Clikapudi Watershed Analysis

June 2000

Prepared for Ecosystem Recovery Efforts in the Lower Pit River 5th Order Watershed

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Preface

This Watershed Analysis is presented as 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 (ROD, 1994).

The Clikapudi Creek Watershed Analysis was prepared in order to develop an ecosystem recovery strategy for areas of the Clikapudi watershed that were burned during the Jones Fire in 1999 and unburned portions of the watershed that continue to be at risk to stand replacing fires. The Clikapudi Watershed Analysis was prepared because over half of the public lands in the watershed are within Riparian Reserves. A watershed analysis must be completed prior to conducting ground disturbing activities in Riparian Reserves.

The area analyzed in this analysis is within the Lower Pit River 5th Order Watershed. The watershed area was reduced for this analysis in order to limit the number of issues and to focus the analysis on the portion of watershed that was impacted by the Jones Fire. All tributaries in the Clikapudi Watershed analysis area are tributary to Shasta Lake.

This document follows the format provided in Part 2 of *Ecosystem Analysis at the Watershed Scale: Federal Guide for Watershed Analysis - Version 2.2* (August 1995). This format consists of six steps:

- Characterization of the watershed
- Identification of issues and key questions
- Description of current conditions
- Description of reference conditions
- Synthesis and interpretation of information
- Recommendations

Key analysis questions are developed for each issue. These questions are organized by analysis step to help focus the analysis and to provide organization to the document while addressing the issues.

Clikapudi Watershed Analysis

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Chapter 1

Characterization of the Watershed

The purpose of this chapter is to identify the dominant physical, biological, and human processes or features of the watershed that affect ecosystem functions or conditions. The relationship between these ecosystem elements and those occurring in the river basin or province is established. This chapter provides the watershed context for identifying elements that should be addressed in the analysis.

The topics covered in this chapter are:

- Location
- Watershed Setting
- Relationship to Larger Scale Settings
- Physical Features
- Biological Features
- Human Uses
- Land Allocations and Management Direction

1.1 Location

The Clikapudi Watershed is located south of Shasta Lake in the Whiskeytown-Shasta-Trinity National Recreation Area. The watershed is located about 10 miles northeast of Redding, California in Shasta County.

1.2 Watershed Setting

The Clikapudi Watershed drains an area of about 4076 acres, 3027 acres of which are National Forest. All tributaries within the watershed flow southward into Shasta Lake. Named streams within the watershed include Clikapudi Creek, Wildcat Canyon Creek, Blue Canyon Creek and Painter Creek. The Clikapudi Analysis Watershed includes three additional areas totaling 328 acres located south of the watershed. While not tributary to Shasta Lake these areas also contains public lands that were burned by the fire and were too small to be analyzed independently in a separate watershed analysis (Map 1 – Vicinity Map).

The northern boundary of the analysis area is the shoreline of Shasta Lake and the southern boundary of the watershed is Backbone Ridge (excepting the 328-acre additions). The eastern boundary of the analysis area runs down the ridge to the east of Blue Canyon Creek and the western boundary of the analysis area is located on a ridge west of Jones Valley Marina.

1.3 Relationship to Larger Scale Settings

The Clikapudi Watershed can be discussed within the context of its relationship to the Lower Pit River Watershed and the Pit River Basin.

Lower Pit River 5th Order Watershed

The Lower Pit River Watershed drains a total area of 65,620 acres. The Watershed includes the entire Pit River Arm of Shasta Lake extending downstream from Fender's Ferry Bridge and all of the drainages flowing into the Pit River Arm with the exception of the McCloud River and Squaw Creek. The Jones Fire burned approximately 2,100 acres (3%) of the Lower Pit River Watershed. The Clikapudi Watershed Analysis area comprises six percent of the Lower Pit River Watershed.

The climate of the Lower Pit River Watershed is typified by long hot, dry summers and mild, wet winters. The average annual rainfall in the watershed is between 45-55 inches.

The Clikapudi Creek area differs from the rest of the Lower Pit River Watershed in that it receives higher levels of human use due to its close proximity to Redding (see Human Uses – Ch. 3).

The Pit River Basin

The Pit River Basin drains an extensive area of roughly 4,952 square miles. Its headwaters are in the Warner Mountains east of Alturas. The Pit River flows to the southwest for approximately 110 miles to its terminus at Shasta Lake.

Climate in the Pit River Basin is characterized as dry with annual precipitation generally below 20 inches and averaging about 12 inches per year.

