribed burning activities is pretty much directly related to the amount of scheduled timber and vegetative management activities associated with an alternative. The more acres of these activities called for in an alternative, the lower the quality of the air during certain seasons of the year.

APPENDIX B
SOCIAL AND ECONOMIC IMPACT ANALYSIS

INTRODUCTION

Many communities, and the people who live within them, in the Central Oregon and nearby surrounding regions of the Pacific Northwest are dependent upon the Deschutes National Forest for their economic, recreational, and social way-of-life Population levels, economic well-being, lifestyles, attitudes, beliefs, values, and social organization are all related to Forest Service activities to a certain extent In fact, many of the issues, concerns, and opportunities which the planning process must address reflect the importance of the Forest to both local and regional publics. Therefore, it is essential that the economic and social consequences that could result from the implementation of land management planning decisions be considered during the evaluation of alternatives.

Economic impact analysis is a means by which relevant Forest management decisions are evaluated with regards to their impacts on employment, personal income, and local government revenues within an area defined as the "Forest Influence Zone " Social analysis, in turn, evaluates the polarization or cohesion effects that arise in different community types within the Forest Influence Zone in response to land management planning decisions This Chapter provides an overview and description of the economic and social impact analysis which was performed during the evaluation of alternatives for the Deschutes National Forest Draft Environmental Impact Statement and Forest Plan

Economic Overview

Forest Influence Zone As Established for Economic Analysis

To assess the current economic conditions and to estimate potential changes, a Forest Influence Zone was determined. The Forest Influence Zone is the geographic area where the majority of Forest resources such as timber, recreation, range, water, and wildlife are first used and where public concern is concentrated. Traditionally, this area has been defined as Deschutes, southern Jefferson, and northern Klamath Counties. For purposes of economic impact analysis, Deschutes County was used as a surrogate for the full zone of influence.

More recently, an increasing amount of Forest timber has been purchased by purchasers from areas farther away This pattern is expected to continue However, the importance of the Forest is not as great proportionately in more distant counties Consequently, Deschutes County will continue to serve as a proxy for the Forest Influence Zone for purposes of economic impact analysis

Social Overview

Social impact analysis is the process of assessing how Forest Service decisions and policies affect human social life. Human social life is influenced by surrounding physical and biological environments. This is most evident in rural areas where the variety and quality of available natural resources often determines the chief means of socio-economic livelihood and, therefore, influence local preferences for the use of public lands Thus, proposed changes in the availability or permitted uses of National Forest resources are of importance to residents of affected communities, commercial users, and recreationists Other people, including many who seldom visit the Forest, also have a strong interest in how Forest resources are managed

For the FEIS, a team of people who had a feel for the pulse of the local communities developed the frame work of the social analysis under the guidance of the Regional Sociologist. Essentially, this consisted of delineating and categorizing different communities within the local area and surrounding regions in which the social environment could be affected by land management planning decisions, and then identifying those effects which might result from the implementation of each alternative.

Forest Influence Zone as Defined for Social Analysis

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People and communities in the Zone of Influence have important, but different, ties to the Deschutes National Forest. The nature of these ties means that different aspects of the alternatives displayed in the Final Environmental Impact Statement could affect each community or interest group somewhat differently. The Social Effects Work Group divided the area into four sub-areas for analyzing social effects The four community types are described below After the four types of communities were identified, two types of ties between Forest and community were established One tie between Forest and community is its contribution of raw material for industry and the jobs it and Forest management provide A second tie is the scenic and recreational environment the Forest offers to recreationists and residents. Two of the community types have very clear and nonoverlapping ties to the Forest while the other two communities are affected by both types of ties but in different ways.

Rural Industrial Communities - Rural industrial communities are closely tied to the Forest in work, subsistence, and play, and are directly affected by what happens on the Forest Obvious links between the Deschutes National Forest and these communities are logs for their harvesting, manufacturing, and transportation businesses The wood products industry is the predominant industry in towns like Crescent, Gilchrist, Prineville, and Redmond But timber is not the only tie. People in these communities use fuelwood, fish, and game for part of their subsistence. Recreation (often roaded and/or motorized) is also an important component of the life styles for these Central Oregonians and the provision of diverse recreation opportunities on the Forest provide is a major attraction to the area. While Prineville is considered as one of these community types, recreation and subsistence use by Prineville residents is more likely to occur on the Ochoco National Forest.

Rural Recreation and Residential Communities - Rural recreation and residential communities near the Deschutes National Forest are based primarily upon recreation and recreation residences. Environmental and scenic amenities and nearby recreational opportunities are major reasons for their existence. Towns and settlements along the Metolius and upper Deschutes River, including both LaPine and Sisters are included in this community type. Local service-oriented businesses provide convenience items and cater to tourists, skiers, and sportsmen.

Air, water, and visual quality are issues of particular importance to these communities. Timber harvesting and prescribed or accidental burns on adjacent or visible Forest lands are typically community concerns. The provision of abundant fuelwood, fish and game are also important to these communities

Changes in the appearance of the Forest setting, amenities, and recreation opportunities provided by the Deschutes National Forest have direct impacts on these communities and any radical changes effecting these resources would probably result in the voicing of public concerns.

Central Oregon Urban Center - This community type includes Bend which is the dominant community in the Forest Influence Zone. It has a large industrial sector based on wood products, and a large service sector keyed to recreation and tourism. It is the major shopping and service center for outlying communities. The socioeconomic health of the wood products industry and service sector and the quality of the environment are all central to Bend's residents.

As a larger and more diverse community, some conflicts over Forest management can be absorbed without much disruption. While more sensitive issues tend to pull people together within the smaller communities, they tend to polarize a community like Bend which has economic and emotional ties on all sides of the issues The Deschutes National Forest, because of its amenities and economic contributions to Bend, renders it a Forest-dependent community.

Westside Communities - While activities on the Deschutes National Forest do not directly impact the daily lives of people in the populous communities west of the Cascades, they are important to many of them for various reasons In recent years, increasingly more Deschutes National Forest timber sales are being purchased by the westside wood products industry. In addition, the provision of a wide diversity of recreational opportunities is important to residents of the Willamette Valley

and Portland metropolitan areas These communities could represent the more diffuse Regional public which is affected by management decisions on the Deschutes National Forest.

Conflicts over resource management decisions on the Deschutes National Forest are more likely to be seen as symbolic of broader issues Responses may reflect the position of specific interest groups rather than the sentiment of local residents who are directly affected by the issues.

Social Effects

The Forest Service plays an integral role in the socio-economic environment of Central Oregon Accordingly, decisions which significantly change Forest Service land use policies and/or resource output levels can impact the socio-economic way of life In order to evaluate the potential consequences associated with the implementation of land management planning decisions, three categories of social effects were identified which would be directly linked to the alternatives. They are (1) Jobs and Lifestyles, (2) Community Cohesion, and (3) Attitudes, Beliefs and Values.

Jobs and Lifestyles - Management of the Deschutes National Forest has direct, indirect, and induced effects on many different aspects of the employment base in the Central Oregon economy. It also can have far reaching effects on many people's lifestyles Negative effects on jobs and lifestyles occur when actions (1) reduce employment opportunities, (2) reduce the diversity of recreational opportunities, (3) reduce freedom to use the Forest for subsistence and recreation and, (4) lower the environmental qualities of the area

Community Stability and Cohesion - Social organization refers to the way society is structured It includes the concepts of community stability and community cohesion Both of these are related to the sense of belonging that is associated with mutual community interests and goals In a community where different groups have a high degree of their own cohesion, a Forest Service action which is interpreted as being in favor of one group may become the focus of a problem for both the community and the Forest Service. Negative effects on community cohesion occur when issues divide a community and result in polarization Forest Service decisions can either aggravate or help to alleviate existing conflicts

Attitudes, Beliefs and Values - These include the feelings, preferences and expectations people have for forests and the management and use of particular areas.

Analytical Tools and Sources of Data

General Description of IMPLAN

IMPLAN is an input-output model developed by the Forest Service. Like all input-output models, it simulates an economy, and can examine the effects on the whole economy of changes made in particular sectors. This means that IMPLAN is forced to assume that the basis for the economy will remain static This means, among other things, that there will be no technological changes, no new industries or industries that cease to exist; and no changes in the patterns in which industries purchase from one another. The industries may change in size only, not in makeup.

This assumption may be fairly realistic for the Deschutes County model for the first decade No IMPLAN runs were made for further decades because for them the assumption was judged not to be reasonable

IMPLAN (specifically, IMPLAN Version 2 0) is based on a 528 sector national model This model derives its interindustry relationships from the 1977 Department of Commerce I-O model, but is updated to 1982. An individual county models is derived from the national model by examining county data to determine which sectors of the national model are present in that county The county model is then created as a subset of the national model. This process requires the assumption that the county interindustry linkages resemble the national picture This assumption is reasonable for the Deschutes County economy.

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Data Used in the Model

The process described above creates a County model - a description of what industries are present in the County. But additional information must be provided which defines the level at which each local industry is producing This information is also provided, in rough form, by IMPLAN. It is mostly taken from various censuses published by the Department of Commerce Bureau of the Census. The data is for the year 1982.

The 1982 economic figures were analyzed to determine their usefulness for analysis in 1990. The fact that employment is much higher in 1990 than in 1982 does not in itself pose a problem to the analysis. However, if there were changes in industry structure, the data needs to be recomputed.

It was judged that for the wood products industries, the industry structure needs to be updated Real income per worker has declined, and productivity per employee may have increased. The structure of the 1990 economy was estimated from data obtained from the Central Oregon Intergovernmental Council and from other sources.

It was estimated that for the rest of the economy, the data adequately represents the industry makeup and the interindustry linkages as they exist in 1990. The one exception was that the figures for Wholesale Trade were unaccountably low, and were recomputed

Expenditures Associated with one Unit of Output

The final step in building the IMPLAN model was to determine the effect on the economy of varying one unit of forest output - one MMBF, one MAUM, one MRVD This data is called expenditure data, since it measures the expenditures in the economic sectors which are associated with one unit of output.

A key part of determining timber-related expenditures is to estimate the extent to which Forest timber is processed in the local economy It was assumed that, in recent years, seventy-five percent of the ponderosa pine harvested in the Forest was milled locally; and fifty percent of all other species were milled locally. We assume that in future years, this pattern will change and that fifty percent of all species will be milled in Deschutes County.

Forage expenditures were computed from USDA Economic Research Service data. The total value of the herd was multiplied by the percentage of the forage that came from the Forest to obtain the value due to the Forest; then that figure was divided by the number of AUM's to get the value per AUM. This method makes two assumptions. First, it is assumed that all the cows and yearlings come either from calves produced by the herd or calves purchased immediately after birth. Second, it is assumed that the value of Forest forage is equal to the average forage value.

Expenditure data for RVD's (recreation) were obtained from the Regional Office, classified by RIM category. These figures were applied to the Forest recreation pattern

The remaining expenditure data are related to 25% monies. 25% monies that went to roads were allocated to 75% road maintenance and 25% new road construction. Those monies that were used by the schools to pay salaries were proportioned according to the average consumer expenditure pattern for the County. The 25% monies that went to schools that were not spent on salaries were proportioned according to the education expenditure pattern for the County

Figure B-16 shows the effects of one unit of different Forest outputs

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Figure B-16 EFFECTS OF ONE UNIT OF OUTPUT

Output	Unit	Jobs	Employee Income
Ponderosa Pine (25% monies not included)	MMBF	8 6	147,000
Ponderosa Pine (including 25% monies @ $300/mbf)	MMBF	10.1	186,000
Other Species (25% monies not included)	MMBF	2 5	47,400
Other Species (including 25% monies @ $150/mbf)	MMBF	3.2	67,000
Livestock Range Forage	MAUM	0 4	4,200
Mount Bachelor Recreation	MRVD	10 2	98,600
Wilderness Recreation	MRVD	0.3	2,800
Developed Recreation	MRVD	6 8	77,000
Dispersed Roaded Recreation	MRVD	3 1	33,200
Dispersed Roadless Recreation	MRVD	3.5	40,100
Deer Hunting	MRVD	0 8	10,600
Personal Use Firewood Collection	MCORD	0 6	8,000

"Current Situation"

IMPLAN can compute either absolute or relative results. Our process was to define a "current situation" and compare the alternatives to the "current situation." However, some caution must be used in analyzing these numbers There is no precise direction on how to define the "current situation" This is an important question when circumstances can change rapidly.

For example, to define the "current situation" for timber harvest levels, we used the average for the years 1986-1989 If harvest levels for any single year were to be used instead, the numbers relative to the current situation would be different

For this reason, it is just as important to compare alternatives to one another as it is to compare them to the current situation. If Alternative X produces n timber jobs, and Alternative Y produces n+100 timber jobs, Alternative Y always produces one hundred more jobs than Alternative X. These numbers reflect differences which exist in the alternatives and which are interpreted by the IMPLAN model But a comparison to the current situation is a comparison to a number outside the IMPLAN model, a number that is potentially volatile

The "Current situation" for timber harvest levels and for 25% moneys was based on the 1986-1989 average. For recreation and grazing, estimates of the current situation were made for the year 1990

Returns to the U.S. Treasury and Local Governments

Predicted returns to the U.S. Treasury and local governments were calculated for each alternative.

These returns illustrate the potential impacts of *Forest management decisions on both the federal* government receipts collected as a result of revenue producing programs on the Forest, and the resultant change in revenues passed on to the local governments.

Returns to the U S Treasury were calculated by deriving the revenue of income producing programs on the Forest which correspond to FSM 653112b "Annual Collections Statement," of the National Forest Fund. Cash returns to the Treasury from the Deschutes National Forest are generated by timber, recreation, range, and special use receipts. The 1982 base year (actually an average for the years 1980-1984) returns to the U S. Treasury and local governments generated by these programs are displayed in Figure B-17 following·

Figure B-17 BASE YEAR ESTIMATE OF RETURNS TO THE U.S. TREASURY AND LOCAL GOVERNMENTS (Thousands of 1982 Dollars)

Revenue Source	U.S. Treasury Receipts	Local Government Receipts
Stumpage Sales	$27,063.0	$6,765.8
Recreation Fees & Special Uses	$ 622 3	$ 155.6
Range Allotments	$ 14 8	$ 3.7
Total	**$27,700.1**	**$6,925.1**

Returns to local governments are calculated as 25 percent of the returns to the U S. Treasury funds. These are paid to the State of Oregon and eventually passed on to the local county governments. These returns to the local counties are often referred to as payments in lieu of taxes.

The projections of these revenues for each alternative were based on their respective proposed output and activity levels for these programs The stumpage receipts, which account for over 97 percent of the total returns to the government, are based on the FORPLAN harvest scheduling solutions for each alternative

Social Impact Analysis

Once the economic impacts in terms of jobs, personal income, and the returns to government were completed, the anticipated social impacts that would result from implementation of each alternative were assessed. As described above under the Social Effects section, some of the social impacts could be tied to anticipated changes in the economic well-being of the Central Oregon Region as represented by the Deschutes County I-O model. However, not all of the social impacts are directly linked to concerns about jobs and income. Some of the social impacts revolve around the attitudes, beliefs, and values of different groups of citizens who are influenced either directly or indirectly by Forest management decisions Sensitive issues regarding how the Forest should be managed tend to polarize some groups against others as they attempt to influence Forest Service decisions and policies.

Estimates of the social impacts were qualitative, rather than quantitative. For each alternative, statements were made regarding how some management decisions, policies, and output levels would affect community stability, cohesion, and polarization. This analysis, in conjunction with the quantitative economic impact analysis, provided a more complete socio-economic impact assessment with regard to the implementation of each alternative.

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Commodity oriented alternatives tend to do well in maintaining the economic aspects of the social structure in the area. Increased supplies of timber in particular provide the where-with-all for the local wood processing industry to respond to regional and national markets, which in turn means more, relatively higher paying jobs for Central Oregonians. To the extent that some communities are more dependent upon the wood products industry than others, they will benefit In addition, more timber means more revenues to the counties This is also an asset when it comes to implementing and maintaining public projects in the local communities, whether they be timber dependent or not

Finances aside, other types of Forest Service decisions can influence the social well-being of Forest dependent communities. Generally, those groups or communities which view or use the Forest from an amenity standpoint are positively impacted by amenity-oriented alternatives and negatively affected by those alternatives with a commodity emphasis Decisions regarding whether or not to develop roadless areas for timber harvesting, where and to what extent the potential geothermal resources on the Forest should be permitted to be developed, and how much timber should be harvested at the expense of scenic quality, wildlife, and other noncommodity types of resources will tend to polarize groups with different values and pull together groups with common values Different issues may change the composition of the groups

These implications apply to communities as well as to groups within the communities While most social groups can be found to some extent in each community, different groups may dominate in certain communities (discussed in the Social Overview above) Towns like Crescent and Gilchrist tend to be oriented around commodity uses of the Forest, whereas communities like Sisters and Camp Sherman are more amenity oriented. Bend, on the other hand, is large enough and diverse enough to experience some internal polarization over sensitive Forest resource management issues

Finally, almost all groups and communities can adapt to slow changes in their environment. However, rapid and dramatic changes in the way the Forest is managed are likely to bring about broad levels of social disruption.

APPENDIX B
ANALYSIS PRIOR TO DEVELOPMENT OF ALTERNATIVES

INTRODUCTION

The following section contains analytical information that was based on the 1971 Continuous Forest Inventory. That inventory was adjusted to take into account events such as the mountain pine beetle epidemic in lodgepole pine which significantly altered vegetative conditions on the Forest. In 1985, a new vegetative inventory was conducted that updated information about the Forest's resources. A decision was made to incorporate the new inventory data into further Planning Analysis conducted by the Forest.

It is assumed that much of the analysis performed prior to the inventory update provides reliable information, especially where relative comparisons are made. Information on which the early analysis was performed was kept current, taking into account significant events which changed the vegetative characteristics of the Forest. Results of the analysis were used to determine sideboards for later analysis, evaluate tradeoffs between competing uses, analyze policy questions and identify need for change

For the reasons stated above, a summary of the "Benchmark Analysis" outlined in the "Analysis of the Management Situation" is presented here. Later in this section, a comparison of analytical results based on the updated 1971 and 1985 inventories are presented. It is intended that this comparison will provide a link between analysis conducted prior to the 1985 inventory and analysis conducted using the new inventory. The comparisons are based on the "Biological Potential Benchmark" (Run 1) and a benchmark which maximized PNV (Run 7).

The primary analysis performed prior to the development of alternatives was the "Analysis of the Management Situation" (AMS) During this step, the conditions of the Forest, its ability to produce outputs, and society's demands for its resources are assessed. The analysis performed during this step helps to define the decision space within which the Forest can operate to address the planning issues, concerns, and opportunities The detailed results of this analysis step can be found in the planning documents titled "Analysis of the Management Situation," and "A summary of the Analysis of the Management Situation."

An important step in the Analysis of the Management Situation is the "Benchmark Analysis " The benchmark analysis was performed in compliance with the national planning direction requirements for establishing benchmark levels The resulting benchmarks served as reference points from which the costs and effects of various objectives and constraints used in the subsequent development of alternatives were evaluated. More specifically, the purposes of the benchmarks were to:

1. Define the maximum potentials of the Forest to produce both economic benefits and resource output levels for market and non-market goods.

2. Evaluate the complementary and conflicting production relationships (tradeoffs) between pertinent market and non-market goods which the Forest can provide to the public.

3. Analyze the relative efficiencies and implications of constraints used to satisfy legal, policy, and discretionary resource management requirements.

4. Identify the range within which alternatives can be developed.

5. Help analyze the implications of continuing on with Current Management Direction and, if necessary, to identify a need for change.

