McCloud Flats
Ecosystem Analysis

September, 1995

Last Edited – February 27, 2004

Preface

The work that went into this report is part of the Aquatic Conservation Strategy adopted for the President's Plan (Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl, including Standards and Guidelines for Management of Habitat for Late-Successional and Old Growth Related Species).

Announcements were published in three local newspapers inviting public input to this analysis. An Open House was held on June 15, 1995 in McCloud, where resource specialists presented information on existing conditions and management direction for the McCloud Flats Focus Area, and the Ash Creek and Mud Creek watersheds.

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Watershed Analyses are iterative, or living, documents that can be updated as new information becomes available. The following edits were made on February 27, 2004:

1. The date of the last edit was inserted at bottom of the Title Page.
2. All references to changing interim Riparian Reserve widths were removed throughout the document.
3. Table 6.1 was recreated and reinserted into the document. This table was present in the 1995 document but was corrupted in the electronic computer copy due to changes in word processing applications.
4. In Table 6.1, last column dealing with Riparian Reserve widths was removed. The official Forest policy is not to change the interim Riparian Reserve widths and to manage within Riparian Reserves; therefore, all references to new Riparian Reserve widths have been deleted.
5. All references to "extinct" channels were changed to "remnant" channels (document-wide).

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* These maps are found in a separate map package at the end of this document.

Chapter 1 - Watershed Characterization

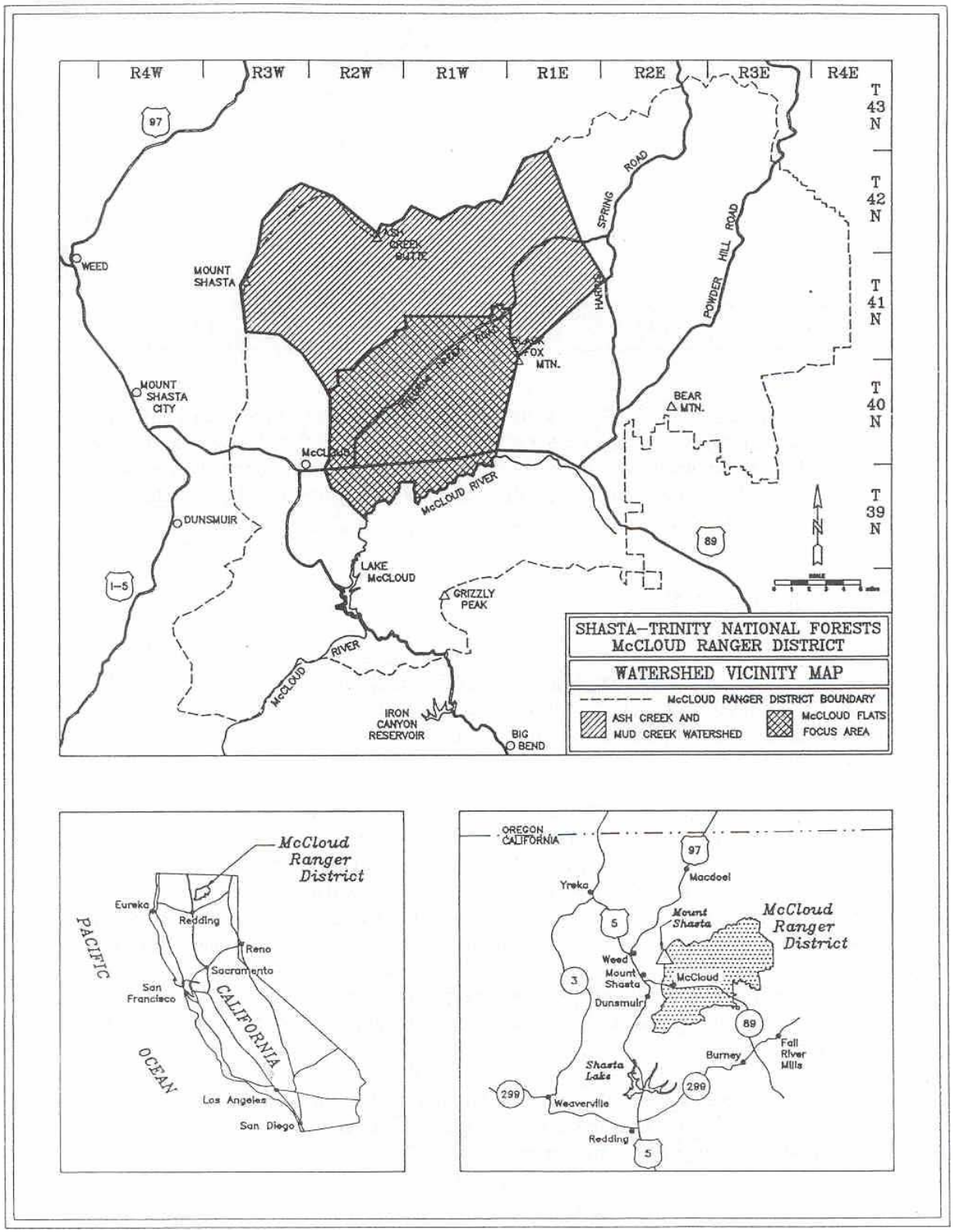
This analysis describes the McCloud Flats and the lower portions of the Ash Creek and Mud Creek watersheds, located in the northern portion of the McCloud River Basin. The watershed drains the southeast slopes of Mount Shasta. Surface and groundwater flows from the watershed enter the McCloud River and are eventually carried to Shasta Lake and the Sacramento River (See Vicinity Map).

McCloud River Basin

The McCloud River Basin is located in north-central California. The basin drains an area of roughly 800 square miles. The headwaters of the McCloud River originate near Colby Meadows, about 20 miles east of the town of McCloud. The river flows approximately 50 miles to its terminus at Shasta Lake. Its largest tributaries include Squaw Valley Creek and Hawkins Creek.

The segment of the Upper McCloud that flows westward from the headwaters to the McCloud Reservoir defines the boundary between two distinct landscapes. North of the river is the "McCloud Flats", an area of level lava flows and low volcanic buttes. The drainage pattern from this area is very sparse. Mud Creek is the only perennial tributary from the volcanic landscape to the north. South of the river is the Eastern Klamath Paleozoic Belt, a landscape of steep, metamorphic mountains. There are many perennial tributaries from the south side of the river. The channel of the McCloud River is of relatively low gradient for its entire length except for three distinctive waterfalls. The Upper McCloud River is confined within a very narrow canyon. The river's flow doubles at Big Springs.

The Lower McCloud flows to the southeast through the Eastern Klamath Mountains for its entire length. The gradient is steeper and the river lies in a wide canyon that has a well-defined inner gorge and riparian zone.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299
Weaverville
Redding
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Timber management is the most common land use in the McCloud Basin. Second growth mixed conifer and white fir-ponderosa pine forest is the principal vegetation. The upper river basin is extensively grazed. Recreational activities include fishing, hiking, camping, picnicing, swimming, mountain biking, hunting, mushroom collection, sight seeing, and rafting.

Ash-Mud Creek 5th Order Watershed

The Ash-Mud Creek 5th Order Watershed sits at the northern end of the McCloud River Basin. The southeast slopes of Mount Shasta, Ash Creek Butte, Dry Creek Peak, and Stevens Butte delineate the northern boundary of the watershed. Buck and Black Fox mountains lie on the eastern boundary and the McCloud River serves as the southern boundary of the watershed. The watershed drains an area of about 152,000 acres. The following distinguishing physical, biological and human features have been identified for the Flats watershed.

Physical Features and Processes

Soils and Geology

Features:

- Upper Slopes: Volcanic buttes and rock outcrops, Wintun, Konwakiton, and Hotlum glaciers, volcanic outwash, steeply sloping terrain.
- Mid-Slopes: Alluvial fans, gently sloping terrain, generally deep, productive, ashy soils interspersed with occasional rock outcrops.
- Lower Slopes: Flat topography composed of mudflow deposits, alluvial terraces, and deep ashy soils overlaying older lava flows.

Dominant Processes:

- Lava, pyroclastic and debris flows.

Hydrology

Features:

- Upper Slopes: Perennial & intermittant streams are concentrated at higher elevations. Radial drainage pattern from southeastern slopes of Mount Shasta.

- Lower Slopes: Surface flow percolates into the soil profile. Groundwater flow predominates. Bundoora and Big Springs are the primary outlets for groundwater flows to the McCloud River.

- Mud Creek is the only perennial stream in the watershed that flows into the McCloud River throughout the year.

- Eighty-seven percent of the watershed is drained by Ash Creek, an intermittent stream which only flows into the McCloud River at approximately 10 year intervals.

- High turbidity levels and sediment loads are present in Mud Creek. Large volumes of sediment also can occur in other channels during rare surface flow events.

Dominant Processes:

- Channel morphology of upland creeks are controlled by peak flows associated with large precipitation events and debris flows.

- Surface flow conversion to groundwater flow occurs in the lower and mid-slope areas. Channel form is controlled by rare surface flow events and episodic debris flows.

- McCloud River channel morphology is controlled by peak flow events and occasional mass movements.

Biological Features and Processes

Forest Types

- Above 8,000' (timberline) scree and barrens with scattered whitebark pine.

- 6,000-8,000' red fir, mixed conifer, chaparral, few riparian corridors.

- 4,800-6,000' mixed conifer, chaparral, few riparian areas.

- 3,600-4,800' ponderosa pine, some mixed conifer, bitterbrush, dry meadows, This zone has few riparian areas, but the McCloud River inner gorge has many riparian areas of meadows with alder and willow. Mud Creek meadows is a wet sedge and pine type of riparian area. The few other springs are this type, and are located mostly in the vicinity of Mud Creek. Two springs are on Black Fox Mountain.

Successional Processes

- On outwash soils, typical succession is sedge-needlegrass to pine to mixed conifer.

- Coarse textured outwash tends to have slower succession, more open stands.

- Lava outcrops, succession goes from manzanita-ceanothus-bitterbrush to open ponderosa pine or to knobcone pine with shrub understory.

- More mature soils, conifers established more quickly, more likely to hold site through disturbance events. More likely to establish white fir, incense-cedar stand component.
- Fire at 10 yr intervals was most common historic disturbance event, retarding succession, maintaining ponderosa pine-sedge-needlegrass community.

- Climatic mudflow events at varying intervals change soil profile. Depending on depth, may interrupt succession.

- Volcanic eruptions at 200-600 yr intervals trigger additional mudflows, deposit ash.

- Decay processes, typical of forest environments, are more apparent on better soils with heavier conifer overstory.

- Insect and disease problems are more evident in current environment of fire exclusion.

- Human disturbance--1895-1920, heavy selective logging, Grazing, up to 10 times current usage. l921-1959, additions to national forest land; logging increasing on private land during and after World War II. l960-1979. Extensive sanititation, overstory removal and thinning harvest; plantation establishment in 9,000 acres of shrubfields and grass-forb. Roughly 300 miles of road constructed. 1980's Clearcut and plantation establishment on 3,000 acres of understocked, diseased or mature stands. Continued thinning and salvage logging.

Species Present

- Aproximately 200 species of birds, 70 species mammals, 17 species of reptiles, 10 species of amphibians, and 5 species of fish.
- Species concentrate in riparian areas and along the McCloud River.
- Federally listed as threatened: Spotted owl.
- USFS sensitive: Goshawk, marten, fisher, pond turtle, cascade frog, willow flycatcher.
- USFS sensitive plants: Salmon Mountains wakerobin.
- FWS: (C1) Redband trout, (C2) Townsend bigeared bat.

Livestock Grazing

- 300 cattle and 1,200 sheep.
-
- Forage conditions very poor to good, mostly poor to fair.

Human

- Population about 15,000 in neighboring towns and outlying areas
- Prehistoric use; permanent camps on the McCloud River; seasonal hunting
- Traditional Native American sacred areas, Mt. Shasta, Black Fox Mt., McCloud River.
- Current Native American ceremonial use at Coonrod Flat.
- Heavy recreational use on the McCloud River.
- 2,300 acres of private summer home and rural recreation subdivisions. About 30 structures
- Locally important for hunting, firewood cutting, mushroom gathering, snowmobiling, driving.
- Long history of conifer harvest.

- Heavy road density in terms of miles per section.

Why is this watershed unique?

- McCloud River biodiversity and spectacular waterfalls
- 14,162 foot solitary volcanic peak.
- Limited riparian areas, except along McCloud River.
- McCloud River Redband trout
- One cave(s) with indigenous life forms.
- Limited surface flow connectivity with the McCloud River
- Relatively high percentage of natural openings and open forested stands.

Ownership and Land Use Patterns

- 52% National forest (78,800 acres)
- 46% Private timberland (70,800 acres)
- 2% Private summer home and rural residential (2,300 acres)

Land Allocations From the LMP and the President's Plan.

- 60% Matrix
- 19% Late Successional Reserve
- 16% Wilderness
- 3% Research Natural Area
- 2% Managed Late Successional Reserve

The watershed is stratified into three focus areas, based on geomorphology and ecological types.

- Lower Ash Creek and lower Mud Creek are the McCloud flats focus area or landscape.
- Upper watersheds of Edson Creek, Trout Creek and Swamp Creek are the Redband focus area.
- Upper slopes of Mt. Shasta are the Shasta east focus area.

The McCloud flats is the focus of this analysis. The other two areas will be addressed in subsequent years.

Management Direction

The source of management direction for the McCloud Flats focus area is the Shasta-Trinity National Forests Land and Resource Management Plan (LMP) which incorporates direction from the Final Supplemental Environmental Impact Statement on Management of Habitat for Late Successional and Old-Growth Forest Related Species within the Range of the Northern Spotted Owl (otherwise known as the President's Plan).

The President's Plan identifies five land allocations in the McCloud Flats focus area:

- Late Successional Reserves
- Managed Late Successional Areas
- Matrix
- Riparian Reserves
- Administratively Withdrawn Areas

The LMP identifies seven Management Prescriptions in the McCloud Flats focus area:

- III - Roaded Recreation (in Matrix above)
- VI - Wildlife Habitat Management (in Matrix above)
- VII - Late Successional Reserves and Threatened, Endangered, and Selected Sensitive Species (Covers both Late Successional Reserves and
- Managed Late Successional Reserves above)
- VIII - Commercial Wood Products Emphasis (in Matrix above)
- IX - Riparian Management (unmapped, in Riparian Reserves above)
- X - Special Area Management (in the Administratively Withdrawn and Managed Late Successional Areas above)
- XI - Heritage Resource Management (unmapped, can fall in any of the land allocations above)

The Management Prescriptions section of the LMP assigns a management purpose to a specific type of land, and specify management practices and standards and guidelines.

The LMP also divides the Forest into “Management Areas”. A management area is a geographic area which usually includes several different prescriptions and President’s Plan allocations. The management area boundaries do not coincide with watershed boundaries. Most of the Flats Focus area is in the McCloud Flats Management Area. However, areas south of the highway are in the McCloud River Management Area, and

some areas northeast of the Pilgrim Creek Road (FA13) are in the Mount Shasta Management Area. Chapter four of the LMP contains three layers of direction:

1. Forest-wide requirements, standards and guidelines;
2. Direction, standards and guidelines for each management prescription;
3. Supplemental management direction for each management area.

Chapter 2 - Issues And Key Questions

High Priority Issues

High priority issues were selected based on the following criteria:

1. There is a potentially high impact or need for action.
2. There are potential impacts on species which are threatened or endengered, sensitive or on the first two categories of the survey and manage list.
3. There is an undesirable trend.
4. There is public controversy.
5. Human health or safety could be affected.
6. There are potential conflicts between existing situations or proposed activities, with the Land Management Plan Standards and Guidelines or other laws and regulations.

The following issues will be examined in detail:

1. The amount and distribution of old growth and mature forest.
2. Biological diversity
3. Forest Health
4. Consumptive forest uses.
5. Nonconsumptive forest uses.
6. Distribution and function of riparian areas.

Following is a more detailed outline of the priority issues, and the key questions associated with each issue.

Issue 1: The amount and distribution and pattern of old growth and mature forest, related to the capability of the land, and the LMP allocation.

Key Questions:

- Do LSR's and the MLSA have 1,359 acres of nesting, forage and roosting habitat within 1.3 miles of activity centers?
- Does the watershed have 15% late-successional (mature and old-growth) forest stands?
- What is the potential vegetation composition and density of each soil mapping unit?
- What is the relationship of fire to old-growth development?

Issue 2: Biological diversity, including protection of unique plant communities, patterns of seral stages, impacts of roads, condition of species of concern, and Native American desires.

Key Questions:

- What is the recent nesting and occupancy status for northern spotted owls?
- What is the current and potential role of Matrix lands in facilitating spotted owl dispersal?
- What are the trends for population and nesting for northern goshawks in the watershed?
- In which land allocations and vegetation types are goshawk activity centers located?
- What factors are limiting goshawk populations?
- What role does this landscape and adjoining areas have in the viability of the goshawk in the province?
- What are the population trends for mule deer on the flats?
- What factors are limiting deer population?
- What management activities would tend to improve deer populations?

- What unique plant communities are located in the landscape?
- What are the ecological and economic tradeoffs between allowing succession of wet meadows to pine or restoring the grass-forb stage through fire or other means?

- What other species of concern are found in the compartment? What role do the flats serve in maintaining these species?

- Are introduced species disrupting natural communities? What human activities promote the spread of weed species?

Issue 3: Forest health, including insect and disease outbreaks, the role of fire, risks of catastrophic fire, and forest stand density.

Key Questions:

- How do species composition, stand density, soil disturbance, fire and soil variations affect insect and disease outbreaks?

- What management actions will minimize the spread of pathogens?

- What are the interactions between achieving late-successional forest goals and the occurancd of insect and disease outbreaks?

Issue 4: Consumptive Human Use of the Landscape, including Wood fiber harvest, firewood cutting, mushroom picking, livestock grazing, hunting and fishing.

Key Questions:

- Where and how are there opportunities to harvest wood products in ways which support biodiversity and scenic objectives on Prescription 6 and Prescription 3 lands, or are compatible with biodiversity and forest health objectives on Prescription 8?

- Are there opportunities to use thinning to maintain or create old growth habitat in Late-Successional Reserves and the Managed Late-Successional Area?

- How can firewood availability be maintained or improved?

- Where are the significant populations of Boletus edulis mushrooms? What is known about the ecology of this species and its relationship to disturbance?

- What is the relationship between roads and quality hunting?
- What are the social impacts of road closures?

- How can range forage be maintained?

Issue 5: Nonconsumptive human Uses of the Landscape, including developed and dispersed recreation, rural residences, spiritual use, and watchable wildlife activities.

Key Questions:

- What is the impact of planned activities on Native American Spiritual Values?

- How can the values associated with spiritually important areas be maintained or improved?

- How can river-associated recreational use be managed consistent with biodiversity standards and guidelines?

Issue 6: Distribution and function of riparian areas, including distribution and function of perennial, intermittent, ephemeral and remnant channels.

Key Questions:

- What is the role of natural disturbance (mudflows, volcanism) in the Flats analysis area? How have these disturbances affected hydrologic conditions in the Flats analysis area?

- What hydrologic interactions occur between the Flats analysis area and the McCloud River?

- Where are riparian meadows located in the analysis area? What is the hydrologic function of the meadows?

- Where are riparian areas found in the Flats analysis area? Which channels meet the LMP/Record of Decision (ROD) definition of an intermittent stream? What is the function of riparian areas in the Flats ecosystem?

- How have management activities (timber harvest, prescribe burning, recreation, grazing) affected channel stability and water quality?

CHAPTER 3 - CURRENT CONDITIONS

Landscape Vegetation Patterns

The pattern of the landscape is conifer forest, ponderosa pine on dryer sites and mixed conifer on more mature soil types. (The terms landscape and focus area are used interchangeably.) The patches at lower elevations are fields of needlegrass, sedge and forbs, or bitterbrush. Geologically, the landscape can be visualized as a non-homogeous sea of unconsolidated volcanic matter, deposited by erosional processes or by eruption and aerial deposit. This sea overlays a layer of harder volcanic lava, which reaches the surface to form islands in many areas. Other areas have a shallow deposit of alluvial material between the islands. The vegetation follows these patterns. Lava rims running generally from northeast to southwest in the landscape are covered with a more sparse conifer forest and a shrub understory of greenleaf manzanita, whitethorn ceanothus and bitterbrush. Additional chaparral types are found on the relatively steep sideslopes of Black Fox Mountain, a very old volcano. Additional patches are formed by young ponderosa pine plantations. Large, amorphous patches of up to 800 acres were created by piling brush or plowing up grass-forb openings, primarily between l959 and 1980. smaller, more regular shaped plantations of 5 to 40 acres were created by clearcutting in the l980's.

The sea of loose volcanic matter contains very coarse material near the channels and paths of old mudflows. In this environment, a sparse covering of needlegrass, sedge, forbs and minor grasses occupies most of the site. Over time, pines have invaded much of this area. Terraces and fine textured alluvium farther from the paths of the mudflows are occupied by dense mixed conifer and ponderosa pine stands.

One of the unique features of this landscape is that the geologic processes shaping the landscape sometimes occur at intervals shorter than the maximum lifespan of the trees occupying the area. As a result, the living components of the ecosystem are less complex than in other areas. The species occupying much of the landscape can be considered pioneers--annual grasses, short-lived forbs, ponderosa pine and knobcone pine. Much less is known about the sub-surface components of the ecosystem. Mycorrhizal fungi such as rhizopogon species are almost always present where pine becomes established. However, the complex food chains arising from the decomposition of large logs over a period of several centuries are less likely to become established. Volcanic soils are normally high in mineral nutrients when deposited. A primary method of nutrient cycling has been the mineralization of nutrients from the conifers and portions of lower vegetation in ground fires. Nitrogen fixing by bitterbrush and ceanothus species is another important method of nutrient cycling.

The unconsolidated soil provides a good habitat for pocket gophers, a ground-dwelling herbivore. As the forest becomes more dense, the primary herbivores are more likely to be more diverse, including wood rats, deer mice, flying squirrels, and voles.

Forty one percent of the total landscape on all ownerships, 22,900 acres, meets standards for dispersal habitat for northern spotted owls. This canopy closure and size is also minimally acceptable habitat for northern goshawks. The landscape contains 8,765 acres, 18 percent of the national forest land, which meets size and canopy standards for roosting and foraging habitat for spotted owls. (See Table 3-1.) Suitable nesting habitat for northern spotted owls, including old growth and some of the younger mature stands occupies 3.6 percent of the national forest land. Typical old growth stands occupy about one percent of the landscape.

Table 3-1. projects that the dispersal habitat total will reach 55 percent of the national forest land in 20 years, as plantations and immature stands grow. This assumes no significant changes due to harvesting or mortality.

Table 3-1 Vegetation, McCloud Flats Focus Area

Vegetation Type	**Withdrawn Reserves**	**Acres Matrix, CHU**	**Acres Matrix, Not CHU**	**Total Area**
M4N, M4G	1,054	41	116	1,211
M3G	169	1,754	36	1,959
50% of M3N	1,393	3,631	572	5,595
Total, Suitable Nest-Roost or ForageHabitat	2,616	5,426	723	8,765
50% of 3N	1,393	3,631	571	5,595
2G, 2N	378	307	1	686
Hardwood	---	141	14	155
50% of 3P, 4P	257	2,288	416	2,961
Dispersal Habitat	2,028	6,367	1,002	9,397
Total 11/40 or better	4,644	11,793	1,725	18,162
>30 year Plt.	161	1,182	---	1,343
20% of 3P, 4P	103	915	167	1,185
Dispersal Habitat by the Year 2005	264	2,097	167	2,528
20% of 3P-4P	103	915	167	1,185
20-30 Year Plt.	148	708	24	880
2P	275	176	---	451
Dispersal Habitat by the Year 2015	526	1,799	191	2,516
10-20 year Plt.	87	4,213	1,615	5,915
1-10 year Plt.	324	2,250	173	2,747
Dispersal Habitat by the Year 2025	411	6,463	1,788	8,662
2S, 3S, 4S, & 10% of 3P,4P	259	4,211	1,579	6,049
KPX	---	1,447	73	1,520
LPX	---	53	---	53
GR	170	1,083	---	1,253
SX	150	529	314	993
NF	7	215	---	222
Not Capable	586	7,538	1,966	10,090
TOTAL	6,431	26,690	5,837	41,958

The data in Table 3-1 are from the LMP database, The vegetation typing was originally done from l975 aerial photos. Revisions in l987 and l990 were done primarily to include new plantations established after clearcutting. A few minor corrections were made this year. (See map 12.)

The table assumes that all of the M3G stands and half of the stands originally typed as M3N have grown to the point that they are now suitable forage and roosting habitat for northern spotted owls. It also assumes that fifty percent of the 3P and 4P stands have now attained a 40% canopy closure and are suitable dispersal habitat. This may vary slightly from conventions used in other projects, but is believed accurate for this area.

The table does not consider variations in habitat quality. Some stands, particularly in the center portions of the focus area, have barely 40 percent crown closure, are single storied and nearly pure pine.

Private Land

16,984 acres of privately owned land in the focus area, are not included in the above table. Vegetation on this land was typed by comparing the l975 typing with l989 orthophotos and l992 infrared photos, and revising the typing where appropriate. An overlay of this typing is in the McCloud office, but has not been digitized on a CAD or GIS format. Thirty three percent of this land meets dispersal habitat criteria. Six percent meets roosting and forage habitat criteria. A higher percentage of private land is on the most productive soil types with a mixed conifer cover.

Unusual or Unique Plant Communities

The top of Black Fox Mountain and adjacent areas in the Bartle Watershed contain a relatively isolated red fir or Shasta red fir community. This community has not been investigated.

The lower portions of Ash Creek sink contain a lodgepole pine, ponderosa pine and spirea community which is relatively unusual.

The riparian meadow communities of sedge, rush, and willow occupy less than 100 acres of the landscape. This community has the potential to contain Trillium ovatum var oetingerii, (R-5 Sensitive) and Cypripedium spp. (Survey and Manage, protect known populations).

Grasslands with Idaho fescue are relatively uncommon. Examples are the northeast portion of Elk Flat, central Pilgrim Flat, and the east side of Coonrod Flat. These are remnants of conditions typical of the flats before European settlement.

Wildlife

Spotted Owls

The LSR's and the MLSA within and adjacent to the landscape were designed to support seven pairs of spotted owls (Draft Recovery Plan p. 145). The nesting and occupancy status is four pairs and one single of the seven projected:

The Mud Creek owls were present in 1994. These are in the focus area.

The Kinyon owls were present in 1994 and are nesting in 1995.
The Whiskey owls were present in 1994, 1995.
The Intake owls were present in 1994.
The single Cold Creek owl was present in 1993, gone in 1994
The single Fons owl has been absent since 1990 (no activity center).
The Sugar Pine Butte owl has been absent since 1990 (no activity center).

The active pairs outside the focus area have adequate or marginally acceptable habitat, but the remainder do not. Habitat conditions in the focus area are discussed in Appendix B, the Threatened, Endangered and Sensitive Species Analysis. The Sugar Pine Butte (Elk Flat) owls disappeared in 1990 during a timber sale near the nest. An LSR assessment for the Elk Flat LSR is included as Appendix A. Habitat conditions for the LSR are discussed in detail in the assessment.

The Fons owl MLSA contains only 1,280 acres, and surrounding private land has been heavily logged. The Cold Creek owl is a single male living in marginal and limited acreage, dependent on logged private lands and usually absent.

Matrix lands provide very little important forage, roosting or nesting habitat for activity centers. No sightings have been made on matrix lands. The Mud Creek owls are in an RNA and are not dependent on matrix or private land. The other owls are partially dependent on private forest for habitat. The Cold Creek single owl was partially dependent on private land at high elevations where habitat is limited.

The focus area contains 21% mature and old growth forest, which exceeds the standard of 15% late successional forest stands. This includes all 4N, 4G, and 3G stands over 80 years old, and half of the stands typed as M3N in l975. However, nearly all of this is early mature forest. Most late successional stands are 80-110 years old and not spotted owl nesting habitat. The focus area has about one percent 4c older types, of which 90% are in LSR, MLSA, or riparian reserve. Almost all of the 4c older stands exceeding 100

acres are occupied by spotted owls and/or goshawks, indicating competition for a shortage of nesting habitat. (See Table 3-1.)

Preliminary indications are that approximately 20% of the national forest land in the remainder of the watershed is in late-successional forest.

Dispersal Habitat for Northern Spotted Owls in Focus Area

The current value of the Critical Habitat Unit is low. The landscape is highly fragmented by logging and pine plantations. Surrounding private forests are continuously logged. The matrix land is centrally divided by a series of lava reefs, large dry open flats and sinks which limit dispersal. Riparian areas are almost absent with the exception of the McCloud River inner gorge and three meadows totaling under 100 acres along lower Mud Creek. These riparian areas and their associated reserves are dispersal habitat, but lack the continuity needed to provide substantial dispersal accross the entire watershed.

The potential value of the CHU is moderate to low because some land will not provide a forest with the crown canopy needed for owl dispersal. Coarse soils and lava reefs now supporting natural open knobcone pine or open dry meadows will not grow 40% canopy forest. If the reintroduction of fire is practiced for forest health, maintaining dense canopies will be difficult. Root rots near Mud Creek continually open up the canopy of trees. The entire CHU is surrounded by harvested private timberlands that will not be allowed to mature. Private land contains under 33 percent dispersal habitat. These situations are not likely to improve.

Controlled burning of habitat appears favorable or inconsequential to owl dispersal habitat. The forest may not grow to mature owl habitat before catastrophic fire removes it, so controlled burning is a good preventive measure. For owls, a controlled burning program appears to provide a better prey base, promote larger and healthier trees, slow down the spread of rot, promote a multilayered tree canopy, protect logs or snags, and protect the larger sizes important to owl habitat. However, controlled fire may limit high density mixed conifer stands suitable for nesting and limit dispersal habitat on sites with low productivity or open canopies.

Goshawks

Goshawks are a sensitive species occupying the watershed. On the combined McCloud and Goosenest Districts, 28 of 50 nesting sites are LSR, MLSA or administratively withdrawn allocations. On a district level, 12 of the 28 nesting sites are in reserves or withdrawn lands. In the fifth order watershed, 4 of 12 are in non-matrix lands, and in the

focus area, 2 of 5 are in reserves. The others are in matrix lands subject to timber harvest. Surveys in 1993-94 indicate that only two of the 28 pairs in nest territories attempted to reproduce. These probably failed to fledge, and all other territories checked were unoccupied or the goshawks failed to nest.

Reasons for declines in the local goshawk population are unclear. Timber harvest, cattle grazing, and road density (nest disturbance) appear to be factors. Goshawks in other portions of their range appear to have static or slightly declining populations. Cumulative effects are important, with loss of old growth forest habitat the major cause of decline.

Furbearers

LSR, MLSA and matrix lands vary in usefulness for the maintenance of furbearer populations. The MLSA is a heavily forested area useful as a travel corridor, especially for connecting Mud Creek MLSA to the McCloud River Corridor. The surveys and sightings indicate marten populations are densest in the LSR's. Sightings are few, scattered, and usually outdated in the matrix. Records of fisher are very few relative to marten in the watershed. Biological literature indicates fisher prefer lower altitudes along the river.

Mule Deer

The local deer population is migratory, and the Ash Creek watershed is summer range. Deer winter over twenty miles south near Shasta Lake and occupy the Flats from May to October. The population was high from 1950-1965, and has steadily declined since then.