Vegetation in the river basin is typified by dry eastside pine forests and western juniper. Forest vegetation changes towards a more mixed conifer forest type in the western portion of the basin where annual precipitation is higher. Several broad valleys within the river basin are dominated by grasses and have mostly been converted to agricultural uses. Volcanic features such as lava flows are common and support only sparse brush.

Land use in the Pit River Basin is predominantly timber management and grazing. Recreational use is concentrated near Lassen National Park and around lakes and rivers. PG&E's Pit River Hydroelectric Project is located along the lower portions of the Pit River between Fall River Mills and Shasta Lake.

1.4 Physical Features

The Clikapudi Watershed is characterized by gentle to moderately sloped foothills that are dissected with numerous small drainages. The most prominent physical features in the watershed include Buck Point, Backbone Ridge and Clikapudi Creek. Elevations range from 1,065 feet at Shasta Lake to 1,679 feet on Buck Point.

Geology and Erosion Processes

The Jones fire area is located within the Pit formation of the Eastern Klamath geomorphic province. Shales, sandstones and volcanics are the predominant lithologies found within the area. When weathered these lithologies tend to form low, rounded hills. Colluviation of moderately erodible soils is the active mass wasting process in the fire area.

Hydrology – Stream Channels – Water Quality

The Clikapudi Watershed is dissected by a dense network of small drainages. The drainage density for the watershed analysis area is among the highest on the forest (approximately 8.6 miles of stream channel per square mile). There are no perennial streams in the watershed, however most of the larger intermittent streams flow consistently from December through April during years of normal or greater precipitation. Several small unmapped seeps located in the drainage bottoms provide perennial water sources for wildlife. Water quality during the rainy season is generally very good, however exceptions do occur as a result of wet weather vehicle use and during large winter storms.

1.5 Biological Features

Vegetation

Vegetation within the Clikapudi Watershed is diverse because the watershed is located in a transitional zone between valley and foothill vegetation types. Vegetation in the watershed consists primarily of mixed conifer and oak stands.

Species and Habitats

Large Ponderosa Pine trees used for nesting by Bald Eagles were lost in the Jones Fire. No plant species of concern are present in the watershed. None to small amounts of suitable habitat for S&M fungi is present in the watershed.

1.6 Human Uses

Developments within the watershed include the Upper and Lower Jones Valley Campgrounds, the Jones Valley boat ramp and associated hard-surfaced roads. Fishing and boating are popular recreation activities. The Backbone Ridge Road (34N02), Clikapudi Trail (3W30), and Clikapudi Road (33N15) receive high amounts of use from hunters, hikers, horses, mountain bikers and off-highway vehicles. The Jones Valley Road is a high-use travel route for recreational traffic going to Jones Valley Marina and boat ramps. Other roads in the watershed also receive moderate to high levels of use due to their close proximity to the Redding area. Approximately 150 acres in the Clikapudi drainage is being considered for nomination as a Prehistoric Archaeological District.

1.7 Land Allocations and Management Direction

Management direction for the Clikapudi Watershed is found in *the Shasta-Trinity National Forests Land and Resource Management Plan* (LMP) which incorporates direction from the *Record of Decision* (ROD) *for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl.*

Management direction for the Clikapudi Watershed is summarized in this section.

Land Allocation

The ROD identifies four land allocations within the Clikapudi Watershed analysis area:

- Riparian Reserves
  Riparian Reserves provide an area along streams, wetlands, ponds, lakes, and unstable and potentially unstable areas where riparian-dependent resources receive primary emphasis. Riparian Reserves are important to terrestrial ecosystems as well, serving, for example, as dispersal habitat for certain terrestrial species (ROD A-5).
- Administratively Withdrawn Areas
  Administratively Withdrawn Areas are identified in current Forest and District Plans or draft plan preferred alternatives and include recreation and visual areas, back country, and other areas where management emphasis precludes scheduled timber harvest (ROD A-4).
- Matrix
  The Matrix consists of those federal lands outside the three categories of designated areas listed above (ROD A-5). The Matrix are lands on which most timber harvest will occur and where standards and guidelines are in place to assure for appropriate conservation of ecosystems as well as provide habitat for rare and lesser known species (ROD B-10).

Management Prescriptions

The Shasta-Trinity National Forest Land Management Plan identifies four Management Prescriptions in the Clikapudi Watershed (see Map 2 – Management Prescriptions and Map 3 – Riparian Reserves). They are:

- II - Limited Roaded Motorized Recreation (LMP 4-46)
- III - Roaded Recreation (LMP 4-64)
- IX - Riparian Management (LMP 4-59) *
- XI - Heritage Resource Management (LMP 4-50) **

* mapped separately due to complexity. See Map 3 - Riparian Reserves.