To accomplish these five objectives, a series of required and optional benchmarks were developed and analyzed in accordance with Regional Planning Direction (November 10, 1983) For this purpose, several analytical tools were employed. The FORPLAN model was used to analyze the timber harvest schedules associated with the various benchmarks The R2MAP grid mapping system was instrumental in providing FORPLAN with spatial information regarding resource inventories and land allocations. Electronic spread sheets were used to help calculate the projected recreation

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and range outputs and effects associated with the benchmarks Spread sheets were also constructed to assist with the present net value calculations and estimated budgetary requirements for certain pertinent benchmarks. Utility software programs were developed to help in the analysis of vegetative diversity and to convert the cubic feet of wood outputs to board feet. The Tranship Model was used to help analyze the transportation network requirements. And finally, professional judgment and conjecture was involved in all aspects of the analysis.

Development of the Management Requirements (MRs)

As the process of developing benchmarks and Alternatives was under way, National direction was developed to ensure that they complied with the minimum requirements of applicable laws and regulations. Subsequently, the Pacific Northwest Region developed direction to ensure that the minimum requirements were applied consistently across all Forests within the Region. This direction was incorporated into a matrix and distributed under a letter dated February 9, 1983, Land and Resource Management Planning (1920). The subject of the letter was "Regional Guidelines for Incorporating Minimum Management Requirements in Forest Planning " The letter and matrix are on file at the Regional Office, Pacific Northwest Region, Portland, Oregon, and the Supervisor's Office, Deschutes National Forest, Bend, Oregon. Since the document is lengthy and not totally pertinent to the resource management situation on the Deschutes National Forest, only its more significant points are summarized in the following section.

Regional direction provided guidelines for MRs pertaining to the management of the following resources.

1 Timber
2. Fish and Wildlife
3. Soil and Water Resources and Land Productivity
4. Water Quality
5. Riparian Areas
6 Range
7. Miscellaneous

The Deschutes ID Team, in assessing the relevant resource management situations and planning issues, determined that for many of the resources addressed in the Regional MR Direction, the application of standards and guidelines combined with coordination could protect most of the resources without impacting outputs or the production of goods and services on the Forest. Specifically, the MRs for soil and land productivity, water quality, riparian areas, and range could be met without developing special requirements or restrictions While these are important resources on the Forest, no serious or significant problems are associated with them Nor are there significant issues pertaining to the management of these resources which need to be addressed Refer to Chapter III of the FEIS for more detailed discussions of individual resources.

On the other hand, it was necessary to apply the Regional guidelines in order to provide for the MRs related to the timber and wildlife resources With regard to timber harvesting, the regulations require that harvest units do not exceed 40 acres in size and that a logical harvest unit is left between them. The nebulous term involved here is "logical harvest unit " On the Deschutes, better than 90 percent of the tentatively suitable and available commercial forest land can be tractor logged This gives the Forest quite a bit of flexibility in designing leave strips which at some time in the future will be logical harvest units

The Regulations also require that the leave units can not be harvested until the adjacent previous harvest units are no longer considered an opening. An area is no longer considered an opening once it is adequately stocked with trees 4 5 feet tall. On the Deschutes, this condition is assumed to be achieved in 10 years after final harvest

In order to ensure that these conditions were achieved in the benchmarks and alternatives, constraints were used in FORPLAN which put an upper limit on the proportion of an area (almost at the analysis area level) which could be in harvest

created openings at one time. The proportions used were based on the following analytical steps:

1. The first step was the development of a grid on which various sizes of cutting units ranging from 10 to 40 acres were placed The logical harvest units left between them varied in size from 20 to 40 acres An additional consideration in the size and shape of the logical harvest units was the width of the strips left between the existing cutting units. The analysis was repeated using 210, 420, and 640 foot wide leave strips between the harvest units. What this displayed was a range in the percent of an area that could be cut in any one decade given different size cut and leave units, and various distances between units. This showed, for example, that if 40 acre size areas were harvested with leave strips between units of approximately 200 feet in width, up to 74 percent of an area could be harvested in any one decade. If leave strips are expanded to approximately 600 feet, then 46 percent of an area could be harvested This showed what the possibilities were but did not define the minimum requirement. For more details regarding this analysis, refer to the unpublished paper titled "The Appropriate Size of Logical Harvest Units" written by Tony Smith (September, 1982) This can be obtained from the process records in the Supervisor's Office, Deschutes National Forest, Bend, Oregon.

2 The second step in determining the minimum requirements concerning how much of an area could be harvested in any decade (harvest dispersion constraint) was to apply somewhat of the same procedure to actual mapped analysis areas Cutting unit sizes of mostly 40 acres, but of varying shapes, were mapped onto mature and immature sawtimber analysis areas with 20 to 40 acre logical harvest units left between them. From this analysis, it was determined that approximately 50 percent of an area could be harvested in any decade and not violate the management requirements for harvest unit sizes and dispersion. This 50 percent upper limit proportion constraint was applied in FORPLAN by Ranger District (Level One), working group (Level Four), and maturity class (Level Six). However, it was not applied to the mature lodgepole pine analysis areas because of the mountain pine beetle epidemic. Cutting unit sizes larger than 40 acres are permitted in mature lodgepole due to the catastrophic insect damage in this working group. This is provided for in Section 219.27(d)(2)(iii). Wildlife habitat, water, soil or other resources were not considered in development of the harvest dispersion constraint. Only the cutting unit size and the leave areas were considered.

To meet the MRs for wildlife habitat, the Regional Direction was followed very closely Species on the Deschutes for which minimum requirements were developed are the northern spotted owl, bald eagle, goshawk, northern three-toed woodpecker, pine marten, and primary cavity nesting species Following are the steps that were followed in developing the amount and distribution of habitats needed to meet the minimum requirements.

1. Capable habitat for all of the above mentioned species in Wilderness, Research Natural Areas and the Bend Municipal Watershed was mapped.

2. All capable habitat on lands that were determined to be not suited for timber production were mapped.

3 Then, the remaining needs for bald eagle habitat were mapped in the tentatively suitable and available commercial forest land. The amount and distribution of habitat was in compliance with the Interim Recovery Plan for the bald eagle A formal consultation was requested and a conservation opinion was received concerning the proposed approach for managing bald eagle habitat.

4. Habitat for spotted owls was then mapped. Capable habitat for spotted owls on the Deschutes is limited and somewhat isolated. The distribution requirements in the Regional Direction could not be applied on the Forest because of the limited habitat available. Considering this, all occupied habitats were used to meet the minimum requirements. This included seven areas outside of Wilderness.

5. Habitat for the pine marten, goshawk, and northern three-toed woodpecker were then mapped by filling in where habitat was not provided by steps 1-4 above In this process, habitat was selected based on the minimum acres for each

species as defined in the Regional Direction The maximum distance between habitats was used

6. While selecting habitats, full advantage was taken of overlap. For example, if a spotted owl area was located where it also satisfied the distribution requirements for pine marten, then it served for both the spotted owl and the pine marten in that particular area The same was true for overlapping habitat for northern three-toed woodpeckers and goshawks. Often times, the same lodgepole pine area could provide the habitat needs for both species.

7 The selection and distribution of habitats was coordinated with the Fremont, Winema, and Willamette National Forests as well as the Oregon Department of Fish and Wildlife.

8. Minimum habitat needs for the primary cavity nesters were established at 20 percent of the maximum biological potential The number and size of trees to provide this habitat was determined and the timber yield tables were reduced accordingly.

The ID Team determined that the habitat needs for most of these species could be achieved either through a dedicated (no programmed harvesting) or managed (stands are scheduled for harvest in FORPLAN) approach In the managed approach for bald eagles and spotted owls, prescriptions and constraints were combined and applied to the designated habitat area The prescriptions provided for old growth characteristics via extended rotation lengths (i e , 300+ years). The constraints put an upper limit on the proportion of the area which could be harvested in each decade with the overall intent being to perpetuate an uneven aged, multi-storied area with some old growth nesting trees

The habitat needs for the three-toed woodpeckers, goshawks, and pine martens were achieved via the application of lower bound inventory constraints for mature sawtimber stands by working group and by Ranger District Habitat was provided for the cavity nesters by reducing the volume in the FORPLAN yield tables to leave enough trees after final harvest to eventually become snags

After MR habitats were selected and distributed, the effects of using managed versus dedicated prescriptions to fulfill the requirements were evaluated Results of that analysis are found later in this Chapter.

The Formulation of Benchmarks and Their Results

Approximately 30 benchmarks were formulated and analyzed in order to help define the production potentials and economic relationships of the market and non-market resources on the Forest As mentioned above, many of benchmarks were developed and analyzed in accordance with the Regional Planning Direction (November 10, 1983). Those benchmark runs which were specifically described in the Regional Direction package will be referred to by their run numbers in that package. This should facilitate ease of discussion and comparison between Forests in the Region This section describes the purpose of each benchmark, and the way it was formulated in terms of objectives, constraints, and assumptions.

RUN-1

Purpose and Background

Since its formulation is relatively simple, it provides a good opportunity for checking and calibrating the FORPLAN model under a volume maximization objective function prior to proceeding on with the other benchmark analyses The absence of economic influences on the outcomes provides a basis for verifying that the model is reasonable in terms of its timber yield and growth functions

Since this run is similar to runs that were performed in previous land management/timber management planning efforts, it offers a point of comparison between past and present estimates of biological potential. Therefore, it provides a basis for all concerned parties to reach an agreement on the validity of the yield tables and acreage base before additional runs are done.

Provides a basis for understanding the relationship between nondeclining flow and the selection of timber management intensities and timing options

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Formulation

Objective Function - Maximize timber for first decade

Land Base - All tentatively suitable and available CFLs are available for programmed timber harvesting.

Constraints

Nondeclining flow (NDF) at or below the long term sustained yield (LTSY)

Rotations based on 95 percent of culmination of mean annual increment (CMAI).

Ending Inventory Constraint.

Yield Tables - No reductions for wildlife snag trees

RUN-2

Purpose and Background

In the benchmark analysis when nondeclining flow is not imposed, a 25 percent sequential upper and lower bounds constraint is to be used in conjunction with a floor of 80 percent of the current harvest level. This will help to mitigate against unacceptable fluctuations in employment levels and reduce the chances of unacceptable management situations in the future decades. The sequential upper and lower bounds are largely surrogates for downward sloping demand curves which are not included in the FORPLAN formulations.

The following information is provided:

Forms a base run for evaluating the opportunity costs of harvest floors.

Forms a base run to use in formulating and evaluating minimum management requirements (36 CFR 219.27).

Formulation

Objective Function - Maximize PNV for 15 decades.

Land Base - All tentatively suitable and available CFLs are available for programmed timber harvesting.

Constraints

Sequential upper and lower bounds of 25 percent for 15 decades

A 15 decade harvest floor equal to 80 percent of the current harvest levels on the Forest The floor is equal to 316 MMCF per decade

Harvest rotations are based on economic criteria rather than 95 percent of CMAI.

Ending inventory constraint.

Yield Tables - No reductions for wildlife snag trees.

RUN-3

Purpose and Background

This run and Run-2 are suggested as the base runs to employ for analyzing the MRs.

When this run is compared to Run-2, the opportunity costs of nondeclining flow in combination with rotations restricted to 95 percent of CMAI can be shown given the absence of MRs.

When this run is compared to Run-1, we can show differences that result when a maximum PNV objective function is used in place of a maximum timber objective function.

Formulation

Objective Function - Maximize PNV for 15 decades.

Land Base - All tentatively suitable and available CFLs are available for programmed timber harvesting.

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Constraints

Nondeclining flow at or below LTSY.

Rotations based on 95 percent of CMAI.

Ending inventory constraint.

Yield Tables - No reductions for wildlife snag trees

RUN-3a

Purpose and Background

Both dedicated and managed approaches for satisfying the wildlife MRs on the Forest were evaluated for their impacts on timber-related economics and outputs. This run was used to assess the dedicated approach for meeting the wildlife MRs with regard to bald eagles, northern spotted owls, goshawks, pine martens, three-toed woodpeckers, and the cavity nesting species.

Formulation

Objective Function - Maximize PNV for 15 decades.

Land Base - All tentatively suitable and available CFLs are available for programmed timber harvesting except those needed to meet the wildlife MRs. MR acres are assigned to minimum level management prescriptions (i e , no programmed harvesting).

Constraints

NDF at or below the LRSY.

Rotations based upon 95 percent of CMAI.

Ending inventory constraint.

Yield Tables - Yield tables reflect volume reductions to account for enough snag replacement trees to maintain the habitat for 20 percent of the cavity nester population potential.

RUN-3b

Purpose and Background

This benchmark is used to evaluate the impacts on timber related PNV and outputs when the managed approach to meeting the wildlife MRs for bald eagles, northern spotted owls, goshawks, pine martens, three-toed woodpeckers, and cavity nesters is utilized.

Formulation

Objective Function - Maximize PNV for 15 decades.

Land Base - All tentatively suitable and available CFLs are available for programmed timber harvesting. However, special prescriptions are applied to the bald eagle and spotted owl MR acres

Constraints

NDF at or below LTSY.

General Forest rotations based on 95 percent CMAI.

Ending inventory constraints.

Upper limit rate of harvesting constraints in bald eagle and spotted owl MR areas.

Lower bound constraints on mature and over mature timber to help meet the habitat needs for goshawks, pine martens, and three-toed woodpeckers

Yield Tables - Yield tables reflect volume reductions to account for enough snag replacement trees to maintain the habitat for 20 percent of the cavity nester population potential

RUN-3c

Purpose and Background

This benchmark is used to evaluate the tradeoffs between the timber related economics and outputs when the managed approach to achieving bald eagle MRs is used.

Formulation

Objective Function - Maximize PNV for 15 decades.

Land Base - All tentatively suitable and available CFL lands are available for programmed timber harvesting. However, special Threatened and Endangered (TE) prescriptions are applied to bald eagle MR areas.

Constraints

NDF at or below LTSY.

General Forest rotations based on 95 percent CMAI.

Ending inventory constraints.

Upper limit rate of harvesting constraints in bald eagle MR areas

Yield Tables - No reductions for wildlife snag trees

RUN-3d

Purpose and Background

This benchmark is used to evaluate the tradeoffs between the timber related economics and outputs when the managed approach to achieving spotted owl MRs is used.

Formulation

Objective Function - Maximize PNV for 15 decades

Land Base - All tentatively suitable and available CFLs are available for programmed timber harvesting However, special Threatened and Endangered (TE) prescriptions are applied to spotted owl MR areas.

Constraints

NDF at or below LTSY

General Forest rotations based on 95 percent CMAI.

Ending inventory constraints.

Upper limit rate of harvesting constraints in spotted owl MR areas.

Yield Tables - No reductions for wildlife snag trees.

RUN-3e

Purpose and Background

This benchmark is used to evaluate the tradeoffs between the timber related economics and outputs when the managed approach to achieving goshawk, pine marten, and three-toed woodpecker MRs is used.

Formulation

Objective Function - Maximize PNV for 15 decades.

Land Base - All tentatively suitable and available CFL are available for programmed timber harvesting.

Constraints

NDF at or below LTSY.

General Forest rotations based on 95 percent CMAI.

Ending inventory constraints

Lower bound inventory acreage constraints for mature and overmature sawtimber by working group and Ranger District in order to achieve the MRs for goshawks, pine martens, and three-toed woodpeckers

Yield Tables - No reductions for wildlife snag trees.

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RUN-3f

Purpose and Background

This benchmark is used to evaluate the tradeoffs between the timber related economics and outputs associated with meeting the cavity nester MRs.

Formulation

Objective Function - Maximize PNV for 15 decades

Land Base - All tentatively suitable and available CFLs are available for programmed timber harvesting.

Constraints

NDF at or below LTSY.

General Forest rotations based on 95 percent CMAI.

Ending inventory constraints

Yield Tables - Yield table reflect volume reductions to account for enough snag replacement trees to maintain the habitat for 20 percent of the cavity nester population potential

RUN-3g

Purpose and Background

The regulations state that "cut blocks, patches, or strips shall not exceed 40 acres in size and they should have one logical harvest unit between them" (36 CFR 219 27 (d)(2)) Many acres were mapped to analyze what this meant in terms of percent of an area that could be harvested in one decade and still comply with these requirements Three benchmarks were examined. Each with different percents representing different distances between the units. This run analyzes the implications to timber related economics and outputs of using a 30 percent dispersion constraint (the same percent used in the 1982 DEIS). For more information, refer to a document in process records entitled "The Appropriate size of Logical Harvest Units," Tony Smith, September 1982.

Formulation

Objective Function - Maximize PNV for 15 decades.

Land Base - All tentatively suitable and available CFLs are available for programmed timber harvesting.

Constraints

NDF at or below the LTSY.

General Forest rotations based on 95 percent CMAI.

Ending inventory constraints.

Upper limit dispersion constraints of 30 percent in General Forest areas.

Yield Tables - No reductions for wildlife snag trees

RUN-3h

Purpose and Background

The regulations state that "cut blocks, patches, or strips shall not exceed 40 acres in size and they should have one logical harvest unit between them" (36 CFR 219 27 (d)(2)) Many acres were mapped to analyze what this meant in terms of percent of an area that could be harvested in one decade and still comply with these requirements. Three benchmarks were examined. Each with different percents representing different distances between the units This run analyzes the implications to timber related economics and outputs of using a 46 percent dispersion constraint (this represents 630 feet between units). For more information, refer to a document in process records entitled "The Appropriate size of Logical Harvest Units," Tony Smith, September 1982.

APPENDIX B
ANALYSIS PRIOR TO DEVELOPMENT OF ALTERNATIVES

Formulation

Objective Function - Maximize PNV for 15 decades

Land Base - All tentatively suitable and available CFLs are available for programmed timber harvesting.

Constraints

NDF at or below the LTSY

General Forest rotations based on 95 percent CMAI

Ending inventory constraints

Upper limit dispersion constraints of 46 percent in General Forest areas

Yield Tables - No reductions for wildlife snag trees.

RUN-3i

Purpose and Background

The regulations state that "cut blocks, patches, or strips shall not exceed 40 acres in size and they should have one logical harvest unit between them" (36 CFR 219.27 (d)(2)). Much mapping work was done to analyze what this meant in terms of percent of an area that could be harvested in one decade and still comply with these requirements Three benchmarks were examined Each with different percents representing different distances between the units This run analyzes the implications to timber related economics and outputs of using a 58 percent dispersion constraint (this represents 420 feet between units). For more information, refer to a document in process records titled "The Appropriate size of Logical Harvest Units," Tony Smith, September 1982

Formulation

Objective Function - Maximize PNV for 15 decades

Land Base - All tentatively suitable and available CFLs are available for programed timber harvesting

Constraints

NDF at or below the LTSY

General Forest rotations based on 95 percent CMAI.

Ending inventory constraints

Upper limit dispersion constraints of 58 percent in General Forest areas.

Yield Tables - No reductions for wildlife snag trees.

RUN-3j

Purpose and Background

This benchmark is used to evaluate the sensitivity of the timber related economics and outputs of an across the board 20 percent increase in timber management costs

Formulation

Objective Function - Maximize PNV for 15 decades.

Land Base - All suitable and available CFLs are available for programmed timber harvesting.

Constraints

NDF at or below LTSY.

General Forest rotations based on 95 percent CMAI.

Ending inventory constraint.

Yield Tables - No reductions for wildlife snag trees

RUN-3k

Purpose and Background

This benchmark is used to evaluate the sensitivity of the timber related economics and outputs of

an across the board 20 percent decrease in timber management costs.

Formulation

Objective Function - Maximize PNV for 15 decades.

Land Base - All suitable and available CFLs are available for programmed timber harvesting.

Constraints

NDF at or below LTSY.

General Forest rotations based on 95 percent CMAI.

Ending inventory constraint.