Opinions offered for the decline of the deer herd vary widely and are passionately upheld by the public and various professional managers. Factors believed responsible are increased hunting pressure, high road density, loss of forage, insufficient water, loss of cover, highway mortality, predation, disease, and other factors.

Forest management can control road density, forage, water and cover. Forest service activity can reduce the number of low-standard roads, but this is opposed by those who wish maximum vehicle access. Forage quality can be improved, but summer forage of grass and forbs is in direct competition with range allotments where bitterbrush is almost unused but abundant. Water in the form of guzzlers can be supplied if fenced from cattle damage. Cover is abundant. Of all management factors, road density is believed the most adverse effect and most controversial. Water, cover, and forage quality can be increased, but the response of the deer herd may be inconclusive.

Snags and Deadwood

Snags and down logs are important habitat for many species of plants and animals. Among the plant species are various forms such as tree fungi, edible mushrooms and a few flowering plants. Animals include sensitive species such as marten, fisher and goshawks. The threatened spotted owl requires snag habitats, and predators are partially dependent on these habitats for a prey base. Some animals are cavity nesters or dependent on snags for roosting, among them some migratory songbirds and the pallid bat.

Inventories are unavailable or out of date for snags and deadwood, but a cursory survey for the focus area has been made. The overall impression is that averages are not met but the situation is improving. The survey indicates that the down log LMP requirement of 4-6 per acre is not met in most areas, but in some areas logs are abundant. Most areas meet the 5-10 tons per acre of deadwood, usually in old logging slash. The snag density has recently improved due to drought mortality so that most timbered areas meet the average LMP matrix requirement of 1.5 snags per acre. Recent computer snag models indicate this density should be higher for snag-dependent life forms. Distribution of snags and deadwood is spotty because large areas of plantations have almost no deadwood or snags. This reduces the average below forest minimums.

Riparian Species of Concern

Several species of concern have been associated with the riparian zone on the McCloud River. The willow flycatcher is a sensitive species which is known to nest in willow thickets and similar riparian vegetation along the river. Data on population trends is absent in this area, but the population is assumed to be stable because the riparian areas are stable and ungrazed by stock. The western pond turtle is a sensitive species found along the river, but data on the population is absent. Cascade frogs (sensitive) and other amphibians are present, but no other sensitive species are known from the few surveys taken. No apparent conflict exists between the needs of riparian species and existing recreational use.

The osprey is considered a species of special concern by the state of Calfornia but has no forest service or USFWS status. A pair has nested successfully for several years near Lakin Dam and tolerates present recreational activity.

Redband trout (C1 species, USFWS) are found in the upper McCloud River and tributaries. All but one known population is above the middle falls. The species appears to have survived only where it has no competition with other trout. Populations in Sheepheaven and Edson Creeks have survived the recent drought, although the streams were mostly dry. Recent studies have indicated that the McCloud populations are threatened by competition from introduced trout and hybridization with hatchery rainbow. Fishing pressure is assumed less consequential, but two streams have been closed.

Three of the redband trout populations are in tributaries to Ash Creek outside of the focus area. The question has been raised, whether there is any genetic interchange during high water flows between Ash Creek and the McCloud River. Although this is theoretically possible, it is not likely. The 10.5 miles of channel in Ash Creek and Edson Creek, between the river and the upstream population, has very little potential pool habitat for resting, and very little potential hiding cover. In addition, there are nine culverts, none of which was specifically designed for fish passage. The chance of a fish surviving this journey during flow periods of three to six weeks are remote. The chances of an occasional downstream passage are somewhat better.

Bald eagles have occasionally been sighted on the McCloud River, but the nearest nest is four miles below the focus area, on the McCloud Reservoir. No known conflict exists between bald eagles and present recreational use.

The Western pond turtle may also be found within the McCloud River corridor in areas where slopes are less than 40 percent.

Bull trout formerly inhabited the McCloud River below Lower Falls, but have been declared extinct.

Other Species

The focus area is considered unsuitable habitat for great gray owls.

Vascular Plants, R-5 Sensitive and Survey and Manage Species

Three vascular plant species of special concern may exist in the wet meadows in the Mud Creek and Bundoora Springs area. Salmon Mountains wakerobin (Trillium ovatum var. Oetingerii) has not been found, but has been located in similar habitat within 10 miles. This species is considered an old-growth or mature stand associate in moist sites or within riparian zones. It is a region 5 sensitive species. (Wilkins' harebell, Campanula wilkinsiana, is found at higher elevations in the watershed, but not in the focus area.)

Clustered lady's slipper (Cypripedium fasciculatum) and mountain lady's slipper (Cypripedium montanum) are perennials in the orchid family. These species have been identified as old-growth associates which are declining throughout their range in North America (FEMAT 1994). They have been found in a wide variety of soil types and habitats, making identifying suitable habitat problematic. There are approximately 25 verified populations of clustered lady's slipper in the state. Populations are generally small. Four of these populations occur on the Shasta-Trinity National Forests, all occurring alongside streams. Shading appears to be a requirement for these orchids, which are commonly associated with other old-growth related species such as prince's pine, wintergreen, Oregon grape, and phantom orchid. Overstory associates are sugar

pine, Douglas fir, white fir, Pacific dogwood, and Pacific yew. Establishment of new populations is very slow. Flowers may not be produced for many years, during which time a slow growing mycorrhizal association is built.

Mountain lady's slipper (Cypripedium montanum) is found from central and northern Sierra Nevada to the San Francisco Bay area, north to Montana, Wyoming, and Alaska. As with clustered lady's slipper, it is thought to be declining throughout its range. It is an old-growth associate (USDA 1994) found in moist, open coniferous forests at elevations ranging from 650 to 7200 feet. Overstory associates include Douglas fir, sugar pine, Pacific dogwood, hazelnut, and canyon maple. Herbaceous associates include Oregon grape, western starflower, trail plant, wakerobin, and false solomon's seal. The habitat and associated assemblages are essentially the same as for clustered lady's slipper. Although both of these plants have been found in disturbed sites in heavily cut areas on the Klamath NFs (Barker 1984), it is likely that these were remnant populations able to remain viable at least temporarily due to their long-term establishment via rhizomes. Populations are generally small with few individuals. Six verified populations occur on the Shasta-Trinity National Forests. The potential habitat for these species in the focus area is in or near the McCloud River Riparian Zone. The likelihood that they exist in other areas is very low. Both species have survey and manage requirements, including survey before ground disturbing activities, and protection of known populations.

Two additional vascular plants may be found in high elevations. Sugar Stick, Allotropa virgata, is a fleshy, perennial saprophyte in the heather family. Sugarstick is found in deep forest duff in shaded mixed conifer or white/red fir and mountain hemlock forests. The only potential habitat for this species is in a red fir stand near the top of Black Fox Mountain.

Northwestern moonwort (Botrychium pinnatum) is a small perennial fern in the adder's tongue family. Although it ranges north to Alaska, it is not common throughout its range, and is a state listed endangered species in Oregon. In California, this species was known only from a historical population near Etna, in Siskiyou County, prior to its discovery last year (1993) on the south slope of Mt. Shasta below Gray Butte. The only potential habitat for this species in the focus area would be on the slopes of Black Fox Mountain, probably above 5,500 feet elevation. Botrychiums often occur sympatrically, and it is possible that other rare moonworts may occur in the area also.

Possible Fungi/Lichen Survey and Manage Species

The information that available from surveys, personal knowledge and the literature was used to arrive at the following conclusions:

The flats area has been very heavily logged and consists primarily of second growth mixed conifer and pine stands below 5000 ft. Most of the species on the C3 list are associated with late successional stages. The two lichen species on category one of the

survey and manage list, Lobaria linita, and Bryoria tortuosa, are no exception. Lobaria linita does not begin to appear in a stand until it is at least 200 yrs old. A few scattered remnants of trees this old are present, but no stand is known that is capable of supporting this species. Lobaria is not on the list of potential species. Bryoria tortuosa has been documented from the Mt. Shasta area but has no adequate habitat description for this species. The probability that it occurs in the flats is low.

Fungi

Fungi are hard to locate, ephemeral, and most of them have been very poorly studied. Most populations and areas need a monitoring study (minimum of 5 yrs). This compensates for yearly variation in moisture and temperature patterns. It is also necessary to conduct surveys on a year round basis as some fungi fruit in the spring and others fruit in the fall and winter. Please bear that in mind and realise that the following is an educated guess at best.

With one notable exception (Gastroboletus subalpinus),the majority of hypogeous(below ground) fungi(Truffles,False truffles) on the C3 list, either occur above 5000 ft or occur in old growth stands or both. Gastroboletus subalpinus occurs in Lodgepole stands from 4500 ft and above. As you are aware, there are several of these on the district.
I think you can safely say that the probability of occurence for the other truffle and false truffle species is low. The remainder of the fungi on the list (Chanterelles, Coral fungi,Phaeocollybias Saprobes(Decomposers)) are associated with later seral stage forests. There are enough older trees scattered throughout the study area to provide refugia for some of these species. The most likely are Ramaria sp., Gyromitra sp.,and Sarcosoma mexicana.

Suitable habitat for Bondarzewia montana, does not exist in the focus area. This is the only fungal survey and manage species for which surveys prior to ground disturbing activities is required.

Four species for which management requirements are limited to extensive surveys have been collected in the focus area. These are: Gomphus floccosus, scaly chantarelle, in S25, T41N R1E, near Edson Creek; Cantharellus subalbidus, in 80 year old pine, Sarcodon imbricatum, hawk wing, in S36, T41N R1E, on the lower slopes of Black Fox Mountain, and a Claveridelphus species in the same location.

Bryophyte Survey and Manage Species

Bryophytes are mosses and liverworts. None of the bryophyte species on the survey and manage list are known or expected to occur or have suitable habitat within the focus area.

Exotic Weeds

Recreational and grazing activity has introduced some undesirable plants into the watershed. Canada thistle, musk thistle, star thistle and cheatgrass are occasionally found, especially near cattle corrals and the Shasta Forest Subdivision.

Caves

Many local people know the location of caves in the watershed, and use of these caves and vandalism is increasing. The caves in the watershed are known to spelunker clubs and are visited by youth for parties and adventure. Few are aware that in 1994 unique cave-dwelling species were found in at least one cave. The Townsend bigeared bat (USFWS C1 species) is present locally, but surveys are inadequate to determine if they roost in the lava tube caves in the focus area. Administrative protective measures would be desirable.

Hardwoods

The ecological requirements of aspen and oaks are known and the species are desirable as part of biological diversity. Both are fire-stimulated species which are harmed by heavy grazing and coniferous competition. In the McCloud Flats hardwoods may be found on areas of finer soils with more moisture holding capacity. Hardwoods are overcrowded by competition from conifers. Grazing is preventing reproduction in some groves near water, but has no effect on others away from water or overcrowded by conifers. Pine competition appears to be the major factor in hardwood decline, although clearcutting may have removed several groves.

Range

Administrative

The focus area of the Ash Cr. watershed analysis contains most of the Bartle Cattle Allotment. This allotment is the larger of two cattle allotments on the McCloud District. It has a permit for 150 cattle from May 15 to October 1 and 150 cattle from July 1 to October 15. Grazing standards are maintained, but the opening date is usually in June.

Portions of the McCloud River Sheep Allotment lie south of a fence about one mile north of the railroad. It has a permit for 1200 sheep from May 16 to October 15. They lightly use the area and the permittee maintains excellent grazing standards.

Range Conditions

The range in the watershed now consists mainly of open sedge areas in plantations, brushfields, and conifers. Several remnants of the historical grassy areas called flats persist in the central focus area. Timber management, fire exclusion, overgrazing, and natural succession growth processes have replaced brushfields and openings with trees, reducing the forage base. If fire replaced conifers with grassland types, and early-season grazing were controlled, the forage base would improve. A decline in forage with a constant number of cattle will affect range conditions.

The range condition has declined since cattle grazing began, for early data indicate conditions were better. Range transects in the 1950's indicate fair to good forage conditions, which coincided with high numbers of deer in the focus area. Measured transects in 1993 indicate very poor to fair declining forage conditions in the Bartle Allotment. Grazing conditions forest wide have declined since the 1950's.

Range Forage Species

A preferred forage species is a plant cattle eat first. Fescue, brome, and sedge are preferred species in dry conifer forest types. These plants are acceptable to cattle and are the mainstay of available forage.

Other species show erratic forage use. Needle grass, squirrel tail, and bitter brush are seldom eaten. Hardwoods such as aspen and oak are sometimes browsed so heavily that sprouts do not survive, but in areas away from salt and water they are ungrazed. Most brush and conifer species are ungrazed.

Forest Health

McCloud Flats contains numerous infection centers of blackstain root disease, caused by Leptographium wageneri. This disease affects primarily hard pines in the flats area. There are believed to be several races of the fungus. A different race infects Douglas-fir, a tree which is uncommon on the flats. The disease is spread slowly through root contact from tree to tree. Rates of spread have been estimated from photo studies at one to seven meters per year. The apparent rate of spread may also be increased when bark beetles attack infected trees, then attack adjacent uninfected trees. Infected trees usually die within a few years. Bark beetles, Dendroctonus or Melanophila species, are usually the immediate cause of mortality. New outbreaks are believed to be started by Hylastes macer beetles, which do not cause mortality directly but transmit the fungus.

The pattern of mortality, and the management activities that have been implemented to control blackstain disease, have created several large openings. A 250 acre plantation in the Edson Creek area resulted from a blackstain infection, and the prescribed treatment of logging all trees within 75 feet of an infected tree.

About 600 acres northeast of Widow Springs was also clearcut to control blackstain disease. Most of this area is private land. Currently, at least 300 acres in the Mud Creek area are heavily infected. Current infection centers are shown on the enclosed map.

Blackstain occurs primarily on the better soils within the flats. Fine textured volcanic soils have been the site of most outbreaks. The better mudflow soils have also been subject to outbreaks where dense pine stands have developed. There are few if any infection centers in the more open groups of pine on coarse textured mudflow (Delaney Series) or in soil-rock outcrop associations. (Ironwell and Lavacrack Series). The disease occurs in stands which are predominantly ponderosa pine. It is seldom seen in stands which are less than 30% ponderosa pine. Dense stands are more susceptible to the disease. However, thinning has not contained the disease in areas already affected. These observations are very consistent with the findings of published studies. There were several small centers of mortality in the l994 underburn area, before the burn was carried out. It is not certain whether these are caused by blackstain or drought-related bark beetle outbreaks.

Annosus root rot, caused by the fungus Heterobasidium annosum, is also present on the flats. This disease affects all conifers. It is spread by root contact. It is also spread by aerially borne spores from the fruiting body, which infect stumps and down logs. Some of the earlier outbreaks identified as blackstain probably included Annosus root disease. The application of borax powder to freshly cut stumps has been shown to prevent the infection of these stumps.

The insects most likely to cause tree mortality on the flats are the mountain pine beetle, Dendroctonus ponderosae, and the western pine beetle, Dendroctonus brevicomis. Ips Confusus, the ips beetle, attacks younger trees or causes top kill in medium sized ponderosa pine. During normal precipitation years, bark beetles typically attack trees weakened by root rots. During drought cycles, these insects tend to attack more uninfected trees.

Research is currently being conducted in the flats on the use of sex attractants or pheromones to disrupt the reproduction of these insects. Preliminary results should be available by the end of the season.

In plantations, pocket gophers are frequently a cause of heavy mortality. An estimated 800 acres of plantations have required replanting in the flats because of gophers. Between l981 and l988, strychnine bait was applied in underground burrows on an estimated 2,200 acres. Gophers tend to flourish in areas with a heavy cover of grass, forbs or rabbitbrush (Chrysothamnus and Haplopappus species). The worst problems have been in areas where plantations were established in dry meadows or rabbitbrush openings. Recent management has focussed on reducing the grass-forb and rabbitbrush food base for the pocket gophers by rototilling or cultivating the plantations.

White fir mortality has been caused by engraver beetles, Scolytus ventralis. However, white fir mortality on the flats has been relatively light and scattered, in contrast to the east side of the McCloud District, where up to 90 percent of the white fir has died over extended areas.

Mortality and tree damage from other causes in the flats, including snow, wind, dwarf-mistletoe (both pine and fir species), heart rots and defoliating insects is generally well within the range of natural variation and the desired management range. These agents may cause localized problems and/or salvage opportunities, but are not a forest health problem.

Mycorrhizal fungi form a mutually beneficial or symbiotic relationship with the rootlets of forest trees. Members of the public have suggested that forest health problems are caused by the destruction of mycorrhizal populations during tractor logging and tractor piling for site preparation. Research in the Hambone area, 15 miles east of the focus area, indicates that several species of mycorrhizal fungi colonize plantations within one year, even in areas that were primarily vegetated by grass and forbs before planting. This research tends to indicate that mycorrhizae are present even in heavily disturbed areas. However, specific mycorrhizal species such as the highly valued Boletus edulis are not found (or at least do not produce fruiting bodies) in areas that are recently tractor piled, or on main skid trails. Most of the collecting areas for boletes were railroad logged before l920 and heavily disturbed at that time.

Fire/Fuels Regime

The Southern Cascades Province is characteristic of a short return interval, low intensity surface fire regime. The mixed conifer series is the most common series found throughout the province which includes stands of ponderosa pine at the drier ends of the mixed conifer zones. Mixed conifer and ponderosa pine series as well are both characteristic of short interval fire adapted fire regimes. Pine sites may have shorter intervals of disturbance (5-15 years) due to drier site conditions and extended burn seasons where higher elevations and transitions zones to mixed conifer stands may experience longer intervals (5-30 years) due to climatic variables. Within the lower elevation and thus drier sites fire regimes have experienced a change from frequent low intensity surface fires to that of infrequent high intensity stand replacement fires. Correspondingly higher elevation moist sites within the same fire regime have changed from infrequent low to moderate intensity surface fires to infrequent low, moderate and high intensity stand replacement fires.

Current vegetation fuel profiles in the Flats can be separated into several groups that define their probable fire behavior. These groups vary slightyly from other vegetation typing because they are aggregated differently.

1. Mature Pine and Mixed conifer- (31% of the area) most stands have been logged over with moderate to high accumulations of older slash. Fire is carried mostly in the surface litter with predicted 6 ft plus flame heights at 90th percentile weather occurrence.

2. Small timber,Pine and Mixed conifer- (25% of the area) Fire is carried in the litter layer with less residual fuels than mature stands. Ponderosa pine plantations over 20 years old are included in this group. Predicted 4 ft plus flame heights at 90th percentile weather occurrence.

3. Knobcone pine- (3% of the area) evidence of past high intensity wildfires, characterized by heavy ground fuels and vertical stand structures that contribute to crowning fire events. 4 ft plus flame heights predicted at 90th percentile weather occurrence.

4. Small timber,White fir dominant - (2% of the area) fire is carried in the litter beneath the timber stand. Most stands are dense with vertical fuel ladders. Occasional jackpots of heavy fuel concentrations. Fire behavior is moderate with 2ft flame heights at 90th percentile weather.

5. Chaparral- (13% of the area) fire is generally carried by the litter from shrubs 2-4 feet tall with a mixture of grasses. This group would include pine plantations(without current maintenance)from 11-20 years old. Flame height predicted at 4 ft with 90th percentile weather occurrence. Older brush over 4 feet in heigt can have flame heights to 8 ft plus.

6. Grasses, Meadows- (22% of the area) fire spread is dependent on cured grass usually below 1 ft in height. This describes meadows and pine plantations (without current maintenance) under 10 years old. Several meadows are being encroached by pine trees and fire may be carried in the litter layer without cured grass. Flame heights at 90th percentile weather is up to 8 feet.

7. High fuel load areas- (5% of the area) residual slash from 45-60 tons per acres generally cover the ground. Stand density is also a feature that contributes to the high hazard as well as isolated mortality. Flame heights at 90th percentile weather is up to 9 feet.

Hazard/Risk Assessment

It will be useful to stratify the focus area into such vegetation types within a single fire regime. This will enable a Hazard and Risk analysis to be determined by projecting expected fire behavior outcomes coupled with the past history of expected ignition starts. Fire Hazard and Risk assessments can provide insight from a landscape perspective as to potential areas of concern to focus attention on fuels management, fire protection and forest health issues. The Hazard and Risk rating for the Flats focus area is shown in Table 3-2 below, and on Map 8.

Table 3-2. Hazard and Risk Ratings

Vegetation description	% coverage	NFFL Fuel Model	1.) Hazard rating	2.) Risk rating	**Combined Hazard/Risk**
Complex-1 Mature Timber P/MC	31%	10	M	M/H	**M/H**
Complex-2 Small Timber P/MC	25%	9	M	L/M	**M/M**
Complex-3 Knobcone	3%	9	M	L/M	**M/M**
Complex-4 Small Timber WF	2%	8	L	L	**L/L**
Complex-5 Chaparral	12%	5	H	L	**M/M**
Complex-6 Grass/Meadows	22%	2	H	M/H	**H/H**
Complex-7 High Fuel loads	5%	12	H	M/H	**H/H**

1.) Hazard Criteria: A four layer process of slope, aspect, and fuel model. Rating is based on flame height from fire behavior modeling: Low -4 ft, Moderate 4-8 ft, High +8 ft.

2.) Risk Criteria: 20 year fire occurrence based on density zones within the watershed. Low-one fire every 20 or more years per thousand acres, Moderate-at least one fire expected in 11-20 years per thousand acres, High- at least one fire expected per thousand acres per decade.

This results in an overall Risk rating of High in 58% of the total focus area and a Hazard rating of Moderate in 71% of the total area. The Hazard/Risk combined is Moderate/High respectively.

The current conditions reflect a shift in fire regimes primarily due to fire exclusion and past logging practices. This shift now results in fire behavior characteristic with stand replacement probabilities where low intensity ground fires were common. The time frame for this shift to the current stand fuels profile appears to be initiated around the mid to early 1800's. By the early 1900's logging was significant within the focus area and suppression was a management practice.

Social Environment

The McCloud Flats focus area lies adjacent to a rural area of Siskiyou County. The closest community is the town of McCloud which is a typical timber dependent community. Occupational categories can be identified as "loggers", "sawmill workers", and "community businesses". Population figures indicate that McCloud exhibited an annual growth rate of zero for the period between 1970-1987. The projected growth rate for the period from 1987-2010 is only 0.3 percent. This suggests a relatively static population. Because of limited job availability, most growth has been in the form of second homeowners and retirees

In timber dependent such as McCloud, community members see their association with the timber industry and their use of the surrounding national forests for activities such as

woodcutting and mushroom gathering, as a way of life. For many, it is a "tradition" that has continued for generations. Community members are often wary of federal or state activities that may interfere with or change their "way of life".

In recent years, people have begun moving into the area for it's aesthetic and amenity values as opposed to the economic conversion value. The McCloud Flats focus area encompasses two rural subdivisions and a few separate parcels of private land. A large percentage of landowners, particularly in the two subdivisions of Mt. Shasta Forest and Wilderness Estates, are retirees and second homeowners who value the aesthetics and amenities of the area. They have chosen the area for it's scenery, peaceful atmosphere, and recreation opportunities. Their values often clash with the values of those tied to the timber industry.

Much of the watershed reverted to public ownership during the depression. Prior to public ownership, much of the lands was owned by the McCloud River Lumber Company who selected all of the large, high value ponderosa and sugar pine, leaving the small trees. The flat terrain and high value pine made the area ideal for railroad logging. Douglas-fir was logged when the market for framing lumber was high. During some periods, there was a market for white fir to make boxes.

On national forest land harvest on the McCloud district went from 10 million board feet per year in the l950's to 60 million board feet per year between l975 and l990. The main sawmill in McCloud closed in l980, but a small log mill has continued to operate, milling cedar and pine for siding and other uses. The population of McCloud has remained relatively constant.

Within the watershed itself, there have never been more than a handful of permanent residents.

Recreation

Within the McCloud Flats analysis area, recreation has always been concentrated around the McCloud River.
Currently, summer recreational activities in the McCloud Flats analysis area occur mainly on an 8 mile stretch of the McCloud River. Popular activities include camping, picnicing, hiking, photography, sight seeing, swimming, fishing, and occasionally mountain biking. Fishing however, has declined on this area of the McCloud River since the California Department of Fish and Game stopped planting hatchery fish above Middle Falls in an effort to protect native populations of Redband trout. Peak use generally occurs between Memorial Day and the end of deer hunting season. Recreation elsewhere in the watershed includes a limited amount of dispersed camping, hunting, limited mountain biking, mushroom hunting during the summer and primarily snowmobiling and snowplay in the winter. Table 3-3 summarizes the recognized camping areas within the watershed.

Table 3-3 Camping and Day Use Areas

Site Name	Type	Units	PAOT	Use Period
Fowlers	CGD	40	200	05/01 - 11/01
Lower Falls	PGD	4	20	05/01 - 11/01
Algoma	CGSD	17	50	05/01 - 11/01
Cattle Camp	PGSD	4	20	05/01 - 11/01
Cattle Camp	CGSD	30	150	05/01 - 11/01
Upper Falls	PGSD	10	50	05/01 - 11/01
Lakin Dam	PGSD	7	35	05/01 - 11/01
Camp 4	CGG	7	35	05/01 - 11/01
Pine Tree Hollow	CD	2	10	05/01 - 11/01
Lower Ash Creek	CD	6	30	08/01 - 10/15
Ash Creek Mill	CD	8	40	05/01 - 11/01
Mud Creek	CD	3	15	05/01 - 11/01
Pilgrim Creek	WS	20	70	01/01 - 12/31

Campsite Types

CGD sites are considered fully developed overnight sites with vault toilets, potable water, picnic tables, garbage service, bulletin boards and designated fire rings. PGD sites are fully developed day use sites with the same amenities as CDG sites. CGSD sites are considered to be semi-developed overnight sites with only vault toilets and bulletin boards.
They do not have designated units although traditional use areas have developed with rock fire rings. PGSD sites are day use sites with the same amenities as CGSD sites. The four CD sites do not have any type of development present other than rock fire rings. The primary intended use of the Pilgrim Creek site is a staging area for winter snowmobile use. It has a paved parking area, loading ramp, vault toilet, garbage service, bulletin board and 4 elevated fire rings. Although the primary use period is during the winter months, this facility remains open during the remainder of the year for forest visitors without any of the developed services available. The Pilgrim Creek site is available for overnight use but has not become a popular site for this type of activity since its construction in 1991.

Of the above mentioned sites, the Mud Creek, Lower Ash Creek, Ash Creek Mill and the Pilgrim Creek site are not along the McCloud River.

All of the overnight sites along the McCloud River are heavily used during the summer months. Lower Falls PGD and Cattle Camp PGSD sites are popular swimming sites during the summer. A ladder is provided at Lower Falls for swimmers to have safer

access out of the hole below the falls. Other popular day use areas along the McCloud River are Bigelow Bridge, Bundoora Springs and Middle Falls. Currently a safety hazard exists at both Middle and Upper Falls due to the near vertical drop off from the popular viewing areas.

There is no marked access at this time to Middle Falls from the loop road. Because of potential liability to the government, visitors are not encouraged to go to a natural overlook at the top of a cliff above the falls.

The Upper Falls area shows the effects of overuse. This area, acquired in the l989 exchange, has had no restriction on vehicle traffic in the past. Little ground cover remains.

Hunting season runs approximately from the middle of August to the end of September. During this time, there is a dramatic increase in the amount of dispersed camping and traffic on the all roads within the watershed area.

Hiking is limited right now to a small section of the river area between Lower Falls and Middle Falls. There is also a proposal for another trail along the McCloud River from Pine Tree Hollow to Bigelow Bridge.

Mountain biking is limited at this time to the McCloud River Loop Road, Bigelow road, Military Pass road and the Edson Creek road.

During the winter, recreation is concentrated at the Pilgrim Creek site and it's associated trails which are located at the intersection of the Pilgrim Creek road and Sugar Pine Butte road. During winter, the Pilgrim Creek road is plowed only as far as the Snowmobile Park.

Mushroom hunting is a seasonal activity undertaken for recreational purposes. There is also some uncontrolled commercial picking. King bolete (Boletus edulis) is the species most collected. Morels (Morchella Spp.) are also abundant in some years. There is no data on how many people collect mushrooms or how much is harvested, but the area is considered one of the most popular spots in Northern California. Many pickers come from out of the area. Boletes are usually found in mature pine and cedar stands. They come up in the same locations year after year. Morels are usually found in disturbed areas, are seldom abundant in the same place for more than two years. The clearcut logging of the l980's removed about 2,000 acres of mature forest which was potential or known boletus habitat. This became a public issue in l991.

Roads

The Flats Focus Area has approximately 252 miles of current system road including 18 miles of arterial, 63 miles of collector, and 171 miles of local road. Non-system roads on National Forest land in this area probably account for another 50+ miles of low standard roads and 4WD trails, and the total mileage figure does not take into account all roads on

private ownership such as the Campbell and Hearst timberlands, Wilderness Estates, Mt.Shasta Forest, and others. Existing road density in the Flats is upwards of 3.5 miles per section.

This section discusses only roads passable to vehicles. The minimal trail system within the focus area is discussed in the recreation section.

State Highway 89 (Forest Highway 77) forms a primary transportation corridor on the south of the area and the Pilgrim Creek Road 42N13 (FA 13) diagonally splits the area from southwest to northeast.

The terrain is generally flat aside from the west slope of Black Fox to the northeast; this has naturally contributed to the multitude of roads in the area.

The heaviest use of the road system is in the spring/summer/fall season when public and commercial use is at its peak, although FA 13 is plowed in the winter for recreational use at the Pilgrim Creek Snowmobile Park.

The local area has historically had a heavy timber management emphasis, as it was first accessed by railroad in order to harvest old growth pine stands prevalent east of McCloud. Recreation followed as word of spectacular vistas of Mt.Shasta and good hunting, fishing, and camping opportunities spread. This is reflected today in the popularity of the same activities which have steadily increased along with the human population. The extensive road system has allowed this dispersed activity to grow to the point where we have many conflicting interests which this WA will hopefully identify and help to resolve:

Safety Considerations

Potential transportation-related hazards include speeding, log truck traffic conflict in certain areas, poor clearance for vehicles such as motor homes, and need for adequate signing, parking areas, and vehicle barriers where necessary. These items need to be considered during design of any road improvements.

Rights of Way

Currently R.O.W./cost share agreements exist on all or parts of the following roads in the management area: FA13, the Pilgrim Creek Road; 40N34Y, the Shasta Forest Road; 41N15, the Widow Springs Road; 41N16, the Sugar Pine Butte Road; 41N12, the Cramer Springs Road; 39N13Y, the Bigelow Road; 41N09, the thicket road; 41N54, the Gray Eagle Road; 41N26Y, the Sugarpine Intertie; 41N81, Circle Trout; 41N81B, Circle Trout; 41N06, the Edson Creek Road, and 41N13, the Swamp Creek Road.

Water Source

Existing water sources for dust abatement include:

- Cattle Camp overhead fill, Sec. 3, T39N R1W.
- Fowlers overhead fill, Sec. 1, T39N R2W.

Rock Sources

Rocking is an option for improving road surfaces for better drainage and less erosion of surface material through rutting and runoff during wet weather, and as an option for dust abatement on heavily used roads.

Pit run rock is available from the Campbell pit just west of the town of McCloud.

Crushed rock is also available from a commercial source in Mt. Shasta.