** unmapped - occurs as minor inclusions within other prescriptions

Management Area

Supplemental management direction for specific units of land is provided in the LMP under Management Area Direction (LMP - Chapter 4 - Section G). The LMP identifies one Management Area in the Clikapudi Watershed. The area is Management Area #8 (Shasta Unit, LMP 4-111).

Table 1-1: Acreage summary by land allocation and management prescription within the Clikapudi Watershed. Except for Riparian Reserves, acres represent the area outside Riparian Reserves.

Land Allocation or Management Prescription	**Area**	
	Acres	**% USFS**
Riparian Reserves		
IX Riparian Reserves on NFS Lands	1572	52%
Administratively Withdrawn Areas		
II Limited Roaded Motorized Recreation	395	13%
XI Heritage Resource Management	*	*
Matrix		
III Roaded Recreation	1060	35%
Total - All National Forest Land	3027	74%
Total - All Private Land	1049	26%
Total – Watershed Area	4076	100%

* The Heritage Resource Management prescription occurs as minor unmapped inclusions within other prescriptions. Actual acreage in the watershed is small and is not displayed in this table. The amount of land in Prescription XI will increase significantly if the Clikapudi Valley is designated as a National Historic District as proposed.

Chapter 2

Issues and Key Questions

2.1 Background

The purpose of this chapter is to focus the analysis on the key elements of the ecosystem that are most relevant to the management questions and objectives, human values, or resource conditions in the watershed. Watershed concerns are identified and framed within the context of issues. Watershed issues and key questions were developed by the Jones Fire Recovery Interdisciplinary Team.

Part 2 of *Ecosystem Analysis at the Watershed Scale, Federal Guide for Watershed Analysis, Version 2.2* (August 1995) lists seven core topics that should be addressed in all watershed analyses. The core topics and core questions that accompany each topic address the basic ecological conditions, processes, and interactions (elements) at work in the watershed.

Watershed Core Topics

1. Human Uses
2. Vegetation
3. Species and Habitats
4. Erosion Processes
5. Hydrology
6. Stream Channels
7. Water Quality

Issues focus the analysis on the main management questions to be addressed. Issues are those resource problems, concerns, or other factors upon which the analysis will be focused. Some of the issues for this analysis were developed from a fire recovery assessment of the Jones Fire area on public lands (January 2000). Other issues were developed from public input in response to scoping or were identified by the fire recovery team during the analysis process. Issues for the Clikapudi Watershed are listed below. Issues will be discussed within the context of the core topics in chapters 3, 4 and 5.

Watershed Issues (applicable core topics are in parentheses)

- Vegetation Management for Public Safety, Fuels Reduction, Plant/Animal Habitat Diversity and Protection of Archaeological Sites (1, 2, 3, 6)
- Fire Protection along Urban Interface (1, 2)
- Riparian Reserve Management (1, 2, 3, 4, 5, 6, 7)

2.2 Issue: Vegetation Management for Public Safety, Fuels Reduction, Plant/Animal Habitat Diversity and Protection of Archaeological Sites.

The Jones Fire consumed approximately 2,100 acres of vegetation on public lands in the Clikapudi Watershed. Fuel loads are increasing in conifer stands that burned at high and moderate intensities. The chances of another catastrophic fire occurring in the watershed are high. The severity of future fires will likely increase over time as standing dead conifers fall down and accumulate on the ground. Fuel loads remain high in decadent brush stands that burned at low intensities and unburned areas adjacent to the fire perimeter. The fire has also created a potential shortage of replacement nesting and roosting trees within Bald Eagle habitat adjoining Shasta Lake. Public safety near roads, trails and recreational facilities has been placed at risk due to the abundance of standing dead hazard trees located in and around high use areas. Archeological sites located in the Clikapudi Valley could be impacted by fire recovery activities.

Key Questions:

- What actions can be taken to provide for public safety at recreational facilities and along roads and trails?
- What types of vegetation treatments are needed to enhance wildlife habitat diversity and reduce fuels concentration in both burned and unburned portions of the analysis area?
- What is the desired future condition for vegetation in the analysis area?
- What vegetation management activities are acceptable and appropriate near archaeological sites, and within the area being proposed for designation as a Prehistoric Archaeological District?

2.3 Issue: Fire Protection along Urban Interface

The urban interface adjacent to the community of Jones Valley continues to be at risk to catastrophic fires. The Jones Fire began on public lands in the Clikapudi Creek drainage. Propelled by strong winds the fire burned over the top of Backbone Ridge and proceeded to burn 26,200 acres; 24,080 of which were in private ownership. There is a concern that fuel loads in the watershed are still high enough to pose a threat to private property adjoining the watershed.