Yield Tables - No reductions for wildlife snag trees.

RUN-3l

Purpose and Background

This benchmark is used to evaluate the sensitivity of the timber related economics and outputs of using a 0 percent real price trend for stumpage as opposed to the Regionally directed 1 percent.

Formulation

Objective Function - Maximize PNV for 15 decades.

Land Base - All suitable and available CFLs are available for programmed timber harvesting

Constraints

NDF at or below LTSY

General Forest rotations based on 95 percent CMAI

Ending inventory constraint.

Yield Tables - No reductions for wildlife snag trees.

RUN-3m

Purpose and Background

This benchmark is used to evaluate the sensitivity of the timber related economics and outputs of using a 2 percent real price trend for stumpage as opposed to the Regionally directed 1 percent.

Formulation

Objective Function - Maximize PNV for 15 decades.

Land Base - All suitable and available CFLs are available for programmed timber harvesting.

Constraints

NDF at or below LTSY.

General Forest rotations based on 95 percent CMAI.

Ending inventory constraint

Yield Tables - No reductions for wildlife snag trees

RUN-3n

Purpose and Background

This benchmark is used to evaluate the sensitivity of the timber related economics and outputs of using a 3 percent real price trend for stumpage as opposed to the Regionally directed 1 percent

Formulation

Objective Function - Maximize PNV for 15 decades.

Land Base - All suitable and available CFLs are available for programmed timber harvesting

Constraints

NDF at or below LTSY.

General Forest rotations based on 95 percent CMAI.

Ending inventory constraint.

Yield Tables - No reductions for wildlife snag trees.

RUN-4

Purpose and Background

This is one of the economic benchmarks required by the Regulations (36 CFR 219.12(E)(1)(iii)(b)).

When this run is compared to Run-2, the Forest can show the opportunity costs of the combination of MRs given an objective function of maximum PNV (assigned values) subject to sequential upper and lower bounds, floors, ceilings, MRs, and ending inventory constraints.

Formulation

Objective Function - Maximize PNV for 15 decades (assigned values)

Land Base - All suitable and available CFLs are available for programmed timber harvesting. Special prescriptions are assigned to intensive recreation, and the MR bald eagle and spotted owl areas

Constraints

Departure from NDF based on 25 percent sequential upper and lower bounds and a 15 decade 316 MMCF floor (80 percent of current harvest levels)

General Forest rotations based on economic criteria (i.e., short of 95 percent CMAI).

Ending inventory constraint.

Upper limit rate of harvesting constraints in bald eagle and spotted owl MR areas.

Upper limit rate of harvesting constraints in intensive recreation areas to achieve visual objectives.

Upper limit dispersion constraints of 58 percent in General Forest.

Lower limit inventory constraints for mature and overmature sawtimber to meet the MR requirements for goshawks, pine martens, and three-toed woodpeckers.

Yield Tables - Yield tables reflect volume reductions to account for enough snag replacement trees to maintain the habitat for 20 percent of the cavity nester population potential

RUN-5

Purpose and Background

This is one of the economic benchmarks required by the Regulations (36 CFR 219.12(E)(1)(iii)(c)).

When this run is compared to Run-4, the Forest can show the opportunity costs of restricting rotations to 95 percent of CMAI given an objective function of maximum PNV (assigned values) subject to sequential upper and lower bounds, floors, ceilings, MRs, and ending inventory constraints

Formulation

Objective Function - Maximize PNV for 15 decades (assigned values).

Land Base - All suitable and available CFLs are available for programmed timber harvesting Special prescriptions are assigned to intensive recreation, and the MR bald eagle and spotted owl areas.

Constraints

Departure from nondeclining flow based on 25 percent sequential upper and lower bounds and a 15 decade 316 MMCF floor (80 percent of current harvest levels).

General Forest rotations based on 95 percent CMAI.

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Ending inventory constraint.

Upper limit rate of harvesting constraints in bald eagle and spotted owl MR areas

Upper limit rate of harvesting constraints in intensive recreation areas to achieve visual objectives.

Upper limit dispersion constraints of 58 percent in General Forest

Lower limit inventory constraints for mature and overmature sawtimber to meet the MR requirements for goshawks, pine martens, and three-toed woodpeckers.

Yield Tables - Yield tables reflect volume reductions to account for enough snag replacement trees to maintain the habitat for 20 percent of the cavity nester population potential.

RUN-6

Purpose and Background

This is one of the economic benchmarks required by the Regulations (36 CFR 219 12(E)(1)(iii)(c)).

When this run is compared to Run-4, the Forest can show the opportunity costs of imposing NDF given an objective function of maximum PNV (assigned values) subject to sequential upper and lower bounds, floors, ceilings, MRs, and ending inventory constraints

Formulation

Objective Function - Maximize PNV for 15 decades (assigned values)

Land Base - All suitable and available CFLs are available for programmed timber harvesting Special prescriptions are assigned to intensive recreation, and the MR bald eagle and spotted owl areas

Constraints

NDF at or below the LTSY.

General Forest rotations based on economic criteria as opposed to 95 percent CMAI

Ending inventory constraint.

Upper limit rate of harvesting constraints in bald eagle and spotted owl MR areas.

Upper limit rate of harvesting constraints in intensive recreation areas to achieve visual objectives.

Upper limit dispersion constraints of 58 percent in General Forest

Lower limit inventory constraints for mature and overmature sawtimber to meet the MR requirements for goshawks, pine martens, and three-toed woodpeckers.

Yield Tables - Yield tables reflect volume reductions to account for enough snag replacement trees to maintain the habitat for 20 percent of the cavity nester population potential

RUN-7

Purpose and Background

This is one of the economic benchmarks required by the Regulations (36 CFR 219.12(E)(1)(iii)(b))

When this run is compared to Run-6, the Forest can show the opportunity costs of rotations restricted to 95 percent of CMAI given an objective function of maximum PNV (assigned values) subject to sequential upper and lower bounds, floors, ceilings, MRs, and ending inventory constraints.

When compared to Run-5, the Forest can show the opportunity costs of NDF given an objective function of maximum PNV (assigned values) and subject to rotations based on 95 percent CMAI, MRs, and ending inventory constraints.

When compared to Run-3, the Forest can show the opportunity costs of the combination of MRs given an objective function of maximum PNV (assigned values) and subject to NDF, rotations based on 95 percent CMAI, and ending inventory constraints

When compared to Run-4, the Forest can show the opportunity costs of NDF in concert with rotations restricted to 95 percent of CMAI.

Formulation

Objective Function - Maximize PNV for 15 decades (assigned values).

Land Base - All suitable and available CFLs are available for programmed timber harvesting. Special prescriptions are assigned to intensive recreation, and the MR bald eagle and spotted owl areas.

Constraints

NDF at or below the LTSY

General Forest rotations based on 95 percent CMAI.

Ending inventory constraint.

Upper limit rate of harvesting constraints in bald eagle and spotted owl MR areas.

Upper limit rate of harvesting constraints in intensive recreation areas to achieve visual objectives.

Upper limit dispersion constraints of 58 percent in General Forest

Lower limit inventory constraints for mature and overmature sawtimber to meet the MR requirements for goshawks, pine martens, and three-toed woodpeckers.

Yield Tables - Yield tables reflect volume reductions to account for enough snag replacement trees to maintain the habitat for 20 percent of the cavity nester population potential.

RUN-8

Purpose and Background

This is one of the economic benchmarks required by the Regulations (36 CFR 219 12(E)(1)(iii)(a)).

This run is similar to Run-4, except that these PNV calculations are based on market values only as opposed to market plus assigned When this run is compared to Run-4, the Forest can show the differences that result from maximum PNV objective functions based on market values only, as opposed to market plus assigned.

Formulation

Objective Function - Maximize PNV for 15 decades (market values).

Land Base - All suitable and available CFLs are available for programmed timber harvesting. Special prescriptions are assigned to the MR bald eagle and spotted owl areas.

Constraints

Departure from NDF based on 25 percent sequential upper and lower bounds and a 15 decade 316 MMCF floor (80 percent of current harvest levels).

General Forest rotations based on economic criteria (i.e., short of 95 percent CMAI).

Ending inventory constraint.

Upper limit rate of harvesting constraints in bald eagle and spotted owl MR areas.

Upper limit dispersion constraints of 58 percent in General Forest.

Lower limit inventory constraints for mature and overmature sawtimber to meet the MR requirements for goshawks, pine martens, and three-toed woodpeckers.

Yield Tables - Yield tables reflect volume reductions to account for enough snag replacement trees to

maintain the habitat for 20 percent of the cavity nester population potential.

RUN-9

Purpose and Background

This is one of the economic benchmarks required by the Regulations (36 CFR 219.12(E)(1)(iii)(c)).

When this run is compared to Run-8, the Forest can show the opportunity costs of restricting rotations to 95 percent of CMAI given an objective function of maximum PNV (market values) subject to sequential upper and lower bounds, floors, ceilings, MRs, and ending inventory constraints.

When compared to Run-5, the Forest can show the differences that result from the maximum PNV (assigned values) as compared to the maximum PNV (market values).

Formulation

Objective Function - Maximize PNV for 15 decades (market values)

Land Base - All suitable and available CFLs are available for programmed timber harvesting. Special prescriptions are assigned to the MR bald eagle and spotted owl areas.

Constraints

Departure from NDF based on 25 percent sequential upper and lower bounds and a 15 decade 316 MMCF floor (80 percent of current harvest levels).

General Forest rotations based on 95 percent CMAI.

Ending inventory constraint

Upper limit rate of harvesting constraints in bald eagle and spotted owl MR areas.

Upper limit dispersion constraints of 58 percent in General Forest

Lower limit inventory constraints for mature and overmature sawtimber to meet the MR requirements for goshawks, pine martens, and three-toed woodpeckers.

Yield Tables - Yield tables reflect volume reductions to account for enough snag replacement trees to maintain the habitat for 20 percent of the cavity nester population potential.

RUN-10

Purpose and Background

This is one of the economic benchmarks required by the Regulations (36 CFR 219.12(E)(1)(iii)(c)).

When this run is compared to Run-8, the Forest can show the opportunity costs of imposing NDF given an objective function of maximum PNV (market values) subject to sequential upper and lower bounds, floors, ceilings, MRs, and ending inventory constraints

When compared to Run-6, the Forest can show the differences that result from a maximum PNV objective function based on market values only as opposed to market plus assigned.

Formulation

Objective Function - Maximize PNV for 15 decades (market values).

Land Base - All suitable and available CFLs are available for programmed timber harvesting Special prescriptions are assigned to the MR bald eagle and spotted owl areas.

Constraints

NDF at or below the LTSY.

General Forest rotations based on economic criteria as opposed to 95 percent CMAI

Ending inventory constraint.

Upper limit rate of harvesting constraints in bald eagle and spotted owl MR areas.

Upper limit dispersion constraints of 58 percent in General Forest.

Lower limit inventory constraints for mature and overmature sawtimber to meet the MR requirements for goshawks, pine martens, and three-toed woodpeckers.

Yield Tables - Yield tables reflect volume reductions to account for enough snag replacement trees to maintain the habitat for 20 percent of the cavity nester population potential

RUN-11

Purpose and Background

This is one of the economic benchmarks required by the Regulations (36 CFR 219.12(E)(1)(iii)(a)).

When this run is compared to Run-10, the Forest can show the opportunity costs of rotations restricted to 95 percent of CMAI given an objective function of maximum PNV (market values) subject to NDF, MRs, and ending inventory constraints.

When compared to Run-9, the Forest can show the opportunity costs of NDF given an objective function of maximum PNV (market values) and subject to rotations based on 95 percent CMAI, MRs, and ending inventory constraints.

When compared to Run-7, the Forest can show the differences that result from a maximum PNV objective function based on market values only as opposed to market plus assigned values.

Formulation

Objective Function - Maximize PNV for 15 decades (market values)

Land Base - All suitable and available CFLs are available for programmed timber harvesting Special prescriptions are assigned to the MR bald eagle and spotted owl areas.

Constraints

NDF at or below the LTSY.

General Forest rotations based on 95 percent CMAI

Ending inventory constraint

Upper limit rate of harvesting constraints in bald eagle and spotted owl MR areas.

Upper limit dispersion constraints of 58 percent in General Forest

Lower limit inventory constraints for mature and overmature sawtimber to meet the MR requirements for goshawks, pine martens, and three-toed woodpeckers.

Yield Tables - Yield tables reflect volume reductions to account for enough snag replacement trees to maintain the habitat for 20 percent of the cavity nester population potential.

MAXIMUM TIMBER RESOURCE
(Preliminary to Subsequent Rollover Run)

Purpose and Background

This is one of the benchmarks required by the regulations (36 CFR 219 12(e)(1)(ii)) used to establish maximum resource levels.

When compared to Run-1, the Forest will be able to assess the impacts of the MRs on the timber biological potential

Formulation

Objective Function - Maximize timber volume for 15 decades

Land Base - All suitable and available CFLs are allocated to General Forest except the MR bald eagle and spotted owl areas which are allocated to TE prescriptions.

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Constraints

NDF at or below the LTSY.

General Forest rotations based on 95 percent CMAI

Ending inventory constraint.

Upper limit rate of harvesting constraints in bald eagle and spotted owl MR areas

Upper limit dispersion constraints of 58 percent in General Forest.

Lower limit inventory constraints for mature and overmature sawtimber to meet the MR requirements for goshawks, pine martens, and three-toed woodpeckers.

Yield Tables - Yield tables reflect volume reductions to account for enough snag replacement trees to maintain the habitat for 20 percent of the cavity nester population potential

MAXIMUM TIMBER RESOURCE
(PNV Rollover Run)

Purpose and Background

This is one of the benchmarks required by the regulations (36 CFR 219 12(e)(1)(ii)) used to establish maximum resource levels

When compared to Run-1, the Forest will be able to assess the impacts of the MRs on the timber biological potential

Formulation

Objective Function - Maximize PNV for 15 decades (Market Values).

Land Base - All suitable and available CFL lands are allocated to General Forest except the MR bald eagle and spotted owl areas which are allocated to TE prescriptions

Constraints

NDF at or below the LTSY

Lower limit constraints to at least meet the timber outputs from the previous run.

General Forest rotations based on 95 percent CMAI

Ending inventory constraint

Upper limit rate of harvesting constraints in bald eagle and spotted owl MR areas.

Upper limit dispersion constraints of 58 percent in General Forest

Lower limit inventory constraints for mature and overmature sawtimber to meet the MR requirements for goshawks, pine martens, and three-toed woodpeckers.

Yield Tables - Yield tables reflect volume reductions to account for enough snag replacement trees to maintain the habitat for 20 percent of the cavity nester population potential.

MAXIMUM VISUAL RESOURCE

Purpose and Background

This is one of the benchmarks required by the regulations (36 CFR 219.12(e)(1)(ii)) used to establish maximum resource levels.

When compared to Run-11, the Forest will be able to assess the timber related tradeoffs associated with managing the Forest to achieve its maximum visual quality.

Formulation

Objective Function - Maximize PNV for 15 decades (market values)

Land Base - All suitable and available CFL lands are available for programed timber harvesting. All important visual areas are assigned to scenic view management area prescriptions. The remainder of the tentatively suitable and available CFLs

are allocated to General Forest except that TE prescriptions are assigned to the MR bald eagle and spotted owl areas.

Constraints

NDF at or below the LRSY.

General Forest rotations based on 95 percent CMAI.

Ending inventory constraint.

Upper limit rate of harvesting constraints in bald eagle and spotted owl MR areas.

Upper limit dispersion constraints of 58 percent in General Forest

Lower limit inventory constraints for mature and overmature sawtimber to meet the MR requirements for goshawks, pine martens, and three-toed woodpeckers.

Upper limit scheduled output constraints on the proportion of an area that can be in harvest created openings are applied to all visual allocations in order to help achieve the desired visual management objectives.

Yield Tables - Yield tables reflect volume reductions to account for enough snag replacement trees to maintain the habitat for 20 percent of the cavity nester population potential.

MAXIMUM RECREATION RESOURCE

Purpose and Background

This is one of the benchmarks required by the regulations (36 CFR 219 12(e)(1)(ii)) used to establish maximum resource levels

When compared to the Maximum Timber Benchmark (rollover), the Forest will be able to assess the timber related tradeoffs associated with managing the Forest to achieve its maximum potential to supply recreation opportunities.

Formulation

Objective Function - Maximize PNV for 15 decades (market values).

Land Base - All suitable and available CFL lands are available for programmed timber harvesting. All important developed and undeveloped recreation areas are assigned to recreation management area prescriptions. All important viewsheds are assigned to scenic view management area prescriptions. Deer habitat is managed to achieve large herd sizes for hunting purposes The remainder of the tentatively suitable and available CFLs are allocated to General Forest except the MR bald eagle and spotted owl areas which are allocated to TE prescriptions.

Constraints

NDF at or below the LTSY.

General Forest rotations based on 95 percent CMAI.

Ending inventory constraint

Upper limit rate of harvesting constraints in bald eagle and spotted owl MR areas

Upper limit dispersion constraints of 58 percent in General Forest.

Lower limit inventory constraints for mature and overmature sawtimber to meet the MR requirements for goshawks, pine martens, and three-toed woodpeckers.

Upper limit scheduled output constraints on the proportion of an area that can be in harvest created openings are applied to all visual and intensive recreation allocations in order to help achieve the desired visual management objectives.

Constraints for thermal cover conditions are applied to deer winter range allocations.

Yield Tables - Yield tables reflect volume reductions to account for enough snag replacement trees to

maintain the habitat for 20 percent of the cavity nester population potential

MAXIMUM WILDLIFE RESOURCE

Purpose and Background

This is one of the benchmarks required by the regulations (36 CFR 219.12(e)(1)(ii)) used to establish maximum resource levels.

When compared to the Maximum Timber Benchmark (Rollover), the Forest will be able to assess the timber related tradeoffs associated with managing the Forest to achieve its maximum potential to supply wildlife habitat needs.

Formulation

Objective Function - Maximize PNV for 15 decades (market values).

Land Base - All suitable and available CFLs are available for programmed timber harvesting. All inventoried deer winter range, bald eagle, spotted owl, and osprey areas are allocated to their respective management prescriptions. The remainder of the tentatively suitable and available CFLs are allocated to General Forest.

Constraints

NDF at or below the LTSY

General Forest rotations based on 95 percent CMAI

Ending inventory constraint.

Upper limit rate of harvesting constraints in bald eagle and spotted owl areas.

Upper limit dispersion constraints of 58 percent in General Forest.

Lower limit inventory constraints for mature and overmature sawtimber to meet the MR requirements for goshawks, pine martens, and three-toed woodpeckers.

Constraints for thermal cover conditions are applied to deer winter range allocations

Yield Tables - Yield tables reflect volume reductions to account for enough snag replacement trees to maintain the habitat for 80 percent of the cavity nester population potential

Benchmark Analysis Results

The significant findings of the benchmark analyses are discussed in this section The focus will be upon information provided by the benchmarks with regards to market and nonmarket resource production relationships, economic tradeoffs, constraint analyses, and the implications concerning the decision space within which alternatives may subsequently be developed in order to address the planning ICOs. It is formatted in such a way as to satisfy the May 17 Appendix B outline for Chapter VI, Sections D, E, and F.

As mentioned above, a series of required and optional benchmarks were developed and analyzed in accordance with the Regional Planning Direction (November 10, 1983). The purposes and formulations for 30 of the key benchmarks are presented in the previous section of this chapter For discussion purposes, the benchmark results displayed in this section will be grouped into the following analysis topics:

1 Biological Potential
2 Economic Potential
3 Management Requirements (MRs)
4. Price Trends
5 Cost Sensitivity
6. Policy Constraints
7. Resource Maximization Potentials

Benchmark runs which are specifically described in the Regional Planning Direction package will be referred to by their run numbers in that package. This should facilitate ease of discussion and comparison between Forests within the Region. Finally, the summary will be concluded with a table which summarizes the relevant outputs and effects pertaining to some of the key required benchmarks.