Heritage Resources

Archaeological Properties

A total of 74 archaeological sites have been recorded in the entire watershed, 47 inside the focus area and 27 outside the focus area. Site density varies throughout. Two prehistoric site concentrations are notable - in the McCloud River area and Trout Creek area. There are 20 prehistoric sites recorded in a 12-mile stretch of the upper McCloud River and 7 sites recorded near within a 1-mile stretch and adjacent to Trout Creek. Historic sites usually associated with the McCloud River Lumber Company are dispersed in the flats area. About 60 percent of the watershed has been surveyed for archaeological sites.

The National Register status of sites in the watershed is summarized here. Two historic properties, the Mud Creek Dam and Ditch and Mud Creek Dam #2 have been determined eligible for the National Register. Two sites associated with the McCloud River Lumber Company are also eligible for the National Register. Along the McCloud River, Cattle Camp and Fowlers have been determined eligible for the National Register.

Interpretation in the watershed was accomplished under the "Early People of the McCloud", American Great Outdoor project. Five signs have beeen made and will be installed at the loop road entrance, Cattle Camp, Lakin Dam, Bigelow, and Fowlers. Additional signs will be designed and installed for Upper Falls and Lower Falls.

Native American Use

Two primary Native American tribes use the watershed - the Wintu and various bands of the Pit River Tribe. The McCloud River Wintu (Winimem Wintu) have been using Coonrod Flat since 1981 for annual renewal ceremonies in August. Members of the Pit River Tribe consider areas along the upper McCloud River and Black Fox Mountain to be spiritually important areas. Most of the Wintu now live in the Redding area. Most Pit River or Achomawi live in the Fall River and Burney areas.

The Pit River tribe is a federally recognized tribe who hold regularly scheduled tribal council meeting. The Wintu, though not federally recognized, also hold tribal council meetings with elected representatives. Both the Wintu and Pit River Tribes are in contact with the District. Tribal members outside the councils have also contacted the district on occasion with their concerns.
Mount Shasta is considered a sacred area by the Pit River Tribe, the Wintu, and other tribes which have lived within sight of the mountain. The Klamath, the Modoc, the Shasta and the Karuk, identify Mount Shasta as a sacred place, but are not specifically associated with the southeast slopes of the mountain.

Although the Native Americans have diverse beliefs and do not speak with one voice, several concerns are shared by almost all of those who have discussed the area with the Forest:

a. Protection of sacred areas from excessive development. Depending on the area and the person or group contacted, protection can range from preservation to providing for some human use. Litter and sanitation issues are a concern.

b. Protection of known archaeological sites.

c. Freedom to practice their religion on national forest lands.

d. Restoration of periodic burning.

e. Maintenance of potential food forage, medicinal and sacred plants.

f. Consultation with tribes on resource management issues. There is a desire for partnership and joint management of key areas.

g. Some believe that tribes should be compensated for National forest sales of timber and other resources.

Black Fox Mountain has been identified both historically (see reference conditions) and currently by members of the Pit River tribe as a power place. In 1981 the McCloud District received a petition from five council members of the Legitimate Pit River Tribe stating that they were opposed to any activity that would destroy the natural state of Black Fox Mountain. They recognized it for traditional religous and ceremonial purposes. In 1991, Floyd Buckskin described Black Fox as a doctor mountain and place

where power quests were done. During a field trip in May 1993 he noted that he was opposed to clearcuts on sacred Mountains but was in favor of thinning, burning and saving the dogwoods.

The evaluation of Black Fox Mountain to the National Register of Historic Places as a traditional cultural property has not yet been done, nor have boundaries of the property been defined.

Coonrod Flat has been identified both historically (see reference conditions) and currently by the Winnemem Wintu as a place for purification and renewal. The area has been used continuously since 1979 for ceremonies that are held the second and third weeks of August. Ash Creek is the ceremonial area's central feature, separating the camping and cooking area from the sacred ground and fire area. A cattelemen's fence defines the limits of camping on the north side of the site. An open pine forest is on the east side of Ash Creek and a flat open meadow with a view of Mt. Shasta is on the west side. During the remainder of the summer, the area is used by loggers or other contractors who camp there. Talks with the Forest Service and Wintu have been initiated the last two years on the desired future condition for the Coonrod Flat ceremonial area.

Geology and Soils

Landscape Morphology

The landscape of the Flats focus area is dominated by Mt. Shasta and is framed to the north by a line of volcanic cones including Ash Creek Butte, Dry Creek Peak and Steven's Butte. At the base of the cones is a series of overlapping fan deposits sloping gently to the south. At the base of the fan deposits is a nearly level outwash plain formed by successive mudflows. On the southern end of the watershed there are extensive outcrops of basalt lava flows. The lava flows are often partially buried by mudflow alluvium and wind-laid ash.

The primary processes that shaped the Flats watershed are volcanic and fluvial. The underlying strata are lava flows and pyroclastic flows. The overlying strata are mudflows, outwash deposits and wind-laid ash. The soil in most of the watershed is formed from unconsolidated ash and mudflow deposits, which are often underlain by lava flows at varying depths. The majority of the soils are immature, with little or no horizon differentiation, and no cohesion.

Physical Processes

Volcanic activity and/or large non-eruptive mudflows have probably occurred approximately once every two centuries, causing major alterations to the stream channel and the landscape. The adjacent Mud Creek watershed experienced a major mudflow in

l924, which buried vegetation on thousands of acres, and moved the the Mud creek channel about one mile to the east.

Recent estimates indicate that Mount Shasta has erupted at 200 to 600 year intervals. Only a portion of the eruptions have affected the Flats. Some eruptions are of small magnitude or directed away from the analysis area. Older eruptions have created the lava flows running from the northeast to southwest in the planning area. More recent eruptions have deposited layers of ash which form the parent material of the soil. Repeated volcanic activity has tended to prevent the long-term formation of a mature soil profile. It tends to favor ponderosa pine, shrub and herbaceous vegetation, instead of mixed conifer. The latter vegetation type tended to become established in areas with the longest interval since being affected by an eruption, and in areas with the finest textured mudflow deposits.

Mudflows have been triggered both by volcanic eruptions and by exceptionally hot and dry weather. The heaviest mudflows have undoubtedly been associated with volcanic events. Within historic times, it is likely that a mudflow moved the channel of Ash Creek one half mile to the south from its location on l909 forest maps. In Mud Creek, the l924 mudflow, triggered by hot and dry weather, moved the creek channel over one mile to the east. Mudflows are the most important factor in soil development on most of the landscape.

The physical processes and landscape features that have been discussed pertain to the entire Flats watershed. The following descriptions of soils and landforms are found within the focus area. Soils and landforms within the focus area can be grouped into four general types: Mudflow sediments, alluvial fans, lava flow soils and volcanic uplands.

Mudflow Sediments: For the purposes of this analysis three major ecological types on the mudflow landforms are defined.

Coarse-textured sediments, very recent alluvium and mudflow deposits: These areas are currently sparsely vegetated with scattered ponderosa pine and knobcone pine. The understory is mostly squirreltail, rabbitbrush, sedges and a variety of forbs. Soils are characterized as being deep, very coarse and droughty. The potential vegetation composition is Ponderosa pine and the potential density is approximately 40 percent.

Young Terraces: These are also relatively recent alluvial deposits but a combination of site factors and minimal soil development has fostered open ponderosa pine woodlands. The understory is a combination of grasses dominated by Nevada needlegrass and Idaho fescue with scattered bitterbrush and rabbitbrush. Heavily grazed areas tend to be dominated by rabbitbrush. Soils are characterized as being deep and coarse-textured but with some development of a surface organic layer. The potential vegetation composition is Ponerosa pine and the potential density ranges from 40-70 percent.

Older Terraces and Fans: These landforms are characterized by more developed soils that support stands that will achieve canopy closure. These are vegetated with ponderosa

pine and white fir with an understory of sedge and dwarf rockcress. Soils are characterized as being deep with well developed surface organic layers and medium-textured subsoils. The potential vegetation composition is mixed conifer and the potential density is approximately 70 percent.

Coallescent Alluvial Fans: For the purposes of this analysis a single ecological type is defined on this landform. These fans are mostly deep outwash material with occasional outcrops. Soils are deep, with a well developed surface organic horizon and medium-textured subsoils. The potential vegetation composition is mixed conifer and the potential density is approximately 70 percent.

Lava Flows: For the purposes of this analysis two landform types are defined on lava flows.

Soil/Rock outcrop: This landform type contains flowerpots and rock outcrops. The flowerpots are typified by a deep soil with 20-30 inches of alluvium over a very cobbly subsoil. On these areas flowerpots are larger than the outcrops and it seems practical to perform some forest management. The outcrops are forested with ponderosa pine and knobcone pine with some white fir understory. The flower pots are either dwarf rockcress with squirreltail or they have been planted with ponderosa pine. The outcrops are broken lava flow and a shallow, stony soil. The potential vegetation composition is white fir-Ponderosa pine and the potential density is 40-60 percent.

Rock outcrop/Soil: These areas are characterized as similar to the above scenario but with a higher proportion of rock relative to the amount of soil. They are dominated by knobcone pine and dwarf rockcress. The potential vegetation composition is ponderosa pine with minor amounts of other conifers and black oak. The potential density is less than 40 percent.

Volcanic uplands: Volcanic uplands occur only in the northeastern corner of the focus area on Black Fox Mountain. This landform is much older than the surrounding lava flows and mudflows. It is dominated by erosional processes that have created a complex of very cobbly soils on erosional sites and deep sandy soils on depositional sites. This upland receives about 60 inches of precipitation annually so the deeper, depositional soils have very high timber productivity. Volcanic uplands on Black Fox Mountain can be further partitioned into three distinct elevation zones.

Lower Slopes (Depositional Sites): These sites are found mostly on the lower slopes of the upland. They are dominated by the Mermac soil series. They support a mixed conifer forest with Douglas fir, black oak and Pacific dogwood.

Sideslopes: These are moderately deep, very cobbly soils that are interspersed with frequent rock outcrops. The area supports a mixed conifer forest with inclusions of oak stands. The potential vegetation is Douglas fir-mixed conifer. Potential vegetation

densities range from 40-70 percent on favorable aspects and less than 40 percent on hotter, dryer aspects.

Upper Slopes (Black Fox Summit): The upper slopes and summit of the uplands are dominated by very stony soils and frequent rock outcrops. These sites currently support shrub fields with slowly invading white firs and red firs.

Geology and Soils of the McCloud River Corridor

The McCloud River corridor lies in an area of geologically recent basalt flows which have created an irregular topographic pattern of low lava rises and outcrops on a broad flat lava flow. The McCloud River delineates the geologic boundary between the volcanic/mudflow deposits of Mount Shasta and the older Klamath Mountains which lie south of the river.

The related soil association is an extremely complex pattern of the Iron Mountain-Nikal-Germany association. The lava ridges have frequent rock outcrops with shallow, rocky Iron Mountain soils. Moderately deep and non-stony soil exists on the lower ridge side slopes. All of these soils are weathered from basalt and volcanic ash. The Germany soils owe their depth to the colluvium and from the lava ridges. (See Map 7, Soil Types.)

Hydrologic Characterization

The lower portions of the Ash Creek and Mud Creek watersheds lie within the Flats focus area. The Ash Creek and Mud Creek watersheds drain an area of approximately 152,000 acres. The majority of the watershed area is drained by Ash Creek. Despite the large area which it drains, Ash Creek is an intermittent stream which only rarely flows to the McCloud River. Mud Creek is the only perennial channel that flows continuously through the focus area into the McCloud River. The hydrology of the McCloud Flats focus area is distinguished by a lack of surface flow. Stream channels with definable inner gorges and banks occur infrequently within the focus area. Perennial streams occur at higher elevations above the focus area. Upon entering the flats, surface flow percolates quickly into the soil profile and all of the channels go dry with the exception of Mud Creek. Virtually all precipitation and incoming surface flows infiltrate into the groundwater supply presumably recharging local aquifers.

The drainage pattern of the Flats watershed is radial at its upper elevations. Because of the scarcity of perennial channels within the focus area the drainage pattern is poorly defined. Streams draining Mount Shasta tend to maintain the radial drainage pattern. With the exception of Ash Creek and Mud Creek, stream channels draining Mount Shasta disappear shortly after entering the focus area. The drainage pattern is slightly dendritic in the eastern portion of the focus area. Trout Creek, Dry Creek, Edson Creek and other ephemeral streams merge with one another before entering Ash Creek's ephemeral

channel in the Ash Creek Sink. Drainage densities are greater in the upper portions of the watershed above the focus area. The drainage density decreases significantly once the streams enter the focus area. (See Map 6.)

Stable channels have not developed in the focus area due to the high frequency of natural disturbance (mudflows) and the lack of perennial surface flow. Significant modifications to channel form can occur during rare surface flow events. It is not unusual for existing channels to fill with sediment or be blocked by obstructions. These modifications to channel form result in bank overflow and the subsequent formation of new channels. The flat topography encourages this type of channel migration. The results of repeated channel migration are evident throughout the Flats landscape.

Once streamflow has been diverted from a channel the downstream portion of the channel is classified as a remnant of prior fluvial system. Numerous remnant channels occur throughout the focus area. Surface flow does not occur in remnant channels even during extremely large precipitation and snowmelt events. In many cases the extinct channels are more incised than the current active channels.

The lack of surface flow and natural tendency of stream channels to meander inhibits the formation of riparian vegetation in the flats focus area. Riparian zones containing riparian vegetation or continuous surface flow are very rare within the Flats landscape. Riparian vegetation only occurs within the McCloud River corridor and along portions of Mud Creek. Several wet meadows associated with channels or springs also occur within the focus area.

Channel Morphology

Ash Creek

The headwaters of Ash Creek originate on the eastern slopes of Mount Shasta. The channel is perennial over its first five miles. Within the focus area the upper 6 miles of channel are intermittent and the lower four miles are ephemeral. The intermittent portion of the channel usually flows from late spring to early fall or until snowmelt from Mount Shasta has ceased. Ash Creek takes in the waters of Dry Creek and Edson Creek along this intermittent stretch. The stream goes underground at Ash Creek Sink, approximately four miles from the McCloud River. The last four miles of the channel from Ash Creek Sink to the McCloud River are ephemeral. Surface flow in the ephemeral portion of the channel occurs approximately every nine years during exceptional periods of high spring runoff. The most recent surface flow events in the ephemeral portion of the channel occurred in May and June of 1995 and 1993, and April and May of 1984. Groundwater received by the Ash Creek Sink is believed to resurface at Big Springs and Bundoora Springs. Discharge from Big Springs is large enough to double base flows in the McCloud River.

The Ash Creek channel is sinuous and braided within the focus area. The channel is defined by banks with heights ranging from 0-5 feet. No riparian vegetation is associated with the intermittent or ephemeral reaches of Ash Creek. Significant accumulations of woody debris are present in the channel below Ash Creek Sink. It is not likely that woody debris could be mobilized by high flows. Concentrations of woody debris may act as sediment traps during rare surface runoff events. Woody debris may also encourage channel migration.

The lack of surface flow and high concentrations of suspended sediments during surface flow events make Ash Creek unsuitable for fisheries. Surface flow occurs in the intermittent portion of Ash Creek during the summer and early fall. The continuous nature of surface flow during this time period makes Ash Creek a very valuable source of water for terrestrial wildlife species. Ash Creek is also heavily used by range cattle.

Ash Creek Tributaries

The named tributaries to Ash Creek are Cold Creek, Brewer Creek, Pilgrim Creek, Swamp Creek, Dry Creek, Trout Creek, and Edson Creek. Brewer Creek and Cold Creek merge with Ash Creek above the focus area. The combined waters of Edson, Trout, Swamp, and Dry Creeks merge with Ash Creek within the Ash Creek sink. There are also several unnamed tributaries which drain the eastern slopes of Mount Shasta. Surface flow from Pilgrim Creek, Swamp Creek and other unnamed tributaries often percolates into the soil profile before reaching Ash Creek. Characteristics of Ash Creek, Mud Creek, and other streams are presented in Table 3-4. All of the tributaries are intermittent within the Flats focus area.

Mud Creek

Mud Creek is the only perennial stream within the Flats focus area. Approximately 8.2 miles of channel pass through the focus area. Mud Creek originates in a deeply incised canyon on the southeastern slopes of Mount Shasta. The unconsolidated soils of the canyon walls are highly erodible and contribute large amounts of sediment to the channel. The continuous load of sediment makes Mud Creek unsuitable for fish. Mud Creek Canyon is also the source of large mud flows which occur at approximately 70 year intervals. At the wilderness boundary above the focus area Mud Creek has an eroded inner gorge about 250 feet wide and 100 feet deep. Higher on the mountain, the inner gorge is up to 600 feet wide. The degree of incision decreases downstream of the wilderness boundary. Mid-way through the focus area Mud Creek canyon disappears completely and the stream channel is only defined by its upper banks.

Springs and Seeps

Several small springs scattered through the watershed provide important sources of water for wildlife. Esperanza Spring is believed to have been a perennial water source at one time, however it has not flowed in l993 or l994. It is possible that wells drilled for nearby residential construction have drawn down the local aquifer and cut off the supply of water to Esperanza Springs. Downstream from Esperanza Spring is a five acre meadow which is gradually being invaded by pine.

Additional intermittent springs are found in the Red Hill area. Meadows in the Red Hill area support riparian vegetation and could be classified as wetlands. In addition to the riparian meadows, about 60 acres between Red Hill and Mud Creek support dense stands of alders. The alder stands indicate the presence of a high water table. Additional springs within the focus area include Widow Spring, Elk Spring, Cowboy Spring, Bundoora Spring and Big Springs.

Water Use

Water use in the focus area is minimal and consists mostly of several diversions, constructed ponds and cattle troughs. The largest diversion within the focus area occurs at Lakin Dam on the McCloud River. Lakin Dam was constructed prior to 1936 by the McCloud River Lumber Company. A 6-7 mile pipeline was constructed to transport water from the reservoir to a log pond constructed by a lumber company and later to Squaw Valley Creek. A smaller diversion at Elk Springs also provides a back-up source of water for the town of McCloud. A man-made water source is provided by a pipeline and a series of troughs used by a cattle permittee in the northwest section of the landscape. Several small constructed ponds are also found along the Edson Creek channel.

Table 3-4: Channels located within Flats focus boundary.

Stream	Miles PER	Miles INT	Miles EPH	General Description	Channel Characteristics
Mud Creek	8.2	0	0	Headwaters originate on southeast slopes of Mount Shasta. Only perennial tributary to the McCloud River within focus area boundary. Receives no tributaries.	Deeply incised canyon above focus area. Channel becomes less incised near Flats focus area boundary. Flow is always turbid due to high sediment loads. Little seasonal fluctuation in discharge. Highest flows occur during June-August.
Ash Creek	0	6	4	Ash Creek channel runs through the entire focus area. Ash Creek flows intermittently from the focus area to Ash Creek Sink from June through October.	Small meandering channel with little to no defined banks. Historic course for past mudflows. Channel bed composed of sandy alluvium. Height of channel banks 1-5 feet. No riparian vegetation in focus area.
Edson Creek	0	3.2	3.4	Headwaters originate North of Black Fox Mountain. Intermittent in northeastern potion of the focus area. Ephemeral over last 3.4 miles to confluence with Ash Creek.	Meandering, braided channel with sandy bed. No riparian vegetation in focus area. Active channel approximately 5-20 feet wide in focus area. Edson Creek supports a Redband trout population in perennial portion above focus area.
Dry Creek	0	1	4	Headwaters originate at Dry Creek Spring. Intermittent for one mile below Trout Creek confluence. Merges with Edson Creek approximately 1.5 miles north of Ash Creek Sink.	Meandering, braided channel with sandy bed. No riparian vegetation in focus area. Channel rarely flows within focus area. High amount of tortuosity above confluence with Edson Creek.
Swamp Creek	0	0	2	Headwaters originate near Dry Creek Peak. Channel runs through Elk Flat near northern boundary of focus area. Surface flow usually percolates into soil profile before confluence with Ash Creek.	Meandering, braided channel with sandy bed. No riparian vegetation in focus area. Introduced Redband trout population occurs in perennial reaches above focus area.
Pilgrim Creek	0	0	2.5	Originates on Eastern slopes of Mount Shasta. Surface flow percolates into soil profile shortly after entering focus area.	Insignificant channel within focus area. No riparian vegetation in focus area. Surface flow from Pilgrim Creek presumably recharges aquifer feeding Big Springs.
Trout Creek	0	2.2	0	Headwaters originate near Rainbow Mountain. Flows into focus area at northeast corner. Merges with Dry Creek in northeast corner of focus area.	Meandering, braided channel with sandy bed. Incised channel approximately six feet deep near upper boundary of focus area. No riparian vegetation in focus area. Lava flows confine channel along portions near northeast corner of focus area. Hosts Redband trout population in upper perennial reaches above focus area boundary.

Perennial streams are defined as carrying surface flow year round. Intermittent streams flow for at least several weeks annually. Ephemeral streams only flow during unusual events occurring at greater than one year intervals.

The McCloud River

The McCloud River serves as the southern boundary of the Flats focus area. The river is the geologic boundary between the volcanic soils of Mount Shasta and the Klamath Mountains. Because it separates two distinct landscapes the hydrology of the McCloud River is very different from that of the focus area. The volcanic material on the north side of the river is stable and has a relatively low erosion hazard. Slopes on the south side of the river are steep and highly erodible. Numerous recreational developments occur along the north side of the river.

The McCloud River is perennial for its entire length along the focus area boundary. Streamflow in the McCloud River increases significantly between Cattle Camp and the southwestern boundary of the focus area. Mud Creek is the only perennial tributary from the north and only contributes small amounts of water to the river. The greatest flow contributions to the river are from Bundoora and Big Springs. A well-defined riparian area exists within the McCloud River corridor. Several large meadows are also found along the McCloud River.

Water Quality

Water quality in the Flats streams is characterized by high turbidity levels. High turbidity levels are a natural occurrence in Flats streams. Water quality impacts are small since only Mud Creek has surface flow connectivity with the McCloud River. The majority of water movement occurs within the soil profile. The quality of this groundwater is believed to be very good.

Water quality in the McCloud River is very good, however there are several sediment sources along the focus area boundary. Mud Creek delivers a continuous supply of suspended sediments to the river. The water quality in the McCloud River is significantly impacted by large debris flows from Mud Creek which occur at approximately 70 year intervals. Mudflow events occurring in the 1920's impacted water quality as far downstream as the city of Redding. The steep slopes of the Klamath Mountains provide another source of sediment to the McCloud River. The river is currently incising into the slopes of the Klamath Mountain. The continual erosion of the southern banks creates conditions favorable for mass wasting on the south side of the river.

Human Disturbance

Flats Streams

European settlement began in the vicinity of the Flats in the 1870's. The Europeans introduced logging, grazing and recreation activities to the watershed. These activities, combined with an aggressive program of fire suppression which began in the 1930's, significantly modified vegetation on the Flats landscape. With the exception of the McCloud River, land use impacts to water quality and channel condition were probably small.

Timber harvesting is believed to have had no effect on water quality and probably only small impacts to channel condition. Impacts to water quality from timber harvesting are nonexistant because of the lack of surface flow connectivity between channels on the Flats and the McCloud River. When surface flow does occur sediment loads are naturally high and are not aggravated by timber harvesting. The removal of large quantities of timber probably resulted in decreased evapotranspiration and a subsequent rise in the water table. The likelyhood of surface flow events would have increased for short periods following intensive timber harvest. Timber harvest activities occurring within and around ephemeral and intermittent channels probably affected channel form. Trees felled and removed in these areas may have affected channel stability by eroding channel banks. Woody debris associated with logging activities would have affected channel condition by blocking flows and creating sediment traps. Excessive accumulations of sediment may have resulted in channel migration.

Road construction which accompanied timber harvest activities had little influence on water quality or channel form. The largest impact of roads occurred in locations where they crossed riparian meadows. In these areas roads compacted the soil and inhibited groundwater movement beneath the road surface. The reduction in groundwater supplied to riparian meadows below roads may result in a lower watertable and a change in vegetative composition.

The McCloud Flats focus area was heavily grazed in the past. Grazing practices did not significantly impact water quality or channel condition within the focus area. Impacts were small because grazing was not associated with perennial stream courses and downstream impacts to water quality could not occur due to the lack of surface flow connectivity between the Flats and the McCloud River. Impacts to riparian vegetation were nonexistent due to the absence of riparian vegetation in the focus area.

The most obvious impacts to channel conditions are associated with activities that redirected channel flow. The channels of Mud Creek and Ash Creek were re-routed for different reasons in the 1900's. Mud Creek was re-routed both by natural processes and human activities. Prior to the 1924 mud flow, Mud Creek flowed approximately 0.3 miles west of the junction of the Pilgrim Creek road with Highway 89. During the 1924 mudflow the channel migrated approximately 1 mile to the east along the highway. Following the mudflow the channel was rerouted to its present day location in the Elk Creek channel approximately 0.3 miles east of the Pilgrim Creek road. (Note: Elk Creek is an extinct channel of Mud Creek).

Following the 1924 mudflow, several projects were undertaken with the purpose of reducing the sediment load in Mud Creek. The first was a sediment retention structure constructed north of highway 89 and below the railroad tracks. The effectiveness of this structure in capturing sediment and its fate is not known. In the 1930's a CCC project on Mud Creek above the focus area was initiated in response to concerns that sediment from Mud Creek was adversely affecting water quality on the McCloud River. The project involved the construction of a sediment retention structure designed to capture the larger sediments. Although it reduced sediment loads the structure proved to be to costly to maintain and was allowed to deteriorate in the 1940's.

The Ash Creek channel was dredged between the railroad and Highway 89 in 1984. Railroad personnel expressed concern that flood flows from Ash Creek could undermine the railroad grade. In response to this concern, the district cleaned and widened the channel in l984 between the railroad and Highway 89. Dredging activities resulted in a temporary change to channel form. Following the high spring runoff of l993 sediments were deposited in the dredged portion of Ash Creek. The resulting channel form was similar to the pre-dredged form of the channel.

McCloud River

Water quality in the McCloud River may be affected by human activities. In areas where recreation use is concentrated sanitation problems can occur. Potential sanitation problems could increase as recreation use increases in the McCloud River corridor. In addition to sanitation problems created from human waste, cases of giardia infection have been documented from people drinking the water upstream from the focus area. It is safe to assume that this protozoa is also in the water which flows through the focus area (Upper McCloud River Management Plan, 1990).

Three notable human caused sediment sources occur along the McCloud River. One is a road fill/slide located near the junction of Whiskey Creek on the south side of the McCloud River. Mass wasting below the road results in slope erosion and fine sediment deposition in the McCloud River. Attempts to restore hillslope stability have been partially succesfull, however further restoration efforts are needed to reduce mass wasting at this location. A second sediment source is located in the Camp 4 area. The river bank is actively eroding due to the placement of a road immediately adjacent to the river. Bank stability may be improved if this road is relocated away from the river bank. A third sediment source occurs at the Upper Falls parking area. The soil in the parking area is continually eroded during spring snowmelt and warm winter storms. The sediment enters the McCloud River above Upper Falls. Future restoration efforts should seek to reduce erosion from sediment sources along the McCloud River corridor.

All of the above sediment sources were first identified during the Upper McCloud River Management Plan (Environmental Assessment) which was completed in 1990. This report identified potential restoration projects and road closures along the river corridor. The plan also called for facility improvements and the development of additional viewing

areas along the corridor. Refer to this plan for additional information concerning the potential impacts of management activities along the McCloud River (Upper McCloud River Management Plan, Environmental Assessment, 1990).

With the exception of the McCloud River corridor, overall land use has not had a significant impact on stream channel morphology or water quality in the Flats focus area. Impacts are minimal because very few channel exist in the focus area, stream flow in these channels is rare, and the channels are naturally unstable. Stream channels and water quality in the focus area is influenced much more by natural processes. Little interaction is believed to occur between land use activities and natural processes such as channel migration and channel stability.

Chapter 4 - Reference Conditions

Overview

Our depiction of pre-contact conditions in the watershed and the focus area needs to be based on historic records, from similar areas and best professional guesses. Because the history of land disturbance goes back about 120 years, the aerial photos do not show reference conditions. The earliest photos, taken in l944, were after the end of the railroad logging area and many years of heavy grazing.

The process of frequent light burning resulted in a higher proportion of natural openings. Grass and brush are currently six percent of the landscape, but may have occupied three times that area. The acreage of young pine stands was a fraction of the current acreage. Then, as now, northern spotted owls occupied the margins of the landscape. High site private lands immediately south of the river were much more likely to support spotted owls than they are now. Private lands in the 4,300 to 5,500 foot elevation band north and west of the focus area were likely to support spotted owls. The percentage of dispersal habitat within the landscape was equal to or lower than what now exists. The vast acreage currently in 80 to 110 year old stands was much lower than the current acreage, although even-age stands became established following periodic mudflows. The typical forested area in the flats consisted of uneven aged ponderosa pine with an old growth overstory. The number of large down logs was much higher, but the tonnage of fuels under 10 inches DBH was lower. Ponderosa pine was the dominant tree in most of the flats, as it is today. White fir was present in the better soils around the edges of the flats, but was less common than in present stands. In the understory, fescue was more abundant, bitterbrush and other shrub species less abundant. Elk were the largest herbivores in the area. Mule deer were also abundant. The McCloud River supported runs of salmon, steelhead and resident bull trout to lower falls. Small native redband trout were found above the falls and in tributary streams. Evidence of human occupation was found primarily along the river, although the area was also a travel corridor to obsidian collection grounds in the Medicine Lake highlands.

Wildlife

The historical situation for wildlife species must be inferred from early human records. In the flats focus area, the prehistoric evidence is concentrated around the McCloud River, so we can assume the river system was fully functional with fish and wildlife. The earliest human records indicate beaver trapping and other furbearers attracted settlers into the area. Lower McCloud Falls were called by the Indians "The place where salmon stop," so we can assume fish were abundant. The records of McCloud as a center of fish

propagation and tourist fishing also indicate a functional riparian ecosystem. Redbands were probably in the headwaters because of the name "Trout Creek."

Nineteenth-century historical anecdotes indicate the central McCloud Flats were very open grasslands and desert-like in character, from three to six miles wide. This area would have been a dry fescue, needlegrass, and sedge meadow with very few trees, probably maintained that way through frequent grass fires. From the historical grazing records, the productivity and forage conditions must have been excellent to support so much livestock. Local fears of grass fires imply the grass was tall and dense enough to present a serious fire hazard. This may indicate that forage was not a limiting factor for deer and elk, or a number of birds and mammals associated with dry meadow habitats. Present grasslands are in much poorer condition than this and not nearly so extensive.

Anecdotal history and records report elk and deer hunting was excellent around McCloud. Elk were exterminated by about 1880, but the deer herd continued to thrive until the 1960's. In the 1970's the deer population began a decline which has lasted to the present.

The Flats became the focus of intense railroad logging and numerous lumber mills created the town of McCloud. From this we can infer that the area had extensive stands of big trees until the historical record mentions that the virgin timber was almost gone. From this we can infer that old-growth dependent wildlife species were once abundant, but were decimated by the industry by about 1920. Large fires in the resultant logging slash further removed habitat and lowered populations of old-growth forest animals.

The forest has grown and populations of some old-growth species may have slightly increased. However, continued logging of more remote stands of old growth trees may have suppressed similar populations. The net effect is that spotted owls, goshawks, and furbearers have never recovered to prehistoric population numbers and continue to be uncommon.

Reference conditions in the Elk Flat LSR are discussed in detail in the LSR Assessment, Appendix A.