Vegetation along Backbone Ridge was mostly burned at high or moderate intensities. Fuel loadings are expected to increase along Backbone Ridge in conifer stands that burned at high and moderate intensities. An existing fuel break east of the fire area on Backbone Ridge is in need of maintenance due to growth of vegetation. Fire exclusion in areas that did not burn in 1999 has resulted in the accumulation of dead and down fuels on the forest floor and promoted the development of understory vegetation. The understory vegetation has created live fuel ladders that extend into the forest canopy.

Key Question:

- What actions can be taken to protect the urban interface and reduce the hazard associated with fires on Backbone Ridge?

2.4 Issue: Riparian Reserve Management

The drainage density of intermittent and ephemeral stream courses in the Clikapudi Watershed is very high. Riparian Reserves occupy 1572 acres (52 percent) of public lands in the watershed. Approximately 1000 acres of riparian reserves burned in the Jones Fire. In order to address fuels, wildlife, hydrology, water quality, and stream channel resource concerns it will be necessary to implement some restoration treatments in riparian reserves.

Riparian reserves are in a degraded condition due to problems associated with the road system in the Clikapudi Watershed. Problems include sedimentation from roads and trails, gully formation from concentrated road runoff, and stream bank erosion at numerous low water fords on roads and trails.

Key Questions:

- What vegetation treatments are appropriate for Riparian Reserves.
- What is the desired future condition of Riparian Reserves.
- What actions can be taken to stormproof the road system in the Clikapudi Watershed and reduce impacts to water quality and stream channels?

Chapter 3

Current Conditions

3.1 Human Uses

The Clikapudi Watershed experiences a large amount of human use due to its close proximity to the Redding area and Shasta Lake. Human use in the watershed is generally concentrated around Shasta Lake and on the Clikapudi Trail. The Clikapudi trail receives approximately 1,500 Recreation Visitor Days (RVD's) annually, which includes hikers, mountain bikers, fishermen and equestrian users.

Recreation facilities in the watershed are operated under several types of special use permits administered by the Forest Service. Facilities under special use permit include the Jones Valley Marina, Jones Valley boat ramps, Upper and Lower Jones Valley Campgrounds and a dispersed camping area in the Jones Valley inlet. The Jones Valley Marina and boat ramps receive approximately 75,000 RVD's annually. The Upper and Lower Jones Valley Campgrounds receive 10,000 RVD's annually. Both campgrounds were rebuilt and modernized in 1999. Dispersed camping is also permitted in the Jones Valley inlet during low water periods from April 1st to October 31st.

There are no recreational residences under FS permit in the watershed. Some private residences are located on Backbone Ridge on private lands.

The transportation system in the watershed totals approximately 13.5 miles (private and National Forest). Over five miles of this system is hard-surfaced road associated with campgrounds, boat ramps, trailheads, and other developments in the Jones Valley area, but much of it is low standard native surface road in the Backbone Ridge and Clikapudi areas. Non-system, user-created OHV roads are prevalent in the Clikapudi Creek drainage. For example, the Clikapudi Road (33N15) is inventoried as 0.3 miles long but it is possible to drive another mile of non-system road connected to it in the valley. This additional mile of non-system road provides access to the lower Clikapudi Valley and the ignition point of the Jones Fire. The current road density is approximately 2.1 miles of road per square mile of land. Jones Valley road provides access to Jones Valley boat ramp, campgrounds and trail system. The Clikapudi Trail (3W30) is 9.3 miles long and 8 miles of the trail are within the Clikapudi Watershed.

The Clikapudi Watershed experiences some resource problems related to the types and amount of human activity in the watershed. Forest Service Law Enforcement is present along paved roads however there is very little Forest Service presence on the Backbone Ridge Road or on the Clikapudi Trail. Illegal human activities such as off-highway vehicle use, woodcutting and trash dumping are common in the Clikapudi Valley. The use of firearms is also a common activity in the watershed. Firearm use is legal provided that firearms are not discharged towards or within 100 feet of trails, roads and facilities. Sanitation problems associated with human waste is also a problem along the Clikapudi Trail and in coves adjacent to Shasta Lake.

The visual quality of the Clikapudi Watershed was affected by the Jones Fire. Approximately 400 acres of the front country (foreground) as viewed from Shasta Lake burned. An additional 500 acres of midslope also burned in the fire. Hazard trees, once felled, will increase visual quality problems along roads and the Clikapudi Trail.