Biological Potential

This discussion pertains primarily to Run-1 of the benchmarks. However, additional runs were made to supplement the analysis Figure B-18 below portrays the timber biological transition between the comparable analysis performed for the 1982 DEIS, the 1985 DEIS and the benchmark analysis done to link the FEIS to the DEIS.

Figure B-18 COMPARISON OF BIOLOGICAL POTENTIAL ESTIMATES

	ASQ (MMCF/DEC)	LTSY (MMCF/DEC)
Biological Potential (1982 DEIS)	571.4	612.6
Biological Potential (1985 DEIS)	534.0	534.0
Biological Potential (1990 FEIS)	437.9	437.9

Two results deserve attention. First, in 1982 the Forest was modeled as a deficit old growth Forest in which the long term sustained yield (LTSY) constraint was not binding, or holding down, the allowable sale quantity (ASQ). Under that type of characterization of existing inventory and future growth potential, the base sales schedule (BSS), which is a nondeclining flow (NDF) timber harvest schedule, stair steps up to the LTSY by the twelfth or thirteenth decade out in the future.

However, both the 1985 DEIS and 1990 EIS formulation characterizes the Deschutes as a surplus Forest in which the LTSY is binding on the ASQ The BSS is flat and equal to the LTSY. If the LTSY was not set as an upper bound constraint on the harvest levels, the ASQ would actually be higher than the LTSY.

The change from a deficit to a surplus Forest is mostly attributable to the recalculated managed yield tables On the average, the new yield tables are less productive than the managed yield tables used to portray future growth potentials for the 1982 DEIS. On the other hand, estimates of the existing standing inventory between the 1982 and 1985 DEIS are approximately equal. The reduced estimated future growth potential of the managed stands compared to the relatively comparable approximations of existing inventory has been the primary cause of the transition from a deficit to a surplus old growth Forest.

From a harvest scheduling standpoint, the differences between a surplus and an deficit old growth Forest have significant implications regarding the intensity and timing choices of timber prescriptions selected by FORPLAN. On a deficit Forest, rotations short of CMAI can have a positive effect on the ASQ level because the higher yielding managed stands are brought into production earlier. However, on a surplus Forest, rotations short of CMAI are not often selected because of their downward pressure on the LTSY and, consequently, the ASQ. More detail on the relationship between rotation lengths, the ASQ, and the LTSY will be presented in the discussion of the Maximum PNV Benchmarks (Run-8 through Run-11).

The second result which deserves some attention is the decrease in both the ASQ and the LTSY since the 1982 DEIS. Some of the decline between 1982 and 1985 is due to the reduction in land base resulting from the Oregon Wilderness Act of 1984, and some is due to the less productive managed yield tables. An optional run was done in which the land base was increased by adding back the suitable and available commercial forest lands (CFL) which were removed from the base as a result of the Oregon Wilderness Act of 1984. The resulting ASQ/LTSY was equal to 552 8 MMCF/decade. From this we can say that approximately 50 percent of the drop in the ASQ from 571.4 MMCF to 534.0 MMCF, and 25 percent of the decline in the LTSY from 612.6 MMCF to 534.0

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MMCF is attributable to the 1984 Act The remainder is due to the less productive managed yield tables

On the surface, it appears that substantial differences occur in projections of the Forest's ability to produce wood fiber when the 1990 FEIS and 1985 DEIS, "Biological Potential Benchmarks" are compared Both the allowable sale quantity and the long term sustained yield capacity are approximately 18% lower in the 1990 version of the benchmark analysis (437.0 MMCF/Decade vs. 534.0 MMCF/Decade).

Further study revealed that about 70% of the defference in standing inventory could be explained by different utilization standards between the 1971 and 1985 timber inventories The 1971 inventory was used in analysis conducted for the 1982 and 1985 DEIS. The 1985 inventory was used in analysis conducted for the 1990 FEIS

The 1971 inventory calculated merchantable volume in trees greater than 5 inches in diameter to a top diameter of 4 inches for all species. The 1985 inventory calculated merchantable volume in trees greater than 9 inches in diameter to a top diameter of 6 inches in all species except lodgepole pine where merchantable volumes were calculated in trees greater than 7 inches in diameter to a top diameter of 4 inches

The Stand Prognosis model was used to calculate growth and yield for the 1990 FEIS and incorporated the same utilization stndards as the 1985 inventory for empirical stands but used merchantability standards which calculated volume in trees greater than 7 inches in diameter to a 4-inch top for all species in managed stands

The net result is that much of the difference in standing inventory (as previously mentioned) can be explained by the difference in utilization standards for the two inventories

A comparison of timber working group stratification indicates some important differences between the acreage bases used for the *DEIS* and *FEIS*. Differences arise due to timber harvest that has occurred over the past five years and from differences in the stratification procedures used for the two inventories Differences in total acres of tentatively suitable land are insignificant.

Figure B-19 COMPARISON OF WORKING GROUP ACREAGES

Working Group	DEIS Acres	FEIS Acres
Ponderosa Pine	586,322	453,501
Mixed Conifer	*184,836*	*240,716*
Lodgepole Pine	321,975	392,278
Mountain Hemlock	56,904	65,286
Tentatively Suitable Acres	1,150,037	y1,151,781

Because the Forest is portrayed as a surplus forest in the Biological Potential Benchmark in the 1990 FEIS analysis, the allowable sale quantity is controlled by the contribution of managed stands to long term sustained yield capacity Due to the fact that different utilization standards were used for empirical and managed stands in the FEIS analysis, less than half of the difference in long term sustained yield capacity and allowable sale quantity can be explained by differing utilization

standards (5 inches dbh to a 4-inch top in the 1985 DEIS vs. 7 inches dbh to a 4-inch top in the 1990 FEIS for managed stands).

The rest of the difference between the two Biological Potential Benchmarks occurs because the managed yield tables used for the FEIS are, on average, less productive than yield tables used in the 1985 DEIS. Documentation of these comparisons can be found in the Forest's planning records.

Economic Potential

Run-2 and Run-3 of the benchmark analyses were used to explore the timber related economic potentials of the Forest. As described in the previous section, Run-2 permits the harvest schedule to depart from NDF by using 25 percent sequential upper and lower bounds and a harvest floor equal to 80 percent of the current harvest levels. As such, it represents the maximum timber related PNV unconstrained by MRs or any other multiple resource considerations Run-3 of the benchmarks is similar to Run-1 except that the objective function is changed to maximize present net value of timber from maximize timber. The results are presented in Figure B-20 below.

Figure B-20 UNCONSTRAINED TIMBER RELATED ECONOMIC POTENTIALS

	ASQ (MMCF/DEC)	LTSY (MMCF)	PNV ($MM)
Maximum Timber (Run-1)	534 0	534.0	825.9
Maximum PNV (Run-2)	994 6	454.6	1285.7
Maximum PNV (Run-3)	512.3	512 3	1133.3

Several findings deserve attention. The obvious are the much higher PNVs which occur under the present net value objective functions in Run-2 and Run-3 as opposed to the maximize volume objective function of Run-1. In addition, the departure harvest schedule in Run-2 allows it to generate a 13.4 percent higher PNV than that produced under NDF in Run-3.

While the PNVs associated with Run-2 and Run-3 are higher than that of Run-1, the LTSYs are lower, as would be expected. The economic objective functions traded off LTSY volume for a more valuable species mix in order to maximize PNV. In other words, they changed the priority of stands selected for harvesting, opting for more of the higher valued ponderosa pine stands earlier as opposed to the lower valued lodgepole, mixed conifer, and mountain hemlock that were selected in the early decades under the volume maximization objective function.

The figure below portrays the PNV analysis (Run 7, described in detail earlier in this section) for both the 1985 DEIS and comparable analysis performed for the FEIS. It provides a link for economic comparisons. The large drop in present net value is primarily due to reductions in timber related benefits caused by; 1) Lower acreages and volumes in the ponderosa pine working group and 2) Lower overall volumes per acre (as well as total volume) reflected in the 1985 inventory.

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Figure B-21 COMPARISON OF PNV ESTIMATES

	ASQ (MMCF/DECADE	LTSY (MMCF/DECADE)	PNV (MM$)
PNV-RUN 7 (1985 DEIS)	490.4	490 4	1420.1
PNV-RUN 7 (1990 FEIS)	351.1	351.1	1260.0

Analysis of MRs

Two types of MRs were analyzed The first were those dealing with wildlife and the second were those dealing with unit size/dispersion. We will discuss the wildlife MRs first. Run-3 will be used as the base to compare against since its NDF harvest schedule was comparable to the formulations used to analyze the MRs.

Our first step was to compare the dedicated versus the managed approach for meeting the MRs for bald eagles, spotted owls, goshawks, pine martens, three-toed woodpeckers, and other wildlife species. For spotted owls, the same acreage was used for both dedicated and management Spotted owl habitat is limited and isolated on the Deschutes The average size which is capable habitat is approximately 1,300 acres. In these areas, the average amount of suitable habitat is 1,050 acres. The dedicated approach resulted in a 5.9 percent drop in the timber PNV and a 5.0 percent reduction in the ASQ/LTSY when compared to Run-3. The managed approach had less of an impact, resulting in 4 2 percent and 2.7 percent drops, respectively The results are displayed in Figure B-22 below.

Figure B-22 ANALYSIS OF DEDICATED VERSUS MANAGED WILDLIFE MRs

	ASQ/LTSY (MMCF/DEC)	TIMBER PNV ($MM)
Maximum PNV Base (Run-3)	512 3	1133 3
Dedicated WL MRs (Run-3a)	486.6 (-5 0%)	1066.7 (-5 9%)
Managed WL MRs (Run-3b)	498 3 (-2 7%)	1086 2 (-4.2%)

The next step was to examine the tradeoffs associated with the individual wildlife MR constraint sets. Since the managed approach had less of an impact on PNV and the ASQ/LTSY when all wildlife species were considered, the tradeoffs analyzed for the individual species were also based on the managed approach. Figure B-23 displays the results.

Figure B-23 WILDLIFE MR TRADEOFFS FOR INDIVIDUAL SPECIES

	ASQ/LTSY (MMCF)	Timber PNV ($MM)
Maximum PNV Base (Run-3)	512.3	1133.3
Bald Eagle MRs (Run-3c)	506.0 (-1.2%)	1118.7 (-1.3%)
Spotted Owl MRs (Run-3d)	507.8 (-0.9%)	1123.4 (-0.9%)
Three-Toed Woodpecker, Pine Marten, Goshawk (Run-3e)	512.6 (+0.1%)	1132 5 (-0.1%)
Cavity Nester MRs (Run-3f)	504 6 (-1 5%)	1110.2 (-2 0%)
Total Wildlife MRs (Run-3b)	498.3 (-2.7%)	1086 2 (-4.2%)

The cavity nester MRs (woodpeckers) have the most impact on both the ASQ/LTSY and the PNV. Bald eagles resulted in the second largest tradeoffs. Having the least impact were the MRs for three-toed woodpeckers, pine martens, and goshawks which were analyzed collectively. Finally, note that the tradeoffs associated with the individual MRs are not additive. The sum of the individuals do not add up to the tradeoffs when all the wildlife MRs are examined collectively. This reflects the fact that there is some overlap in the conditions needed to the meet the habitat requirements for the different wildlife MRs

The second set of MR constraints analyzed were those dealing with the legal requirements for unit sizes and dispersion between units (i.e., a logical harvest unit). It is important to keep in mind that the Deschutes did not use these constraints as surrogates for any other resource management objectives such as cover, sedimentation control, or whatever. The constraints are designed to result in 40 acre average unit sizes with logical harvest units between them

The nebulous term involved here is "logical harvest unit." On the Deschutes, better than 90 percent of the suitable and available Forest land can be tractor logged. This gives the Forest quite a bit more flexibility in designing leave strips which at some time in the future will be logical harvest units

For this analysis, we examined three different proportion constraint levels which would be applied to the General Forest Management Area in order to meet the legal requirements for unit size/ dispersion The 30 percent proportion was analyzed because it is the constraint that was used in the 1982 DEIS. The next two proportion constraint levels were based on some more recent mapping analysis regarding this MR. The 46 percent constraint represents 40 acre units with 630 foot leave strips between the units. The 58 percent constraint reflects 40 acre units with 420 foot leave strips. The percent indicates the maximum proportion of an area (almost at the analysis area level) which can be in harvest created openings at any one time. A harvest unit remains an opening for one decade. The tradeoffs are presented in Figure B-24 below.

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Figure B-24 COMPARISON OF ALTERNATIVE UNIT SIZE/DISPERSION MR CONSTRAINTS

	ASQ/LTSY (MMCF)	Timber PNV ($MM)
Maximum PNV Base (Run-3)	512 3	1133 3
30% Area Constraint (Run-3g)	481.4 (-6 0%)	1080.1 (-4.7%)
46% Area Constraint (Run-3h)	516.5 (+0 8%)	1111.2 (-2.0%)
58% Area Constraint (Run-3i)	523.3 (+2.1%)	1121 1 (-1.1%)

In terms of present net value, the 58 percent dispersion constraint was less binding, as you would expect. The surprising increase in the ASQ/LTSY is due to fewer economically unsuited acres and slightly more intensive silviculture associated with the larger proportion constraints

Unit size/dispersion constraints were analyzed one more way. Forty acre units were laid out on a computer grid map of the FORPLAN analysis areas. Twenty to 40 acre logical harvest units were left between the harvest units planned for the current decade The resulting proportion of the area that could be harvested ranged from 48 percent to 50 percent depending on the shape and size of the analysis areas for the small portions of the Forest examined. Therefore, it seemed reasonable that either the 46 percent or 58 percent dispersion constraints would satisfy the intent of this MR

Finally, the combined impacts of both the wildlife and dispersion MRs on PNV and the ASQ/LTSY were evaluated Figure B-25 depicts the results of this tradeoff analysis

Figure B-25 COMBINED TRADEOFFS OF BOTH WILDLIFE AND DISPERSION MRs

	ASQ/LTSY (MMCF)	Timber PNV ($MM)
Maximum PNV Base (Run-3)	512 3	1133.3
All Wildlife MRs (Run-3b)	498 3 (-2 7%)	1086.2 (-4.2%)
58% Dispersion MRs (Run-3i)	523 3 (+2 1%)	1121.1 (-1 1%)
All MRs (Run-11)	505 7 (-1 3%)	1077.2 (-5 0%)

Analysis of Price Trends

It is Regional Direction to use a 1 percent per year real price trend for stumpage and 0 percent for all other resource values and costs. It is also Regional Direction to perform a sensitivity analysis on the price trends so that the implications of the direction can be better understood. For that purpose, Run-3 (Maximum PNV Base) was run with alternative stumpage price trends of 0, 2, and 3 percent (Run-3 uses a 1 percent trend) The results of this analysis are some of the most complex to understand, and in some cases counter intuitive, of any of the benchmark analyses performed Some of the runs were redone to verify their accuracy. The results are displayed in the Figure B-26 below

Figure B-26 ANALYSIS OF ALTERNATIVE PRICE TRENDS

	PNV ($MM)	PPN ASQ/ LTSY (MMCF)	PCT DEC. 1-3 (MMCF)	DEC. 1-5 (M ACRES)	ECON. UNSUIT. (M ACRES)
0% Trend (Run-3l)	916.6	523.6	1100.9	31 0	8 9
1% Trend (Run-3)	1133 3	512.3	1065 2	29 6	34.9
2% Trend (Run-3m)	1431 9	510.9	955.5	112 0	27 9
3% Trend (Run-3n)	1886.3	510 8	798.7	272.8	10.1

Some of the results are not surprising at all. As the price trend is increased, the present net value of the timber resource increases The model also selects more intensive silvicultural prescriptions as is evident in the amount of precommercial thinning that is scheduled during the first five decades. The more intensive prescriptions often have a higher contribution to long term sustained yield (i e , higher culmination at mean annual increment (CMAI) but a somewhat lower per acre present net value due to the early investments in stocking level control As the price trend increases, these investments become more attractive. Also, as the price trend increases, the harvesting of ponderosa pine is delayed and substituted for with the lower valued mixed conifer and lodgepole pine stands. With higher price trends it pays to hold the more valuable ponderosa pine on the stump due to the net effects of price trends, net growth per acre, and the discount rate.

Some of the other results are more complex to explain In moving from a 1 percent price trend to a 3 percent trend, the amount of acres determined to be economically unsuitable decreases. The higher price trends help to overcome the relatively less desirable economics associated with some of the economically marginal lodgepole and mountain hemlock acres. However, just the opposite occurs in moving from a 0 to a 1 percent price trend. The 0 percent price trend has fewer unsuitable acres There appears to be a very fine line between the contribution these marginal acres make to the timber present net value versus the LTSY (Which is directly related to the ASQ on a surplus Forest). Apparently, the contribution these acres make to the LTSY (therefore allowing the harvest of more ponderosa and mixed conifer stands earlier in the harvest scheduling horizon) outweighs the negative per acre values associated with the marginal stands involved.

As should be evident, the implications associated with the use of different price trends can be quite complex It would be desirable to test the sensitivity of the preferred alternative to different price trend assumptions

Cost Sensitivity

Another sensitive issue in this round of Forest Planning pertains to the costs which different Forests are using for their economic analyses. In order to shed some light on the relevance of this topic, an across the board plus and minus 20 percent cost sensitivity analysis was performed. Additional costs analyses should be done during the implementation/monitoring phase The results from this are displayed below in Figure B-27. There are no surprises If costs were really 20 percent higher than we are using in the benchmark analyses, more acres would be economically unsuitable, the ASQ/LTSY would drop, and present net value would be lower The opposite effects would occur if the costs were really 20 percent lower. Other factors such as silvicultural intensity are also affected Higher costs render timber stand improvement (TSI) investments even less desirable

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Figure B-27 COST SENSITIVITY ANALYSIS

	ASQ/LTSY (MMCF)	Timber PNV ($MM)	UNECON. ACRES
Maximum PNV Base (Run-3)	512 3	1133.3	34,853
Costs Plus 20% (Run-3j)	507.9 (-0.9%)	1078.0 (-4.9%)	42,495
Costs Minus 20%(Run-3k)	524.6 (+2.4%)	1181.5 (+4.3%)	8,382

Analysis of Policy Constraints

Several FORPLAN runs were executed to help analyze the implications of the nondeclining flow and CMAI rotation age policy constraints. These runs are described in the Regional Direction package as Run-8, Run-9, Run-10 and Run-11

The present net worth calculations include only market values (timber). The constraints to meet the minimum management requirements (MRs) are also included in these runs. In examining the results, it helps to focus on only two runs at a time even though all the results are presented in Figure B-28

Figure B-28 ANALYSIS OF NDF & CMAI POLICY CONSTRAINTS

	Timber PNV ($MM)	ASQ (MMCF)	LTSY (MMCF)	UNECON. ACRES
Run-8 (DEP, UTIL)	1203 6	938 9	439 8	19,534
Run-9 (DEP, 95% CMAI)	1200.9	929.4	453.8	15,948
Run-10 (NDF, UTIL)	1074.0	504.8	504.8	10,369
Run-11 (NDF, 95% CMAI)	1077.2	505.7	505 7	9,048

By comparing Run-8 to Run-9, we can examine the effects of permitting rotation ages short of CMAI under a departure from nondeclining yield. We will refer to the prescriptions with short rotation ages as utilization prescriptions since they permit FORPLAN to begin considering regeneration harvest of a stand as soon as a minimum diameter (d h b) of 7 inches is achieved, as opposed to delaying the regeneration options until the stand has reached CMAI. The departure from nondeclining yield permitted the harvest schedule to vary up and down by as much as 25 percent from one decade to the next (i e , sequential upper and lower bounds of 25 percent). It is important to keep in mind that under these departure formulations, there is no direct linkage constraint between LTSY and the ASQ as there is under the nondeclining flow runs

Since the economic culmination of a stand occurs before the biological culmination, utilization prescriptions give the FORPLAN model regeneration harvest timing choices which include both the economic and the production optima In contrast, the 95 percent CMAI prescriptions do not provide the Model with final harvest timing choices which include the economic culmination age Since in both Run-8 and Run-9 there is no link between LTSY and the ASQ, the Model is more concerned with harvesting stands closer to their economic optima, at the expense of a higher biological production rate. This is why Run-8 has a higher PNV and ASQ, but a lower LTSY. It also did not

need quite as many acres to achieve its objective of maximizing present net worth.