Range

Historical records of livestock grazing indicate early grazing was extensive and intended to prevent fire spread by creating bare ground. This severe sheep and cattle grazing continued to 1943, when the US Forest Service began issuing permits and some control began to improve the range. Transect records indicate the range was in good condition in the 1950's, but by the 1980's had degenerated to poor or fair forage conditions.

Other notes indicate the surrounding area was heavily timbered, so range elsewhere in the focus area is presumed to be inconsequential. Very likely it was small meadows along the river and other permanent streams. This range was probably western hairgrass and sedge in excellent condition.

Geology and Soils

The landscape of the McCloud Flats has been shaped by a combination of geologic and fluvial processes. Although volcanic activity and debris flows occur frequently with respect to geologic time, the general character of the landscape is not believed to have changed appreciably over the past 4000 years. In general terms, the Flats landscape is composed of the southeastern slopes of a strato volcano (Mount Shasta), a large plain composed of lava flows, lahars and post glacial outwash and the western slopes of a tertiary composite cone (Black Fox Mountain). The plain is composed of a series of alternating ridges and valleys known as horsts and grabens (Jasso and Haskins, 1983). These features display little relief because the valleys have been partially buried by subsequent mud flows, lahars and pyroclastic flows. The alternating ridges can still be observed near the lower extent of the flow deposits along the Highway 89 corridor. The valley and ridge pattern was created by a series of north trending faults. These faults run parallel to one another through the focus area. The faults play an important role in determining groundwater flow pathways, water table elevations and the distribution of vegetation in the focus area (Jasso and Haskins, 1983).

Pyroclastic flows and mud flows were responsible for the creation of the flat landscape in the lower Mud and Ash Creek basins (Osterkamp et al., 1986). Mount Shasta has been active in recent geologic time. At least seven eruptions are known to have occurred over the past 4000 years (USGS, Open-File 94-585, 1994). Frequent mud flows originating mainly in Ash, Mud and Pilgrim Creeks also played a major role in the development of the Ash and Mud Creek basins. Because of the flat topography much of the sediment carried off Mount Shasta by the mud flows was deposited over the Flats landscape. Both Ash Creek and Mud Creek have experienced mud flows during the past 100 years.

Volcanic activity and debris flows also affected the development of the McCloud River corridor. The flow path of the McCloud River was controlled primarily by the spatial distribution of lava flows. Lava flows probably blocked the original flow path of the river and forced the river southward to its present location abutting the Klamath Mountains. Along some portions of the focus area boundary the McCloud River cuts through these lava deposits. The lava flows were responsible for creating the Upper, Middle and Lower Falls on the McCloud River.

Groundwater

The vast majority of water movement in the Flats landscape occurs as groundwater flow. The majority of precipitation and snowmelt percolates through the permeable soil profile and recharges local aquifers. It is likely that numerous perched aquifers exist beneath the focus area. Groundwater flow within these aquifers moves both horizontally in lenses of high permeability and vertically along faults. For further information pertaining to the hydrogeology of the focus area refer to Jasso and Haskins, 1983.

Stream Channel Development

With the exception of the McCloud River, hydrologic features in the Flats focus area are very limited. The development of stream channels and riparian plant communities within the Flats landscape has been suppressed by frequent debris flows and volcanic activity. These flows discouraged the development of stable stream channels by obliterating existing channel networks and creating a highly permeable soil profile composed of Tertiary and Quaternary volcanic deposits. Surface flow rarely occurs in landscapes formed from these deposits (Jasso and Haskins, 1983).

Several other factors hindered the development of stream channels in the Flats focus area. The combination of high sediment loads, flat topography and immature channels lacking definable banks encouraged channel aggradation which was followed by channel migration. During rare surface flow events fine sediments were deposited in channels. The accumulation of sediments elevated the channel bed to an elevation higher than the surrounding landscape and this resulted in the diversion of surface flow. Channel migration also has occurred in response to debris flows. Debris flows resulted in rapid channel aggradation which in turn resulted in channel migration and the creation of another abandoned channel. The numerous remnant channels present on the eastern slopes of Mount Shasta testify to the tendency for channels to migrate over the landscape.

The location of streams channels over the Flats landscape and the extent of perennial, ephemeral and intermittent reaches has been highly variable over the past 4000 years. A large portion of this variability can be attributed to the interaction of the radial drainage pattern from Mount Shasta with the dendritic, meandering channel network draining Rainbow Ridge. The interface between these two drainage patterns is very complex and influences stream channel patterns and groundwater flow. The flats focus area is dominated by the alluvial fan deposits from Mount Shasta. Visual inspection of topographic maps indicates that the apparent interface between the two channel networks occurs within close proximity to the northern boundary of the focus area. The alluvial fan appears to have pushed the Rainbow Ridge drainage network to the east abutting Black Fox Mountain. More intensive studies are needed to gain a better understanding of how the interface between the two drainage networks influences ground and surface water flows and the possible implications to management.

The question has been raised, whether Ash Creek flowed to the McCloud River consistently enough to allow fish passage in the recent historic past. Maps made in l907 show the channels of Ash Creek and Edson Creek disappearing at Ash Creek Sink. There are no known climatic records for the nineteenth century which are specific to this watershed, but the general climatic pattern in this period was colder and drier, with less snowmelt, than currently. This would probably have resulted in less streamflow. Of the human influences, logging would tend to increase runoff, at least during peak flow periods. Reforestation would tend to reduce runoff after 20 years. Grazing would initially increase runoff, but eventually could reduce runoff by favoring succession of grass to pine. Fire exclusion tends to reduce runoff. The general consensus of the WA

team is that human influences have not measurably affected the connectivity of the stream. A possible guess as to a period of connectivity would be during a warm period 1,000 years ago.

Fire and Stream Channel Interactions

It is difficult to determine the pre-historic role of wildfire and its influence on channel morphology in the Flats landscape. It is hypothesized that wildfires did not significantly impact stream channel morphology within the focus area. In the lower elevations of the focus area the terrestrial vegetation was probably identical to the vegetation found within stream channels. During dry periods wildfires probably burned through ephemeral and intermittent channels. Wildfires may not have burned through stream channels in the upper elevations of the watershed where streams were mostly intermittent or perennial. The existence of Redband Trout in streams above the focus area indicate that streams in the focus area must have been navigable to fish at some pre-historic date. It is probable that riparian areas and perennial streams were present in the focus area during pre-historic times. The effect of fire on these historic ecosystems would have been different from that described above.

Channel Development: McCloud River

Debris flows probably exerted some influence over channel form on the McCloud River, however, impacts to water quality from debris flows probably were much greater. Large debris flows comparable to those of the 1920's probably occurred on an average of every 70 years (Dickson and Crocker, 1952). These mud flows impacted water quality and fish habitat for extended periods of time depending on the duration of the debris flow event. Much of the sediment deposited in the channel from debris flows was probably flushed downstream during spring runoff the following year.

Large scale geologic disturbances were the primary control of channel form on the McCloud River, however peak flows also played a role in shaping the form of the channel over smaller time and spatial scales. Peak flows on the McCloud River occurred in response to large winter storms and rain-on-snow events. Peak flows altered channel morphology by redistributing channel substrates and woody debris.

Different reaches of the McCloud river responded differently to peak flows due to variations in geologic controls and channel substrates. The portion of the McCloud River above the upper falls contained easily erodible sediments while the portion of the river below the falls was largely confined by bedrock. Thus the effects of peak flows on channel morphology were greater in the upper reaches of the McCloud River.

Riparian vegetation along the McCloud River was also affected by peak flows. Peak flows scoured riparian vegetation from floodplains in high gradient reaches and deposited

sediment over floodplains in low gradient reaches. Sediment deposition from peak flows affected soil development in meadow systems along the McCloud River. The influence of peak flows on meadow soil development can still be observed today. Sediment deposition from the 1995 peak flows is apparent over large portions of Bigelow Meadows.

Fire

Recurring fire has been a significant disturbance process in many ecosystems throughout North America. Fire regimes are a way of describing the recurring combination of fire behavior, occurrence, effect, and subsequent development that is typical of a certain type of vegetation. That such regimes can be altered and have in effect shifted over time is evident from notable interruptions and influences on natural disturbance processes such as fire.

Fire History, Pre-Settlement

The forest within the Southern Cascades Province while reflecting past geological and climatological events, also reflect the influence of natural fire presence, fire use by Native Americans, European settlers and the inhabitants of today. Native cultures managed fire to meet there resource needs. Anecdotes can be found indicating that several tribes lived in classic "Fire Environments" capable of recurring low intensity underburns within the dry conifer forest of California. Much of the Flats focus area lies within the Wintu and Achomawi territories. It can be assumed that these native american cultures used fire for several reasons ranging from improved hunting, forage, and enhancing desired vegetation for specific uses.

Prior to the early 1800's low intensity fires both lightning caused and those set by Native Americans burned periodically through summer and late autumn. In dry forest regimes these frequent fires perpetuated open park like stands. A description of the McCloud Flats area in the North Star newspaper in 1888 noted: "One may drive for miles through valuable timber land regardless of roads". It is estimated that fire regimes prior to the early 1800's could have been functioning in a natural recurring manner. Within the Flats focus area this would be described as a short interval low intensity surface fire with intervals of 5-30 years depending on specific moisture and site variables.

Fire History-Settlement

Following the arrival of European settlers, fire regimes have been greatly altered. By the end of the 1800's and the start of 1900's logging as well as fire protection policies designed to protect homes, grazing lands and timber were factors in the gradual change of the frequency and type of fires that were characteristic prior to human disturbance. The US Forest Service established the Shasta National Forest in 1907 which also began the protection of National Forest by suppression policies that excluded all fires from burning. It appears that these two human disturbance factors have had the greatest role within the

flats watershed and its relationship to a more natural fire regime. Historical evidence can be found in a 1907 circular produced by the U.S. Forest Service in cooperation with the McCloud River Lumber Company who then actively logged much of the flats watershed area. This circular describes a cooperative protection plan for an experimental area comprised of approximately 14,000 acres in an area East and Northeast of McCloud mostly in the flats vicinity. After a six to eight year period of heavy harvesting a survey of land classification was done to facilitate the design of the protection plan. It noted that at that time only 2% of the total experiment area (mostly the McCloud Flats) was still virgin timber. In addition it noted that 20% of the area had visible evidence of post stand replacement fire events much of what was attributed to heavy accumulations of logging debris. It also made mention of very dense thickets of ponderosa pine in the 10-15 year age class (some as large as 640 acres).

This would indicate that the absence of low intensity surface fires at short intervals was already showing its effects by this time period or earlier. Noting the age class of the understory described in this 1907 study and earlier descriptions of the Flats area seems to indicate that the watershed has not experienced fires of its natural characteristic fire regime since at least the early to mid 1800's. A large fire history analysis shows that from 1918 to present approximately 26,300 acres have burned within the total watershed. The large patches of knobcone show that much of these were stand replacement events. This total burned over acreage is approximately 25% of the entire watershed over a 75 year period. A large fire history summary is as follows:

Table 4-1. Fire History Study: Flats Watershed

Year	Acres Burned	Location/Cause
1918	21,000	North of McCloud
1922	500	Red Hill
1924	2,500	Esperanza Spr./RR fire
1926	500	West Red Hill
1928	2,000	Coonrod Flat

The acreage burned within the focus area only is approximately 5,200 acres over the same 75 year period which is approximately 16% of the total focus area. Lightning fire and human cause fire starts for the focus area over a 20 year period shows a total of 93 ignitions or 1.0 fires per thousand acres per decade which is considered a High risk factor.

Heritage Resources

Prehistoric Activity

Evidence of prehistoric activities are found inside the watershed through recorded archaeological sites. These prehistoric sites are generally located along drainage courses or other types of water sources, and were seasonally used during the summer months. Recent excavations along the McCloud River suggest that prehistoric peoples inhabited the area from around 5,000 years B.P. to 900 years B.P. (Sundahl and Cassidy 1995).

The McCloud Flats watershed area is within the ethnographic territory of the Pit River or Achomawi (Kniffen, 1928; Theodoratus Cultural Research, 1981). This area has also been attributed to the Okwanuchu, a little known Shastan-speaking group who occupied the headwaters of the Sacramento and McCloud Rivers (Dixon, 1905). Very little information exists on this group and the delineation of their territory is uncertain. The northern boundary of the watershed is the division between the Achomawi and the Modoc ethnographic groups (Olmstead and Stewart, 1978).

Coonrod Flat was used by the great-grandfather of Florence Jones, the Wintu Medicine Woman, in annual ceremonies. Ceremonies may have been conducted into the 1950's and resurrected in 1979. Both Elk Flat and Coonrod Flat were places named in the Wintu language. Coonrod flat was known as Kil-charrow-daun (hailstone field) and elk flat as Phpaw'athwam - no translation. Both Black Fox and Little Black Fox Mountains were named in the Pit River language and also were given a Wintu name.

Historic Activity

Early Explorers and Transportation Routes

Early explorers of the area included Hudson Bay Company trappers Peter Skene Ogden in 1827, Alexander McLeod in l829, and John Work in l832 and 1833. These trappers were followed by scientific and railroad related expeditions. An 1851 railroad survey by R.S. Williamson may have passed near the headwaters of Trout Creek in the Stephens Pass vicinity. But most notable are those expeditions which described the landscape of the watershed. John Feilner, a scientist from the Smithsonian Institution, on May 13, 1860
traveled along the Military Pass Road and made the following observations. He came across a desert of about six miles in extent, entirely of sand, and not a particle of snow (the rest of the area was still in deep snow). Presumably this was the Ash Sink area. As he continued from Pilgrim's Camp in section 36, T41N, R2W he noted that the county was with very few exceptions, a barren waste. William Brewer, a noted geologist, also noted in 1860 a similar plain..."Elk Valley, three or four miles in width, is without trees...". He may have been referring to Coonrod Flat. Other scientists such as Charles Townsend, a naturalist, made observations about the fauna of the upper McCloud in 1883 (Miesse, 1993).

The editors of the North Star, which was the local newspaper published at Mott, have a lively account of their visit to the McCloud River basin for the July 12, 1890 edition: "Next we came to what is called the Desert, a great tract of level land which we rode over

for miles through manzanita and other brush, and found no difficulty in getting through it, although there were no roads. Not a tree grows upon its broad expanse. Here we had the grandest view of Mt. Shasta to be seen anywhere."(The North Star, 1890)

The Military Pass road was built in l856, taking its name from use by soldiers going from Yreka to the Fall River Valley during conflicts with the Indians. The Sisson Fall River road was started in the 1880's and headed through the watershed roughly along the McCloud River where it joined onto the original road from Yreka to Ft. Crook (Wells, 1881). A stage line was started on this route in 1887 between Sisson and Adin (The Northstar, 1887). Several changes were made to the road as it came under an increased volume of traffic until Highway 89 became the established thoroughfare.

Lumber Industry

Sawmilling in the McCloud River basin was not a viable business until after the railroad was built northward through the Sacramento River canyon. Transporting lumber to the railroad by wagon and teams was an expensive situation. The first sawmill in the McCloud River area was located near the Bartle brothers ranch on the McCloud River (The Northstar, 1887). The second oldest sawmill was located on Ash Creek within this watershed. This was known as "The Siskiyou Lumber Company" (Sisson Mascot, 1891). The sawmill was built in 1891. A third mill was constructed in 1892 by A.F. George and was located at McCloud (Mt. Shasta Herald, 1892).

Under the direction of George Scott and William Van Arsdale, the McCloud River Lumber Company took over from where A.F. George and the Siskiyou Lumber Company left off. A railroad was completed to the new community of McCloud in 1897, and was shortly afterwards was extended to the previous owner's mill site on Ash Creek in 1899 (Hanft, 1971). The McCloud River Lumber Company soon grew to become one of the largest lumbering enterprises on the west coast and operated an extensive railroad logging system. The main line east from McCloud to Bartle was completed before 1905 (Hanft, 1971).

Additional sawmills came and went. Two in particular were those of John McKea and William Elkins. Mr. McKea operated two mills in the McCloud River area. He incorporated his holdings into the Esperanza Lumber and Timber Company in 1903 and built the second mill at what is known as Esperanza.

William Elkins obtained harvesting rights from the McCloud River Lumber Company to cut Incense Cedar from the lumber company's land within the watershed. Mr. Elkins began his operations in the early 1920's at Mr. McKea's mill location at Esperanza.

United States Forest Service

The Forest Service and the National Forest System was established in 1905 by congressional authority (Steen, 1991). The Shasta National Forest was headquartered in Sisson (Mt. Shasta City) with the McCloud Ranger District office located in McCloud. Controlling wildfires and forestry conservation were the basic objectives. Activities also included building lookouts, roads, and telephone lines. Black Fox lookout was constructed in 1922. The Pilgrim Creek Nursery was established in 1910 ... This was followed by the Pilgrim Creek Experiment Station. It was built for conducting a variety of forestry related matters as well as operating a nursery. The operation closed shortly after World War I, but remained as a fire guard station until the early 1950's. Another nursery was located 10 miles east of McCloud along Highway 89. This was in operation from 1950 to 1970, and was named the Mt. Shasta Nursery. It continues as a fire guard station today.

The Civilian Conservation Corps was created during the depression era of the 1930's as a program to serve the national conservation needs as well as the prevaling economic conditions at the time. The program was administered through several Federal agencies. However, the Forest Service managed more than 50% of all the activities by the CCC (Otis, Alison T., 1986). Locally, one of its largest projects is the dam and diversion system on Mud Creek on the slopes of Mt. Shasta. A large camp was set up just north of McCloud, and other smaller and temporary project camps were used across the District.

The national forest land base greatly increased during the 1930's when Congressional enactment allowed private timber companies to return cut over lands to the Forest Service and other government agencies. Additional land exchanges between public and private lands have been instituted in recent years to consolidate and increase the land base.

Recreation

Within the McCloud Flats analysis area, recreation has always been concentrated around the McCloud River. The area became popular for fishing, camping, and sightseeing in the late 1800's. Guildford-Kardell (1994:36) notes that in 1855 Ross McCloud guided recreational fisherman to the river from his hotel on Upper Soda Springs along the Sacramento River.

Fishing along the McCloud River continued to be a favorite pastime for guests that vacationed on the Sacramento through the 1880's. But it was not until the late 1880's and 1890's that parcels of land along the McCloud River were bought by private parties. Justin Hinckley Sisson was among the first to buy land along the river at "The Bend" in 1883 (deed in possession of Guilford-Kardell dated July 5, 1883). As a guide and outfitter for hunters and fishermen he not only guided John Muir to the river but other famous visiting scientists, business leaders, college presidents, etc.

This inauspicious beginning finally set the course in motion by which the McCloud River was owned by private parties, many of whom were wealthy San Franciscans. W.R. Whittier, a wealthy San Francisco capitalist and owner of the Whittier and Fuller paint company bought Ah-Di-Na in 1896 and set up a private retreat. Charles Stetson Wheeler, a wealthy lawyer and friend of the Sisson's acquired The Bend circa 1898. His was the first of several mansions in the area. In 1901 Mrs. Hearst built her own summer resort on an adjacent property. Meanwhile, George W. Scott and William W. Van Arsdale, operators of the McCloud River Lumber Company, and their friends Wakefield Baker and Alexander Hamilton organized the McCloud River Association in 1900 (in 1902 it was renamed the McCloud River Club) and bought land below the Whittier's.

The exclusivness of these summer retreats were counterbalanced by tourists resorts upriver. Mr. R.P. Bigelow opened the Bigelow Dairy Hotel in the late 1870s. Guests participated in fishing, hunting, and trips via horseback to visit the McCloud Falls. Completion of the Sisson-Fall River Road in the late 1880's opened the way for increasing numbers of visitors to the area. A spur road provided access to the McCloud Falls. The Elk Lawn stage stop also provided a stopping point for people traveling through the area. Fowler's Resort was built in the 1890's by Mr. T.B. Fowler. Guests spent time fishing and strolling out to the waterfalls.

Both Fowler's Resort and the Bigelow Dairy Hotel were acquired by the McCloud River Lumber Company by 1903. The land remained in private ownership until the 1930's. At this time, the land where these two resorts stood returned to public ownership when the McCloud River Lumber Company took advantage of the General Exchange Act of 1922, which allowed timber companies to return cutover lands back to the government. Dispersed camping at Fowler's took place until sometime around the 1950's when the campground was developed by the Forest Service.

Cattle Camp was another popular area for camping in the early 1900's. Prior to that, it had been sheep/cattle camp used by the Fiock family starting sometime in the late 1870's. Cattle Camp appeared as a camping area on Forest Service maps in 1924. It was formally designated as a campground in 1932.

Lakin Dam was built in the 1930's to supply water to the mill and log ponds. Later it became a popular fishing spot.

Chapter 5 - Interpretation

Old Growth and Biological Diversity

The natural processes and human influences previously discussed have created the wildlife habitats and resultant species present today. Among the most important in the focus area are exclusion of fire, emphasis on silviculture, continued cattle grazing, and human disturbance in the forest.

TES Wildlife

Spotted owl populations in the focus area are undoubtedly below prehistoric levels, and probably below or approximating the populations when most of the old growth forest was cut and burned by 1920. Due to long-standing land use patterns of private logging and rural residential subdivisions, it is very unlikely that prehistoric levels could ever be restored. Roading and grazing disturbances are lowering habitat quality. Corridor access through the majority of the critical habitat unit will always be poor due to poor soils and fragmentation of the habitat. Active and inactive spotted owl activity centers are located on CAF and OTF soil groups. The mudflow owls, an apparent exception, are located on young terrace soils. However, it is likely that the mapped soil group in this area is a top layer overlaying an older, more mature layer. The vegetation near the Mudflow owls is very different from the open pine usually found on YT soils. The prehistoric spotted owl population probably had a similar distribution. Likely activity centers would have been near Widow Springs, the section 11 Springs, Junction Spring area, Edson Creek, Dry Creek Springs and Upper Trout Creek.

The focus area may be able to provide one pair of owls in the Mudflow MLSA, one pair in the Elk Flat LSR, and possibly one pair in the McCloud River riparian canyon or one pair on Black Fox Mountain. The habitat and conditions do not appear sufficient for more than three pairs. A detailed discussion of potential habitat conditions and criteria for possible treatments in the Elk Flat LSR is contained in the LSR Assessment, Appendix A.
Connectivity among the LSR's and MLSA's will be a continuing problem. The current dispersal habitat condition of the central part of the McCloud Flats is probably no worse than the prehistoric condition. Open conditions in this area are caused primarily by the frequent volcanic or mudflow events resulting in coarse textured soil and early successional vegetation. However, areas around the edges of the focus area, as well as land to the north, east and south, has the potential to provide much better dispersal habitat. Logical dispersal corridors are shown on Map 5. These corridors follow most of the finer textured soils and include most of the dense mixed conifer stands in the focus area. The corridors as mapped include some private land. This is not meant as a recommendation that private land use be restricted, but to reflect what is most likely to be used as dispersal habitat. Between Big Springs and Bundoora Spring, lava flows on

national forest land north of the river reduce the dispersal habitat potential. Numerous plantations established in this area are growing relatively slowly. On private land south of the river, the soil is more mature, and dispersal habitat conditions are better, in spite of the heavy selective logging that has occurred in that area. As the plantations on national forest land mature, the land north of the river will gradually improve as dispersal habitat. At the north end of the focus area, Elk Flat is a possible barrier to dispersal of northern spotted owls. Private land north of the focus area would be a more feasible migration route.

Goshawk populations are in a similar situation to the spotted owls, limited by lack of habitat and harassed by human activity. However, their habitat requirements are not as stringent and the focus area may support up to eight nesting pairs under ideal conditions. The basic LMP direction for goshawks is to provide for goshawk viability through LSR's MLSA's, riparian reserves and withdrawn lands. (LMP Appendix L, page 6) However, the monitoring plan (5-17) provides that further evaluation and/or corrective action would be required if monitoring shows a significant decline in occupancy or reproduction, or failure to designate goshawk territories prior to implementing major habitat modification projects. Another reference, on page 4-66, says to provide additional habitat for goshawks in prescription 6. The FEIS for the LMP states that "all alternatives will consider goshawks during development of watershed analysis (landscape analysis)."

For cattle and sheep grazing, the Shasta Trinity National Forest Grazing Biological Evaluation recommends a later opening date for prevention of impacts to nesting goshawks, Willow flycatchers, and other sensitive species.

The Standards and guidelines for the adjacent Klamath National forest, on page 4-38 of the Klamath NF LMP, call for the retention of 200 acres of habitat within one half mile of the nest or last known nest site. The remaining 300 acres within one half mile should be managed for a habitat mosaic dominated by large tree conditions and open understories (3N,G - 4P,N,G+), but lower canopy closure (40-60%) and small openings are allowable. Encourage the use of underburning, precommercial thinning and fuels reduction to achieve desired habitat conditions. The standards also specify a foraging zone with a one mile radius, and activities restriction during nesting season.

Recent nesting and occupancy surveys for goshawks do not cover a long enough period to prove a population decline, but caution is indicated. Fifty seven percent of the district territories are in matrix lands where nest groves are not protected from timber harvest. This situation probably is unique to the McCloud and Goosenest districts, which have substantial amounts of eastside-type habitat. The combination of unfavorable nesting/occupancy surveys and the distribution of known nest sites in matrix forests suggests that in this watershed and adjacent areas the reserves may not be adequate to maintain goshawk populations.

The WA team does not know how important the eastside areas of these two districts are to the viability of the goshawks. If monitoring shows a continuing decline for this species in this area, this question should be addressed at a province or regional level.

Marten, fisher, and wolverine are present in less than prehistoric numbers, and are reduced by the similar situation of lack of habitat. Wolverine and fisher were probably never common in the focus area and no appreciable difference in numbers can be expected. However, marten appear to tolerate human activity and may recover to near historic levels if habitat is managed according to the LMP standards and guidelines. The STNF Grazing BE recommends maintaining functional ecosystems to maintain these species, and an opening date which is commensurate with true range readiness and proper utilization would benefit these species. See details in the range sections of this document.

Riparian Species

Aquatic or riparian-obligated species such as amphibians, turtles, trout, beavers, and osprey have populations below historical levels. The decline appears due to human disturbance and management, but these populations may recover to near prehistoric levels with public education and restoration of healthy ecosystems. Habitat for redband trout in the headwaters of Edson Creek and Trout Creek, above the focus area, is adversely affected by grazing and some restoration work has been done. Migrations between headwater populations and the main river are a concern. Culverts on Upper Edson Creek and low water flows inhibit migrations.

Mud Creek meadows is the largest riparian meadow system in the focus area and a center of biodiversity similar to the McCloud River. It is not a typical riparian meadow such as is found at high elevations, but has a seasonally high water table. Few studies have been made except one which indicated the Cascade frog is present. Biological surveys are lacking, but local birdwatchers find the riparian meadows of Mud Creek attractive with high species diversity.

These meadows are disappearing due to pine encroachment caused by past overgrazing, lack of fire in the ecosystem, and a drainage ditch which lowered the water table in the meadow. None of these causes are beneficial. Esperanza Spring and Sheep Meadow Spring near Red Hill are part of the Mud Creek meadows complex and have similar pine encroachment from similar causes.

If the succession to pine is allowed to continue, the resulting forest stands will be economically valuable, and fast growing because of the abundant soil moisture. The stand might eventually become late successional forest. However, the riparian meadows are a much more valuable and scarce resource for biodiversity.

Exotic Weeds

Noxious weeds, including Canada thistle, musk thistle, star thistle and cheatgrass appear to be localized problems which do not threaten native plant communities in the focus area as a whole. No recommendations will be made regarding noxious weeds, other than continued informal monitoring as part of range permit administration.

Deer Management

The migratory deer herd is profoundly affected by the processes and activity listed in the introduction to this section. These processes are believed to combine to influence the continued decline of the herd.

Fire exclusion has created a decline in the quality of forage. Since the area is summer range and bitterbrush is a winter forage, this explains the absence of browse "hedging" on bitterbrush in the focus area. Green lush forage for does and fawns is believed to be the most needed forage in the watershed, and this is minimal due to lack of fire in the ecosystem.

Silviculture and grazing have contributed to the lack of nutritious herbage and grasses for does and fawns. Forage areas have been converted to tree plantations. Present and past grazing processes predisposed forest openings to tree reproduction and slowly but steadily removed the forage base (Morgan SCBD 1995). The increased and direct forage competition with cattle has had negative effects on the deer herd, but the degree of it is unknown.

Continuous human use of roads, where road density is well above 1.5 miles per section, contributes to harassment, overharvest, poaching, and a variety of social attitudes toward deer which prevent effective management. Much of this is unintentional, but still affects the herd. Increased cover may be important to alleviate road density problems, but this may not be sustainable due to the need for fire to restore ecosystem health.

The predator population on the flats is very low and it has a negligible effect on the deer herd. Natural predation is historically considered the reason for deer herd decline, but the primary predators at present are hunters.

Road kill on Highway 89 is a problem. Providing more water sources north of Highway 89 may reduce deer travel across the highway, and, to some extent reduce road kill.

Range

The range before 1940 was more extensive due to the large forest fires of the previous decades. The severe grazing caused the grass cover to decrease, opening up mineral soil to pine reproduction. The pine reproduction matured, and prevented forage growth underneath. This process of overgrazing and pine invasion hastened self-destruction of the grazing industry to its present low level. Harvest and reforestation caused further

conversion of many areas of range into trees. Trees were more valuable and replaced forage.

Lack of fire in the ecosystem aided the succession of rangeland into timberland. Without the recycling of fire, most nutrients and biomass in the ecosystem are in trees and deadwood, not forage. Trees have shaded out forage in forest openings, and openings in plantations were replanted.

Summary of Relationships to Deer

While the causes and effects are unclear, several parallel occurrences indicate relationships of one process with another. The decline in forage conditions since the 1960's has correlated with the decline of the deer populations. A reduction in density of the best forage species and their replacement with poorer species is correlated with the decline of the herd. The increase in road density occurred simultaneously with the decline of the herd. The effective removal of fire from the ecosystem occurred at the same time as the decline of the deer herd. The first effective control of grazing is correlated with the excellent hunting in the 1940's and 1950's. Grazing has continued at the same level for several decades while plantations eliminated range. This is correlated with the decline of the deer herd.

Summary of Relationships to TES and Aquatic Species

The TES and aquatic species are at low levels but can partly recover if the habitat is restored. Grazing control would help, but restoration of fire and old growth habitats may be most important for healthy ecosystems.

Sensitive and Survey and Manage Plants

The salmon mountains wakerobin is a riparian species in this area. Its niche is in moist meadows or the upper portion of streamside riparian areas where the water table is relatively high. It probably will be found in the focus area near the river. However, management activities outside of the riparian reserve are unlikely to affect it.

The Cypripedium species are not likely to be found in the focus area, but there is some possibility that they exist in habitats similar to that of the Salmon mountains wakerobin. The old-growth fragment near Bundoora Spring is the most likely spot for these species. However, this stand is not undisturbed. It has been part of a dairy and a resort area, and has probably been logged. There is little chance that activities in other areas would affect these species.

The possible habitats for Allotropa virgata and the Botrychium species are high elevation. No high-priority activities that might affect this habitat have been identified.