The Jones Fire has had an unknown impact on the integrity of archaeological sites located in close proximity to Clikapudi Creek. Fences protecting the sites were vandalized and in a state of disrepair prior to the fire occurring. Sites were also being affected by OHV use. OHV use in the Clikapudi Valley increased after a gate on the Clikapudi Road (33N15) was vandalized in the late 1990's. In addition to the fire the sites may also be affected by felling of trees that pose a safety hazard to users of the Clikapudi Trail.

The Clikapudi Valley is currently being considered for nomination as a Prehistoric Archaeological District. The nomination process began in 1982 and was resumed in 1999. The current proposed district includes 13 sites along a 1.25 mile length of Clikapudi Creek. The proposed boundary for the district is delineated in a rectangular formation 1.25 miles in length and approximately 500 feet in width on either side of Clikapudi Creek. The total area for the proposed district is 150 acres. The size and configuration for the proposed district are still negotiable.

3.2 Vegetation

Vegetation of the Clikapudi Watershed

The Clikapudi Watershed represents a transition zone between valley vegetation types and foothill vegetation types. This transition zone results in an interesting mix of vegetation and a great deal of floristic diversity. Six species of oak can be found in this watershed. Dominant conifer species include ponderosa pine, gray pine and knobcone pine. Douglas fir and an occasional sugar pine can be found on north slopes and along creeks. Large pines are scattered throughout the area with an understory of oaks and shrubs. Due to fire suppression, approximately 300 acres of decadent knobcone stands occur in the watershed. Major shrub species include manzanita, Lemon ceanothus, deer brush and poison oak. Some areas also have populations of Klamath plum and oso berry. Acreages of generalized vegetation types in the Clikapudi Watershed are listed in Table 3-1 according to the intensity they were burned at during the Jones Fire. Vegetation types for the watershed are shown on Map 4.

The dominant age classes of conifers and oaks are early mature (30-60 years old to mid mature (60-120 years old) with most being 50-80 years old. There are scattered late seral ponderosa pines throughout the area. Many of these pines were killed or damaged in the Jones Fire during 1999.

No plant species of concern are known to occur within the watershed. Habitat for Survey & Manage plant species is minimal to none.

Vegetation Type	Acres burned at High Intensity	Acres burned at Moderate Intensity	Acres burned at Low Intensity	Acres Unburned
Ponderosa Pine	77	8	498	409
Ponderosa Pine and Gray Pine	24	82	168	172
Ponderosa Pine and Douglas Fir	27	9	20	9
Ponderosa Pine and Knobcone Pine	20	96	22	80
Knobcone Pine	58	78	163	0
Grey Pine	89	50	38	0
Black Oak	37	6	84	15
Canyon Live Oak	0	0	0	8
Chaparral	40	34	262	169
Total Acres	372	363	1255	862

Table 3-1: Acres of vegetation type listed according to burn intensity in the Clikapudi Watershed.

Ethnobotanicals

There are many species of plants in the Clikapudi Watershed that were, and may still be used by many people for many things. Some of the uses for native plants in the watershed included consumption as food and the use of plants for making tools, medicines, soaps, and building materials. Many of the exotic species currently found in the watershed were brought by immigrants to be used as medicines. The Native Americans used soap plant for making brushes, soap and stunning fish. Deer brush flowers were also used as soap. Lomatiums and rose hips were used as a food source. Acorns of all types were a stable food source. Manzanita and gum weed were used as cures for poison oak. The examples listed above represent a small sample of native plant uses.

St. Johns wort (Klamath weed), Dandelions, bedstraw, sheep sorrel and curly dock are just some of the exotic species that were introduced by immigrants and used as medicines. The list of usable plants in the watershed is quite extensive.

Noxious and/or exotic plants

There are many noxious weeds in the watershed. Yellow star thistle (*Centaurea solstitialis)* is at the top of the list in the forbs category. This plant is an aggressive colonizer, but only a fair competitor. It needs disturbed, open soil to spread. If the spread of yellow star thistle is not controlled the weed will eventually take over all of the meadows and open areas in the Clikapudi Creek area. There are several tools that may be used tools that can be used to control yellow star thistle. They are prescribed fire, mowing, grazing, disking, herbicides and irrigation. However, the use of these tools has to occur at the proper stage in the plants development. If any one of these tools is used at the wrong time, it will only increase the population by removing competition and creating openings.

Other examples of exotic forbs in the area are bedstraw (*Galium aparine)*, field hedge parsley (*Torilis arevensis)*, fiddleneck (*Amsinkia sp.*), dandelions (*Taraxacum officinale*), St. John's wort (*Hypericum perforatum*), and filaree (*Erodium sp.*).