By comparing Run-8 and Run-10, we can examine the effects of imposing a nondeclining flow constraint Both runs permit rotation ages short of 95 percent CMAI The effect of the nondeclining flow constraint on a surplus old growth Forest is to force the FORPLAN model to select longer average rotation ages than it could use under departure The longer rotation ages are further from the economic optima but closer to the wood fiber production optima Also, on a surplus Forest under nondeclining flow constraints, the LTSY is binding on the ASQ (i e , holding it down). Therefore, the model is in the position of having to juggle rotation ages somewhere between the economically optimal timing choice and the CMAI age In doing so it often treats the working groups differently depending on their relative contributions to PNV versus LTSY. For example, a working group with a relatively low economic value but high wood fiber production rate may be harvested close to its CMAI age due to its contribution to LTSY (which is directly linked to the ASQ, and therefore effects PNV indirectly). On the other hand, a working group composed of relatively high valued species may be scheduled for harvest closer to its economic culmination for its contribution to PNV, but at the expense of a lower contribution to LTSY

This is essentially what happened in Run-10 as compared to Run-8. The average rotation ages are longer in Run-10, but vary somewhere between the economic optima and production optima depending on the working group (i e , higher valued ponderosa and mixed conifer stands versus lower valued lodgepole and mountain hemlock). The longer average rotation age (closer to CMAI) resulted in a higher LTSY. However, the LTSY is holding down the ASQ. The lower early decade harvest levels in Run-10 consequently lead to a significant drop in the PNV. Apparently, fewer acres were dropped out of the solution due to poor economic returns due to their contribution to LTSY.

In comparing Run-9 to Run-11, a similar analysis is performed except the FORPLAN model can not begin to consider final harvest options until the stands have achieved 95 percent CMAI By forcing the model to delay regeneration harvest choices until at least 95 percent CMAI is achieved, the long term sustained yields are slightly higher than if the Model could consider final harvest closer to economic culmination. Again, the nondeclining yield run keeps more acres in the timber base due to their contribution to LTSY.

Finally, Run-10 and Run-11 are compared Both runs are subject to nondeclining flow constraints. Run-10 permits harvest short of CMAI, while Run-11 does not. Theoretically, rotation lengths short of CMAI do no not have much effect on the ASQ or PNV on a surplus old growth Forest under nondeclining flow. These two runs basically substantiate this. Their outputs and effects are nearly identical. While Run-10 permits a wider age range of regeneration timing choices, it only considers final harvest every other decade once the utilization sizes are reached (due to Version I, Model I limitations). Any slight differences between the two runs can be attributed to these differences.

Resource Maximization Potentials

Several benchmark runs were made in order to explore the maximum potentials of the Forest to produce various outputs. These outputs include present net value, range, recreation, timber, visual quality, and wildlife In addition to helping define the maximum resource production capabilities of the Forest and the decision space within which alternatives can be developed to address the planning ICOs, some idea can be obtained about the magnitude of output tradeoffs that are incurred when various resources are emphasized

Except for Run-4 and Run-7 (Maximum PNV), and the Maximum Timber Benchmark, the analysis was performed by providing FORPLAN with the land allocations and prescriptions which would lead to the maximization of a particular resource (i.e., recreation, or visuals, or wildlife). FORPLAN was then run with a maximum present net value objective function. On the other hand, the Maximum Timber Benchmark was first run with a maximize timber objective function. The timber outputs from this run were then rolled over to a second run which was executed with a maximum present net value objective function.

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The recreation and range outputs and their associated discounted benefits were calculated with electronic spread sheets outside of FORPLAN. The budget estimations and the overall present net value calculations were also performed with the use of electronic spread sheets.

Figure B-29 displays the outputs and effects associated with the various resource maximization benchmarks. With regard to the discounted benefits, the timber resource accounts for 50 to 80 percent of the totals, while recreation contributes from 20 to 45 percent to the totals. Special use permits and range usually account for less than 10 percent. The importance of the recreation values on the Deschutes should not be overlooked. In fact, the two maximum present net value benchmarks (Run-4 and Run-7) achieved their objectives by allocating 70,000 acres of forested lands to an intensive recreation emphasis due to relative tradeoffs between the recreation and timber values on those acres

Figure B-29 OUTPUTS AND EFFECTS OF REQUIRED BENCHMARK ANALYSIS

	Minimum Level	Maximum PNV Dep. + Util. (Run-4)	Maximum PNV NDF-CMAI (Run-7)	Maximum Timber	Maximum Range	Maximum Wildlife	Maximum Visual	Maximum Recreation
Discounted Benefits ($MM)								
--Timber	0 0	1217 7	1053 6	1060 3	1060 3	992 1	964 7	858 1
--Recreation	160 7	773 6	773 6	409 9	409 9	217 2	409 9	776 9
--Range	0 0	6 8	6 8	6 8	10 5	3 7	5 6	5 6
--Special Uses	0 0	20 3	20 3	20 3	20 3	20 3	20 3	20 3
Discounted Costs ($MM)	119 0	516 8	434 2	521 2	521 2	389 6	381 9	416 4
PNV ($MM)	41 7	1501 6	1420 1	976 1	979 88	843 7	1018 6	1244 5
Harvest Levels (MMCF).								
--Decade 1		890 9	490 4	517 8	517 8	450 8	455 4	402 7
--Decade 2		668 2	490 4	517 8	517 8	450 8	455 4	402 7
--Decade 3		501 1	490 4	517 8	517.8	450 8	455 4	402 7
--Decade 4		375 9	490 4	517 8	517 8	450 8	455 4	402 7
--Decade 5		316 0	490 4	517 8	517 8	450 8	455.4	402 7
Long Term Sustained Yield (MMCF)		425 2	490 4	517 8	517 8	450 8	455 4	402 7
Acres With Programmed Harvesting Prescriptions (M Acres)		1115 3	1125 4	1150 0	1150 0	972 1	1079 8	869 2
Recreation Use (MRVD/Year):								
--Developed	143 5	1449 2	1449 2	494 8	494 8	494 8	494 8	1456 6
--Dispersed	1037 8	1537 7	1537 7	1067 6	1067 8	1067 6	1067.8	1586.9
Wildlife Population Levels								
--Three-Toed Woodpecker (Pairs)		110	110	110	110	600	110	110
--Deer (Number of Deer)		N/A	N/A	N/A	N/A	33,500	N/A	30,500
--Osprey (Pair)		N/A	N/A	N/A	N/A	180	N/A	N/A
--Pine Marten (Number of Pine Marten)		100	100	100	100	1890	100	100
--Woodpeckers (% of Bio Pot)		20%	20%	20%	20%	80%	20%	20%
--Spotted Owls (Pairs)		10	10	10	10	12	10	10
--Bald Eagles (Pairs)		45	45	45	45	50	45	45
--Goshawks (Pairs)		70	70	70	70	115	70	70
Old Growth (% of Ecoclass)		0	0	0	0	20%	0	0
Visual Quality --Percent of Maximum Potential Retention, Partial Retention		0	0	0	0	4	61%	35%
Range (Permitted M AUM's/Year)		29	29	29	45	16	24	24

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INTRODUCTION

Changes Between the 1985 DEIS and FEIS

Alternatives D, F, and H were considered in detail in the DEIS and are not considered in detail in this FEIS. The reason for not considering them in detail was because of a basic lack of public support for them. Some comments were in favor of some parts of these alternatives and those comments were considered in developing the Preferred Alternative. All other alternatives will retain the same identification which was used in the DEIS. This is being done for the sake of continuity and easy comparison between the DEIS and the FEIS

After the Draft Environmental Impact Statement for the Forest Plan was released in 1985, public response indicated a need to greatly modify the preferred alternative to address their concerns and needs This alternative became "Alternative E" in the DEIS and Alternative E in the FEIS. Suggestions were also made to incorporate the Forest's new vegetative inventory into further analysis of alternatives The decision was made to use the 1985 inventory as a basis to develop new empirical yield tables for FORPLAN. Additionally, it was suggested that the Forest use the Stand Prognosis model to project yields on existing stands in the future and to develop managed yield tables for FORPLAN. These suggestions were incorporated in the analytical process.

The new inventory, FORPLAN yield tables and the concern that uneven-aged management be considered in the Planning Process resulted in the decision that all alternatives developed in the Draft Environmental Impact Statement (other than those eliminated from detailed consideration) would be rerun in FORPLAN to put them on a comparable footing with new alternatives that are developed.

The formulation of alternative process can be best understood if presented in chronological order. Information on alternative formulation was brought forward from the DEIS. Alternative output and effects estimation represents information from the most recent analysis which incorporated changes made since the 1985 DEIS.

Requirements Concerning the Development of Alternatives

A Forest Plan Alternative is a mix of management prescriptions applied in specific locations and amounts of the Forest in order to achieve the desired management goals and objectives. Alternatives were developed according to the following NFMA 36 CFR 219 12(f) requirements

The ID Team shall formulate a broad range of reasonable Alternatives according to NEPA procedures The primary goal in formulating Alternatives, besides complying with NEPA procedures, is to provide an adequate basis for identifying the Alternative that comes nearest to maximizing net public benefits, consistent with the resource integration and management requirements of CFR 219.13 through 219 27

Alternatives shall be distributed between the minimum resource potential and the maximum resource potential to reflect to the extent practicable the full range of major commodity and environmental resource uses and values that could be produced from the Forest Alternatives shall represent a range of resource outputs and expenditure levels.

Alternatives shall be formulated to facilitate analysis of opportunity costs and of resource use and environmental tradeoffs among Alternatives and between benchmarks and Alternatives

Alternatives shall be formulated to facilitate evaluation of the effects on present net value, benefits, and costs of achieving various outputs and values that are not assigned monetary values, but are provided at specified levels.

Alternatives shall provide different ways to address and respond to the major public issues, management concerns, and resource opportunities identified during the planning process.

Reasonable Alternatives which may require a change in existing law or policy to implement shall be formulated if necessary to address a major public issue, management concern, or resource opportunity identified during the planning process.

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At least one Alternative shall be developed which responds to and incorporates the RPA Program tentative resource objectives for each Forest displayed in the Regional guide.

At least one Alternative shall reflect the current level of goods and services provided by the unit and the most likely amount of goods and services expected to be provided in the future if current management direction continues. Pursuant to NEPA procedures, this Alternative shall be deemed the No Action Alternative.

Each Alternative shall represent to the extent practicable the most cost efficient combination of management prescriptions examined that can meet the objectives established in the Alternative.

Each Alternative shall state at least:

--The condition and uses that will result from the long-term application of the Alternative;

--The goods and services to be produced, the timing and flow of these resource outputs together with associated costs and benefits;

--Resource management standards and guidelines;

--The purpose of the management direction proposed.

In addition to the RPA and Current Direction Alternatives required by the above mentioned regulations, three other Alternatives were required by Regional direction: one that emphasizes high market opportunities, one that emphasizes high nonmarket opportunities, and one that emphasizes undeveloped lands with intensified management on the remainder of the Forest.

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Summary of the Process Used for Developing Alternatives

The formulation of Alternatives (planning step five), was based upon information gathered during the first four steps of the planning process:

1 Identification of issues, concerns, and opportunities (ICOs)

2 Development of planning criteria.

3 Resource inventories and data collection.

4. Analysis of the Management Situation.

Information gathered during these steps was assimilated and analyzed to guide the formulation of Alternatives The Alternatives reflect a range of future resource management options for the Forest. Each major issue, concern, and opportunity was addressed in one or more of the Alternatives The need to satisfy legal and regulatory mandates was also a factor in the development of the Alternatives Finally, cost efficiency was a consideration throughout the process The following discussion is a summary of the planning actions involved in the formulation and analysis of the Alternatives The focus will be upon the roles which the ICOs and the benchmarks played in their development

The mixture of Alternatives formulated and analyzed were basically designed to address the different ways in which people prefer to use the Forest Most of these preferences, along with the physical, biological, and legal limits of Forest management are reflected in the issues, concerns, and opportunities which were identified at the outset, and served to guide the overall Forest planning process

A public issue was defined as being a subject or question of widespread public interest relating to management of the National Forest system

A management concern was seen as being an issue, problem, or condition which constrained the range of management practices identified by the Forest Service during the planning process

A third component which influenced the development of Alternatives came from the various resource use and development opportunities suggested by both the public and the Forest Service

An extensive and continuing process was used to identify and assemble the ICOs. Public meetings, newsletters, local news media, and many personal contacts by Forest Service officials were used to gather the issues. Those contacted included a wide cross section of individual members of the public, adjacent private landowners, adjacent National Forests, state and local government agencies, local industry, conservation groups, and Native Americans

While the attempt to resolve some issues conflicts with resolving others, this is not necessarily always the case. For example, the mountain pine beetle epidemic in lodgepole pine can be addressed in a manner that complements the firewood issue if some proportion of the dead material is made available for personal use firewood Harvesting mature lodgepole pine can also be used to improve and perpetuate bald eagle nesting habitat where the lodgepole is competing with ponderosa pine Lodgepole stands do not provide the type of trees suitable for eagle nesting sites while ponderosa pine stands do Finally, harvesting lodgepole pine has the potential to increase the production of forage which can be used by livestock, deer, and elk.

Recreation and visual quality are the fabric of local life styles and economies, and thus the focus of many issues. A Forest with a broad recreation base in a pleasing environment could be an asset to the central Oregon area while still providing goods and services necessary for stable timber-based industries One mix may favor financial returns while a different mix may favor non-priced values

The future of the remaining unroaded nonwilderness areas is also an issue Developing some roadless areas could increase wood production or increase the opportunities for geothermal production On the other hand, retaining some roadless areas in an undeveloped condition minimizes conflicts with habitat for threatened or sensitive wildlife species and also provides opportu-

nities to participate in undeveloped nonwilderness types of recreation experiences.

Additionally, the extent of the use of clearcutting was voiced as a major issue between the Draft and Final EIS. As a result, uneven-aged management silvicultural prescriptions were added to alternatives which emphasized aesthetics, especially visual quality

More detail on the specifics of the planning ICOs, their inter-relationships, and their roles in the planning process can be found in Appendix A.

Once the issues, concerns, and opportunities were identified, and the planning criteria were developed, the ID Team began to formulate management areas and their associated standards and guidelines Management areas coupled with their respective standards and guidelines provide specific direction for implementation, and serve as a framework for how to use, develop, and protect the Forest's resources in a manner consistent with the goals and objectives of an Alternative

Since the standards and guidelines provide general, rather than site or project specific direction on how to implement the Forest Plan, there was little opportunity to calculate a present net value for many of them. However, economic efficiency was a strong consideration throughout their development For example, from a silvicultural standpoint, clearcutting and planting is more desirable in terms of control over species mix than is natural regeneration. However, natural regeneration is often more cost effective and we have had documented success with it in various plant communities. The standards and guidelines state that natural regeneration will be taken advantage of where possible.

Another example concerns the determination of which trees are to be left after a regeneration harvest in order to meet the cavity nester habitat needs for snags Several Alternatives were considered including artificial killing Many options were eliminated either because they did not have documented success, were not pragmatically implementable, or were not cost effective The resulting snag management plan specifies the number and size of trees that are to be left as future snags in such a way as to have minimum impact on the timber volumes forgone from harvest.

Finally, evidence of the concern for cost efficiency can also be found in the stated goals for the management areas For example, the goal for Timber Management in the Plan is worded: "To provide for the optimum production of wood consistent with various resource objectives, environmental constraints, and economic efficiency "

This type of consideration for cost effectiveness was carried throughout the development of the management area standards and guidelines.

Concurrent with the formulation of management areas and the standards and guidelines, the ID Team also began to identify the analysis areas that would be used in the FORPLAN model (see the section on The Forest Planning Model) For this task, a comprehensive multiresource computer mapping data base system was developed to store, retrieve, and analyze information needed to address the identified planning ICOs. It was used extensively to examine different analysis area combinations that could be used to model and evaluate the production and economic tradeoffs between the recreation, timber, visual, and wildlife resources on the Forest The objective of this exercise was to delineate the analysis areas in such a way as to capture the important variations in the biological, social, and economic characteristics of the land and yet keep the FORPLAN model size to a minimum so it was quicker and less expensive to run

Once the final analysis area delineation was settled upon, the next step was to develop the prescriptions for the FORPLAN model. This included the development of timber yield tables (refer to the section on the Forest Planning Model), other resource yield coefficients, and the economic costs and benefits (see the section on Economic Efficiency Analysis) associated with each FORPLAN prescription. These prescriptions were designed to enable FORPLAN to analyze the timber related outputs and economic consequences associated with alternative land allocations and multiple use objectives

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In order to provide FORPLAN with the harvest scheduling flexibility it needed to satisfy the multiple use objectives of each Alternative, a wide range of timber yield tables was developed for each management area and working group combination As the yield tables were developed, they were reviewed by the respective resource specialists to determine if they achieved their intended objectives (i.e., thermal cover, retention foreground, etc.). A soil expectation value was calculated for each. In some cases prescriptions were dropped if another prescription achieved the intended objectives equally as well but had a higher present net value But for the most part, if FORPLAN had the room and the prescriptions contributed to the range of scheduling choices, they were included in the model so it had the option of whether to use them or not to satisfy its objective function and constraints.

The Analysis of the Management Situation was a key step leading up to the development and evaluation of Alternatives Projected demands or consumption levels were estimated for those resources which were elements of the identified planning issues, concerns, and opportunities. In turn, the potential of the Forest to supply these key resources was also analyzed.

FORPLAN played a key role in this step. Various assumptions, constraints, and objectives were combined to formulate the benchmark analyses of maximum supply potentials for each resource. A benchmark was also developed to estimate the maximum present net value of the market plus nonmarket priced resources on the Forest This analysis established the benchmark levels required by National planning direction. The benchmarks served as reference points from which the outputs and effects of various objective functions and constraints used during the development of Alternatives could be evaluated

Once the Benchmark analyses were completed, the ID Team proceeded to formulate Alternatives. The resource supply potentials and projected demands were compared with respect to resolving the identified planning ICOs. In turn, these potentials, when compared to the Current Direction, indicated opportunities and/or needs for change in order to best resolve the ICOs.

Alternative goals were established in order to provide a broad range of options regarding the future management of the Forest Descriptions were written to define the resource management intent for each Alternative. Each issue, concern and opportunity was addressed in one or more of the Alternatives either through land allocations, harvest scheduling, standards and guidelines, or policy statements.