Unusual Plant Communities

The association of Spiraea douglasii, Pinus ponderosa and Pinus contorta is found in low-lying areas such as the ephemeral portion of Ash Creek. An example of disturbed land in this type is found in the l984 clearcut just north of highway 89. Downstream from this plantation, spiraea is about half of the bottom vegetation layer below ponderosa pine with a 50% crown closure. Within the clearcut, spiraea has survived or recolonized areas up to 200 feet inside the edge, but is much less common. The ground cover is primarily needlegrass. The survival of planted ponderosa pine is only fair. In low areas of the plantation, lodgepole pine from advanced regeneration is the most common conifer. Spiraea occurs in several places on the edge of highway 89 between McCloud and Ash Creek, and is common adjacent to the McCloud Golf Course, in areas that have been selectively logged. This suggests that this association is reasonably resilient after disturbances.

Little is known about the red fir or shasta red fir near the top of Black Fox Mountain. The national forest land in this area has never been a priority for logging.

Forest Health and Fire Management

The desired future condition for the matrix in the LMP says that "Forest stand densities are managed at levels to maintain and enhance growth and yield to improve and protect forest health and vigor, recognizing the natural role of fire, insects and disease and other components that have a key role in the ecosystem." In Late-Successional Reserves and Managed Late Successional Areas, "Late successional forest stands are managed to maintain health and diversity components through the use of prescribed fire and thinning from below. Patches of dead trees are scattered throughout the landscape."

In matrix lands, the LMP carries an implied expectation that mortality will be scattered over the landscape, consisting of individual trees and small groups, preferably no more than eight trees. In the reserves, patches of mortality up to ten acres are considered desireable, according to the standards and guidelines.

In contrast existing conditions include large patches in which most trees are dead, dying or severely stressed. Root diseases and bark beetles are causing mortality in mid-successional and early mature successional stages, instead of old growth. The value of resulting snags is lower because heart rots characteristic of older trees have not had time to develop.

Blackstain Root Disease

A possible relationship between soil disturbance and black stain incidence has been reported (Cobb 1988). Disease incidence appears to be higher adjacent to recently constructed roads and old railroad beds. It is hard to relate this information to the McCloud Flats since almost all of the area has been disturbed. It has been suggested that large scale natural disturbances such as volcanic activity also contribute to the development of this disease, when the disturbance results in the establishment of nearly pure ponderosa pine stands (Cobb 1988). Recent examination of putative insect vectors of black stain root disease on McCloud Flats has found that the number of these vectors increases in stands following harvesting activity (Ferrell, pers. comm. 1995). It is not known how this relates to the development of new disease centers.

The black stain fungus is known to favor cooler temperatures (Smith 1969). Infection also appears to be favored by higher soil moistures and high amounts of organic matter (Cobb 1988). This suggests that opening the canopy and reducing the amount of duff and litter may permit more warming of the soil and reduced infection and spread of the fungus. The use of fire to alter the amount of litter and the carbon/nitrogen ratio may influence microbial antagonists or competitors. The use of these management techniques needs to be explored further before they are widely implemented as a disease control strategy.

Probability of Sustainability

The effective exclusion of fire primarily by fire protection policies and advance technology has led to unnatural accumulations of surface fuels, a shift in species composition, increased stand densities and ultimately over several decades a change in characteristic fire regimes. In such fire regulated ecosystems where absence of fires extend beyond the normal return intervals, fire adapted species are replaced by late successional species that are predominantly shade tolerant but less fire tolerant. This change in species composition and primarily vertical stand structure results in overall stand profiles that alter fire behavior and its effects.

Forest Health Concerns: Insects, disease and wildfire are normal components of ecological processes in the flats. When the ecological state of the forest is dramatically altered by fire suppression, and other management practices, the role of insects, disease and wildfire are likewise altered. The frequent low intensity fires of the past created forest that were ecologically more stable than the forest of today. The current forest conditions particularly in lower and drier areas are more susceptible to insects, disease, and stand replacement fires than have been recorded before. The current regime and the characteristic fuel models display predictable fire behavior and effects that when integrated with associated "Risk" of ignition, can draw a picture of sustainability of the current stand profile over time. Wildfires will continue to burn as long as there are wildlands therefore the focal point is a management theme aimed not at "if" it will burn but rather "How" it will burn. It has been estimated that approximately 13% of the state of Calif. burned annually under a natural fire regime. In the past 20 years especially wildfire acreage has doubled with little increase in actual number of fire starts. It is also notable that high value plantations in California's National Forest have a 35% chance to

reach rotation age due to the risk of wildfire. This same analogy is applicable to the Flats focus area. Fire history records approximately 8 fire starts annually within the watershed. Within this random area of ignitions it will have a 91% chance of burning within a fuel model that predicts flame heights of 4 ft plus with rates of spread above 20 chains per hour on an average summer day. Historically 16% of the focus area has burned since 1918 (5200 acres). The scattered complex of knobcone pine is evidence that some of these fires were stand replacement events. As taken from the Risk/Hazard analysis within the focus area, the following displays the potential to lose any expected management outcomes due to loss from stand replacement wildfires:

Table 5-1. Risk Class

	Risk Class		
	Low	Medium	High
Hazard Class Low	1	1	2
Medium	1	2	3
High	2	3	4

1- Low probability of loss to wildfire
2- Moderate probability to loss from wildfire
3- High probability to loss from wildfire
4- Very high probability to loss from wildfire

Conclusion: There is a high probability that given the current stand fuel profile and the expected fire starts that wildfire will occur and produce fire behavior characteristics applicable to stand replacement events within the Flats watershed focus area.

Consumptive Human Uses

Timber Harvest and Silviculture

The timber harvest history of this area began with high grade selection harvests from l895 to 1920. Occasional sanitation and salvage harvests took place through the mid l960's. Overstory removal and early commercial thinnings were emphasized through l980, as well as plantation establishment in areas burned in the l920's and natural openings. From l981 through l990, patch cutting of understocked and mature stands was emphasized.

The effect of railroad logging on the landscape has varied. Some areas, left with a heavy fuel load, burned in stand replacement fires of the l920's. Most of these areas were windrowed and planted in the l960's. Other areas never regained the crown density

desired for fiber production and an esthetically pleasing forest. Many of these areas were clearcut in the l980's.

Timber sales in the l980's in the focus area averaged about 7 million board feet per year. In the past four years, almost no timber has been sold from the area.

The LMP harvest projection for this area is approximately 7.3 million board feet per year (MMBF), or 73 MMBF for the decade. This is based on the projection of 20.7 MMBF per year from the Entire McCloud Flats Management Area. The focus area contains 35 percent of the matrix acres in the McCloud Flats Management Area.

The site quality in the focus area is above average for the McCloud Flats and McCloud River LMP management areas. In addition, the timbered prescription 6 lands in the focus area have a substantial programmed harvest, while prescription 6 lands outside the focus area are largely high elevation brush fields with little harvest potential. If these two elements could be accurately factored in, the harvest projection might be 10 to 12 million per year from matrix lands in the focus area. The following timber harvest opportunities on matrix lands could be used to meet this objective:

> Commercial thinning to maintain forest health on M3N and M3G stands. Thinning reduces the total evapotranspiration within a forest stand. This raises the amount of available soil moisture, reducing stress during dry years. When combined with fuel treatments such as whole tree yarding, spot piling by tractor, and/or underburning after logging, thinning will reduce fuel loading and fuel continuity, increasing the stand's ability to withstand a wildfire. Thinning opportunities include 1,699 acres of M3G, and 8,167 acres of M3N. Assume 3,000 acres not treated because of goshawk nest core, key Boletus edulis area, riparian reserves, hiding cover or low silvicultural need because of recent entry. Thin 1,000 acres of M3G from below, removing 18 MBF/acre. Thin 5,800 acres of M3N from below, removing approximately 25% of standing wood at 10 MBF per acre-- harvest approximately 76 MMBF.

For this type of activity, there is little difference between prescriptions 3, 6 and 8. The majority of the areas deferred for goshawk protection or boletus emphasis are in prescription 8.

> Commercial biomass thinning in older plantations can accomplish the same objectives. In addition, plantation thinning can improve diversity by increasing the percentage of white fir, incense-cedar and hardwoods in pine plantations. There are 1,182 acres in this stratum. Harvest 8 MBF per acre, approximately 10 MMBF total. An additional 708 acres will be ready for this type of treatment within 10 years.

Knobcone pine stands do little to enhance biological diversity. The harvest of approximately 30% of 1,500 acres of knobcone with green tree retention would break up

the stands, temporarily improving lower seral stage vegetation and breaking up the continuous fuel types. Harvest approximately 10 MBF per acre for 5 MMBF total.

Approximately one third of the 10,218 acres of M3P have a very clumpy stocking. Stocking within the clumps is so dense that suppression is occurring. Suppressed and intermediate trees with less than 35% crown ratio are susceptible to insect attack from ips beetles and dendroctonus species. Most of these stands are located on soil/rock outcrop soil types, which have less ability to support dense stands, and greater susceptibility to drought related mortality.

Thin 3,000 acres, remove 4 MBF/acre, totalling 12 MMBF.

Salvage harvest, including individual tree salvage and green tree retention harvest in disease centers where mortality exceeds needs for snags and dead/down logs. Best guess, 500 acres green tree retention, 300 acres individual tree salvage, 25 MMBF.

The potential from these activities would be approximately 128 MMBF.

34% of the matrix lands would have an intermediate harvest. 3% green tree retention.

The question has been asked, how much reduction in potential yield would be caused by recommendations discussed elsewhere in the WA, including protection for goshawks, dispesal corridors for northern spotted owls, boletus edulis management, and old growth fragments as refugia for potential survey and manage species populations? These recommendations would have the practical impact that 700 acres of high site prescription 8 land, well stocked with mature trees, would be minimally managed. On these lands, salvage of catastrophic mortality would be appropriate. Thinning may be appropriate in a few stands. An additional 300 acres of prescription 3 and 6 land, similarly forested, would be minimally managed. About 5,900 acres of high site prescription 8 land would be managed to meet or exceed a 50-ll-40 standard, with rotations of 120 to 180 years where the stands remain healthy. An additional 5,600 acres of prescription three and 6 land woudl be managed this way. Management of prescription 3 and six lands as dispersion corridors would not constitute a maeasurable change from current modeling.

When timber harvest was modeled for the LMP, the average capability of most land on the Shasta side of the national forest has a potential yield of about 400 board feet per acre. Under the standards and guidelines for the LMP and the president's plan, the timber yield in most matrix land is about 250 board feet per acre. Some matrix lands, because of very harsh growing sites or other resource values, are modelled as minimum management under a stand maintenance approach, with a timber yield about 100 board feet per acre per year.

On the better soils in the McCloud Flats, the potential growth and harvest is higher, approximately 700 board feet per acre. Under LMP and President's Plan Standards and

Guidelines, estimated harvest is about 450 board feet per acre per year. Minimal management would yield about 150 board feet per acre per year.

Shifting 1,000 acres to minimum management would reduce the timber yield approximately 0.3 MMBF. Shifting 5,900 acres of prescription eight land to longer rotations would reduce the output about 20% on these lands, about 0.5 Overall, this would reduce the long-term timber harvest by 7% in the matrix. However, the timber harvest opportunities listed above, estimated at 12.8 million board feet per year, are compatible with these restrictions.

Fuel Wood.

In past years, the two most used sources of firewood have been cull material from logging activities, and knobcone pine stands set up for firewood harvest. Firewood has been harder to find on the flats in the past four years, since neither of these sources have been available.

Mushroom Collection

The popularity of collecting Boletus edulis appears to be increasing, although there is less habitat than there was 15 years ago. The potential for overharvest is considered an issue by some, and the need for regulation is mentioned in the LMP. However, the only information available on this subject, an article by David Arora, author of Mushrooms Demystified, indicates that collection is not likely to adversely affect Boletus populations.

There is no information on the spread of Boletus populations, and the likelihood of their colonization of new areas. Mycorrhizal fungi as a group are not readily propagated. The 75 year old Show plantation has characteristics similar to known Boletus habitat, but it is not known whether the Boletes occur there. Boletes have never been known to occur in the Pilgrim Creek Plantation, which was burned in l918, windrowed and replanted in l959. Our knowledge of how this species responds to levels of disturbance is based on casual observation and comments from harvesters. Some of the popular boletus collecting areas had a commercial thinning harvest between l971 and l990, and continue to be productive. Areas underburned in l994 produced boletes in the lightly burned areas, but there was a loss of productivity in areas where heavy duff around older trees was completely consumed. The effects of the l995 underburn cannot be evaluated yet, because this year's crop was poor in both burned and unburned areas. Anecdotal reports of a l990 fuels piling project indicate that the boletes do not fruit where the blade has scraped the ground. There is one report of boletus being harvested at least on the edges of a piled area. Most of the popular harvesting areas were railroad logged before l920, and were heavily disturbed at that time.

Transportation

The extensive road system has allowed dispersed recreational activity to grow to the point where we have many conflicting interests which this WA will hopefully identify and help to resolve:

1. Having a system that meets minimum safety requirements to support increased traffic. Some roads present safety and liability problems relating to road width, clearance, speed, surfacing, sight distance for intersections, etc., but raising the standard of a road usually guarantees an increase in use, exacerbating the problem. More and more users are from urban areas and are not familiar with mountain driving; this has to be taken into account if the Forest Service is going to encourage and/or accept increased public use of this land.

2. Determining at what point traditional vehicle access has to be limited or eliminated to mitigate environmental impacts; ie. social vs. ecological trade- offs. It is one thing to make a judgement that there is no legitimate need for a particular road, quite another for a family to find that they no longer have access to an area they've been using for 30 years. No doubt there are inappropriate uses like illegal woodcutting and ORV travel that need to be addressed, and there are roads that are definitely having impacts. But the abundance of roads provides the type of dispersed recreation opportunities that a large segment of the public prefers, and at the same time helps prevent overcrowding in the more popular developed sites. The using public includes considerable numbers of both seasonal tourists and locals.

3. How to pay for upgrades, closures, and other transportation-related costs as commercial use (such as timber sale log haul and road maintenance funding, which have traditionally paid these costs) declines. Implementation is just one phase; equally important are monitoring and maintenance. With anticipated budget and workforce cuts, the outlook is not good. We are having a hard enough time staying on top of our signing and road closure programs as it is.

Perhaps a detailed investigation into the history of this area would be helpful to all concerned with this analysis, as a knowledge of past activities can only give us a better understanding of the conditions we see now and guidelines for future management. As previously mentioned, much of the popularity of this area is due to the relatively good access, and the original impetus for this access was logging-related. Much information about early road-building, railroads, cultural resources, fire history, mining, logging, and so on is available, it's just a matter of digging it up (no pun intended).

Road Closures

Existing open road density in the Flats Watershed Area is upwards of 3.5 miles per section.

In the past, road closure plans were developed during timber sale planning to eliminate roads surplus to the transportation system, or seasonally close them to protect road surfaces or wildlife. These included obliteration, earth barricades, gates, and guardrail barricades. These closures were implemented with varying degrees of success. Review of transportation plans for timber sales and other projects in this area in the last 10-12 years showed proposed road closures for approximately 44 miles of road. The Esperanza Compartment in particular had an ambitious goal of 19 miles of closures (out of a total road figure of 57 miles) including both obliteration and barricades. It will be interesting to revisit this 1983 plan and field review the present situation. Ongoing monitoring is essential if any road closure program is to be effective.

Road closure efforts will help remove unwanted roads and limit access to a certain extent but, given our track record in this area, it is suggested that a creative approach to signing and improving desirable access will have a more beneficial effect by encouraging the public to use the proper routes. There will always be those people who have to "see what's on the other side of the gate". Dispensation of a little information to the public on why roads are being closed, whether it be by signs, Host Role contacts, maps, etc., may help alleviate road closure problems to some extent.

A coordinated effort should be made on a site-specific basis to develop additional practical and cost effective traffic control devices; this might include use of natural barriers such as slope, boulders, and cull logs as well as fences, guardrails, and signs where applicable. Some roads could be closed to vehicle access and converted to trails (example: Lakin Dam/Upper Falls).

Again, funding for road closures must take into account monitoring and maintenance needs in addition to implementation. Monitoring should include a more comrehensive traffic count system.

Roads Essential for Administrative and Public Use

It's easy to identify a primary road system. Naturally the arterials and most of the collectors have capital investment/maintenance considerations and commercial/co-op/public use factors that make it hard to justify changing their status to any large degree. The extensive local road network is the challenge. Besides the traditional organizational infighting over road needs (example: fire access versus wildlife considerations), the public is taking a more active voice in questioning (and challenging) road closures. Engineering does not own these roads; most were built to support or service other functions. Hopefully the IDT will determine whether these service needs are still legitimate. Remember, this is an ongoing process and the transportation needs will change over time.

Criteria for Road Closures

It would seem that the first priority for road closure would be those roads where actual resource damage is obvious. Normally this would be where road drainage is altering hydrological function (ie. steep slopes or near riparian) and/or having substantial erosional effect, which would focus our attention in this case on the west slopes of Black Fox Mountain, some of the steeper terrain along the north boundary of the area, and naturally along the McCloud River corridor and various spring and meadow areas. Whether streams such as Mud, Ash, Edson, and Trout Creeks with their natural sediment load fall into "high priority" status is for the IDT to decide. Another road impact would be to wildlife, ie. the 1.5 mile/section standard, which we have seen from past experience is hard if not impossible to attain and maintain in the flats, at least using traditional methods. Coordinating road closure efforts with road cooperators in this area is also an important consideration.

-What are the tradeoffs between types of closures?

a. Seasonal closure- The East McCloud closure, during hunting season, has been fairly effective when properly signed and patrolled, especially in conjunction with cooperators like Campbell.

b. Permanent closure by signing- If backed up by regular monitoring and enforcement it might work. Who pays? Sign costs alone start adding up considerably if you're talking a large area. What are minimum legal requirements for signing to avoid tort and other damage claims?

c. Gating- Our record to date is dismal with existing gates. We don't have a decent inventory, we don't have a coherent open/close program or anyone with responsibility for it, but we do have a lot of damaged gates (snowload and vandalism). Campbell is undertaking an ambitious gate program around town, let's see how it works!

d. Barricading- Earth barricades are ineffective after a year or two; guardrail barricades are more effective and cheaper than gates ($700 vs. $3500), with the added benefit of being reasonably easy to remove in an emergency, and also get better public acceptance than gates.

e. Decommissioning- There is still a lot of discussion over the meaning of this. It can be everything from simply ripping to recontouring to the original slope, and may include removing drainage structures like culverts. The intent is to remove road prism FOREVER and EVER, never to be used again for any purpose. Currently there are arguments over whether culverts absolutely WILL be removed or whether risk assessment should be done on case-by-case basis, which seems more reasonable. Decommissioning is not to be confused with Level 1 maintenance where road is put to bed temporarily till needed again.

f. What are the social impacts of road closures?- Mainly irritated people! Really, it depends on which side of the fence (gate?) you sit, as in anything else. Some hunters really enjoy a more "vehicle-less" experience, some folks are of necessity roadhunters.

There is some evidence that fewer roads would improve the deer population (see page 56). Whether this would result directly in improved hunter success is not known. In order to improve fawning survival, roads would probably have to be closed in late spring as well as hunting season. There has been a fairly good response to limited road hunting areas on the east end of the district. Some hunters have expressed a desire to expand this to the Flats, but it is not known whether a closure program would be accepted in an area such as the Flats with a long history of road hunting.

Most mushroom gatherers probably approve of fewer roads, until they get cut off from their favorite area. Dispersed activities are more popular as people try to get away from it all. The trend on private land to close off public access means more pressure on National Forestland. Increased restrictions do not always have a beneficial effect. With the McCloud Dump closure (1995), watch the National Forest road system become a convenient outlet for trash disposal. The road closure issue in this area will largely be a trial-and-error exercise as the public will play a very large role in determining what does and doesn't work, and we should be receptive to that.

Non-Consumptive Human Uses

Native American Land Use

The gradual succession of grasslands to pine forest, noted in several parts of this report, is a concern to Native Americans, particularly at Coonrod Flat. Members of the Wintu tribe have suggested activities to move this area closer to its prehistoric condition.

Recreation

Recreational use within the Flats focus area has primarily been limited to the McCloud River corridor. Recreation use along the McCloud River corridor is expected to increase significantly over the next 20 years. The McCloud River Management plan outlines several projects that will enhance recreational opportunities along the river corridor. A number of the projects are planned for potential implementation in the next five years. Most of these projects are low impact items such as guard rails, trails, interpretive signs and revegetation. Some of the projects involve road closures and revegetation of heavily impacted areas. These projects will improve riparian habitat in accordance with Aquatic Conservation Strategy objectives.

The potential impacts and the effects of proposed projects are discussed in the EA for the Upper McCloud Management Plan, which is on file at the McCloud District. Potential impacts from projects are believed to be minimal for the following reasons.

a. The majority of the projects call for the development of trails, interpretive features, improved santitation facilities and campgrounds on the north side of the river. The geology of the north side of the river is volanic in origin and more stable than the south side. Projects such as trails and campground developments should not affect channel stability or increase sedimentation in the river.

b. The landscape on the lava based soil does not contain high quality habitat outside of the immediate riparian vegetation zone. The majority of projects will occur outside of the riparian vegetation in the terrestrial environment located in riparian reserves. Incidental disturbance in the terrestrial environment surrounding the river will not reduce the viability of any species. Campgrounds developments will be located on flat ground and if properly constructed should not increase sedimentation in the river.

Distribution and Function of Riparian Areas

Background

One of the objectives of watershed analysis is to provide a scientific basis for managing riparian reserves. The Flats focus area presents a unique problem to the identification of riparian reserves. Normal riparian indicators such as riparian vegetation and perennial flow are largely absent from the focus area, however channels are not, particularly on the western slopes of Mount Shasta. Without common riparian indicators the task of identifying riparian areas becomes more complex.

Many of the channels within the focus area do not meet the definition criteria necessary to be classified as riparian reserves. For this reason the distribution and function of riparian areas was chosen as an issue to be addressed in this watershed analysis. The objective of this chapter is to address the key questions developed for this issue and to increase our scientific understanding as to how channels in the focus area fit into the riparian reserve concept.

Riparian Reserves have been developed to meet the objectives of the Aquatic Conservation Strategy. "The Aquatic Conservation Strategy was developed to restore and maintain the ecological health of watersheds and aquatic ecosystems contained within them on public lands" (ROD, B-9). A discussion of the goals of the Aquatic Conservation Strategy and the role of watershed analysis in recommending riparian reserve widths can be found on pages B-9 - B34 of the ROD. Additional information regarding standards and guidelines for management activities in riparian reserves can be found in the Shasta-Trinity National Forest Land Management Plan (4-53 - 4-60).

Many of the channels within the Flats focus area are classified as intermittent streams. "Intermittent streams are defined as any non-permanent flowing drainage feature having a **definable channel and evidence of annual scour or deposition**. This includes what are sometimes referred to as ephemeral streams if they meet these two physical criteria" (ROD, 4-54). According to this definition many of the channels within the Flats focus area do not meet the necessary criteria to be considered as intermittent streams. Many of these streams have definable channels but do not carry seasonal flows on an annual basis. Because ephemeral streams are grouped into this category it is possible that riparian reserves may not be applicable to many of the channels in the Flats focus area based solely on the definition of intermittent streams. Because riparian reserve widths are not provided for these streams by definition the watershed analysis must address the function of these channels to determine how they should be managed.

The following sections address the key questions as they relate to the distribution and function of riparian reserves in the Flats focus area.

The Role of Natural Disturbance

The role of debris flows and volcanism has generally been to discourage channel development in the Flats focus area. Volcanic activity and debris flows have occurred at a frequency high enough to inhibit the development of stable stream channels and riparian areas. Because of the lack of topographical features and slope, large amounts of sediment from mud flows and volcanic events has been deposited over the Flats landscape burying existing channels and further decreasing channel gradients. Low channel gradients encourage sediment deposition during surface flow events which leads to channel aggradation. Channel aggradation sometimes results in channel migration. The combined affect of natural disturbance and channel processes is to discourage the formation of stable channels and well developed drainage systems.

The ROD states that "the width of Riparian Reserves necessary to protect the ecological integrity of intermittent streams varies with slope and rock type" (ROD, B-15). Because side slopes (V-shaped valleys) are almost completely absent from channels in the focus area the recommended riparian reserve widths for most intermittent streams would be less than the interim riparian reserve widths. An example of how to determine riparian reserve widths for intermittent streams based on side slope gradients can be found in the ROD on page B-15 (also see Figure, B-15). Channels within the Flats focus area have sideslopes less than five percent. Assuming an unconsolidated rock type and a sideslope of five percent the appropriate riparian reserve width for intermittent streams would range from 50-75 feet on either side of the stream. Note that the recommended widths were developed with other factors in mind such as "habitat for riparian-dependent species, the ability of streams to transmit damage downstream, and the role of streams in the distribution of large wood to downstream fish-bearing waters" (ROD, B-15). None of these characteristics are applicable to intermittent streams in the Flats focus area.

Hydrologic Interactions - Flats and McCloud River

Little hydrologic interaction occurs between Flats channels and the McCloud River. As described previously, Mud Creek is the only perennial stream that is tributary to the McCloud River. Ash Creek only flows to the McCloud River approximately once every nine years. When flow in Ash Creek does occur it is only for a period of several months and after unusually wet winters. During these periods the flow of the McCloud River is also greater than normal years. The higher flows in the McCloud River attenuate additional sediments from Ash Creek during spring runoff.

The groundwater flow linkage between the Flats and the McCloud River is much greater in terms of water quantity than the surface flow linkage. Water quality in Big and Bundorra Springs is very good. Management activities occurring in the Flats may have the potential to increase water yield in these springs in the short run through removal of vegetation. Management activities will not have any effect on groundwater quality. The greatest risk to groundwater quality is from introduced contaminants. At this time no significant non-point or point sources for contaminants exist within the focus area, excluding those associated with the McCloud River corridor. The only possible source of contaminants would be associated with grazing activities, but the potential impacts from grazing are very small and are believed to have no effect on water quality. Because of the limited well development on the Flats not much groundwater is converted to consumptive uses. Development of groundwater resources might have some impact on the flow of springs, however the extent of this impact cannot be determined without additional knowledge of the water bearing properties of aquifers beneath the focus area.

Location and Function of Riparian Meadows

Riparian meadows occur infrequently across the Flats landscape. They are mostly vegetated with forbs and sedges. In most cases they are associated with rivers, springs and/or high water tables. Riparian meadows within the Flats focus area have water tables close to, but not at the ground surface. The locations of riparian meadows and springs have been identified and are displayed in Map 6.

The time frame in which this analysis was conducted did not permit adequate study of the function of riparian meadows. All riparian meadows in the Flats focus area have been included within the recommended riparian reserves.

Location of Riparian Areas and Riparian Function

The total area of riparian reserves is estimated at 1,310 acres. Of this, 1,080 acres would otherwise be in the matrix, and 230 acres would be in LSR, MLSA or RNA. This figure

was obtained by tracing channels with a map wheel. One site tree height averages 175 feet in the focus area. 470 acres of the riparian reserves are on the McCloud River.

Channel Typing

As mentioned previously the drainage density of the Flats focus area is very low. To determine the location and flow regime of stream channels all possible channels indicated by contour map crenulations were mapped on 1:24,000 quads. These channels were field verified and classified as perennial fish-bearing, perennial nonfish-bearing, intermittent, ephemeral and remnant.

1) Perennial - Fish Bearing

The McCloud River is the only perennial fish bearing channel in the focus area. Additional water supplied to the river by Big and Bundoora Springs is partly responsible for perpetuating perennial surface flow in the river. Riparian vegetation can be found along the entire length of the McCloud River corridor.

2) Perennial - Non-Fish Bearing

Mud Creek is the only perennial non-fish bearing channel found within the focus area. The high sediment load in Mud Creek makes it unsuitable for fish. Discharge from Mud Creek fluctuates very little over the year. Riparian vegetation is not as prolific as along the McCloud River, however a continuous band of riparian vegetation occurs along the lower reaches of Mud Creek within the focus area.

3) Intermittent - Seasonal Flow

Intermittent channels flow at least once every year. The duration of flow varies significantly depending upon the reach location. Generally the duration of flow is shortest in the lower reaches and longest in the upper reaches. Intermittent channels flow primarily during the snowmelt season. Ash Creek has the longest intermittent stretch of channel and flows for the longest period of time during the summer months. Edson, Trout and Dry Creeks are the only other intermittent channels within the focus area. No riparian vegetation occurs along intermittent channels within the study area.

4) Ephemeral - Flow at least once every 10 years

Ephemeral channels flow for periods of 1-2 months every 10 years. These channels
can carry large amounts of suspended sediments during the brief periods when they flow. Channels having traces of scour every ten years are currently included in this category. Ephemeral channel beds often contain terrestrial vegetation. No riparian vegetation is associated with ephemeral channels.

5) Remnant - Former channel; no evidence of annual scour

Remnant channels have no known hydrologic function. No riparian vegetation is associated with remnant channels. These channels display no evidence of scour and are probably remnants of old channel networks that were altered by large scale disturbances originating on the western slopes of Mount Shasta.

The high runoff during the spring and summer of 1995 provided an opportunity to map remnant and ephemeral channels with a high level of confidence. All ephemeral channels flowed for periods ranging from less than one day to several weeks during May and June in 1995. It is safe to assume that if no scour was observed in channels during the high runoff period that surface flow does not occur in those channels. Channels without observable surface flow or scour of any type were classified as remnant channels. Channels that were not flowing during the high flow period but had some trace of scour were classified as ephemerals. Note that the larger ephemerals (lower reaches of Ash, Swamp, Dry and Edson Creek) were all flowing during the high runoff period during May-June, 1995. Ephemerals could further be divided into those that flow once every ten years and those that show minimal evidence of annual scour with no sustained flow every ten years.

While it was easy to map ephemeral and remnant channels in the spring of 1995, it was very difficult to determine the break between intermittent and ephemeral channels since most of the ephemerals were flowing. This break was determined by interviewing people familiar with the watershed. The resultant channel map showing perennial, intermittent, ephemeral and extinct channels is displayed in Map 6.

The method used to identify stream channels relied on topographic features (crenulations) visible on 1:24,000 quadrangles. Because many of the channels in the Flats lack well defined inner gorges it is likely that some channels were not identified during the channel identification process. While some channels may be missing from the inventory, all perennial and intermittent channels have been accounted for.

Riparian Function

The function of "riparian reserves" varies according to stream type. As was mentioned previously the majority of the channels located in the Flats focus area (ephemerals and remnant channels) do not meet the criteria to be classified as intermittent streams. The function of these channels must be addressed to determine if they warrant some form of riparian reserve protection. These channels serve no purpose in terms of sediment transport and they have no downstream impacts to water quality or fish habitat.

Ephemeral channels have no hydrologic benefits, but they do have the potential to provide future benefits to wildlife. Presently it is unlikely that the ephemeral reaches of Ash, Swamp and other creeks provide any benefits to wildlife. This is due to past management activities which have modified vegetation and habitat around and within these channels. It may be possible to restore habitat within these ephemeral reaches by regulating management activities. No immediate benefits will be provided to wildlife but the long term potential to create additional wildlife corridors exists.

Land-Use Impacts to Channel Morphology and Water Quality

The effects of management activities on channels within the Flats focus area have been described in Chapter 3. Existing impacts from land-use activities have affected channel morphology and water quality in the Flats focus area in many different ways. Impacts to streams located in the Flats are mostly related to fire suppression and past diversion activities while impacts to the McCloud River corridor are mostly associated with recreation and roads. The largest impacts are described as follows:

- Channel diversion and dredging activities have altered channel flowpaths and channel form, respectively. Impacts to channel form in Ash Creek associated with dredging have been largely mitigated by subsequent high flows.