Nearly all of the grasses throughout the watershed are exotic species introduced by European settlers. Many years of over grazing and over burning have resulted in native perennial grasses being replaced by European annual grasses. Annual grasses mature early in the spring during April and May. By the end of June they are dead. Dead grass matter becomes a high fire hazard. Some examples of exotic, annual grasses found in the found in the watershed include cheat grass (*Bromus tectorum*), Ripgut brome (*Bromus dianddrus*), red brome (*Bromus amdritensis ssp. Rubens*), wild oat grass (*Avena barbata*) and assorted foxtails (*Hordeum sp.).* All of these grasses have long, sharp awns that can cause injury to animals.

Sensitive Plants

There are no known populations of sensitive plants in the Clikapudi Watershed.

Fuels

Every watershed analysis has a catalyst that triggers the need for a WA. In this case the trigger was the Jones Fire. The fire began in the early morning hours of October 16th, 1999 near the confluence of Clikapudi and Wildcat Canyon Creeks in the center of the Clikapudi Watershed. The fire burned from Shasta Lake to the south, eventually consuming 26,200 acres. The Jones Fire was classified as a "high-energy, wind driven fire"; its effects were catastrophic.

Generally speaking, fuel loads in the Clikapudi Watershed fall within a range of 5-10 tons per acre. Over the next 5-10 years the tons per acre should double to 10-20 tons per acre. Pockets of trees killed by the Jones Fire have begun to topple and have become jackstrawed over the landscape. This is expected to continue over the next 10 years. The fuel hazard will increase over the next 10 years as older, unburned Knobcone stands gradually die off (knobcone pine is a short-lived early successional fire dependent species). Many of the unburned knobcone pine stands in the watershed have culminated and are in the 60-70 year old range.

Currently mixed conifer, and oak seedlings (mainly knobcone seedlings), brush, grass, and forbs are sprouting over the burn area. Cured grasses and herbaceous fuels have colonized much of the burn areas. Herbaceous and grassy fuels will serve as the primary fire carrier over the next several years. Over the next 3-5 years vegetation in the burn area will compete vigorously for sunlight and water. Chaparral recovery in the burned areas will be rapid and may reduce growth rates of young knobcone seedlings and affect seedling survival. The rapid recovery of chaparral will prolong the time required for the landscape to recover to a forested condition. If fuels in the watershed are left untreated chaparral will dominate the burn area for decades. Occasional trees will be interspersed throughout the chaparral. Over the next two years the chaparral will cover more of the ground and increase in height. In 10-20 years chaparral canopy is expected to cover 60-100% of the ground.

Fuel loadings in the watershed vary by vegetation type and burn intensity. Much of the unburned area in the watershed is vegetated by decadent brush fields that are totally devoid of trees. Some burned areas have no horizontal (surface) fuel component other than occasional patches of duff and litter. Other areas contain flashy fuels consisting of grass and light layers of needle and leaf litter. Many of the areas burned by the Jones Fire are being vegetated by brush that currently lacks the fine fuel and the dead component necessary for fire spread. The vertical (standing material) component consists mainly of completely scorched trees, dead burned brush, and areas of unburned or lightly burned patches and mosaics of brush and conifers and hardwoods.

Fire Return Intervals

Fire history data dating from 1905 to present indicates that only one large fire, known as the Bear Fire, occurred in the vicinity of the Clikapudi Watershed over this 95-year period. The Bear fire occurred in 1990 and burned a total area of 1600 acres to the east of the analysis area. The bulk of the area burned by the fire was on lands managed by the California Division of Forestry (1280 acres) and the remaining portion on USFS lands (320 acres). In the past one hundred years no large fires have occurred in the Clikapudi Watershed. The absence of fire over this period can be attributed to effective fire suppression. As a result of fire suppression approximately five fire return intervals have been excluded from the watershed (i.e. the watershed should have burned approximately 5 times over the past 95 years). The fire hazard in the watershed is very high as a result of the exclusion of fire during this 95-year period. The high fire intensities that occurred during the Jones Fire were due in part to the accumulation of fuels and absence of fire over the past century. The risk of future high severity or catastrophic fires will remain high if fire return intervals are not shortened.

Fire Occurrence – Risk

The term “risk” refers to the rate of fire occurrence within a given area in a given period of time, or the number of ignitions that are expected to occur. The average fire occurrence rate in the area of the Jones Fire on National Forest Lands over the last 20 years has been 3 fires per year. In the past twenty years 92% of all the fire starts in the Jones Valley area were human caused and the other 8% were lightning caused. Most of the fires started by humans can be attributed to arson, campfires and smoking.