Finally, each Alternative was analyzed using the FORPLAN model. Alternatives were modeled through the specification of an objective function and a set of constraints that were necessary to achieve the intent of a particular Alternative. Prescription assignments, combined with the necessary constraints, were analyzed in FORPLAN to identify an optimal solution which maximized PNV and achieved specific resource objectives in the most economically efficient manner. With varying objectives, each Alternative produced a different combination of priced and nonpriced outputs

The Iterative Analysis Process and Cost Efficiency

FORPLAN was used to analyze the production and economic tradeoffs between the recreation, timber, visual, and wildlife resources on the Forest. The model was utilized to analyze the most economically efficient timber related outputs and effects associated with the achievement of the multiple use objectives of an Alternative. Which prescriptions FORPLAN selected depended upon the objective function and the set of constraints used to represent a particular benchmark or land management plan Alternative The objective function was usually to maximize present net value or maximize the production of timber These were subject to first satisfying all the specified constraints The constraints were designed to guarantee the spatial and temporal feasibility of land allocation and harvest scheduling choices in order to achieve the multiple use objectives of the Alternative being analyzed The following is a list of some of the types of constraints used·

--Constraints on harvest flow, rotation length, and ending inventory,

--Dispersion and wildlife MR constraints;

--Constraints on the amount of analysis areas available to certain management area prescription sets;

--Rate of harvest constraints in scenic view and intensive recreation allocations;

--Constraints for thermal cover in deer winter range allocations, and

--Other miscellaneous constraints such as accelerated lodgepole pine harvesting, species mix, and budget levels.

Once the model had determined that a feasible solution existed by satisfying all of the constraints, it would then search for the set of prescriptions and timing choices which permitted it to optimize the solution according to the specified objective function.

Several other steps in the analysis process were implemented before the evaluation of an Alternative was considered complete The outputs and effects associated with the recreation and range programs for the respective Alternative were analyzed outside of FORPLAN with the use of electronic spread sheets. During this step, alternative capital investment, and operations and maintenance strategies were examined in order to determine which combination of prescriptions were most efficient in terms of satisfying the objectives of a particular Alternative.

Another step in the analysis process consisted of loading the FORPLAN solution onto the transportation network model (Transship) in order to determine the most cost efficient capital investment, and operations and maintenance program, and the associated transportation network needed to move the projected timber and recreation traffic around the Forest

Next, an electronic spread sheet was used to determine the total Forest budget that would be required to implement each Alternative. The budget estimates were based on the various resource output levels, capital investment, and operation and maintenance programs that were developed in the previous analysis steps The budget levels were tracked by resource, appropriated versus allocated funds, and capital investment versus operations and maintenance costs.

Finally, all market plus assigned priced benefits associated with the timber, recreation, range, and special use outputs, and the associated Forest budget for the first five decades were entered into a spread sheet which calculated the overall present net value of the particular benchmark or Alternative being evaluated

Which land allocation and resource management investment options resulted in the most economically efficient solution was determined through iterative model and spread sheet analyses. For example, the Maximum Present Net Value (PNV) Benchmark (market plus assigned values) was arrived at by first examining the solution to the Maximum PNV Benchmark (market values only) and adding the associated recreation and range present net values to it. A per acre PNV analysis indicated that the total Forest PNV could be increased by allocating intensive recreation management areas in the FORPLAN model. These allocations resulted in higher combined timber and recreation discounted values than if they had been managed for timber alone. The other recreation allocations excluded timber harvesting, and their discounted values were less than if they had been allocated to timber production FORPLAN was run again with the appropriate intensive recreation allocations added in and the resulting timber PNV was added to the PNV for the recreation and range resources to arrive at the maximum present net value (market plus assigned) for the Forest.

The economic analysis of each Alternative with FORPLAN, Transship, and the various spread sheets was followed up by several other analytical steps before the evaluation of an Alternative was considered complete. Three of these additional analytical tools were software programs developed by the ID Team to generate custom reports from the FORPLAN solution One converted the cubic foot harvest schedule from FORPLAN to board feet by working group and diameter class for five decades. This was used to facilitate communications both internally and externally with people

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who understand boards better than cubes. Another program interpreted the dynamics of the FORPLAN Forest inventory in terms of the seven successional stages by working group for fifteen decades This better enabled the wildlife biologists to evaluate the effects of the harvest schedule solution on the habitat requirements of certain key indicator species A third program disaggregated the FORPLAN solution to each of 86 implementation units Implementation units are contiguous areas of land averaging 19,000 acres in size and are combinations of up to three TRI data base compartments. This made it much easier for personnel on the districts to understand the implications of each Alternative in terms of where, when, and how they were to implement the Alternative if it were selected as the preferred This also provided a forum for verifying the spatial feasibility of an Alternative.

Sometimes the results from any one of these additional analyses indicated the need to do more FORPLAN runs in order to improve upon the overall evaluation of the outputs and effects of a particular Alternative Sometimes the need was apparent to develop another Alternative and proceed through the analysis process with it. Once the ID Team was satisfied with the outputs and effects of the Alternatives, their implications with regards to income and jobs in the local economy were analyzed with the IMPLAN input/output model After all of this was done to satisfaction, the ID Team along with the Forest Management Team and district personnel then evaluated how well each Alternative addressed the issues, concerns, and opportunities that were identified at the outset of the planning process Based on this analysis, a preferred Alternative was recommended to the Regional Forester.

Common Constraints

The FORPLAN model was used to estimate the timber related management activities, economic consequences, and outputs by reflecting the multiple use resource management objectives of each Alternative through a given set of constraints. Many of the constraints used to help formulate and characterize the different Alternatives were the same across all Alternatives. These were necessary in order to meet either management requirements, existing laws and policies, or the objectives of prescriptions. There were also constraints which, while serving common purposes across all of the Alternatives, varied in the amounts and locations to which they were applied. In addition, there were constraints which were totally unique to a particular Alternative In the following discussion, those constraints which were applied in common to all Alternatives will be presented in terms of their purpose and rationale. The constraints which were more or less unique between the Alternatives will be discussed in the next section pertaining to the development of Alternatives.

While many of the constraints discussed in this section were common to all of the Alternatives, the amount of acres they applied to varied depending on the different objectives and resulting allocations of resources associated with each Alternative. The tradeoffs discussed pertaining to each set of constraints are presented in general terms rather than specific quantified measures This is because each constraint set was not isolated and analyzed with regards to the development of each Alternative Most of them were examined during the benchmark analyses performed for the Analysis of the Management Situation The relative magnitude of tradeoffs associated with these constraint groups can be obtained by referring to the benchmark analysis results (see the section dealing with Analysis Prior to Development of Alternatives), and the allocation of land to various management area prescriptions presented in the next section pertaining to the development of Alternatives.

The Ending Inventory Constraint

Purpose: The use of this constraint ensures that the total inventory volume left at the conclusion of the harvest scheduling planning horizon (150 years) will equal or exceed the volume that would occur in a regulated Forest managed in accordance with the prescriptions selected for regenerated timber.

Rationale: If this constraint were not used, the FORPLAN model would have no incentive to leave enough inventory at the end of the harvest

scheduling horizon to sustain the harvest levels into perpetuity.

Tradeoff: Since some volume which is available for harvest at the end of the harvest scheduling horizon must be reserved for future decades, timber related outputs and benefits will be reduced.

The 40-Acre Unit Size/Logical Leave Unit Dispersion Constraints

Purpose: This constraint is used so that the resulting FORPLAN harvest scheduling solution is in compliance with the Regulations 36 CFR 219.27(d)(2) which state that even-aged regeneration harvest units do not exceed 40 acres in size and that these openings are separated by logical harvest units.

Rationale: If these constraints were not used, the FORPLAN model could schedule for harvest in one decade large contiguous acreages of stands in order to best meet its objective function of maximizing present net value. To prohibit this from happening, upper limit constraints are placed on the proportion of an area that can be in harvest created openings at one time The area is specified by combinations of the ranger district, working group, and maturity class analysis area identifiers.

Tradeoff: Since the unit size/dispersion constraints have the potential to restrict FORPLAN's freedom in the way it schedules the harvesting of timber to meet its objectives, both the present net value (PNV) and the allowable sale quantity (ASQ) may be reduced as a result of these constraints. However, the analysis performed on these MR constraints during the AMS indicated that the impacts would not alter the final solution by more than 1 or 2 percent.

Inventory Constraints for Wildlife MRs

Purpose: These constraints are applied to ensure that the wildlife habitat management requirements for three-toed woodpeckers, goshawks, and pine martens are satisfied in accordance with the regulations.

Rationale: All of these species are dependent upon mature and overmature stands of trees for their habitat. These constraints were designed to maintain at least the MR levels of habitat for these species. If they were not applied, it is very likely that FORPLAN would convert all or most of the mature and overmature suitable habitat to young managed plantations by the fifth or sixth decade.

Tradeoff: Since certain specified amounts of mature and overmature stands which are available for regeneration harvest must be reserved, FORPLAN's harvest scheduling flexibility is restricted and may result in a lower PNV or ASQ The analysis performed on these constraints during the AMS indicated that they would impact the final solution by less than half a percent.

Rate of Harvest Constraints in Bald Eagle Areas

Purpose: These constraints are applied to ensure that the wildlife habitat management requirements for bald eagles are satisfied in accordance with the regulations. These constraints were designed to achieve and maintain multi-storied ponderosa and mixed conifer stands with 8 to 10 old growth trees which would provide suitable nesting habitat for bald eagles These constraints were used in conjunction with uneven-aged or small group selection evenaged prescriptions designed to grow 350 year old trees with multiple understories The constraints placed an upper limit proportion of area that can be harvested in each decade. This ensured that the larger nesting area as a whole would provide suitable habitat in the long term.

Rationale: If these constraints were not applied to the bald eagle nesting areas, FORPLAN would have converted the existing mature and overmature stands to young managed plantations without any consideration of the habitat needs of this species.

Tradeoffs: Since these constraints restrict FORPLAN's harvest scheduling flexibility, they do tend to lower the present net value and allowable sale quantity levels of an Alternative. How much they do so is a function of the amount of acres allocated to bald eagle nesting habitat in each particular Alternative Of course, the tradeoffs associated with achieving the habitat needs for this species result from the combined effects of both the special

extended rotation prescriptions and the upper limit constraints on the rate of harvesting

Constraints on the Amount of Harvest Created Openings in Scenic Views Management Areas

Purpose: These discretionary constraints are used in conjunction with special FORPLAN prescriptions in order to ensure that visual management objectives are achieved on portions of the Forest allocated to the Scenic Views Management Area They are designed to provide an upper limit proportion on the amount of a seen area that can be in harvest created openings at one time. The upper limit bounds are a function of the working group and visual sensitivity of the area. In general, the upper limit proportions range from 5 percent for retention foreground ponderosa pine stands to 10 percent for partial retention lodgepole stands. The upper limit proportion of an area that can be in
harvest created openings in all middleground scenic views is 7 percent.

Rationale: In the absence of these constraints, the model would have scheduled too much harvesting, too fast, and in too large of units to achieve the conditions that would satisfy the visual management objectives in parts of the Forest allocated to the Scenic Views Management Area.

Tradeoff: Since these constraints restrict FORPLAN's harvest scheduling flexibility, they do tend to lower the present net value and allowable sale quantity levels of an Alternative. How much they do so is a function of the amount of acres allocated to the Scenic Views Management Area in a particular Alternative. However, in the benchmark which was developed to explore the tradeoffs associated with managing the Forest to achieve its maximum visual benefits, the allowable sale quantity dropped 11 percent from Benchmark Run-7 Of course, this was a result of the combined effects of both the special extended rotation prescriptions and the constraints on harvest created openings.

Deer Winter Range Thermal Cover Constraints

Purpose: These scheduled output constraints were utilized to achieve and maintain the desired 30% in thermal cover areas on lands allocated to the Deer Habitat Management Area. Stands over 40 to 50 years of age had sufficient crown cover to meet thermal cover needs.

Rationale: Current forage to cover conditions on inventoried deer winter ranges are less than optimal There is an overall absence in thermal cover in the deer winter range with localized areas of limited foraging It was decided that thermal cover was the most limiting factor to timber harvest and constraints were developed to provide as much thermal cover as could be achieved in a natural condition, increased where possible by vegetative management not to exceed 30%

It was assumed that the continued production of thermal cover would provide the necessary 10% hiding cover required by the standards and guidelines.

Treatment of areas where forage is limiting are outlined within the standards and guidelines and were not constrained in the model Rotations which extend and hold stands that are in a condition which provides thermal cover were also employed in managed stands to model the impact of these extended rotations on long term sustained yield.

Tradeoffs: Since these constraints restrict FORPLAN's harvest scheduling flexibility, they tend to lower the present net value and allowable sale quantity levels of an Alternative The tradeoffs associated with achieving the desired amount of thermal cover result from both the combined effects of the special extended rotation prescriptions and the lower limit constraints for maintaining thermal cover.

Development of Alternatives

The following discussion pertains to the development of the Alternatives displayed in the FEIS The focus will be upon describing the purpose of each Alternative and identifying the constraints used to characterize them so their multiple resource

management objectives were achieved as efficiently as possible.

Each Alternative is a combination of land uses, Forest management activities, and resource outputs As such, Alternatives must consider the resource production capabilities (both the high and low limitations) of the many different areas on the Forest Each Alternative is designed to manage the land to achieve some predetermined goals and objectives Some of these objectives, such as maintaining clean air and water, are common to all of the Alternatives; while other objectives, such as providing a certain mix and amount of resources outputs, vary between the Alternatives Several steps were involved in the development and analysis of the Alternatives. They can be summarized as follows:

National and Regional direction, the planning ICOs, and the benchmark analyses were all used to help define a broad range of reasonable management Alternatives which needed to be developed.

Within that range, Alternatives with different management philosophies, goals and objectives were developed so as to reflect a wide range of choices concerning the best way to manage the Forest in order to maximize net public benefits.

Once the management philosophies, goals and objectives for all of the Alternatives were determined, a land use pattern for the Forest was developed to reflect the intent of each Alternative.

Other resource management objectives for each Alternative were formulated in terms of constraints on activities, resource mixes and output levels, etc., in order to fully characterize the purpose of the Alternative.

FORPLAN was then used to analyze the timber related outputs and effects for each Alternative under nondeclining flow, CMAI, and the various allocation and multiple resource constraints developed in the preceding steps

The results from the original FORPLAN run were examined with regards to how well the predetermined goals and objectives of the Alternative were achieved. It was during this stage of the Alternative development process in which constraints for resource mixes and output levels, rotations short of CMAI, and departures from nondeclining flow were examined. Usually, two to five more FORPLAN runs were executed before this stage of the Alternative development and analysis process was considered complete.

The Transhp Network Model, and various customized software packages and electronic spread sheets were then used to evaluate other outputs and effects associated with each Alternative. Based on the results of this analysis, additional FORPLAN runs may or may not have been necessary to finish the Alternative.

In the following discussion, the purpose of each Alternative, the criteria and assumptions underlying its development, and its accompanying constraints are presented The constraints presented are those which were used in the final FORPLAN formulation of the Alternative as it appears in the FEIS.

Appendix B of the DEIS displays the tradeoff analysis of constraint sets used in the formulation of each alternative. By examining the incremental changes in the FORPLAN solution from one run to the next, some idea of the marginal tradeoffs in terms of timber related PNV, discounted benefits, costs, ASQ and LTSY can be obtained.

Following the publishing of the DEIS, alternatives were rerun incorporating the resulting comments and recommendations including the new vegetative inventory, improved modeling techniques such as the Stand Prognosis Model used to develop new empirical and managed yield tables, uneven-aged management constraints and other constraints where deemed appropriate to accomplish the stated objectives of the alternatives Often the modified constraint sets facilitated comparison between Alternatives cast in the DEIS and Alternatives modified to respond to public input.

For instance, uneven-aged management prescriptions were required for Alternative E to respond to comments which referred to too much even-aged management The high amenity-producing Alterna-

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tive, G, was also constrained to apply uneven-aged silviculture

Where new land allocations and constraint sets were added, they were analyzed with FORPLAN where possible to gauge their relative impacts on outputs and economic efficiency. Additional analysis was done surrounding a Timber Industry Alternative, an alternative and tradeoff analysis for the State of Oregon and a National Conservation Area proposal for the Metolius River Basin. For more information regarding the process of developing the Alternatives, refer to the planning records available at the Deschutes National Forest Supervisor's Office, East Highway 20, Bend, Oregon 97701

Alternative A (Current Direction)

The purpose of the No Action Alternative, as required by NEPA, is to portray a description of the outputs and effects that could be expected to occur if the current management direction, as provided by the 1978 Land Management Plan, is continued. It was not to specifically designed to address the identified planning ICOs. It features a blend of land uses intended to balance resource uses Dispersed recreation, visual quality, and deer habitat management are emphasized along with timber and range management Some emphasis is also placed on developed recreation, old growth, and threatened and endangered species

The criteria and assumptions underlying the development of this Alternative are·

It will be based on existing land use patterns and management direction provided in the 1978 Land Management Plan, and other functional/unit plans pertaining to the way the Forest is currently being managed.

In addition to the common constraints described earlier in this section, other unique constraints were also used in order to help achieve the objectives of this alternative

Rotation ages were based on 95 percent of CMAI except where rotations were lengthened to account for opening constraints in visuals and thermal cover requirements in deer winter range

Enough live snag replacement trees will be left after harvest to provide habitat for 40 percent of the cavity nester population potential in lodgepole pine and 60 percent in other species.

Land Allocation Constraints

Purpose: These constraints were applied so that the multiple resource land use pattern of the current land management plan would be correctly represented across all of the FORPLAN analysis areas

Rationale: Since many of the wildlife, recreation, and visual resources on the Forest are not represented with output and value coefficients in FORPLAN, in the absence of these constraints the Model would only have timber related values available to it for making land allocation choices. These constraints indicate how many acres of each analysis area should be allocated to particular multiple resource management emphases FORPLAN then decides which schedule of management activities, and which level of capital investment is the most efficient in order to meet the overall objectives of the Alternative These constraints also determine the number of acres to which the various common multiple use constraints discussed in the previous section are applied to. The breakdown of acres allocated to the various FORPLAN management emphases for this Alternative are displayed in Figure B-30.

Figure B-30 FORPLAN MANAGEMENT EMPHASES ALLOCATIONS FOR ALTERNATIVE A

MANAGEMENT EMPHASES	ACRES
General Forest	648,900
Deer Habitat	193,200
Scenic Views	321,300
Bald Eagle Habitat	3,500
Osprey Management Area	9,600
Wilderness (No Programmed Cut)	181,300
Other Mgmt. Areas (No Programmed Cut)	263,200
TOTAL FOREST	**1,621,000**

Tradeoffs: While these constraints were not evaluated separately, the analysis performed for Alternative E would suggest that together they account for a considerable drop in timber related outputs and a corresponding drop in timber related benefits In the absence of these constraints, both the timber related present net value and outputs would be higher, while the other multiple resource outputs and associated values would be lower However, without these constraints, the multiple use resource management objectives of this alternative would not be satisfied

Nondeclining Flow/Long Term Sustained Yield Constraints

Purpose: Presumably, the Forest is currently selling and harvesting timber on a nondeclining flow basis This set of constraints is designed to *assure that future harvest levels will never decline* and that the harvest levels will be less than or equal to the long term sustained yield at the end of the harvest scheduling planning horizon

Rationale: Without these constraints, harvest levels could rise and fall erratically. This would not be consistent with the current management plan

Tradeoffs: By imposing the nondeclining flow constraints as opposed to permitting a departure harvest schedule, the model's flexibility to harvest timber in such a way as to maximize PNV is reduced. Therefore, early decade economic returns and timber output levels are traded off in exchange for stable long term harvest levels.

Summary of Alternative A Results·

ASQ	24.8 MMCF/YR
LTSY	24.8 MMCF/YR
PNV	383.7 MM$

Alternative B (RPA Alternative)

The purpose of this Alternative is to meet the RPA Program and provide opportunities for undeveloped recreation, winter recreation, old growth, and visual quality. Visual quality is provided for on most of the major roads and buttes. Only a part of the high potential geothermal areas would be

available for leasing Mule deer populations could increase some as well as bald eagle populations. Undeveloped recreation opportunities would be available in roadless areas, the Wildernesses, and the Oregon Cascade Recreation Area

The criteria and assumptions underlying the development of this Alternative are:

Meeting the RPA program timber and wildlife targets are primary objectives of this Alternative. A departure from nondeclining yield was also analyzed

A range and balance of recreation opportunities will be provided including both developed and undeveloped recreation experiences.