- The exclusion of fire has resulted in densely vegetated stands along portions of intermittent and ephemeral channels. Current densities are believed to be higher than natural conditions and may be impacting channel form and development.

- Roads have altered groundwater flowpaths in riparian meadows. The overall impacts to vegetation are yet to be determined.

- Increased recreational use along the McCloud River corridor has resulted in impacts to water quality. Several sediment sources associated with roads have been created.

- Historical grazing and timber management activities have had minor impacts to channel form.

Land-use activities have undoubtedly affected the composition of vegetation types in the focus area, however impacts to channel morphology and water quality from most land-use activities have been small. Land-use impacts to channel morphology have been small because they are overshadowed by the more dominant effects of natural disturbance processes. Water quality has not been significantly impacted due to the lack of surface flow connectivity between Flats channels and the McCloud River.

Chapter 6 - Recommendations

Old Growth and Biological Diversity

1. Ten percent of the focus area is late successional forest in LSR, MLSA or RNA prescriptions. Five percent, approximately 2,300 acres, are needed from the matrix to meet 15% retention requirement. Approximately 6,100 acres of late successional forest currently exist in the matrix. The areas used to meet standards and guidelines should come from the following priorities:

a. Protect goshawk nest sites which have been active within three years, using best available scientific information. Three goshawk nest sites have been recently active in the matrix. As a short-term measure while goshawk populations are being monitored, this recommendation is not inconsistent with the LMP. As a long-term policy, this recommendation would require an amendment to the LMP.

b. Maximize dispersal habitat for northern spotted owls along logical corridors. Corridors (see Map 5) would generally follow the most productive soil types from the Elk Flat LSR to the Mud Creek MLSA, to the McCloud River, including areas east of the Shasta Forest Road. Maintain mature stands within one mile of the McCloud River. Between The Elk Flat and Kinyon LSR's the corridor will follow the lower slopes of Black Fox Mountain and the riparian reserves of Edson Creek. Within these corridors, it is probable that significant amounts of mature forest may be removed in the next ten years because of blackstain, annosus and bark beetle outbreaks. Healthy mature stands should be maintained.

Thinning from below will help to maintain younger mature stands, and bring younger stands to a large diameter, mature condition more rapidly. In the short run, salvage and thinning opportunities in the corridors will allow the amount of timber harvest projected in the LMP to occur. This recommendation does not recommend a change in land allocation. At this time no change in the LMP would be needed to follow this recommendation. The objective in the next ten years for the corridors should be to maintain healthy mature stands.

When the LMP is revised, in approximately 10 years, The long-term objectives for these areas may be reviewed. Long-term objectives might be to maintain 50-11-40, or to maintain better than 50-11-40 to compensate for open conditions in the center of the focus area. This would require longer rotations than the LMP currently prescribes. If an emphasis on dispersal habitat is eventually adopted as an LMP objective, a change from prescription VIII to prescription VI would be appropriate. Some reduction in timber harvest would occur.

c. Manage scattered pockets of true old growth forest in the matrix, as a potential refugium for potential survey and manage fungal and lichen species. These pockets are approximately 300 acres total. (See map 5.) All but 10 acres are in corridors and/or goshawk nest groves.

d. Maintain key areas for the production of Boletus Edulis Mushrooms. Approximately 200-300 acres are involved, most of which are already included in corridors. These areas are not mapped, to avoid attracting excessive use. Compatible management activities which will help maintain a mature forest with minimal soil disturbance should continue. The area east of Edson Creek may need an underburn to control the spread of blackstain. Thinning and salvage treatments, where needed, should be initiated on a small scale and monitored carefully. Minimizing soil disturbance is very important.

2. Increase the growth of immature stands by all practical means. This includes the numerous 20-50 year old plantations and second growth now approaching early maturity. A multi-layer closed-canopy forest structure is preferred in corridor areas, emphasizing the larger trees and fire resistance. The central meadow-like and lava outcrop areas would have a mmulti-layer structure with a more open canopy and grasslike understory maintained by frequent fire.

3. When thinning trees, promote a diversity of species consistent with the perceived natural fire regime. Maintain or promote healthy stands of broadleaf species, especially oak, aspen, plum, and chokecherry, to enhance habitat for big game and other wildlife species.

Deer Management

4. Burn selected bitterbrush and mixed brush stands on prescription VI lands. Continue underburning in conifer stands and meadows (Map# 9) in the matrix and consider underburning in reserves. The objective is to produce quality forbs and grasses while removing excess fuels.

5. Break up Large bitterbrush and knobcone/brush fields with corridors of pine of a size and density to provide deer cover. This recommendation does not apply to open grasslands such as Elk Flat and Coonrod Flat which should be managed according to LMP direction to maintain as open areas.

6. Small 500 gallon deer guzzlers may be installed south of the cattle allotment fence, mostly in S27-35, T40N, R1W. This will deter some deer from daily crossing highway 89 and reduce the road kill and hazard. Density of these guzzlers would be about one per square mile. It will also benefit prey species for TES species and other predators. Guzzlers would not be within one mile of Mud Creek.

Redband Trout

7. See recommendations 1 and 2 in the section on distribution and function of riparian reserves. No other opportunities to improve redband trout habitat within the focus area are evident. The upper portion of the watershed, including Trout Creek, Upper Edson Creek and Swamp Creek, should be analyzed as soon as possible.

Grazing

8. Grazing presently encourages tree reproduction by lowering grass cover density on the focus area. Range allotment use may be continued until the present permittee ceases operations. Allotments will be evaluated upon permit renewal as to the ecological effects. The following recommendations are made:

a. Continue the underburning program, which creates high-quality forage for cattle. Forage may be used with short term commitments, but no increase in animal months is desirable (Map# 9).

b. If range improvements are proposed, a range analysis should occur first to determine if investment is prudent. This includes repair of existing improvements and forage planting.

c. This range is usually not ready until June. The opening date needs to be consistent with normal range readiness. Forage should be shared with wildlife and provide adequate early-season quality nutrition for does in the deer herd. Other early-season needs of wildlife should be considered as in the Shasta-Trinity National Forest Grazing BE.

d. Expedite thinning of tree plantations with grass understories to provide forage for cattle. Encourage cattle to use these areas.

Caves

9. Monitor condition of the lava caves in the watershed. Surveying for bats and other cave life is desirable as recreational usage increases and more intensive management becomes necessary.

Grassland and Aspen Restoration

10. Improve the dry grass fescue community by prescribed fire and controlled grazing. Pine removal and grass fertilization should be attempted in selected areas (consistent with the LMP) to determine whether this improves the range condition. Specific project areas are Elk Flat and Coonrod Flat. Wet meadow restoration projects are listed in recommendations for riparian reserves.

11. Restoration of aspen, black oak, plum, and chokecherry is recommended for biological diversity in the watershed. Pine competing with aspen may be removed in stands in sections 28 and 17, T40N, R1W, near the Bigelow Road. Additional groves of aspen and other broadleaf trees should be chosen for treatment in followup projects. If monitoring of retained broadleaf trees shows improved health and reproduction, other deciduous groves will be similarly treated (Map #9). The scale of these treatments will be small enough to have no significant impact on commercial timber harvests. Under 250 acres and less than 1% of the watershed is involved.

Road Closure

12. Four priority areas have been identified for road closures. They are, the Elk Flat LSR, the McCloud River Corridor, Black Fox Mountain, and selected roads adjacent to private land where the private owner wants to make a joint effort to reduce access. These areas are selected for high resource values and/or feasibility of implementation. Permanent road closures in the rest of the flats have a low probability of success.

13. Additional study is recommended concerning seasonal road closures in the flats. Any plan to institute hunting season road closures should be preceded by adequate public sensing.

LSR-MLSA Management

14. (Detailed recommendations for the Elk Flat LSR are in the initial LSR assessment, Appendix A.) In the Elk Flat LSR, thin plantations to prevent overcrowding mortality and accelerate the development of a large-diameter overstory. Thin selected areas of dense

natural stands to accelerate the development of nesting habitat for spotted owls and goshawks.

15. Complete an assessment for the Mud Creek MLSA as soon as possible. In the Mud Creek MLSA, create a modified fuel break adjacent to the Shasta Forest Subdivision, and

an additional fuel break on the east side of the Pilgrim Creek road, and on the north side of the railroad. (Map# 9)

16. Also in the MLSA, within a 60 acre blackstain center east of the Pilgrim Creek Road, remove hazard trees, reduce heavy fuel concentrations and take steps to establish tree specier which are not susceptible to blackstain. (Map# 9)

Biodiversity Monitoring Needs and Data Gaps

17. Survey Bigelow Meadow, Bundoora Spring, and small meadow patches along river for Trillium ovatum var. oetingerii, Cyprepedium montanum and Cypripedium fasciculatum. As a lower priority, survey high elevation areas for Allotropa virgata and Botrychium species.

18. Continue nesting and occupancy surveys for goshawks. Coordinate monitoring with Klamath NF.

19. Survey strategies need to be developed for survey and manage lichens and fungi.

Forest Health Recommendations

1. Implement a recurring program of underburning which will remove small diameter fuels but preserve logs over 15" diameter and portions of the duff layer. The objective is to create a fuels profile that simulates a natural fire regime and prevents catastrophic wildfires. (Map# 9)

2. In CAF and OTF soil groups in matrix allocations, work toward establishment and maintenance of mixed conifer stands with 25 percent ponderosa pine. Favor Douglas fir, incense-cedar and white fir when thinning pine dominant stands. Favor pine and cedar in white fir stands. As a general rule, retain all hardwoods. Exceptions will be some stands on Black Fox mountain which are more than 25% black oak (some oak may be thinned to favor larger oak).

3. In CTS, YT and most SRO soil groups in the matrix, ponderosa pine will be the species suited to the site. Maintain a more open stocking density consistent with the site capability through commercial thinning. Management activities should prevent a succession to white fir in these soil types, since it is poorly suited to long-term survival, However, some individual trees of this and other minor conifer species should be maintained in approximately the same proportion as they now occur. Existing oaks and aspen should be maintained. (See biodiversity recommendation 10.) Some of the ROS soil types are best suited for long-term knobcone pine stocking and regeneration.

4. Minimize soil disturbance during thinning operations. In addition to standard contract provisions, consider over-snow logging.

5. Continue stump application of borax or other measures to limit the spread of annosus root rot.

6. Some Priority areas for salvage harvest are in S35, T40N R2W, near Esperanza Spring; S27, T41N R1W, near Dry Creek; and S7 T40N R1W, near Pilgrim Creek Road.

7 A biomass thinning is needed on 1,182 acres of plantation, including areas currently planned with the Mud forest health project. An additional 708 acres will need thinning within 10 years.

Consumptive Forest Uses

1. Maintain a steady flow of wood products through commercial thinning and salvage sales as outlined above, to maintain forest health and biodiversity.

2. Harvest and regeneration by the green tree retention method is recommended in matrix land where the stand is susbstantially damaged or endangered by root diseases or insect-caused mortality. Measures outlined in the biodiversity recommendations for maintenance of late-successional forest stands will limit the green tree retention harvest and regeneration of healthy mature stands during the next 10 years.

3. Consider different options for management of understocked conifer stands. (Most remaining understocked stands are in prescription VI, Prescription III, or are located on very poor soil types.)

a. Development of an uneven aged stand by thinning clumps, with underplanting or encouraging natural reproduction.

b. Developing a mix of cover and forage areas (see biodiversity recommendation 10).

c. Watch and wait for existing stand to mature on harsh sites.

d. Harvest by green tree retention method, site preparation and replanting may still be appropriate in some stands.

4. Harvest a significant part of the 2,000 acres of knobcone to meet social needs for firewood and biomass generation. The impact of knobcone harvest on biodiversity is neutral. The harvest of these stands of knobcone by green tree retention will break up fuel types, meet social needs, meet silvicultural requirements of this species and provide a temporary increase in forage and browse.

Consider various methods to meet green tree retention requirements. In some stands, the retention of individual trees of other species may meet the intent of the GTR standards better than retention of clumps of knobcone, which is not windfirm. Amend the GTR standards and guidelines if necessary.

The primary product of knobcone harvest should be firewood. Commercial harvest for biomass can also be prepared if markets are high. Most of the knobcone stands are suitable only for knobcone regeneration through broadcast burning. Planting of ponderosa pine and other conifers will increase diversity in the better "flowerpots." Areas recommended for initial fuelwood cutting are shown on Map 9. Other knobcone areas are shown on map 10, Existing Vegetation.

5. Complete the Evaluation of Black Fox mountain, including consultation with the Pit River Tribe and other concerned individuals, in order to plan thinnings to maintain forest health on the lower slopes. Complete the evaluation of significance and consultation with State Historic Preservation Officer and/or Council on Historic Preservation. This is a high priority evaluation, because there are approximately 1,500 overstocked acres which are currently vigorous, but will probably exhibit forest health problems if density is not reduced in the next 10 years.

6. Maintain habitat for growth and harvest of Boletus edulis mushrooms as outlined in biodiversity recommendations. This report does not make recommendations regarding regulation of harvest. These questions should be addressed later.

Nonconsumptive Human Use of the Landscape

1. The long-term development strategy outlined in the Upper River Management Plan EA appears consistent with the aquatic conservation strategy. Implementation of the projects in this plan is recommended, with the following reservations:

a. Incomplete information acknowledged in the decision notice regarding sensitive species and archaeological sites should be remedied.

b. The riparian reserve analysis area, set at 300 feet in the EA, should be increased to 350 feet because of the two site tree requirement. (This does not preclude low impact projects.)

c. Projects need to be reviewed for compliance with new standards and guidelines, including survey and manage species (see biodiversity recommendation #17), evolving redband trout protection requirements, and potential historically significant sites which are not directly associated with archaeological sites.

Distribution and Function of Riparian Areas (See Table 6-1)

1. Continue Whiskey Creek slide restoration efforts to further reduce slope erosion and sediment delivery to the McCloud River.

2. Decommission roads at Camp 4 and Upper Falls as recommended in the Upper McCloud River Management Plan EA. Reduce erosion at Upper Falls overlook. Improve sanitation facilities along the McCloud River to enhance water quality.

3. Allow prescribed burning to occur within areas of terrestrial vegetation located within riparian reserves on intermittent and perennial, non-fish bearing streams. Monitor effects of fire in riparian reserves.

4. Maintain interim riparian reserve widths for perennial and intermittent streams. Provide stream-side protection zones for ephemeral portions of Ash Creek, Swamp Creek, Dry Creek, Edson Creek and Pilgrim Creek.

5. On the McCloud River, the interim riparian reserve width of 350 feet will lead to flat ground in all cases. At three locations the existing two lane gravel loop road comes closer than 350 feet to the river. In these areas, the ground above the road is flat and covered with manzanita and scattered pine. Bringing the Riparian Reserve boundary to the road in these three cases is consistent with the aquatic conservation strategy.

6. Ensure protection of the population of Cascade frog, Rana cascada, by maintaining the interim riparian reserve width of 175 feet on either side of Mud Creek. Underburning in the terrestrial vegetation (ponderosa pine) may be feasible within the riparian reserve if a biological evaluation shows no adverse effect on this species.

7. Restore riparian meadow systems by cutting pine and prescribed fire. Highest priority areas are the portions of Mud Creek Meadow on Pilgrim Creek Road, Goshawk Meadows in SW section 24 near Mud Creek Bridge, and selected portions of Sheep meadow and Red Hill meadow. Fill in the artificial drainage ditch on Pilgrim Creek Road on Mud Creek meadow.

8. Restoration of Esperanza Springs is desirable both to improve the meadow and to remove human debris in an area considered important by Native Americans. However, this will require evaluation of a historic site before any projects are implemented (Map #9).

Table 6-1: Summary of Recommendations for Management in Riparian Areas.

Channel Type	Fire Management	Timber Management	Road Management	Recreation Management
Perennial Fish Bearing	Exclude burning within riparian reserves except under conditions specified in LMP (4:56-67).	Exclude timber management activities within riparian reserves except under conditions specified in LMP (4:54).	Continue Whiskey Creek slide restoration efforts. Decommission roads at Camp 4 and Upper Falls as recommended in McCloud River management Plan. Follow LMP Guidelines (4:54-55).	Resurface upper falls parking area to reduce erosion and water quality impacts. Improve sanitation facilities along McCloud River as recommended in McCloud River Management Plan. Follow LMP Guidelines (4:55-56).
Perennial Non-Fish Bearing	Exclude burning within zone of riparian vegetation. Allow fire to back into portions of riparian reserve containing terrestrial vegetation. Monitor effects.	Same as Perennial Fish Bearing.	Exclude construction of additional new roads along Mud Creek. Follow LMP Guidelines (4:54-55).	No recommendations.
Intermittent	Evaluate prescribe burning in riparian reserves on a individual segment basis. Exclude burning activities from reaches where channel stability may be impacted by removal of vegetation.	Same as Perennial Fish Bearing.	Same as Perennial Non-Fish Bearing.	Clean-up trash/debris located near Ash Creek at Coonrod Flat.
Ephemeral	Allow burning within riparian reserves containing terrestrial vegetation. Possible exceptions may occur along reaches where channel stability may be impacted by removal of vegetation or woody debris.	Allow thinning and salvage projects if they are in compliance with ACS objectives. Exclude timber management activities immediately adjacent to channel if channel stability will be impacted.	No recommendations.	No recommendations.
Remnant	Same as ephemeral.	Same as ephemeral.	No recommendations.	No recommendations.
Wet Meadows	Implement burning program to remove encroaching vegetation. Monitor meadow recovery.	Cut down pine in meadows. No salvage. Monitor meadow recovery.	Evaluate meadow restoration opportunities related to roads.	No recommendations.

Appendix A - Elk Flat Late Successional Reserve Assessment

The Elk Flat LSR (RC 360) contains approximately 3,440 acres. It is bounded on the north and west by privately owned land, and by matrix national forest land on the south and east. It includes 400 acres of private land. However, the President's plan does not affect management of private land. This assessment adds additional detail to the Watershed Analysis.

This is an initial LSR assessment. The only projects specifically recommended for implementation in FY 96 in this assessment are exempt from review by REO and REIC, according to the ROD, pages C-12 and C-26, and the memo in April, l995, from the REO.

However, the assessment recognizes the need for additional silvicultural treatments, including commercial thinning and underburning. When additional detail is available on silvicultural prescriptions and fire management planning, the assessment will be revised and submitted to REO for review.

Summary, Objectives

The LSR has not been occupied by northern spotted owls since l990. The current habitat conditions within and adjacent to the LSR are such that the probability of occupancy in the next 10 to 20 years is considered relatively low. Management objectives for late successional reserves is to protect and enhance conditions of late-successional and old growth forest ecosystems. (ROD Standards and Guidelines, p. C-9) The specific objective for this LSR, from the Draft Recovery Plan, is to support one pair of northern spotted owls. Additional species present which need late successional forests include the northern goshawk and the marten.

Existing Conditions

The following table shows seral stages and vegetation size-density categories in the LSR. (See Maps 11 and 12.) The 4C-Older category can be considered old growth. It consists of residual trees from the logging 90 years ago, with the understory developed since then. The 4B-C and most of the 3C and 3B stages are early late successional forest.

Vegetation Types, Elk Flat LSR
Wildlife Habitat Relationships (WHR)
and Shasta-Trinity LMP Vegetation Type Categories

Natural Openings (Primarily Elk Flat Area) WHR 1, LMP GL	327 Acres	(11%)
Plt Est. l991, formerly WHR 4BC, 4C older	106 Acres	(3%)
Plt Est 1985-91, formerly WHR 3A, 4A	362 Acres	(12%)
Plt. Est 1960's, brush conversion (WHR 3B, LMP P2G or XX3)	426 Acres	(14%)
WHR 3A, 4A, naturally filling in (LMP M3P, M4P)	43 Acres	(1%)
Subtotal, earlier and open seral stages	1,264 Acres	(42%)
4C older, suitable Nesting Habitat (LMP M4N, M4G)	313 Acres	(10%)
3C, 4BC, suitable forage-Roosting Habitat (M3G, M4N, M4G)	1,240 Acres	(41%)
Dispersal Habitat 3B (LMP M3N, P3N)	223 Acres	(7%)
Subtotal Dispersal, Forage, roosting, or nesting habitat	1,776 Acres	(58%)

This typing is a refinement and correction of the LMP data, based on walk-through surveys and photo typing. Plantations logged in l990 and planted in l991 are added. One 32 year old plantation had been erroneously typed as M4G. Two other older plantations had been typed as M2G. (These plantations are well developed, with inclusions of white fir and incense-cedar, but are ecologically still more like plantations than natural stands.) A mixed conifer stand at 4,400 feet elevation had been mistyped as red fir. In addition, the typing within the M3N, M3G, M4N and M4G types has been refined. The table indicates 51% suitable habitat, as compared with 38% suitable habitat in Appendix G-3 of the FEIS for the President's Plan. This difference is due to stands growing into suitability for forage and roosting habitat since the original typing in l975. However, the 106 acres clearcut in l990 included some of the best nesting habitat. The clearcutting of understocked stands increased the fragmentation of the LSR.

The early late successional forest has good crown closure, close to or greater than 70%. It generally has adequate dead and down material, including blowdown and cull logs from early railroad logging and later sanitation harvests. However, these stands do not have decadent green trees with cavities. The snags in these stands usually do not have heart rot when they die, and are less valuable for cavity nesters. For these reasons, most of the "suitable" habitat is considered suitable for forage and roosting, but not for nesting.

In addition, the dense crown closure in these stands meets descriptions in the literature of habitat that is suitable for use by male spotted owls, but poor for females.

About 45% of the 400 acres of private land is suitable dispersal habitat, based on photo typing and driving through the area.

The Plantations, and 200 acres of other seral stages are ponderosa pine types. Some of the natural openings are gradually being encroached by pine. However, most plantations contain some residual white fir and incense-cedar saplings. The older plantations also have some natural seedlings of these species that have become established since the plantations were planted. The remaining 1762 acres are mixed conifer, with varying proportions of white fir, ponderosa pine and incense-cedar. Sugar pine and Douglas-fir are less common, although an old-growth Douglas-fir served as a nest tree in l990. Hardwoods are very scarce. Black oak are common only on the sloping ground at the west edge of the LSR. There are no stands dominated by hardwoods. Oak and aspen are almost totally absent on the young terrace soils and the coarse sediments.

Because of the shortage of high quality habitat and the fragmentation of the LSR, the probability that it will be occupied in the next 10 to 20 years is considered relatively low. However, if there are no significant mortality losses, the trend for suitable habitat development would be favorable. The older plantations are within 10 years of being dispersal habitat. Existing dispersal habitat will develop into forage habitat. Development of nesting habitat will be more of a long-term process because of the decadence requirements. Eighty nine percent of the LSR has the potential to develop into suitable northern spotted owl habitat in 80 years or less.
The stand composition in 20 years would be as follows:

Dispersal Habitat	469 Acres (15%)
Forage-Roosting Habitat	1,423 Acres (47%)
Nesting Habitat	353 Acres (12%)
	2,245 Acres (74% of total)

Forest Health

A healthy forest, for the purpose of this assessment, is considered to one with a continuous canopy, more than 40 percent crown closure, and limited mortality in the overstory canopy. Insects, disease and abiotic factors create 1.5 to 5 snags per acre, which are generally scattered throughout the forest canopy.

In areas outside of the LSR, encroachment of pine seedlings in dry meadows might be considered an unhealthy result of fire exclusion. The succession of a ponderosa pine and sedge community to an uneven aged mixed conifer would be considered unhealthy in areas with less precipitation and different management objectives.

The small size of the LSR changes the evaluation of forest health. In a 50,000 acre LSR, a 100 acre opening caused by fire or insects would be buffered by surrounding areas, and

could be looked at as a good source of wood rat habitat. In this 3,440 acre LSR, a 100 acre opening could be a considerable habitat loss.

In the southeast corner of the LSR, 270 acres have been identified by the forest pathologist as a hotspot for blackstain root disease and bark beetle outbreaks, primarily in pine dominant stands. This is a broad-brush delineation at this time. Specific areas of infestation may be smaller. Minor infestations may have been missed.

In addition, the timber stands typed as M3G and M4G appear healthy at this time, but present potential future forest health problems. Approximately 1,350 acres currently have a stand density index more than 55% of the maximum, and 450 acres have an SDI greater than 80 percent of the maximum. At this stocking level, trees in the codominant, intermediate and suppressed crown classes tend to have live crown ratios of less than 30 percent. Mortality tends to increase. The stand is much more sensitive to drought. Most research on density management uses the assumption that stands at higher densities tend to self thin. However, observations in much of the McCloud Flats indicate that typical mortality is patchy, creating openings instead of simply reducing stands below maximum density. A blackstain infection two miles southwest of the LSR led to the creation of a 500 acre opening, primarily on private land. Another outbreak two miles southwest of the LSR led to the creation of a 250 acre opening.

Forest health problems are most common where one species dominates a stand. Blackstain root disease is a problem in nearly pure pine stands on the east side of the LSR. Scolytus insect mortality is a problem in white fir stands on the west side of the LSR.

Connectivity With Other LSR's

The LSR is two miles south of the unoccupied Fons Butte MLSA, which consists of two square miles of national forest surrounded by private land. It is four miles (edge to edge) from habitat in the Kinyon LSR (RC 357) and 4.8 miles from the Mud Creek MLSA. A direct line from the Mud Creek MLSA would cross 2.7 miles of private land and 2.1 miles of national forest. On this line, 23% would be dispersal habitat or better, 44% would be open selectively logged land, and 33% would be plantations less than 15 years old. (This is calculated simply by scaling distances across the different types of vegetation polygons on a direct line.) If a dispersing owl followed a more indirect route, detouring about one mile to the west and avoiding most private land, it could pass through 50% dispersal habitat or better.

A spotted owl dispersing from the Kinyon LSR would pass through 38% dispersal habitat or better, 38% open forested stands, and 24% plantations.

The corridor to the Mud Creek MLSA goes through the best soil types in the watershed. This indicates that the condition of the dispersal corridor should improve as existing plantations mature.

The straight-line corridor to the Kinyon LSR passes through 2.5 miles of coarse textured sediments and lava reefs, which are expected to remain relatively open over time.

Logical corridors incorporating the best dispersal habitat and the best soil types for future habitat development are shown in Map 5 from the watershed analysis.

Adjacent Habitat

In S5, T40N, R1W, just south of the LSR, approximately 460 acres is dispersal habitat or better.

Standing Dead, Dead and Down Wood

In l990, a snag survey in the Elk Flat Compartment showed 1.2 snags per acre. Forested areas were well over 1.5 snags per acre, but plantations had few to none. Dead and down logs were not tallied. It is likely that residual logs from railroad logging, plus recent mortality, is adequate to meet standards and guidelines for dead and down material.

Riparian Zones

Three miles of Ash Creek flow through the LSR. Approximately 131 acres are riparian reserve. This portion of Ash Creek flows from late spring through early fall. It usually dries up during the winter months, but flows dependably during the summer. There is no riparian vegetation along Ash Creek, except a few scattered willow clumps. The lack of riparian vegetation is typical of streams in the McCloud Flats, and is probably caused by the immaturity of the channel. Maps from l909 show much of the channel in a different location.

The ephemeral channel of Swamp Creek cuts across the east end of the LSR.

Soil and Geology

Thirty two percent of the LSR is described as "coalescent alluvial fans (CAF)," a moderately fine textured deep ashy soil. Forty one percent is described as "outwash terraces and fans (OTF)," a less mature mudflow deposit. The remaining 27 percent is described as coarse textured sediments (CTS). The latter are located within one quarter mile of Ash Creek, and in Elk Flat. The CAF soil is extremely fertile. A 48 inch DBH ponderosa pine with yellow bark was found to be about 110 years old. The productivity of this soil is forest survey site 2, capable of producing 200 foot trees. The OTF soil is also very productive, capable of producing 175 foot trees. The coarse textured sediments along Ash Creek are generally forested, and can produce trees 150 to 175 feet tall. The coarse sediments in Elk Flat are occupied by needlegrass, squirreltail, fescue and

buckwheat, with a 5-10 percent cover of ponderosa pine seedlings. An old, well weathered lava reef cuts the eastern edge of the LSR.

The LSR is flat, except for 60 acres on the west edge, with a 20-30 percent slope.

Northern Spotted Owl Occupancy

In l989, a three-visit survey found no spotted owls. In l990, a nesting pair was found in section 30. A timber sale was active at the time, with four clearcuts planned within one half mile of the nest, and a total of 106 acres of clearcut within 1.2 miles of the nest. Operations were suspended on the units within one half mile of the nest, according to the guidelines in effect at that time. These units contained the most valuable timber in the sale. Shortly thereafter, the owls abandoned the nest and disappeared. When the owls were not relocated after several weeks, logging was allowed to proceed, and the sale was completed. It was never determined whether the abandonment of the nest was caused by harassment or by several cold, late spring storms. One of these owls could have been the same as the male owl seen in l989 in the Fons Butte MLSA. Prior to the l989 land exchange, connectivity between the two areas was good. No evidence of northern spotted owls was found in 1991-1995 in either this LSR or the Fons Butte MLSA.

Other Late-Successional Species

Goshawks have been seen repeatedly in the LSR. Four nest sites have been located during the past 12 years in the LSR. Several sightings of marten have been recorded.

No other T&E, sensitive or Survey and Manage species have been found in the LSR. After reviewing the R-5 sensitive species list, the sensitive and endemic plant list in Appendix P of the LMP, and the Survey and Manage list in Appendix R of the LMP, the team is confident that no additional mammals, birds, amphibians, mollusks, vascular plants or bryophyte species of concern inhabit the area. There is no suitable habitat for great gray owls.

Data is lacking on lichens and fungi. One lichen, Bryoria tortuosa, can be considered a possible in old growth stands. Among the 87 fungi species on the first two categories of the Survey and Manage list for the forest, Gastroboletus subalpinus and Ramaria species are possible residents. There is no suitable habitat for Polyporus bandarzewia, the only species requiring survey before ground disturbing activities. In the third category, extensive surveys, Cantharellus subalbidus, Sarcosoma mexicana, and Gyromitra species are possible endemics. Other survey and manage fungi are are very unlikely to occur, but can not be ruled out entirely.

Historical records indicate that elk were extirpated from this area by 1880. There have been occasional sightings of elk in recent years. Black bear are occasionally sighted, but habitat is low capability.

Human Use History

Logging

the first sawmill in the area was located at Ash Creek crossing in l895. The railroads reached the area around l898. The logging was essentialy a high-grade selection. Ponderosa pine and sugar pine were the species in demand. Douglas-fir was logged primarily for local markets. Other species and smaller trees were left. There are probably no unlogged old-growth stands in the LSR.

Railroad logging in the LSR was probably completed around l910. Most of the area became part of the national forest in the l930's. Subsequent logging was apparently limited to occasional salvage and sanitation entries, until the mid l970's, when thinning timber sales included portions of the LSR.

In the l960's 426 acres of plantations were established by piling brush and planting ponderosa pine, primarily in areas near the railroad grades which had been heavily logged. Between 1985 and l991, 468 acres were clearcut and replanted. One hundred six acres were mature or or old-growth stands, The remainder were poorly stocked stands in the M3P stratum. Approximately 200 acres were commercially thinned during this time.

Roads

The LSR contains 5 miles of arterial and collector roads, and 10 miles of local roads.

Total road density is 3.2 miles per section. Some of the roads follow old railroad grades. None were constructed in the past 15 years.