The rate of human caused ignitions is partially dependent on the effectiveness of the fire prevention program, but in general it can be expected to vary directly with the number of forest users. During the past 20 years 100% of fires reported in the Jones Fire area have been held to 10 acres or less. Since this particular area is a high recreation use area the rate of fire starts is expected to remain at 3-5 per year. The risk of another fire occurring, similar in character to the Jones Fire, is high.

Fire Behavior – Hazard

The term “hazard” refers to the behavior of a fire, or the rate at which a fire is expected to spread, and the intensity level at which a fire is expected to burn. The Jones fire area consists of approximately

2100 acres (see Map 5). The fire area includes several smaller fires adjacent to Shasta Lake that actually occurred in the summer of 1999 prior to the Jones Fire. Of the total acres within the burn area 389 burned at high intensity, 388 at moderate intensity, and 1332 at low intensity (Map 5). These figures differ from previous reports that only considered acres within the Jones Fire area and not the additional fire acreages addressed in this analysis.

The majority of Riparian Reserves in the Jones Fire were impacted by high and moderate intensity fire. The fire burned 175 acres of Riparian Reserve at high intensity, 225 acres of Riparian Reserve at moderate intensity, and approximately 600 acres of Riparian Reserve at a low intensity. Vegetation in upland ephemeral drainages and along Clikapudi and Wildcat Creeks was completely consumed in many areas. Ground fuels were reduced in some low intensity burn areas, however fuel loads increased in other low intensity burn areas due to partial die-off of vegetation.

Fire Suppression

Suppression responsibility for the Jones Fire and the Jones Valley area rests with the California Department of Forestry. Additional response comes from the US Forest Service in Lakehead and the Volunteer Fire Department in Mountain Gate. The California Department of Forestry also has suppression responsibility to the south of the forest boundary line. Approximately 150 acres of urban interface including the community of Jones Valley is adjacent to the watershed.

3.3 Species and Habitats

Current Conditions

The Clikapudi Watershed is home to many species of wildlife associated with low elevation ponderosa pine, gray pine, knobcone pine, oak woodland forests and chaparral habitats. Species found within the watershed include black-tailed deer, black bear, mountain lion, Western gray squirrel, wild turkey, California quail, brush rabbit, mourning dove and band-tailed pigeon.

The Jones Fire burned approximately 2100 acres of habitat used by the species listed above. Decadent chaparral habitat has been burned, creating acres of new growth of palatable grasses, forbs and young stump-sprouts of black and live oak. Cover/forage ratios have been improved due to the fire and subsequent treatments, facilitating wildlife movement across the landscape. Wildlife species associated with early seral habitats will eventually benefit from the fire while species that depend upon large woody debris and mast (acorns) will be negatively affected.

Approximately 1000 acres of riparian habitat were burned at various intensities during the Jones Fire. Low and moderate intensity fires may have improved the forage value of riparian habitat. The amount of cover and the large wood habitat component were negatively impacted in areas that burned at high intensities.

Except for the bald eagle, this fire event did not affect TES species and their habitat. Approximately 80 acres of the Reno/Panther Canyon nest territory, including the most recent nest tree, burned at moderate to high intensity. An additional 500 acres of bald eagle roosting habitat adjoining Shasta Lake was also affected by low, moderate and high intensity fire. Although Valley Elderberry Longhorn Beetle (*Endangered*) habitat may have been affected, no known greater that one-inch diameter elderberry bushes are known to occur in this watershed or have been located within burned areas.

Survey and Manage Species

There is no limestone present within the Clikapudi watershed. As a result, Shasta salamander would not be expected to occur.

Proposed project areas in the Clikapudi Watershed were surveyed for terrestrial species of S&M mollusks during the spring of 2000. Two species of S&M snails are present within the surveyed areas of this watershed: Monadenia Churchii (MOCH) and Trilobopsis Roperii (TRRO). The MOCH was found to be relatively widespread in the Ponderosa pine and oak woodland habitats and was less common in the knobcone stands. This species was often found in cavities in the base of black oaks. The TRRO was only found in 2 locations near riparian areas. Of the 940 snails found during the survey, only 1 was found alive. All of the other shells found were within the fire perimeter and had been charred by the burn. No habitat for aquatic S&M mollusk species is known to occur within the watershed.

Fisheries

There are approximately 3.6 miles fish bearing streams and 21.3 miles of non-fish bearing streams within the watershed. Fish bearing reaches are located Clikapudi and Wildcat Canyon Creeks. Both of these stream channels are intermittent and only provide fish habitat during the rainy season. To date there have been no confirmed sightings of fish in either of these creeks. The lower reaches of Blue Canyon and Painter Creeks may also contain seasonal fish habitat (needs to verified).