Some special Interest Areas will be provided to enhance the recreation opportunity spectrum.

Portions of six rivers have been classified as Wild, Scenic or Recreation Rivers under the Wild and Scenic Rivers Act

Six new Research Natural Areas will be recommended for inclusion into the system

Populations of mule deer could increase and exceed the current population objectives Spotted owls would be maintained at there current levels. Habitat for bald eagles and cavity nesters would be increased. Habitat for pine marten and goshawks would be decreased.

In addition to the common constraints described earlier in this section, other unique constraints were also used in order to help achieve the objectives of this alternative.

Rotation ages were based on 95 percent of CMAI except where rotations were lengthened to account for opening constraints in visuals and thermal cover requirements in deer winter range

Enough live snag replacement trees will be left after harvest to provide habitat for 40 percent of the cavity nester population potential.

Land Allocation Constraints

Purpose: These constraints were applied so that the multiple resource land use pattern needed to achieve the objectives of this Alternative would be correctly represented across all of the FORPLAN analysis areas

Rationale: Since many of the wildlife, recreation, and visual resources on the Forest are not represented with output and value coefficients in FORPLAN, in the absence of these constraints the Model would only have timber related values available to it for making land allocation choices. These constraints indicate how many acres of each analysis area should be allocated to particular multiple resource management emphases. FORPLAN then decides which schedule of management activities, and which level of capital investment is the most efficient in order to meet the overall objectives of the Alternative. These constraints also determine the number of acres to which the various common multiple use constraints discussed in the previous section are applied to The breakdown of acres allocated to the various FORPLAN management emphases for this Alternative are displayed in the following table:

Figure B-31 FORPLAN MANAGEMENT EMPHASES ALLOCATIONS FOR ALTERNATIVE B

MANAGEMENT EMPHASES	ACRES
General Forest	718,900
Scenic Views	220,700
Deer Habitat	189,100
Osprey Management	8,200
Bald Eagle Habitat	18,900
Wilderness (No Programmed Cut)	181,300
Other Mgmt. Areas (No Programmed Cut)	283,900
TOTAL FOREST	**1,623,648**

Tradeoffs: While these constraints were not evaluated separately, the analysis performed for Alternative E would suggest that together they account for a considerable drop in timber related outputs and a corresponding drop in timber related benefits In the absence of these constraints, both the timber related present net value and outputs would be higher, while the other multiple resource outputs and associated values would be lower. However, without these constraints, the multiple use resource management objectives of this *alternative would not be satisfied*

Summary of Alternative B Results:

ASQ 25.9 MMCF/YR
LTSY 25.9 MMCF/YR
PNV 586.0 MM$

Alternative C

The purpose of this Alternative is to address those ICOs which are related to the production of goods and services from the Deschutes National Forest.

As such, this Alternative satisfies the Region's requirements for an Alternative which emphasizes commodity production High levels of wood, range, developed recreation, mule deer, and geothermal energy are provided. The timber levels meet the States Forestry Program for Oregon. Mule deer population levels could increase providing increased hunting opportunity. Most of the high potential geothermal areas could be available for leasing All of the roadless areas could be developed

The criteria and assumptions underlying the development of this Alternative are.

This Alternative emphasizes the production of commodity resources from the Forest.

Developed recreation will be emphasized. Both undeveloped and dispersed recreation will be primarily limited to the Wildernesses and the Oregon Cascade Recreation Area

Wildlife habitat, other than mule deer winter and transition ranges, will be provided at the Management Requirement levels.

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Visual quality will only be provided for along the major highways.

No new Research Natural Areas are proposed.

In addition to the common constraints described earlier in this section, other unique constraints were also used to help achieve the objectives of this alternative

Rotation ages were based on 95 percent of CMAI except where rotations were lengthened to account *for opening constraints in visuals and thermal* cover requirements in deer winter range.

Enough live snag replacement trees will be left after harvest to provide habitat for 20 percent of the cavity nester population potential.

Land Allocation Constraints

Purpose: These constraints were applied so that the multiple resource land use pattern needed to achieve the objectives of this Alternative would be correctly represented across all of the FORPLAN analysis areas.

Rationale: Since many of the wildlife, recreation, and visual resources on the Forest are not represented with output and value coefficients in FORPLAN, in the absence of these constraints the Model would only have timber related values available to it for making land allocation choices. These constraints indicate how many acres of each analysis area should be allocated to particular multiple resource management emphases FORPLAN then decides which schedule of management activities, and which level of capital investment is the most efficient in order to meet the overall objectives of the Alternative. These constraints also determine the number of acres to which the various common multiple use constraints discussed in the previous section are applied to. The breakdown of acres allocated to the various FORPLAN management emphases for this Alternative are displayed in the following table:

Figure B-32 FORPLAN MANAGEMENT EMPHASES ALLOCATIONS FOR ALTERNATIVE C

MANAGEMENT EMPHASES	ACRES
General Forest	913,100
Scenic Views	42,200
Deer Habitat	227,000
Osprey Habitat	0
Bald Eagle Habitat	14,500
Wilderness (No Programmed Cut)	181,300
Other Mgmt. Areas (No Programmed Cut)	242,900
TOTAL FOREST	**1,621,000**

Tradeoffs: While these constraints were not evaluated separately, the analysis performed for alternative E would suggest that together they account for a considerable drop in timber related outputs and a corresponding drop in timber related benefits. In the absence of these constraints, both the timber related present net value and outputs would be higher, while the other multiple resource outputs and associated values would be lower However, without these constraints, the multiple use resource management objectives of this alternative would not be satisfied.

Summary of Alternative C Results:

ASQ	34.0
LTSY	34.0
PNV	681.54 MM$

Alternative D

(This alternative was presented in the DEIS and not considered in detail in the FEIS)

Alternative E (Preferred)

The purpose of Alternative E is to provide much the same opportunities and outputs as Alternative B but by providing them from different areas of the Forest You will need to consult the maps to fully understand the differences between these alternatives.

Alternative E provides for moderately high levels of timber outputs The Forest would be intensively used and developed, but options for maintaining undeveloped lands and old growth ecosystems would be retained

A mix of developed and undeveloped recreation opportunities would be provided Alternative E would provide for increases in deer and bald eagle populations. Some of the higher potential gothermal areas are available for leasing and others are not.

Scenic quality would be provided along heavily used roads, developed recreation areas, and some roads to trailheads.

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The criteria and assumptions underlying the development of this Alternative are:

Mature and overmature lodgepole pine will be converted to managed stands over the next 10 to 15 years.

Rotation ages will be based on 95 percent of CMAI except that ponderosa pine stands in deer winter range and visula zones have extended rotations.

Enough live snag replacement trees will be left after harvest to provide habitat for 40 percent of the cavity nester population potential in even-aged stands and 60 percent in uneven-aged stands Snag levels in areas where programmed harvest will not take place will probably be at higher levels.

A balanced spectrum of developed and undeveloped recreation opportunities will be provided.

Several Special Interest Areas will be provided to enhance the recreation experience or provide for special biological features.

Seven new Research Natural Areas will be recommended for inclusion into the system.

In addition to the common constraints described previously, other unique constraints were also used in order to help achieve the objectives of this Alternative. Many of the public comments received following the release of the DEIS were incorporated in Alternative E (and where appropriate were modeled in FORPLAN). Additional constraints were formulated as development of the Alternatiave progressed To assess tradeoffs associated with the constraints, they were released individually or in groups of related constraints. The results are displayed in the following table as increases in the PNV and timber related outputs which result from releasing the constraint or constraint set. The purpose, rationale, and tradeoffs associated with each of these unique individual constraints, or constraint sets, is discussed below

Figure B-33 ANALYSIS OF CONSTRAINTS WITHIN ALTERNATIVE E

Constraint or Constraint Set	Impact of Releasing Constraint (Increase) PNV (MM$)	ASQ (MMCF/YR)	LTSY (MMCF/YR)
Land Allocation: Proposed Special Interest, RNAs, Bend Watershed	2.1	231	.238
Intensive Recreation	9.4	1 570	1.152
Dispersed Recreation	6.9	1.492	1.056
Winter Recreation	11 0	1.576	1.007
Metolius Heritage	12.4	1.020	1 092
Metolius Special Forest	2.7	249	.300
Black Butte and Metolius Scenic Views	4.9	367	.464
Front Country "Seen Areas"	.9	120	.271
Metolius Wildlife Primitive	4.1	454	.496
Osprey Management	0	.027	.052
S O H A s	8.3	.812	790
Wild and Scenic Rivers	3 2	.284	.343
Bald Eagle	2 5	.189	.442
Riparian Areas	3 5	.340	.448
Mountain Hemlock	.5	430	.218
Deer Constraints[1]	8.1	1 330	332
Visual Allocations[2]	21.7	1 746	2 185
Uneven-aged Management:	92 1	4.569	2.043
Lodgepole Pine Harvest Scheduling Constraints	29 0	.486	1.061

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FORMULATION OF ALTERNATIVES

[1]Includes the land allocation tradeoffs and impact of thermal cover constraints.
[2]Includes the land allocation tradeoffs and impact of opening constraints.

Land Allocation Constraints

Purpose: *These constraints were applied so that* the multiple resource land use pattern needed to achieve the objectives of this Alternative would be correctly represented across all of the FORPLAN analysis areas

Rationale: Since many of the wildlife, recreation, and visual resources on the Forest are not represented with output and value coefficients in FORPLAN, in the absence of these constraints the Model would only have timber related values available to it for making land allocation choices

These constraints indicate how many acres of each analysis area should be allocated to particular multiple resource management emphases FORPLAN then decides which schedule of management activities, and which level of capital investment is the most efficient in order to meet the overall objectives of the Alternative These constraints also determine the number of acres to which the various common multiple use constraints discussed in the previous section are applied to. The breakdown of acres allocated to the various FORPLAN management emphases for this Alternative are displayed in the following table·

Figure B-34 FORPLAN MANAGEMENT EMPHASES ALLOCATIONS FOR ALTERNATIVE E

MANAGEMENT EMPHASES	ACRES
General Forest	626,300
Scenic Views	171,700
Front Country	*34,700*
Metolius Black Butte Scenic	10,600
Metolius Scenic Views	4,800
Deer Habitat	208,900
Osprey Habitat	8,100
Bald Eagle Habitat	19,100
Metolius Special Forest	18,400
Wilderness (No Programmed Cut)	181,300
Other Mgmt. Areas(No Programmed Cut)	337,100
TOTAL FOREST	**1,621,000**

Tradeoffs: As Figure B-33 shows, the effect of changing land allocation, along with the related practices which can take place with that land allocation, have a significant effect on the model solution. When viewed in aggregate, these constraints explain the major difference between the Forest's ability to produce timber related outputs and those outputs actually produced for the alternative In the absence of these constraints, both the timber related present net value and outputs would be higher, while the other multiple resource outputs and associated values would be lower. However, without these constraints, the multiple use resource management objectives of this Alternative would not be satisfied.

Uneven-aged Management Constraints

Purpose: The purpose of these contraints was to portray the maximum amount of uneven-aged management that could be prudently applied in the mixed conifer and ponderosa pine working groups given existing disease conditions which limit its application. The constraints also involved setting a minimum level for uneven-aged management because the model often chose even-aged prescriptions which better contributed to timber production and timber related PNV objectives

Rationale: In the absence of these constraints, the Model would make choices on the basis of timber related values only. Sentiments to limit even-aged management and to provide continuous forest cover would not be considered.

Tradeoffs: Without the constraints, both the overall timber related outputs and present net value would be higher Many of the benefits associated with the application of uneven-aged management would be forgone In visual management areas, however, uneven-aged management prescriptions provide greater contributions to timber outputs and PNV than even-aged management prescriptions

Lodgepole Conversion Constraints

Purpose: The constraints were formulated to allow the remaining mature lodgepole pine stands which are presently infested or threatened by mountain pine beetle to be harvested. Constraint applies to decade 1 and harvests about 80% of the remaining mature lodgepole in General Forest.

Rationale: Without the constraints the harvest of lodgepole pine would be postponed causing losses due to mortality to increase

Tradeoffs: Tradeoff analysis grouped this constraint with other scheduling constraints. The impact of this individual constraint would tend to be more significant on PNV than production of timber volume due to the relatively low value of lodgepole pine stumpage.

Miscellaneous Scheduling Constraints

Purpose: Scheduling constraints include; a constraint to spread group selection harvest in mixed conifer over time to help meet the objectives of creating uneven-aged stands, a constraint to cause more acreage to be precommercially thinned in the first decade, and a constraint which allows stands of posts and poletimber to be harvested, on a logical schedule

Rationale: Inventory methodology requires that individual stands of trees be grouped with similar stands In a scheduling model such as FORPLAN, between stand variation is lost Through the application of constraints, differences in stand characteristics which could affect their need of, and timing for, particular harvest treatments can be portrayed

Tradeoffs: Tradeoff analysis grouped these constraints. In aggregate, they affect timber related outputs insignificantly but have a greater impact on timber related PNV. Constraining stands to be precommercially thinned earlier in the planning horizon causes discounted costs to rise considerably.

Deer Thermal Cover Constraints

Purpose: To meet the needs of deer for thermal cover in winter and transition ranges

Rationale: In the absence of these constraints, the Model would make choices on the basis of timber related values only. Deer requirements for thermal cover might not be met

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Tradeoffs: Because existing stands cannot produce the minimum of 30 percent thermal cover, over the management area, the FORPLAN Model was run to determine how much cover would occur if the stands were not managed. This was viewed as a minimum amount of cover needed except when the figure exceeded 30 percent. FORPLAN was then constrained to produce the amount of cover (in each decade) for the previous run and then rerun to maximize cover over the planning horizon The resulting cover outputs provided the minimum amount of thermal cover up to 30 percent.

Tradeoffs: In the absence of these constraints, both the timber related present net value and outputs would be higher Ponderosa pine would be scheduled for harvest earlier in the planning horizon. Without the constraints, the multiple use resource management objectives of this alternative would not be satisfactory.

Nondeclining Flow/Long Term Sustained Yield Constraints

Purpose: This set of constraints is designed to assure that future harvest levels will never decline and that the harvest levels will never decline and that the harvest levels will be less than or equal to the long term sustained yield at the end of the harvest scheduling planning horizon

Rationale: Without these constraints, harvest levels could rise and fall erratically. Nondeclining flow was a concept frequently supported in DEIS comments

Tradeoffs: A run to assess the tradeoff for these constraints was not made However, in general, by imposing the nondeclining flow constraints, the model's flexibility to harvest timber in such a way as to maximize PNV is reduced. Therefore, early decade economic returns and timber output levels are traded off in exchange for stable, long term harvest levels.

Mountain Hemlock Constraints

Purpose. The constraint is applied to achieve the objective that the mountain hemlock working group will not contribute to the calculation of the ASQ for this Alternative. Where nearly pure stands of mountain hemlock occur, these areas better provide for other resource outputs.

Rationale: In the absence of these constraints, the Model would make choices on the basis of timber related values only.

Tradeoffs In the absence of these constraints, both the timber related present net value and outputs would be higher, while the other multiple resource outputs and associated values would be lower.

Summary of Alternative E Results

ASQ	17.9 MMCF/YR
LTSY	20.7 MMCF/YR
PNV	595 1 MM$

Alternative F

(This alternative was presented in detail in the DEIS and was not considered in detail in the FEIS).

Alternative G

The purpose of this Alternative is to address the ICOs related to undeveloped lands and using the National Forest to provide for non-market types of outputs High levels of undeveloped lands, old growth, and watchable wildlife are provided. Lots of opportunities for dispersed recreation in a Natural Forest are available while limited opportunities for developed recreation are provided. Geothermal leasing opportunities are limited. Visual quality is provided for along roads, trails and on the prominent buttes

The criteria and assumptions underlying the development of this Alternative are·

The timber outputs will be developed using the principals of non-declining yield since commodity outputs are not emphasized in this Alternative.

In addition to the common constraints described earlier in this section, other unique constraints

were also used to help achieve the objectives of this alternative.

Rotation ages were based on 95 percent of CMAI except where rotations were lengthened to account for opening constraints in visuals and thermal cover requirements in deer winter range.

In the General Forest and Deer management areas where even age management is practiced the rotation age will be set to achieve a 24 inch diameter tree size. Uneven-aged management will be practiced on 75 % of the ponderosa pine type and 30 % of the mixed conifer type and we will manage to a target tree size of 30 inch DBH.

Enough live snag replacement trees will be left after harvest to provide habitat for 100 percent of the cavity nester population potential.

Use of the Forest by cattle and sheep would be maintained at the current level.

Opportunity for developed recreation will be limited.

Habitat for bald eagles, spotted owls, cavity nesters, and osprey will be increased.

Interpretation and protection of all potential Special Interest Areas will be provided for in this Alternative.

Seven new Research Natural Areas will be provided for in this Alternative.

Portions of six rivers were classified as Wild, Scenic or Recreation Rivers under the Wild and Scenic Rivers Act and will be managed under the interim direction established in the Forest plan untill the River planning is completed.

Land Allocation Constraints

Purpose: These constraints were applied so that the multiple resource land use pattern needed to achieve the objectives of this Alternative would be correctly represented across all of the FORPLAN analysis areas.

Rationale: Since many of the wildlife, recreation, and visual resources on the Forest are not represented with output and value coefficients in FORPLAN, in the absence of these constraints the Model would only have timber related values available to it for making land allocation choices. These constraints indicate how many acres of each analysis area should be allocated to particular multiple resource management emphases FORPLAN then decides which schedule of management activities, and which level of capital investment is the most efficient in order to meet the overall objectives of the Alternative These constraints also determine the number of acres to which the various common multiple use constraints discussed in the previous section are applied to The breakdown of acres allocated to the various FORPLAN management emphases for this Alternative are displayed in the following table:

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Figure B-35 FORPLAN MANAGEMENT EMPHASES ALLOCATIONS FOR ALTERNATIVE G

MANAGEMENT EMPHASES	ACRES
General Forest	786,200
Scenic Views	133,100
Deer Habitat	116,800
Osprey Habitat	30,000
Bald Eagle Habitat	19,700
Wilderness (No Harvest)	181,300
Other Mgmt Areas (No Programmed Cut)	353,900
TOTAL FOREST	**1,621,000**

Tradeoffs: While these constraints were not evaluated separately, the analysis performed for Alternative E would suggest that they account for a considerable drop in timber related outputs and a corresponding drop in timber related benefits In the absence of these constraints, both the timber related present net value and outputs would be higher, while other multiple resource outputs and associated values would be lower. However, without these constraints, the multiple use resource *management objectives of this alternative would* not be satisfied

Summary of Alternative G Results:

ASQ	15.6 MMCF
LTSY	15 6 MMCF
PNV	274.5 MM$

Alternative H

(This alternative was considered in detail in the *DEIS and was dropped from detailed consideration* in the FEIS)

APPENDIX B
EFFECTS OF BENCHMARKS, CONSTRAINTS, AND ALTERNATIVES

INTRODUCTION

This section provides a detailed discussion of the outputs and effects of the FEIS Alternatives. The focus is upon the tradeoffs between the Alternatives as they provide different levels and mixes of goods and services, and as they address the planning ICOs in different ways The purpose of presenting a discussion pertaining to the outputs and effects of each alternative, the consequences of the constraints used to help formulate them, and their relationship to the benchmarks, is to facilitate the identification of the alternative which comes closest to maximizing net public benefits In order to accomplish this objective, there needs to be an understanding of the abilities of the Forest to produce different goods and services in response to the ICOs, and the tradeoffs involved with the decisions to produce one mix of outputs as opposed to another. As such, this comparative analysis provides the basis for selecting a proposed action, which is Step 8 of the planning process.