Land Exchange

In May of l989, 1,500 acres adjacent to the LSR on the north side were exchanged to what is now the Campbell Corp. timberlands, in as part of the exchange which brought 3,650 acres along the McCloud River into the national forest. A cursory study of the l975 type maps indicates that about 65 percent of the lands given up were dispersal habitat or better. Nearly all of this land was logged in the three years following the exchange. The typical forested stand on this land now has 20 to 39% crown closure.

An additional five sections in a potential corridor between the Mud Creek MLSA and the Elk Flat LSR were exchanged to private ownership in the l970's and early l980's. These sections were S26, 28 and 34, T41N R2W, and S2 and 10, T40N R2W.

Grazing

The LSR has been in a cattle or sheep allotment since about 1910. Early permits were largely uncontrolled but had the objective of heavy use to prevent fires. In 1943 the US Forest Service began cattle permits which have remained steady at 300 head to the present. The present permit has approximately 300 cattle and a season from 6/1 to 10/15.

A corral in S4, T40N R1E, south of the LSR boundary, is used as a gathering point when the cattle are rounded up. The holding area and corral are located in Coonrod Flat, a natural opening. Well-used cattle trails are visible in the southwest quarter of S33, T41N R1E leading into Elk Flat. Some use is evident farther north, along Swamp Creek and Ash Creek. Range use in most of the LSR is low and the area is a minor part of the allotment.

The impact of grazing on the terrestrial development of the LSR has probably been neutral to favorable, since it has encouraged succession from grass to conifers. It is possible that cattle have retarded the development of riparian vegetation on Ash Creek, but there is no real data to support or refute this.

Recreation

Snowmobiling is a winter recreation activity. Since l992, the Pilgrim Creek Road has been plowed to a smowmobile parking area in S5, T40N R1W, at 4,000 feet elevation, one mile south of the LSR. Most snowmobile use follows existing roads. The snowmobile season at the snow park is very short in most winters, since it is only 4,000 feet elevation. When snow is limited to higher elevations, there is some use of the area by snowmobilers driving through and unloading at unimproved areas higher up.

Two popular dispersed camping areas are located in the LSR, at the old mill site and where Pilgrim Creek Road crosses Ash Creek. Areas within the LSR are not particularly productive for hunting, but these spots are used as base camps. The campsite at the old mill site is within one mile of most of the nesting habitat. Use of this area during nesting season would have the potential to conflict with the LSR objectives if the LSR is occupied. During hunting season, conflict is less likely. The lower campsite, at Pilgrim Creek road, is more than 1.5 miles from the probable activity centers.

Boletus edulis mushrooms are collected at several locations within the LSR. They are generally found in mature stands with a predominantly pine overstory, and an open understory. They are sometimes associated with the root systems of codominant and intermediate incense-cedar.

The Sugar Pine Butte Road (41N16) is the main access to climbing routes on the east side of Mt. Shasta.

The area has not had heavy use for firewood collection, except during periods immediately after timber sales. The most prevalent species, white fir and ponderosa pine,

are not considered highly desirable in this area. Since the proposal to designate the LSR in l993, the area has been closed to firewood harvest.

Fire History

No large fires have been recorded in the LSR. Existing records go back to 1910. A large fire burned within 1 mile northeast of the LSR in l918.

Reference Conditions

Reference conditions are defined as what existed prior to the 1870's, when the first range cattle, sheep and permanent white settlers came to the area. Our projection of pre-contact conditions in the LSR is based on historic records, from similar areas and best professional guesses. Because the history of land disturbance goes back about 120 years, the aerial photos do not show reference conditions. The earliest photos, taken in l944, were after the end of the railroad logging area and many years of heavy grazing.

The process of frequent light burning before european settlement resulted in a higher proportion of natural openings. Elk Flat was larger. Fescue and brome grasses were more abundant. The acreage of young pine stands was a fraction of the current acreage. Spotted owl occupancy of this area depended on fire frequency and intensity. Land now in private ownership in the 4,300 to 5,500 foot elevation band north and west of the LSR were likely to support spotted owls, or provide good dispersal corridors. The percentage of dispersal habitat within the LSR was equal to or lower than what now exists. The vast acreage currently in 80 to 110 year old stands was much lower than the current acreage, although even-age stands became established following periodic mudflows. The typical forested area consisted of uneven aged ponderosa pine, Douglas-fir and incense cedar, with an old growth overstory. The number of large down logs was much higher, but the tonnage of fuels under 10 inches DBH was lower. Ponderosa pine was more common and white fir less common than in present stands. Elk were the largest herbivores in the area. Mule deer were also abundant. Human use was transient, although evidence of at least one prehistoric hunting camp has been found in the LSR.

The crown canopy density needed for spotted owl habitat is higher than the typical conditions before European settlement in the area, but is probably within the range of natural variation.

Fire Management Plan

A complete fire management plan is not required for initial assessments. However, the two salient characteristics of the area are its small size and its proximity to private land. The only feasible fire management strategy for this situation is to extinguish all man

caused and lightning fires. If the LSR becomes occupied this may affect suppression strategy. However, the LSR has not been occupied by spotted owls for five years, and the probability of occupancy in the next ten years is relatively low. The primary objectives of fire suppression tactics are human safety and containment within 24 hours. To the extent consistent with these objectives, the operations chief will be advised to use "light on the land" tactics, maximize the use of water and retardant, and minimize the use of tractor lines more than one blade wide. Both road crossings of Ash Creek can be used for water drafting. Engine travel times are about 20 minutes to any part of the LSR. These factors tend to facilitate the use of low-impact suppression techniques.

The role of natural fire in this area will need to be simulated by prescribed burns outside of fire season. Within four miles of the LSR, 1,500 acres of pine and mixed conifer stands were underburned in l994 and l995. These projects provide a basis for predicting fire behavior and effects on vegetation of spring burns.

Criteria for Developing Appropriate Treatments

1. Emphasize long-term development of late-successional forest. Stand treatments which temporarily reduce crown closure below 70% to increase diameter growth, fire resistance and species diversity are more appropriate here than in currently occupied LSR's.

2. Through underburning and thinning, maintain a balance between stands with an open understory, which are more suitable for use by female spotted owls, (Solis and Guitierrez, 1982) and dense stands which are more suitable for use by male spotted owls.

3. Establish and maintain a balance of conifer species to improve diversity and reduce susceptibility to insects and disease. Douglas-fir and sugar pine are not common in the LSR, but make the best nest trees. These species should be encouraged and released where they occur. Ponderosa pine should ideally make up 25 percent of the stand. More than this risks blackstain outbreaks in the pine. Less increases the risk of large-scale white fir mortality. To the extent possible, establish and maintain hardwood species.

4. Reduce the risk of catastrophic fire.

5. Reduce the risk of catastrophic insect and/or disease infestation.

6. Assist in the development of a large-diameter overstory canopy suitable for nesting and roosting habitat of northern spotted owls.

7. Youngest stands have the highest priority for silvicultural treatment.
    a. Precommercial thinning opportunities in younger plantations.
    b. Precommercial or biomass thinning opportunities in older plantations.

c. Biomass and commercial thinning opportunities in stands with quadratic mean DBH less than 21 inches.

8. No silvicultural activities are needed in old growth stands currently suitable for nesting habitat. Younger mature stands with average DBH of dominant and codominant greater than 21 inches, and largest dominant trees greater than 35 inches DBH, are very low priority for silvicultural treatment. Fuels reduction activities are appropriate near roads.

9. Reduce road density. Eight miles of potential road closure have been identified. Some closures would require the concurrence of adjacent landowners.

10. Enhancement of potential nest trees would be valuable only if and when the area is occupied by a single spotted owl or a non-nesting pair.

11. No silvicultural activities should be undertaken in current or recently active goshawk nesting territories, of 200 acres.

12. No timber harvest activities are needed in the Ash Creek riparian reserve. Possible silvicultural activities include precommercial thinning and hand piling for wood rat habitat, planting of willow cuttings, and limited underburning.

13. No activities are currently planned in Elk Flat. The three options are to plant the area with ponderosa pine, do nothing, or cut and burn the encroaching pine.

Specific Areas for Treatment

The following three types of activities are exempt from further review and are recommended for implementation in FY 96:

1. Approximately ten percent of the 477 acres of recently established plantation could benefit from a thinning of dense clumps of advance regeneration. Thinning will emphasize retention of conifers other than ponderosa pine, retaining all hardwoods.

2. Rototilling or cultivating to reduce competition from rabbitbrush, and reduce gopher damage, is needed in plantation 12-112.

3. The installation of removable barricades is recommended on roads 41N96, 41N77, 41N02Y, 42N13E, 41N13, and 41N33. and 41N14A, and an unnamed adjacent spur. With the agreement of adjacent landowners, additional barricades can be installed on roads 41N09 and 41N64.

Unnamed temporary roads can be closed by spreading debris, logs and rocks in the northeast and southeast 1/4 of section 30, at Ash Creek and the Pilgrim Creek Road, near the center of section 33.

Future Treatment Options

The following activities will be considered after the completion of detailed silvicultural prescriptions and the fire management plan, with review by REO and RIEC.

1. Thinning with utilization for biomass in 80% of the 426 acres of older plantations would accelerate the growth of large diameter trees, reduce the susceptibility of the area to fire, and increase the proportion of white fir and incense-cedar. Whole tree logging would be required to reduce fuel loading. Areas not treated would be islands of dense vegetation left for diversity, and small plantations adjacent to openings.

2. Thinning fifty percent of the M3N and M3G stands would accelerate the development of a large diameter overstory, improve species distribution and reduce the susceptibility to catastrophic fire. YUM yarding of pieces 6 to 18 inches in diameter, and whole tree yarding would keep project-related fuels from becoming excessive. Most trees harvested would be in the 6 to 16 inch DBH class. No trees greater than 27.0 inches DBH would be harvested. In most aggregations few if any trees greater than 21.0 inches DBH would be harvested. The thinning would reduce canopy closure below 70 percent for a period of 10 years. Fifty five percent would be the target closure immediately following treatment. Fuels treatment would be a combination of tractor piling around landings and main roads, and underburning. The stand composition objective would be to favor fir and incense-cedar in pine stands, pine and incense-cedar in fir stands, and to retain all Douglas-fir, black oak and aspen. Retain all forked and broken topped trees greater than 17 inches DBH.

Areas not treated include active or recently active goshawk nesting cores, riparian reserves, and 60 acre islands where dense canopy closure is maintained.

3. Salvage logging of dead and dying trees is needed for fire prevention within 200 feet of the Pilgrim Creek Road, the Sugar Pine Butte Road, and the 41N14 road. In addition, removal of dead and dying trees is needed within 30 acres of a blackstain and/or annosus root disease outbreak in section 33. In this area, all snags under 16 inches should be felled. snags 16 to 24 inches may be felled and removed where there are five or more snags of equal or greater size, per acre. In thinning units, snags under 16 inches should be felled, and those over 16 inches left.

4. Approximately 10 percent of the 4BC seral stage would benefit from thinning from below. Areas treated would be pockets where the understory is unusually dense, and areas within 200 feet of the major roads.

5. Underburn objectives should include 50% of the thinned areas, 50 percent of the pine stands thinned in l991, and 100 acres not otherwise treated. Unburned areas will be monitored as control areas.

Implementation Schedule

for projects listed as "Specific Areas for Treatment," environmental documents (CE or brief EA) will be completed in FY 96 and implementation begun. Environmental Assessments for projects listed as "Future Treatment Options" could be completed by the end of FY 96, or FY 97, with implementation in the following two years.

Monitoring

Spotted owl calling should continue, though occupancy is unlikely for ten years or more. Goshawk surveys should be done before project implementation and annually if funding is available.

The resulting stand conditions after thinning and underburning projects should be reviewed by an interdisciplinary team before additional projects are planned, to ensure that prescriptions maintain habitat or recover according to projections.

If spotted owl presence or occupancy is detected, monitoring for mating behavior should be conducted. If courtship or nesting is detected, the snowmobile season will have to be closed early.

Nesting may also necessitate seasonal closure of the old mill site to camping. (The other dispersed camping sites, where the Creek crosses Pilgrim Creek Road are more than 1.5 miles from most of the nesting habitat, and probably would not conflict with LSR objectives.)

Appendix B - Threatened, Endangered and Sensitive Species Analysis

This appendix contains answers to questions posed in Appendix C, page C7-12, "Endangered Species Act and Other Species Considerations", contained in the June 13, 1994 letter on "FY 1994-96 Watershed Analysis Guidelines", signed by Regional Forester Ronald Stewart.

Northern Spotted Owl

1. Are spotted owl activity centers located within the watershed? Yes

a. If so, how many and in what ROD land allocations are they located?

One owl activity center is within the watershed (CD 107), located within a Managed Late Successional Area (MLSA), in a research natural area.

b. Which of these are currently above "take" thresholds and which are below?

The territory is above the incidental take threshold, with less than 500 acres for suitable habitat. At the home range 1.3 mile radius level, it has less than 1336 acres required to preclude incidental take allowance.

c. When were the activity centers located? 1988.

d. Describe the reproductive history.

The owls were verified present every year, and produced young in 1991, 1992.2. Has a 100 acre core area been designated around each activity center located in matrix lands?

Not applicable. The owls are in a MLSA.

3. How many acres of nesting, roosting, and foraging (NRF) habitat are there in the watershed?

Only nesting and roosting habitat has been defined and tracked for the Forest. This NR habitat is known as suitable owl habitat. 8765 acres.

a. What percentage of the watershed is this? 21%

b. Which of these stands have been surveyed to protocol? (2 years)

All of the focus area has been surveyed to protocol.

c. Which were not? Private lands over 1.3 miles from the national forest.

4. What is the amount of nesting, rearing and foraging habitat in each ROD land allocation within the watershed?

Only nesting and roosting habitat has been defined and tracked for the Forest. This NR habitat is known as suitable owl habitat. Most of the suitable habitat occurs within the LSR and matrix ROD land allocation.

Habitat (NRF) ROD Alloc.	Acres
LSR, MLSA	2,616
Matrix CHU	5,426
Matrix not CHU	723
PVT	none

5. Does any portion of the watershed contain LSRs?

Yes, the Elk Flat LSR, as discussed in the document.

a. What percent of the total watershed is this?

The LSR area totals 3440 acres, or 6 percent of the watershed.

b. What are the current totals of NRF habitat and capable habitat in the LSR?
Suitable habitat within the LSR is 1,553 acres (45 percent of LSR). Only 313 acres are suitable nesting habitat. The remainder is forage and roosting habitat. These figures are based on district vegetation typing. In addition, the capable forested habitat is 3060 acres (89 percent of the LSR). Acres of suitable habitat plus acres of capable forested habitat total 89 percent of the LSR in 20 years.

6. What is the amount of dispersal habitat (11-40 and above) in each ROD land allocation within the watershed?

Including reserves and matrix, 18,162 acres provide dispersal habitat over 43% of the watershed.

Dispersal Habitat

ROD Alloc.	Acres
all reserves	4,644
Matrix CHU	11,793
Matrix not CHU	1,725
PVT	none

7. Is the distance between LSRs (those over 10,000 acres) greater than 4 miles?

Yes

a. If so, then what is the amount of dispersal habitat on Federal lands for all 1/4 townships between the LSRs? (50/11/40)

13518 acres of current dispersal habitat are outside of reserves in the federal lands of the watershed. Outside reserves and private lands, additions of 12505 acres are capable of becoming dispersal habitat by the year 2025. The current dispersal habitat is 52 percent of these forested lands. Riparian reserves are included in the current dispersal acreage.

The acre and percent figures below reflect the detailed analysis of the 1/4 townships inside the watershed, outside the LSR, and excluding private lands.

1/4 Township #s	**Total Acres**	**Capable Acres**	**Dispersal Acres**	**Percent of Total**	**Percent of Capable**
139-1W-B	4,345	3,978	367	8	91
139-2W-A	1,869	1,659	210	11	89
140-1W-A	4,268	2,049	2,219	52	48
140-1W-B	5,184	2,777	2,407	46	54
140-1W-C	5,696	4,381	1,315	23	77
140-1W-D	3,833	2,478	1,355	35	65
140-2W-A	137	111	26	19	81
140-2W-D	3,234	2,231	1,003	31	69
141-1W-D	4,044	1,688	2,356	58	42

b. What percent of the total Federal lands in these 1/4 townships is this?

Approximately 72 percent of the focus area watershed is National Forest.

c. How much (percent and total) of the dispersal habitat is in Riparian Reserves, Administratively Withdrawn (which provide long-term protection), Congressionally Reserved, 100 acre cores, and smaller (<10,000 acres) LSRs?

About 3% or 1310 acres are Riparian Reserves. 1080 acres are in matrix and 230 are in LSR/MLSA. None are administratively withdrawn, congressional reserves, or spotted

owl cores. A wildlife travel corridor has been designated to be managed to increase cover, including dispersal habitat. The corridor includes Riparian Reserves and also expands to include areas which may produce dispersal habitat. This corridor will be emphasized for creating and protecting dispersal habitat in the CHU.

d. Is this total greater than 50 percent?

No. Managing the wildlife corridor would increase the total percentage of 11/40 forest cover to 52% in 30 years as plantations and immature stands grow if no losses occur to fire or disease.

e. Describe, if present, the natural barriers to dispersal.

The central area will likely be avoided by dispersing owls because the soils are incapable of producing dense mixed conifer stands. The central area is dry meadows and lava outcrops with ponderosa and knobcone pine. Serious blackstain root disease centers could be considered a natural barrier, because management indicates an open canopy forest is resistant to loss, and an open canopy forest is a barrier to dispersal and a necessary fragmentation of some dispersal habitat.

Tree growth, structure, and canopy closure will be managed to improve dispersal habitat within planned corridors.

f. Is connectivity, or dispersal habitat, sufficient to allow movement?

Connectivity is very limited at present. While the situation can be improved, owl dispersal will always be difficult in this CHU focus area. Soil and disease limitations are common.

8. How much critical habitat has been designated within the watershed?

Within the focus area, 86% of all acres are located within a Critical Habitat Unit, LSR or MLSA.

a. How much of this total overlaps with LSRs?

Nineteen Percent of the CHU within the focus area is also an LSR or MLSA. (For the entire CHU 40% of 128,000 acres overlaps.)

b. For areas that do not overlap, how much is currently NRF habitat?

The suitable habitat (NRF) outside of reserves is 6149 acres. 5426 acres of suitable habitat (20% of the CHU) are within the CHU. This suitable habitat is marginal, small-sized pine forest.

And how much is capable?

These figures are not available. Estimates would be misleading because the effect of soils, fire, and blackstain disease is unknown.

c. How many activity centers are located in this non-overlap area of CHU?

none.

d. How many territories are currently above "take"? How many below? (use acres established by FWS for .7 and 1.3 mile radius)

not applicable. The only territory is in a reaserch natural area, and is above the take threshold with less than adequate acreage of suitable habitat.

e. What role does this non-overlap critical habitat play in this watershed in relation to the reasons for the designation of the CHU?

The critical habitat was established to provide dispersal habitat. With the ROD allocation network, this area is no longer required for late successional species viability.

Bald Eagle

1. Are occupied bald eagle activity areas (nesting, foraging, winter roosts, or concentration areas) located within the watershed?

No. An eagle pair nests 7 miles away at McCloud Reservoir, foraging occasionally along the river but concentrating on the reservoir and below.

2. Has an assessment been made as to potential bald eagle activity areas?

Yes. None occur.a. If so, what type? n/a

b. How many? n/a

c. What ROD land allocations are they located? n/a

d. Have these areas been surveyed to protocol to determine they are unoccupied? n/a

3. Describe historical bald eagle occurrence and nesting within the watershed.

No occurrence in the watershed.

4. What is the status of the watershed as it relates to the Recovery Plan? (target territories, including beyond watershed boundaries)

a. Does the watershed and the surrounding area meet objectives of the Recovery Plan? n/a

b. If not, then are there capable eagle activity areas located within the watershed?

No, there are no capable activity areas since there is not an adequate fisheries food base.

c. If capable activity areas are present, what type are they? n/a

1). How many? n/a
2). What ROD land allocations are they located? n/a

d. What type of project or enhancement could develop sites into potential or occupied sites?

The McCloud River is the only resident trout stream. Restoration goals for the watershed will contribute to increase habitat quality for trout in the future. The watershed is not expected to be a complementary foraging area to the larger reservoir.

5. If present, describe significant habitat within the watershed that is not under Federal ownership.

Private lands do not have significant habitat for the eagle.

Amphibians

1. Have any amphibian inventories been done on a project or watershed level?

No. Several sightings of pond turtle, cascade frog, and newt are recorded.

a. What species does the literature suggest may be present?

The home range of the following frogs and salamanders extends into the watershed:

northwestern salamander
Pacific giant salamander
southern torrent salamander
rough-skinned newt
ensatina
black salamander
western toad
tailed frog
Pacific tree frog

northern red-legged frog
foothill yellow-legged frog

2. Are sensitive species and ROD Table C-3 species present or based on best information, is there a possibility they can occur in the watershed?

None of the Table C-3 salamanders are suspected to occur in the watershed or vicinity. The northern red-legged frog, cascade frog, and foothill yellow-legged frog are listed or may become listed as sensitive species. The cascade frog is present. This frog has been observed in Mud Creek and the river. The northern red-legged and foothill yellow-legged frog have not been found.

3. Have intensive or extensive inventories been conducted in adjoining drainages/sub-watersheds?

no.

a. If so, can those inventories be extrapolated to this watershed?

n/a.

4. Are endemic species known to occur in the general geographic region?

No.

5. Are exotic species known or suspected to be in the watershed? (e.g. bullfrogs)

very unlikely.Peregrine Falcon

1. Are any cliffs located within the watershed? (rock wall >50 feet)

no.

2. Are any cliffs present that are historic (pre-1975) or traditional (post-1975) peregrine eyries?

no.

3. For past projects near historic cliffs, have mitigation measures for habitat been considered?

Not applicable

a. At these historic cliffs, have surveys to protocol been accomplished for at least 2 years prior to the activities?

Not applicable

4. For traditional cliffs, have surveys/monitoring been conducted to determine nest site occupancy and reproductive status?

no.

b. Has a draft or final site mgt plan been created?

no.

5. Have the cliffs located been rated or monitored for falcon potential or presence?

Not applicable

6. If cliffs are un-rated, have surveys been accomplished to protocol?

Not applicable

7. Describe site habitat variables within a 3 mile radius of historic and traditional nest sites. (cliff parent material, distance to water/riparian, vegetative habitat, seral stages, human activities)

n/a

Gray Wolf

Not applicable. Species not in the State or province.

Grizzly Bear

Not applicable. Species not in the State or province.

Marbled Murrelet (Zone 1 & 2)

Not applicable. The watershed is beyond the Zone 2 boundary.

Appendix C - Glossary

Administratively Withdrawn - Allocated in LMP to land uses which exclude scheduled timber harvest, such as semi-primitive Recreation.

Aggradation - The upbuilding perfomed by a stream in order to establish or maintain uniformity of grade or slope.

Alluvial - Deposited by a stream or running water.

Amorphous - Lacking definite form; occurring in a mass as without stratification or structure.

Aquifer - An underground water bearing rock formation.

Barrens - Level or slightly rolling land, usually with a sandy soil and few trees, and relatively infertile.

Biomass harvest - Logging of small diameter trees, tops and other material not suitable for manufacture into boards. Material is normally chipped and used for power generation. Often used to remove suppressed small trees from immature forest stand.

Browse - Leaves and twigs of shrubs and small trees used as food source, primarily by deer and elk.

Bryophyte - True moss, peat moss or liverwort

Bull Trout - A fish in the trout family closely related to Dolly Varden, and more distantly related to eastern brook trout. Extinct in McCloud River drainage.

Commercial Thinning - Sale and harvest of some trees within a young forest stand in order to improve the growth and vigor of the remaining trees. Usually, smaller suppressed trees are removed. Material removed is used for sawlogs, pulp chips, or power generation.

Composite cone - (see Stratovolcano).

Debris flow - A moving mass of rock fragments, soil, and mud, more than half the particles being larger than sand size.

Decomission - The permanent closure of a road or trail.

Dendritic drainage pattern - An arrangement of surface drainage in which the streams branch randomly at almost any angle, resembling in plan the branching habit of trees. It indicates that the underlying rocks offer uniform resistance to erosion.

Developed Recreation - Use of established facilities such as campground with water and sanitation facilities, boat dock or ski area.

Dispersed Recreation - Use of undeveloped national forest land.

Disturbance - A discrete event, either natural or human induced, that causes a change in the existing condition of an ecological system.

Drainage density - Ration of the total length of all streams within a drainage basin to the area of that basin. It is a measure of the topographic texture of an area.

Ephemeral - As defined for this analysis: A channel that flows at least once every 10 years.

Ethnographic - A branch of anthropology dealing with the scientific description of individual cultures.

Evapotranspiration - The combined processes of transpiration and evaporation.

Fifth Order Watershed - The smallest definable stream channel and the land area contributing to its seasonal flow is a first order watershed. Two first order streams combine to form a second order stream draning a second-order watershed, and so on. In practice, a fifth-order watershed is a logical study watershed of 20,000 to 200,000 acres.

Fragmentation - Breaking up of continuous areas into progressively smaller patches of increasing degrees of isolation.

Geomorphology - The study of the classification, description, nature, origin, and development of landforms and their relationships to underlying structures, and the history of geologic changes as recorded by these surface features.

Gradient - The average downstream slope of a streambed, expressed in feet per mile or percentage of fall to horizontal distance.

Guzzler - A device to collect, store and distribute rainwater to wildlife.

Horsts and grabens - Alternating ridges (horsts) and valleys (grabens).

Intermittent - As defined for this analysis: A channel that sustains streamflow at least once every year.

LMP - Land And Resource Management Plan for the Shasta-Trinity National Forest. The planning document required by the National Forest Management Plan.

LSR - Late Successional Reserve, the Land Allocation in the President's Plan designed to maintain and develop mature and old-growth forest to provide habitat for the northern spotted owl and other species.

Lahars - A landslide or mudflow of pyroclastic material on the flank of a volcano, also the deposit produced.

Lava - Fluid rock that issues from a volcano or fissure, also the same material solidified by cooling.

MMBF - Million Board Feet. A board foot is 1" x 12" x 12".
MBF - Thousand Board Feet.

MLSA - Managed Late Successional Area, a land allocation in the California Cascades Province designed to provide habitat for a single pair of Northern Spotted Owls.

Mass wasting - A general term for the downslope movement of soil and rock material under the direct inluence of gravity.

Matrix - The land allocation on the Shasta National Forest that is available for scheduled timber harvest.

Modified Fuelbreak - A fuelbreak designed for specific objectives that deviate from agency standards.

Mycorrhizal - A symbiotic association of the mycelium of a fungus with the roots of certain plants, in which the hyphae form a closely woven mass around the rootlets or penetrate the cells of the root.

Mudflow - A general term for a mass-movement landform, and process characterized by a flowing mass of fine-grained earth material with a high degree of fluidity.

NFFL - Fuel models developed by the National Forest Fire Labratory

Peak flows - The highest level of streamflow in response to a rainstorm or period of snowmelt.

Perennial - A permanently flowing stream.

Permeability - The capacity of porous rock, sediment, or soil for tranmitting a fluid.

Pheromone - Sex Attractant or repellant chemicals emitted by insects. Synthetic pheromones are used in biological insect control.

Protozoa - The phylum comprising the protozoans (animals consisting of one cell or a colony of like or similar cells).

Pyroclastic - Pertaining to clastic rock material formed by volcanic explosion or aerial expulsion from a volcanic vent, also pertaining to rock texture of explosive origin.

Scree - A term commonly used in Great Britain as a loose equivalent of talus; it may also include any loose fragmental material lying on or mantling a slope.

Seral stage - A biological community viewed as a single developmental or transitional stage in an ecological succession.

Site - An index of the growth potential of a forest stand, based on published yield tables; can be expressed as roman numeral (I to VII), or as tree height at a given index age.

Stratovolcano - A volcano that is constructed of alternating layers of lava and pyroclastic deposits, along with abundant dikes and sills.

Turbidity - A measure of the amount suspended sediment in water.

Underburn - A prescribed fire burning in the understory, with flame lengths of 1-3 feet.

Vectors - An insect or other organism that transmits a pathogenic fungus, virus, bacterium, etc.

90th percentile weather - Average summer season weather expected to occur 90% of the time.

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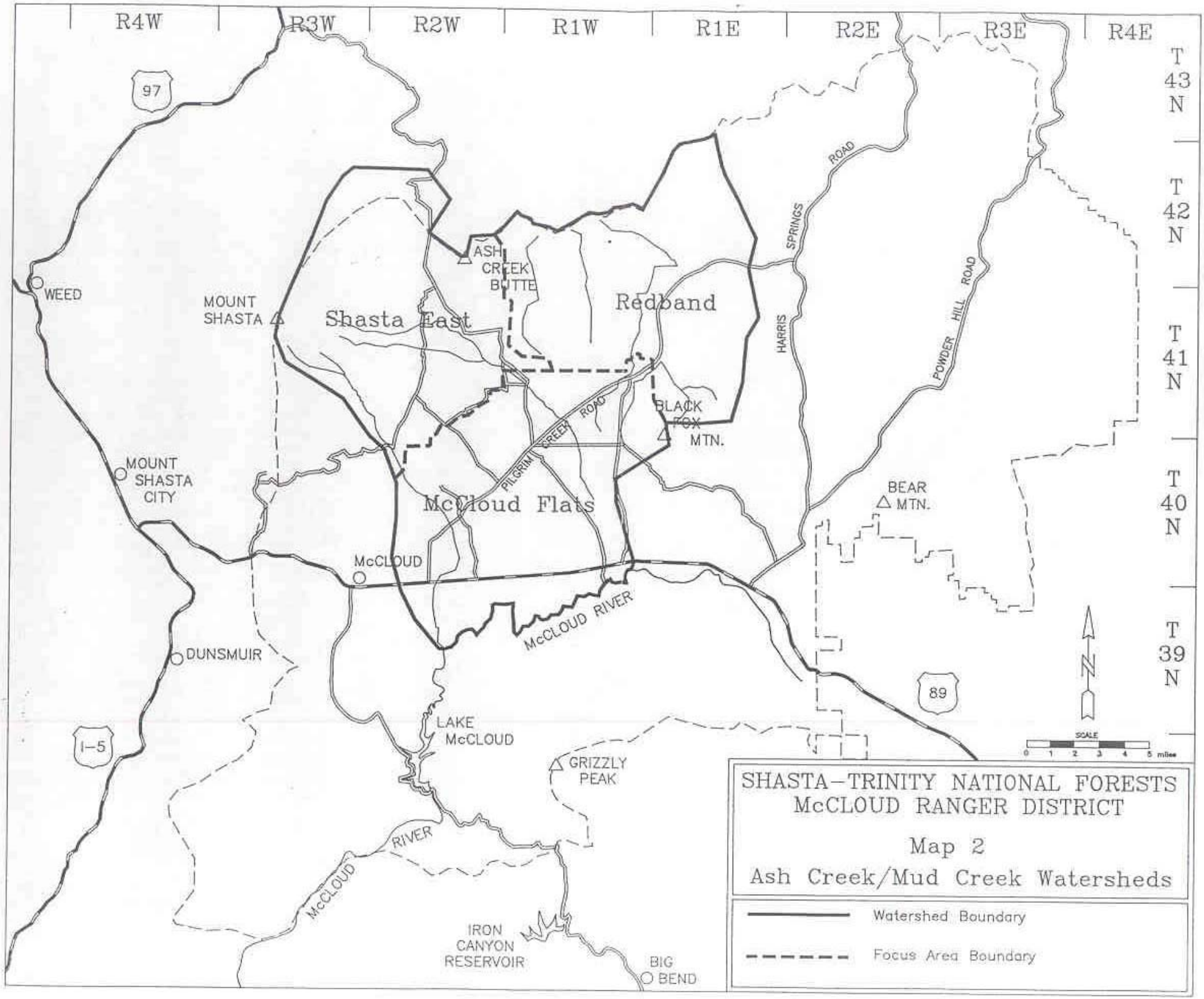
R4W
R3W
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R2E
R3E
R4E
T 43 N
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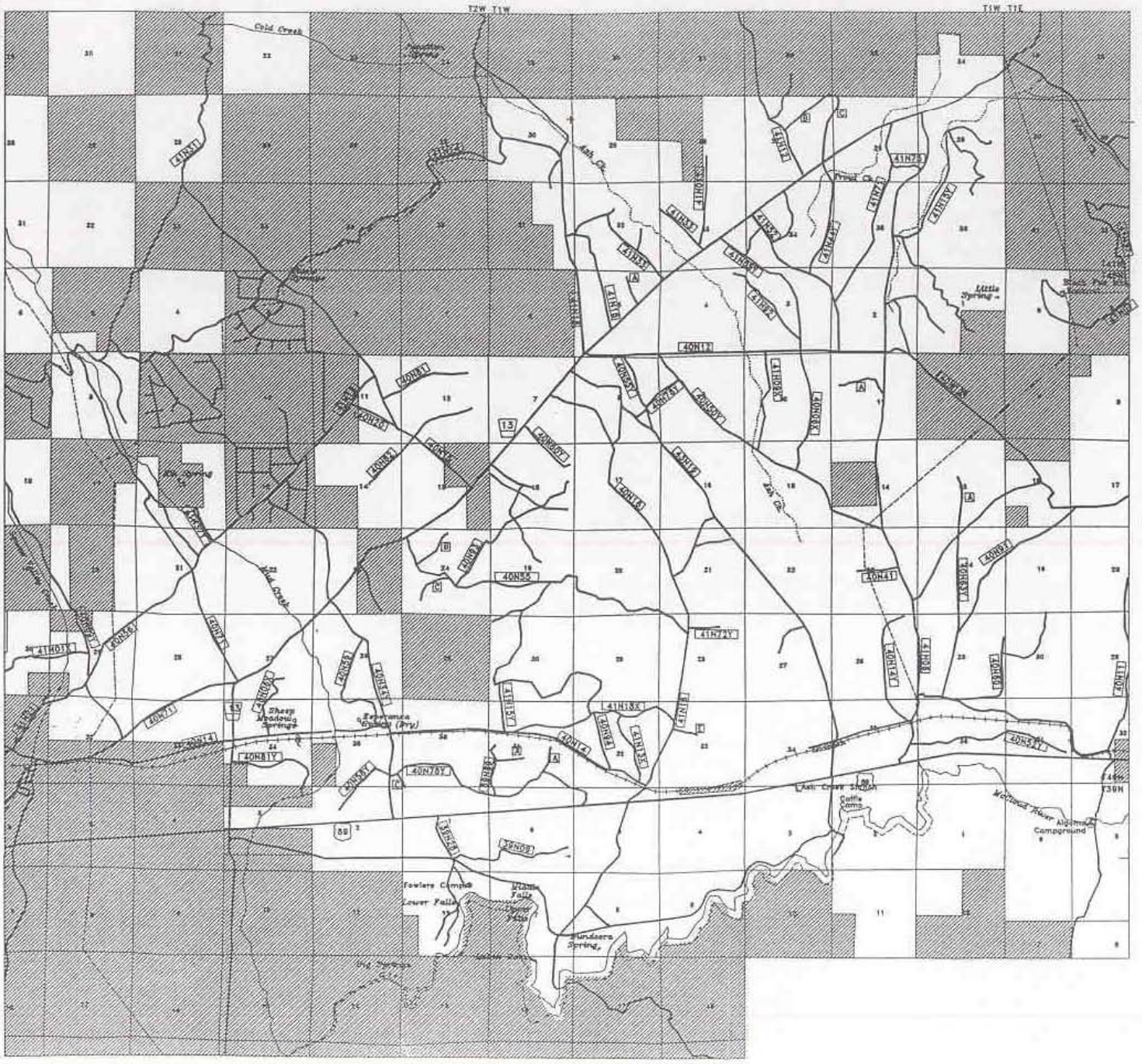
T 41 N
T 40 N
T 39 N
97
WEED
MOUNT SHASTA
Shasta East
ASH CREEK BUTTE
Redband
SPRINGS ROAD
HARRIS
POWDER HILL ROAD
PILGRIM CREEK ROAD
BLACK FOX MTN.
MOUNT SHASTA CITY
McCloud Flats
BEAR MTN.
McCLOUD
McCLOUD RIVER
DUNSMUIR
89
I-5
LAKE McCLOUD
GRIZZLY PEAK
McCLOUD RIVER
IRON CANYON RESERVOIR
BIG BEND
N
SCALE
0 1 2 3 4 5 miles
SHASTA-TRINITY NATIONAL FORESTS
McCLOUD RANGER DISTRICT
Map 2
Ash Creek/Mud Creek Watersheds
Watershed Boundary
Focus Area Boundary



McCloud Flats Focus Area Landscape and Watershed Analysis

Map 3, Base Map

SCALE
0 2640 5280
1" = 1320'
1" = 1 mile

N

Legend

- Landscape or Focus Area Boundary
- 22 Section number
- Private Ownership
- Perennial Stream
- Intermittent Stream
- 40N81 Existing Road With System Number (Incomplete, see larger scale map)

McCloud Flats Focus Area Landscape and Watershed Analysis

Map 4. Land Allocations, Management Prescriptions and Critical Habitat in Matrix

SCALE

Legend

Landscape or Focus Area Boundary

Late Successional Reserve

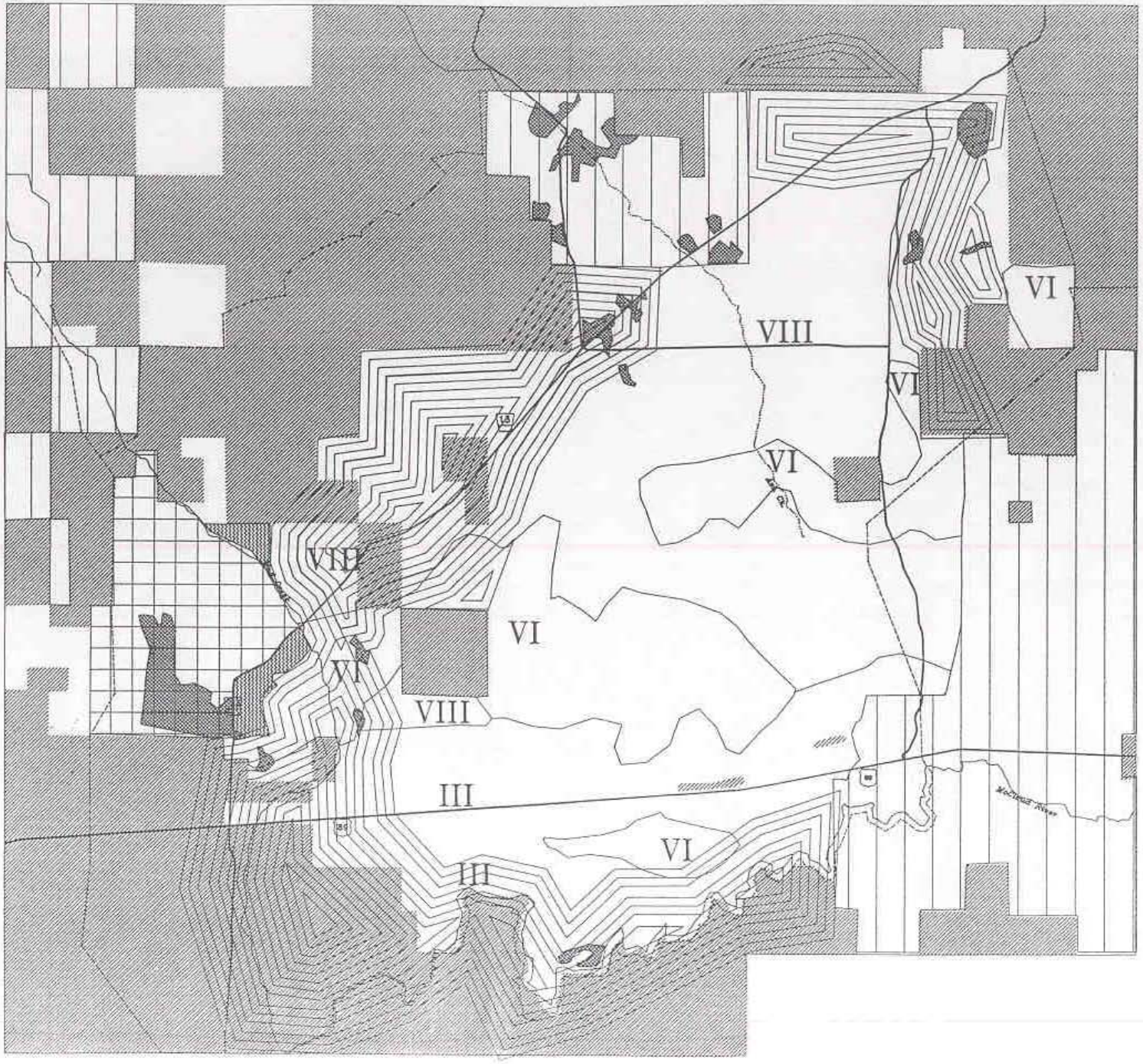
Managed Late Successional Area

Managed Late Successional Area and Research Natural Area

Critical Habitat in Matrix

Private Ownership

VIII Matrix Prescription from LMP



McCloud Flats Focus Area Landscape and Watershed Analysis

Map 5. Dispersal Corridors, Allocations, Prescriptions and Old Growth Fragments

SCALE

N

Legend

Landscape or Focus Area Boundary

Late Successional Reserve

Managed Late Successional Area

Managed Late Successional Area and Research Natural Area

Logical Dispersion Corridors

Private Ownership

VIII Matrix Prescription from LMP

Old Growth

McCloud Flats Focus Area Landscape and Watershed Analysis

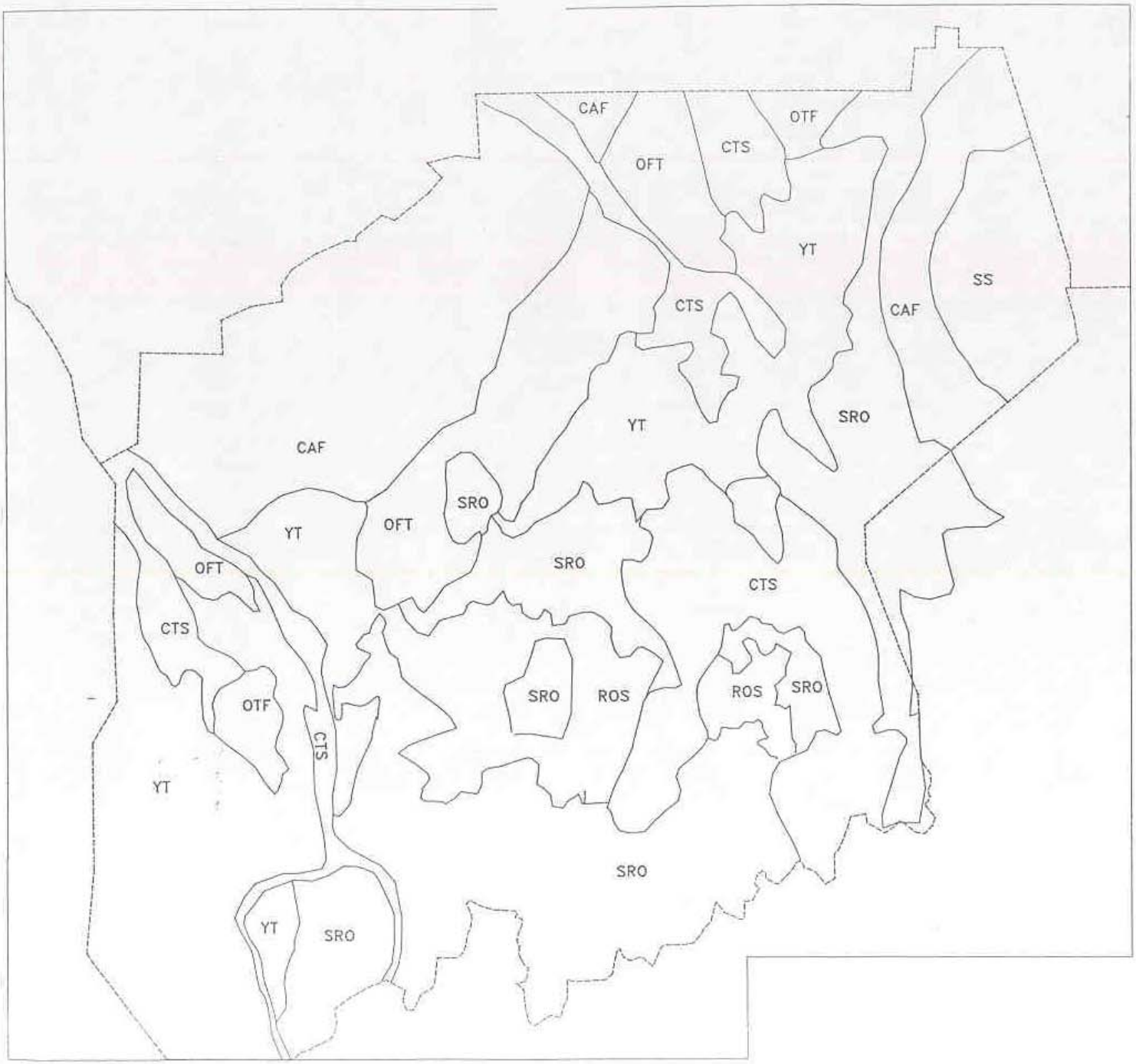
Map 6, Riparian Reserves

SCALE
0 2640 5280
1" = 1320'
2" = 1 Mile

N

Legend

- Landscape or Focus Area Boundary
- Perennial Stream With Riparian Reserve (On National Forest Land)
- Intermittent Stream With Riparian Reserve (On National Forest Land)
- Ephemeral Channel
- Extinct Channel
- Wet Meadow With Riparian Reserve
- Springs



McCloud Flats Focus Area
andscape and
Watershed Analysis

Map 7, Soil Types

SCALE
0 2640 5280
1" = 1320'
2" = 1 Mile

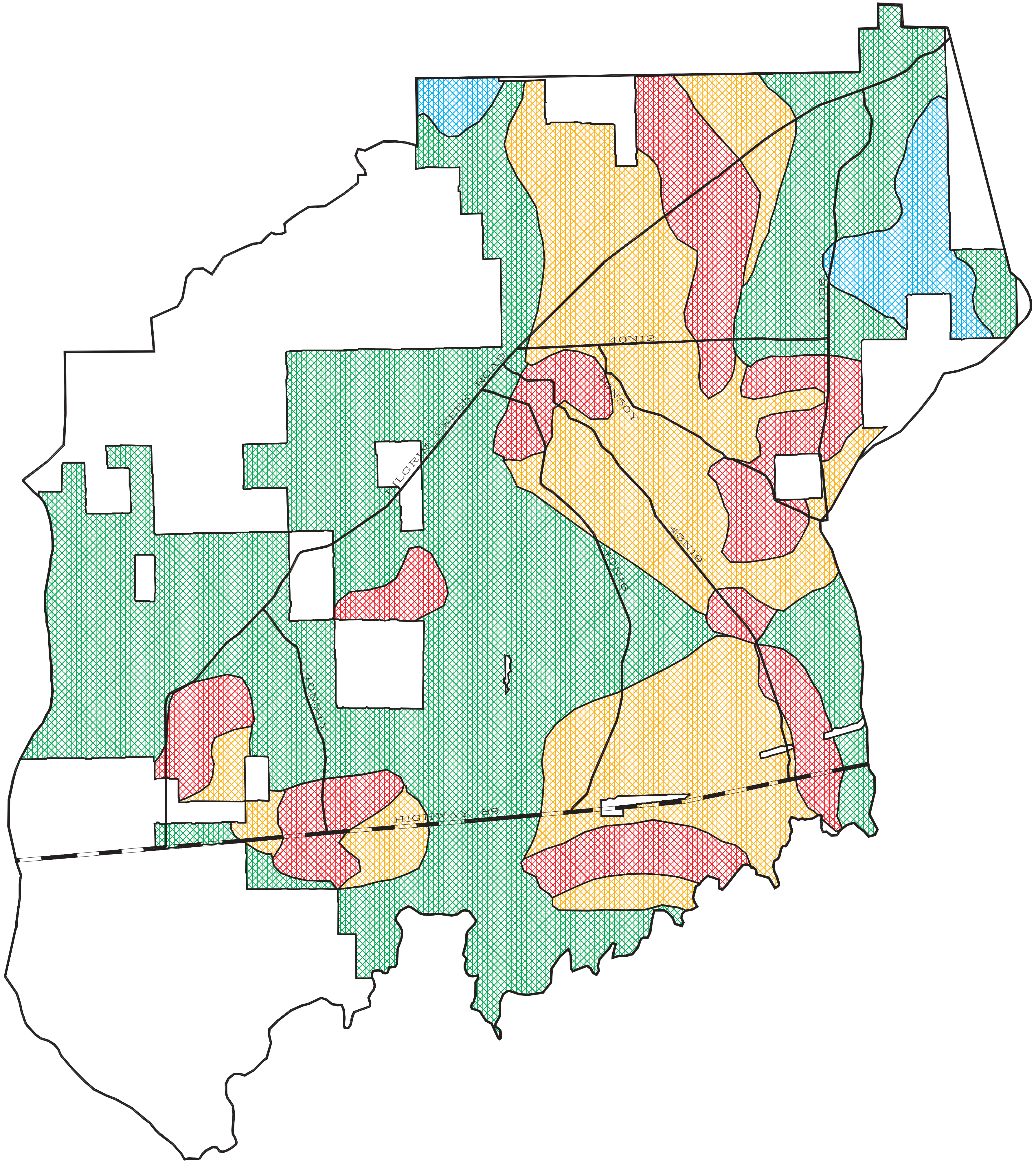
N

Legend

---------- Landscape or Focus Area Boundary

McCloud Flats Soil Types

CAF	Coalescent Alluvial Fans
OTF	Outwash Terraces and Fans
YT	Young Terraces
CTS	Coarse-Textured Sediments
SRO	Soil-Rock Outcrop Complex
ROS	Rock Outcrop-Soil Complex
SS	Side Slopes



McCloud Flats Focus Area Landscape and Watershed Analysis

Map 8, Fire Hazard/Risk Rating

SCALE: 1:80000
(0.8 inch = 1 mile)

N

Legend

HIGH/HIGH

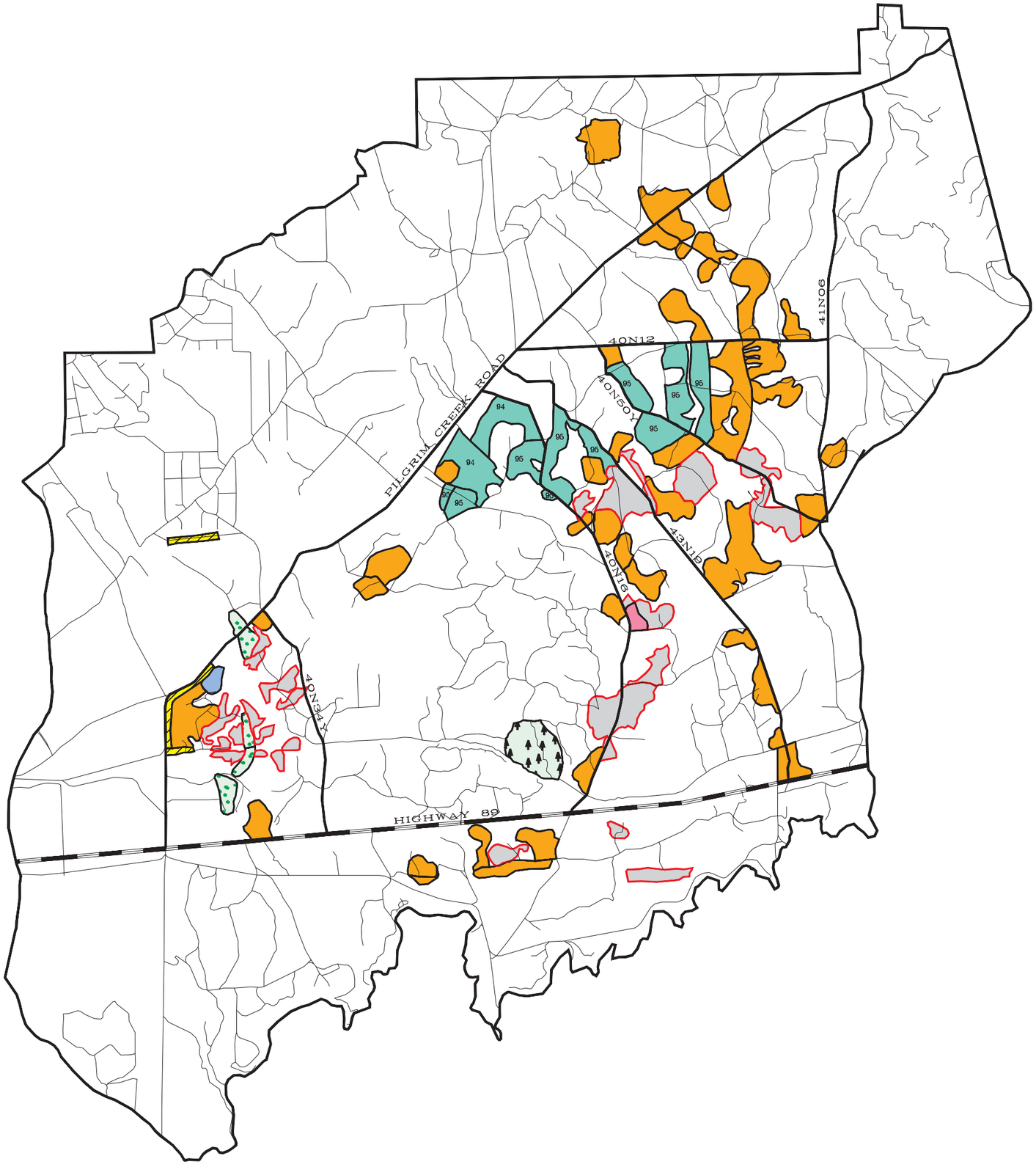
MODERATE/HIGH

MODERATE/MODERATE

LOW/LOW

McCloud Flats Focus Area Landscape and Watershed Analysis

Map 9, Fuels Opportunities



SCALE: 1:80000
(0.8 inch = 1 mile)

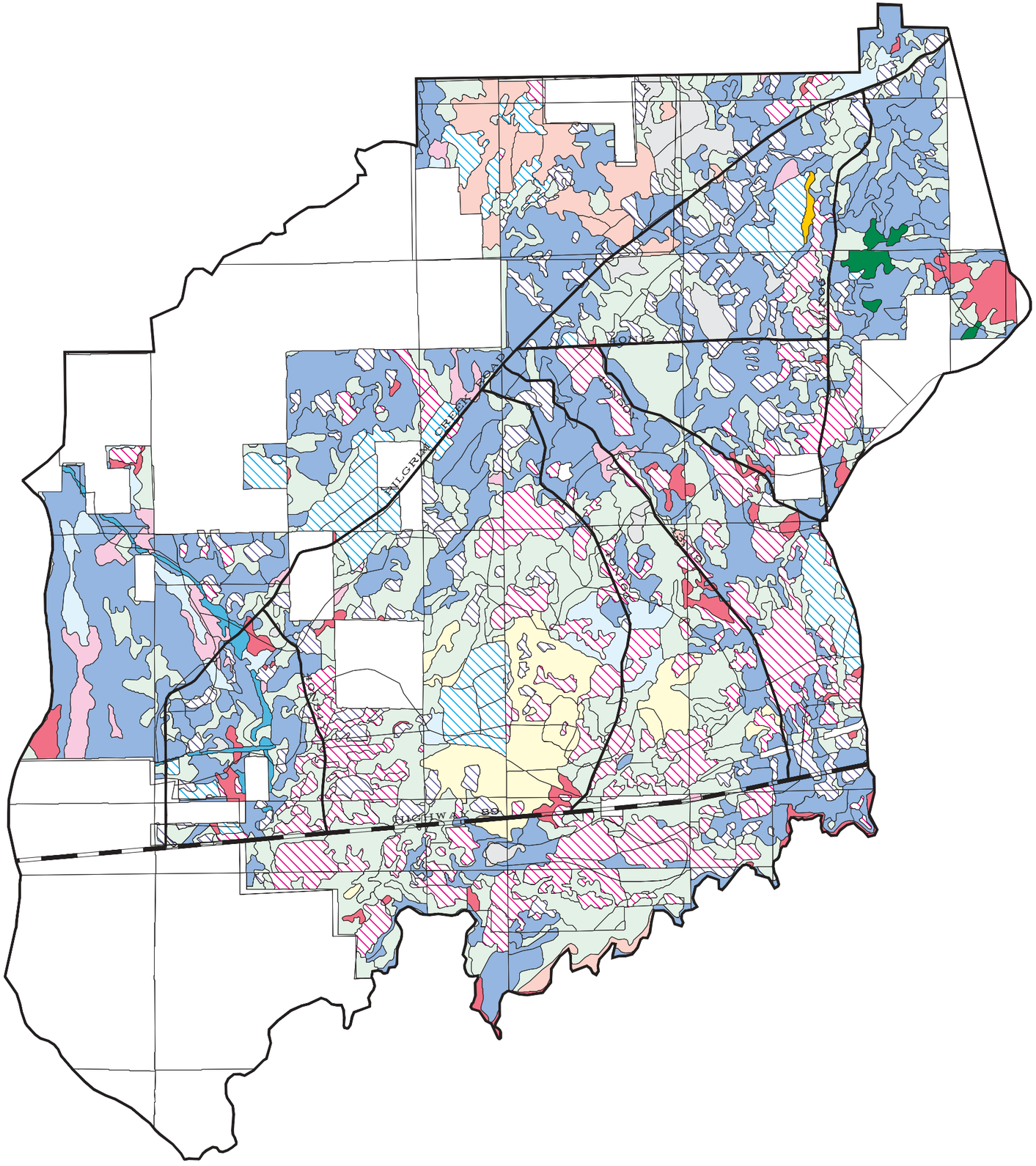
N

Legend

- Completed Underburn
- Proposed Underburn
- Knobcone Fuelwood Area
- Fuelbreaks
- Tractor Piling
- Meadow Restoration
- Aspen Restoration
- Bitterbrush Burning

McCloud Flats Focus Area Landscape and Watershed Analysis

Map 10, Existing Vegetation



SCALE: 1:80000
(0.8 inch = 1 mile)

N

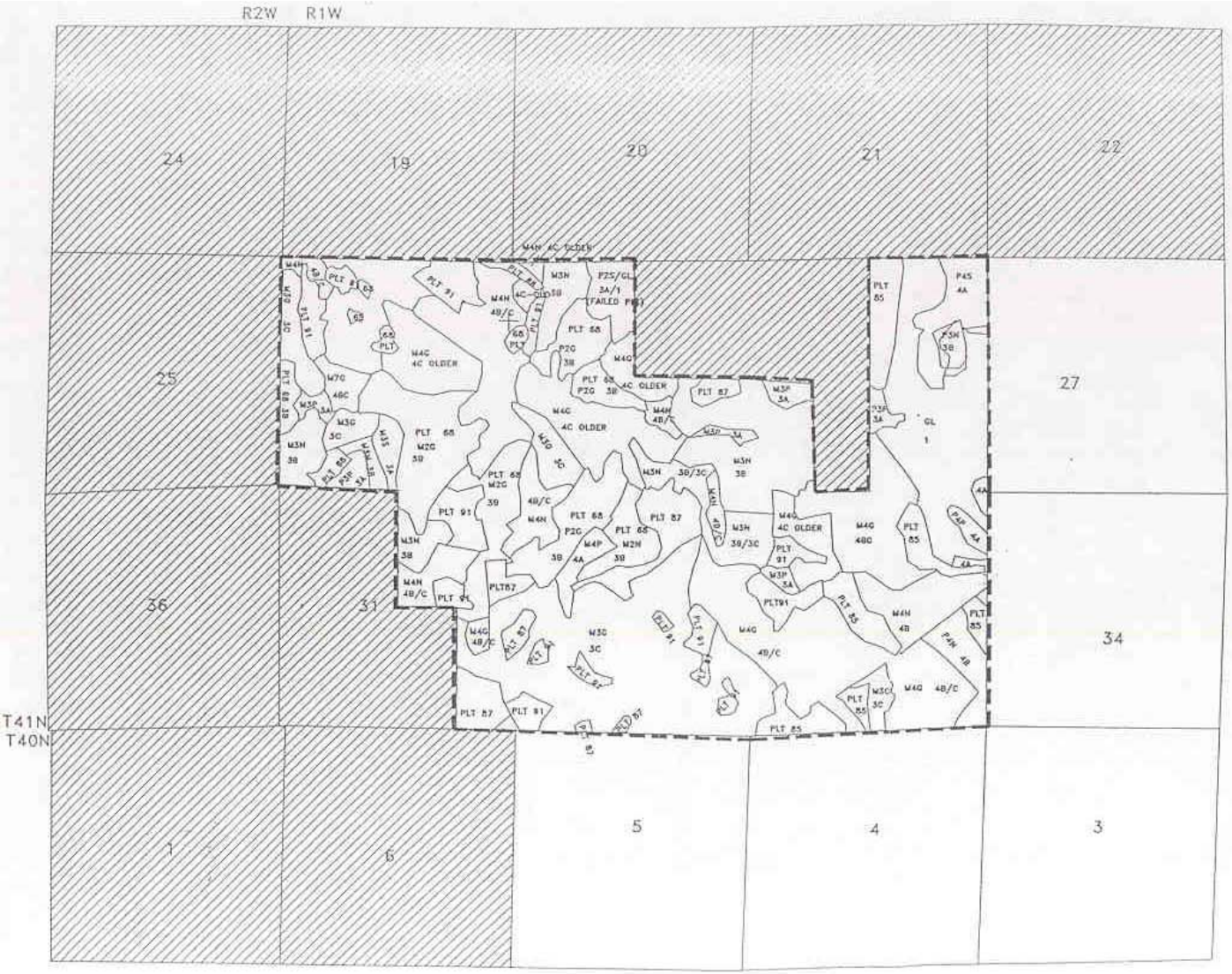
Legend

- Grass
- Hardwoods
- Knobcone Pine
- Lodgepole Pine
- M2G
- M2P
- M3G
- M3P
- M4G
- Non-forested
- Chaparral
- XX1
- XX2
- XX3

Map 11

Elk Flat Late Successional Reserve

Elk Flat Late Successional Reserve



Vegetation Types, WHR and Shasta–Trinity LMP Strata

McCloud Flats Focus Area
Landscape and
Watershed Analysis

Map 13, Size and Density Classes

SCALE: 1:80000
(0.8 inch = 1 mile)

Legend

- 4G
- 4N
- 3G
- 3N