Process for Evaluating Significant Constraints

The multiple resource management objectives associated with a particular benchmark or land management alternative were represented in FORPLAN as a combination of constraints, and an objective function. The objective function was usually "maximize present net value." This objective function guided the FORPLAN model in the selection of the most economically efficient combination of prescriptions, activity scheduling choices, and resource output levels which satisfied the multiple resource management objectives of a particular benchmark or alternative.

However, the maximization of present net value was subject to first satisfying all of the constraints which were used to represent the other resource management objectives not provided for by the economic efficiency objective function. The imposition of the constraints often, but not always, reduced the PNV for a particular alternative. The PNV given up in response to achieving the objectives of a constraint is referred to as the "opportunity cost." In order to isolate the opportunity cost associated with a particular constraint, or set of constraints, the resulting solutions of FORPLAN runs made with and without the constraints included in them were examined for their differences in PNV (and other outputs and effects of interest) As long as the only difference between the runs being compared was the addition of the constraints, the reduction in PNV represented the opportunity cost (at the margin) of achieving the constraint's objective

During the Benchmark Analyses, constraint sets which were needed in order to achieve the various multiple resource management objectives were developed and evaluated For example, all of the different constraints which were proposed in order to achieve the MRs were evaluated both individually, and collectively, to determine the magnitude of their tradeoffs, and to assess the relative efficiency of alternative constraint sets designed to achieve common objectives If one set of constraints achieved a particular objective with less impact on the PNV than an alternative set of constraints designed to accomplish the same purpose, it was considered more efficient and was used throughout the remainder of the process of developing and analyzing alternatives Sometimes, alternative approaches to formulating constraints to meet a common objective were not available In these cases, the analysis was performed solely to determine the opportunity costs associated with the constraints.

Discretionary constraints (those not legally required) were also examined in order to assess the magnitude of their opportunity costs These constraints were often used in conjunction with special prescriptions in order to produce the desired multiple resource management objectives (i.e., visual quality, wildlife habitat, recreation settings, etc) of an alternative The policy constraints associated with nondeclining flow and rotations based on CMAI were also evaluated in the context of their effects on PNV and timber output levels. Finally, sensitivity analyses were performed in order to provide information regarding the consequences involved in making assumptions about timber management costs, and future stumpage values (i.e., price trends).

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The results of these analyses are provided in the "Summary of the Analysis of the Management Situation" planning document, and in the section on Analysis prior to the Formulation of Alternatives in this Appendix Since they are discussed in detail in these documents, they will not be repeated here

The opportunity costs associated with the individual constraints in each alternative were not evaluated due do the prohibitive costs of performing this type of analysis. However, many of the constraints used to formulate the alternatives were examined in the Benchmarks, so their approximate tradeoffs can be determined from that analysis Also, each alternative was developed and analyzed with a sequence of three to seven FORPLAN runs in which the differences between the solutions were examined in order to determine the tradeoffs and effects associated with the collective group of constraints added from one run to the next. This analysis was usually performed to help develop and refine the constraints which were unique to each alternative as was discussed in Formulation of Alternatives Finally, by comparing the alternatives in their final forms, the economic tradeoffs of their different collective multiple resource management objectives was assessed. These efficiency tradeoffs were then compared to the environmental and socio-economic consequences in order to help identify the alternative, or alternatives, which came closest to maximizing net public benefits.

Analysis of Tradeoffs Among Alternatives

In this section, the tradeoffs between the alternatives are discussed The focus will be upon the resolution of ICOs, resource outputs, environmental consequences, economic and social effects, and the overall tradeoffs incurred in attempting to address the ICOs

Responses to Major ICOs or Groups of ICOs

Except for Alternative A, which was designed to portray the outputs and effects associated with continuing on with current management direction, the alternatives were specifically tailored to reflect different ways of addressing the planning issues, concerns, and opportunities. The following discussion highlights some of the variation in the way the major issues were treated between them Figure B-36 tabularly summarizes these differences For a more complete description of the ICOs and the role they played in the Forest planning process, refer to Appendix A Chapter II of the FEIS and the following portions of this Appendix present the detailed outputs and effects of the alternatives with regards to their responses to the ICOs.

The factors relating to the timber issues key around how much and what kind of timber will be sold on an annual basis This was addressed in the alternatives by varying how much of the Forest was available for timber production, and by exploring departure timber schedules in order to achieve higher wood outputs than could be produced under nondeclining flow. The resulting wood outputs were expressed in terms of average annual millions of cubic feet, and average annual millions of board feet These outputs were also estimated for the four timber working groups: 1) ponderosa pine, 2) lodgepole pine, 3) mixed conifer, and 4) mountain hemlock

The factors relating to the wildlife issues key around what the population levels should be for certain key species such as mule deer, osprey, bald eagles, spotted owls, and pine martens. The issues were treated by applying prescriptions to appropriate areas of the Forest in order to provide habitat which could support more or less numbers than currently exist While population numbers were estimated for deer, numbers of pairs were estimated for the other species

Components of the recreation issues centered around providing a wide spectrum of opportunities for both undeveloped and developed recreation. Dispersed recreation was also a consideration The alternatives varied in the amount and diversity of recreation opportunities which they offered over the long term The output levels were estimated and expressed in terms of millions of recreation visitor days per year. Diversity was measured in terms of the number of acres of developed or undeveloped recreation provided in each alternative The variety of opportunities provided by each alternative was also tempered with subjective evaluations.

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Related to the recreation issues are concerns about visual quality. This issue was addressed in the alternatives by applying prescriptions which provide for visual quality to different areas of the Forest. The extent to which visual quality was provided for in each alternative was measured by the number of acres where visual quality objectives were met in sensitive scenic areas The more sensitive areas were in the categories of retention and partial retention.

The thrust of the geothermal issue is where on the Forest should geothermal leasing and development be provided for. The Forest was mapped by categories of high, medium and low geothermal potential. Many of the high potential areas include roadless areas or areas with high recreation values. Specific data on the geothermal resource is not available at this time so effects of leasing and development could not be estimated. What was estimated was the acres potentially available for leasing by the categories of high, medium, and low Each alternative varied which areas would be available for leasing and which would not

The availability of personal use firewood is a key local issue. A range of options from making no special provisions for personal use firewood to fully meeting the demands for it were explored in the alternatives. The amount provided was expressed in terms of thousands of cords per year.

A broad issue encompasses lifestyles and economics. Many people live and/or recreate in Central Oregon because of the clean environment that is present and the variety of recreation and job opportunities that exist Many people are willing to sacrifice economic growth in favor of clean air and water, good fishing, and the freedom to cut personal use firewood. However, jobs and personal income are also a concern in relation to lifestyles. The consequences of the alternatives with respect to this broad issue were estimated by examining a variety of outputs and effects. They are 1) jobs, 2) recreation opportunity, 3) firewood, 4) visual quality, and 5) revenues and payments to the counties

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Figure B-36 COMPARISON OF ISSUE AND CONCERN RESOLUTION BY ALTERNATIVE

Issues and Concerns	Outputs or Effects to be Measured	No Change Alternative (NC) & Alt. A (No Action)	Alt B (RPA)	Alt. C	Alt. E (Pref)	Alt. G
Local and Regional Economies, Lifestyles, & Population levels	N/A	Is in harmony with local and regional economies & lifestyles in the short term	Emphasizes mix of commodity & amenity Maintains lifestyles near present conditions	Emphasizes commodity outputs & growing economic conditions & possibly populations	Emphasizes fairly high commodity outputs, primarily timber in short term mixed emphasis on commodity & amenity	Emphasize amenity values with reducing emphasis on commodity values
Timber Harvest Level & Schedule	MMBF	Continue with current level for Alt. A and increase to potential yield for Alt NC	Meets RPA 80 Program	Increase to meet Forestry Program for Oregon and treat lodgepole	Maintains a mix of products while accelerating harvest of lodgepole	Harvest level will be determined based on meeting goals for amenity values
Management of LP & PP stands infested with MPB and susceptible to infestations on Deschutes, Fremont, & Winema	Acres treated and time frame	Limits amount of area treated Extends treatment over an 80-year period	Limits amount of area treated Extends treatment over a 50 year period	Extends treatment over a 60 year period.	Treats large area in first decade, & then limits area treated until the fourth decade	Starts treatment slowly in the 2nd decade, and extends treatment over a long period (100+ years)
Future demands for use of firewood	M Cords	No specific long term plans	40,000 cords provided annually	No special provisions for personal use firewood All wood sold on competitive basis except slash	40,000 cords provided annually, more provided if needed to meet demand	40,000 cords provided annually, more provided if needed to meet demand
Provisions for present & future developed recreation	MRVDs	Limits the Potential	Increases the potential	Significantly increases the potential	Same as C	Limits the potential
Expanding demands for dispersed recreation	MRVDs	Limits motorized, maintains nonmotorized	Emphasizes a mix of motorized recreation	Significantly increases motorized, reduces nonmotorized	Emphasizes a mix of motorized and nonmotorized.	De-emphasizes motorized; heavy emphasis on nonmotorized

Figure B-36 COMPARISON OF ISSUE AND CONCERN RESOLUTION BY ALTERNATIVE (continued)

Goods and services provided while maintaining visual quality		Heavy emphasis on visual	Moderate emphasis on visual in different Yreas	Heavy emphasis on goods & services Little emphasis on visual	Same as B except visual emphasized in different areas	Low emphasis on visual and goods & services
Non wilderness roadless areas	Mixed developed & not developed	Areas with high public concern remain undeveloped Others are developed	All developed	Same as B, with a different variation on what is developed	None of the areas are developed	

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Resource Outputs, Effects, and Environmental Consequences

The implementation of any one of the alternatives will result in the production of certain outputs and effects and their associated environmental consequences. Some of the consequences are direct while others are indirect. Some of the consequences are short term while others are cumulative or long term. Chapter II of the FEIS presents a detailed description of the resource outputs and effects for each alternative. Chapter IV of the FEIS describes the associated environmental consequences. Much of the analysis performed to develop these outputs, effects, and consequences is quite complex and is described in previous Chapters of this Appendix. Therefore, in order to fully understand the resource outputs, effects, and environmental consequences associated with each alternative, and their derivation, it is recommended that Appendix B be read along with Chapters II and IV of the FEIS.

Figures B-37 through B-39 present the direct, indirect, and cumulative resource outputs and effects associated with each alternative and certain selected benchmarks. By examining Figure B-36 (Comparison of Issue And Concern Resolution by Alternative) in conjunction with these tables, a better understanding of the relationship between issue resolution and the resulting outputs and effects for each alternative can be obtained. At the same time, it is also necessary to associate the anticipated environmental consequences that would result from the production of these outputs and effects.

The most significant environmental consequences are those associated with the manipulation of vegetation. Vegetation management in the form of timber harvesting results in changes in the appearance of the Forest; changes in wildlife habitat; the short term creation of dust, smoke, and noise; and soil disturbances. The magnitude of these consequences varies between the alternatives depending on how many acres are harvested.

On areas of the Forest where producing timber is the primary objective, existing old growth and mature tree stands will be converted to new and younger stands. This is especially true where even-aged management is practiced. The trees in the long term will be smaller and organized in a more uniform manner. There will be less dead and downed material except in areas where it is specifically provided for. Therefore, as old and mature stands of trees are replaced with younger stands, overall plant and animal diversity shifts from species associated with old growth communities to species associated with younger communities. Also, as existing mature stands are converted to plantations, more forage is available for grazing by domestic livestock and wildlife.

All of the alternatives address the harvesting of lodgepole pine in reaction to the mountain pine beetle epidemic. This will result in large areas of the Forest being harvested over a fairly short period of time. Large harvest units will be visible even in areas where visual quality is important. In the short term, these units will detract from the scenic quality of the area until the new stands begin to fill the harvest created openings, and the stumps and logging residues can no longer be seen. In addition, hiding cover for deer and elk will also be reduced over the short term in these areas. This can be mitigated by providing screens or restricting use of roads.

In the long term, some of the alternatives require the development of roadless areas. This would introduce human activity into areas where little human activity presently occurs. This could disturb some species of wildlife and result in increased recreational use levels in areas adjacent to established Wildernesses. Once an area is developed, its Wilderness values are diminished, if not lost, and future options for including the area in Wilderness are forgone. Roading unroaded areas also reduces the opportunity for unroaded dispersed recreation, but at the same time increases the opportunities to develop other resources such as timber or geothermal energy which, in turn, have the potential to provide economic returns to the federal and local governments.

Ground disturbing activities will displace and compact soils but within acceptable limits as outlined by the standards and guidelines. Some compaction will occur, however, as a result of roads, skid trails, and construction of facilities.

To different extents, the alternatives provide for livestock grazing The higher the livestock grazing levels, the greater the chances are for competition between livestock and deer and elk. Livestock use can also cause damage to young trees in plantations and result in increased reforestation costs, and some loss of tree growth Also, vegetation is trampled in small isolated areas where livestock tend to concentrate near water sources or salt. However, livestock use levels in riparian zones are controlled to prevent damage to the vegetation and soils and to protect water quality.

Providing for different levels and types of recreation also affects other resources Providing for undeveloped recreation reduces the amount of timber that could be harvested and limits other types of development such as geothermal. On the other hand, areas used for developed recreation are unusable by many species of wildlife. Also, managing an area for developed recreation results in concentrations of people which can cause soil compaction and has the potential to degrade water quality

All of the alternatives have their associated social effects as well as environmental effects. For the most part, the social effects are keyed around lifestyles and expectations of Forest users A broad and diverse public is interested in and uses the Deschutes Forest. The major social concerns are related to visual quality, recreation diversity, personal use firewood, and economics There is also some concern regarding the development of roadless areas and other specific locations on the Forest Some of the alternatives would tend to polarize people and communities. This is particularly true of both the high amenity and the high commodity alternatives since they are not well balanced regarding the development and use of the Forest. Alternatives with a commodity emphasis tend to result in fewer provisions for visual quality, recreation opportunity, and personal use firewood. On the other hand, an alternative with a commodity emphasis can result in more jobs and higher revenues On the other hand, alternatives with an amenity emphasis do more to protect the visual quality on large areas of the Forest, but limit the developed recreation opportunities. Jobs and revenues are not emphasized while personal use firewood is abundant. Refer to Appendix F for more details.

Figure B-37 displays the average annual quantifiable resource outputs and effects by alternative. The table is quite comprehensive and will be referred to time and again throughout the remainder of this document The figures following Figure B-37 help to graphically summarize some of the information in this table which pertains to key issues

Most of the outputs and effects for each alternative are displayed for the years 1986, 2000, and 2030 These can be interpreted as the average annual outputs for the decadal planning periods they represent. The year 1986 is the first year of the the first decade of the plan (1986 to 1995) The year 2000 is the mid-point of the second decade (1996 to 2005), and 2030 is the mid-point of the fifth decade (2026 to 2035) These years are displayed for their coverage of both short and long-term outputs and effects.

Note that the output levels for some resources during the first two time periods are similar across all of the alternatives This makes it appear as though there are no differences between the alternatives However, there usually are. The Developed Recreation outputs at the top of the table are a good example for this discussion The consumption levels across all alternatives during 1986 vary from 1393 MRVDs for Alternative A to 1430 MRVDs for Alternative C, a relatively narrow range. However, there is quite a wide range of differences between these Alternatives in the amount and location of lands managed for recreation purposes. The future projections of recreation use for each alternative are based largely on the projected population levels for the State of Oregon and its resulting effects on demand for recreation use on the Forest. Consequently, the short term differences in the amount of recreation use between the Alternatives are relatively small. The differences become greater over time as the different carrying capacities and recreation emphases between the Alternatives begin to affect the recreation use levels and patterns on the Forest. In essence, many of the consequences resulting from decisions made in the alternatives will not be apparent in the short

term, but will become more noticeable in the long run outputs and effects. The same is true for the projections of range use and wildlife population changes where response to land use management decisions is often more gradual than abrupt.

Figure B-37 AVERAGE ANNUAL QUANTIFIABLE RESOURCE OUTPUTS AND ENVIRONMENTAL EFFECTS BY ALTERNATIVE

Outputs/Effects	Unit of Measure	No Change	No Act. A	RPA B	C	Preferred E	G
Developed Recreation Use							
Decade 1	MRVDs[1]	546	546	1421	1439	1421	1408
Decade 2		652	652	1725	1812	1727	1662
Decade 5		995	995	2369	3392	2432	1926
Non-Wilderness Dispersed Recreation Use							
Roaded	MRVDs[1]						
Decade 1		1117	1117	1548	1515	1493	1124
Decade 2		1348	1348	1853	1853	1772	1237
Decade 5		1476	1476	2157	2472	2138	1237
Unroaded							
Decade 1		55	55	55	4.3	55	56
Decade 2		67	67	67	4.3	67	71
Decade 5		121	121	121	4.3	121	143
Wilderness Use							
Decade 1	MRVDs[1]	77	77	77	77	77	79
Decade 2		77	77	77	77	94	101
Decade 5		77	77	77	77	171	212
Trail Construction/Reconstruction (Summer & Winter)							
Decade 1	Miles	5	5	5	0	5	10
Decade 2		5	5	5	0	5	10
Decade 5		5	5	5	0	5	10
Developed Site Construction/Reconstruction							
Decade 1	Camp	75	75	65	75	65	0
Decade 2	Ground	75	75	65	75	65	0
Decade 5	Units	75	75	65	75	65	0

[1]MRVDs–Thousands of recreation visitor days All projection based on growth in demand

Figure B-37 AVERAGE ANNUAL QUANTIFIABLE RESOURCE OUTPUTS AND ENVIRONMENTAL EFFECTS BY ALTERNATIVE

Outputs/Effects	Unit of Measure	No Change	No Act. A	RPA B	C	Preferred E	G
Visual Quality Objectives							
Preservation	Acres						
Decade 1		232,389	232,389	231,727	228,101	232,137	232,538
Retention	Acres						
Decade 1		222,541	222,541	160,030	28,693	126,462	240,421
Partial Retention	Acres						
Decade 1		179,273	179,273	204,998	178,724	218,090	185,558
Modification/Max Mod	Acres						
Decade 1		986,209	986,209	1,023,657	1,184,894	1,043,722	961,895
Unroaded Areas Total Including Wilderness and OCRA	M Acres	357 6	357 6	357 6	357 6	357 6	357 6
Unroaded Areas existing outside of Wilderness and OCRA	M Acres	145 1	145 1	145 1	145 1	145 1	145.1
Unroaded Assigned to a Harvest Prescription	M Acres	27 8	27 8	42.8	78.7	47.4	23 4
Unroaded Planned for Harvest in First Decade	M Acres	No Data	0	7.1	8.1	0	0
Wildlife and Fish Use	Thousands						
Decade 1	Wildlife	24 5	24 5	24 5	24 5	24.5	24.5
Decade 2	and Fish	29 9	29 9	29 9	29 9	29 9	29.9
Decade 5	User Days	54.2	54 2	54 2	54 2	54 2	54.2
Management Indicator Species							
Bald Eagles	Pairs						
Decade 1		35-45	35-45	35-45	35-45	35-45	35-45
Decade 2		35-45	35-45	35-45	35-45	35-45	35-45
Decade 5		35-45	35-45	35-45	35-45	35-45	35-45
Northern Spotted Owls	Pairs						
Decade 1		10	14	14	10	14	14
Decade 2		10	14	14	10	14	14
Decade 5		3	14	14	14	14	17