The Jones Fire impacted seasonal fish habitat in Clikapudi Creek. The fire consumed large woody debris in the creek that resulted in the release of stored sediment. The release of stored sediments increased turbidity, negatively affecting water quality in the stream and Clikapudi inlet of Shasta Lake.

3.4 Erosion Processes

Geology and Geomorphology

The geology of the area encompassed by the Jones Fire is located within the Pit Formation of the Eastern Klamath Mountain geomorphic province. In this area the Pit formation overlies the Dekkas andesite to the west (contradictory to relations seen in other locales that suggest structural concordance between the Dekkas andesite and the Bully Hill rhyolite and between the Bully Hill rhyolite and the Pit formation).

Within the fire area the Pit formation consists of shale, mudstone, and siltstone sediments and weathered volcanic/pyroclastic rocks. Shale and mudstone form beds that range from a fraction of an inch to about 2 feet in thickness; individual beds are separated by planes of parting, or by slight color differences. Siltstone, which is much less abundant than shale and mudstone, forms beds as much as 6 feet thick. These beds have been folded to form low-lying, dissected hills with slopes averaging about 30-35%.

Colluviation is the mass wasting process that predominates in this area, but occasional ancient and dormant rotational-translational landslides are also in evidence along lithologic contacts.

The transportation system has resulted in higher amounts of erosion in some areas of the watershed. The Backbone Ridge road is not maintained on a regular basis. Runoff concentrating on the road has eroded portions of the road prism and created gullies on the hillslopes below the road. Off-highway vehicle use on user-created trails also promotes erosion.

Soils

According to the Soil Survey of Shasta-Trinity Forest Area, California (RI) there are eight soil map units in the Clikapudi Watershed.

1. Deep soils with a seedling survival rate of moderate to high, and erosion potential of moderate.
    a. 98 - Holland family, 40-60 percent slopes
    b. 105 - Holland-Holland family, deep complex, 40-60 percent slopes
    c. 182 - Marpa-Holland, deep families complex, 20-40 percent slopes
    d. 183 - Marpa-Holland, deep families complex, 40-60 percent slopes

2. Moderately deep to deep soils with a seedling survival rate of low to moderate, and erosion potential of moderate.
    a. 178 - Marpa-Goulding families association, 20-40 percent slope
    b. 203 - Neuns family, 40-60 percent slopes, (75%) Inclusions (25%)

3. Shallow, coarse soils with a seedling survival potential of very low to low, and erosion potential of moderate.
    a. 80 - Goulding family, 40-60 percent slopes
    b. 195 - Millsholm family, 20-60 percent slopes

The deep soils cover 1,326 acres or 48% of the watershed. The moderately deep to deep soils cover 406 acres or 15% of the watershed, and the shallow, coarse soils cover 1,028 acres or 37% of the watershed.

Of the soil types in the burn area 470 acres have a low potential for soil erodibility; 700 acres have a moderate potential for soil erodibility and 950 acres have a high potential for soil erodibility. The Jones Fire created approximately 850 acres of hydrophobic soils in areas that burned at high intensities.

Recent erosional evidence since the fire is manifested as soil pedestaling and minor sheet wash. Straw-bale check dams constructed in intermittent channels and hillslope mulching in high intensity burn areas have trapped sediments and reduced erosion in the burn area.

3.5 Hydrology, Stream Channels Water Quality

Hydrology

Hydrologic features found within the Clikapudi Watershed include intermittent and ephemeral streams, small seeps and Shasta Lake. The watershed contains approximately 16 miles of intermittent streams and 38 miles of ephemeral streams. Intermittent streams differ from ephemeral streams in that they flow for several months a year while ephemeral streams only flow during precipitation events. During the winter of 1999-2000 stream flow was observed in very small channels located in close proximity to ridgetops from December through March. The larger intermittent streams such as Clikapudi Creek generally flow from November through May in years of normal precipitation.

Stream Channels

Stream channels in the Clikapudi Watershed are composed of upland swales, small colluvial channels and larger valley bottom intermittent channels. Upland colluvial channels have active channel widths ranging from 1-5 feet and are generally stable. Exceptions occur near Backbone Ridge where runoff from the Backbone Ridge Road has resulted in the creation of gullies in some areas. Some deposition of fine sediments was observed to have occurred in the upland channel network following the Jones Fire. Log and rock grade stabilizers constructed in the channels after the fire were moderately effective in trapping fire generated sediments. Vegetation located within and adjacent to the upland channels was burned at the same intensities as vegetation on the surrounding hillslopes.

The upland channel network drains into several larger intermittent channels that carry runoff to Shasta Lake. These channels include Clikapudi, Wildcat, Painter and Blue Canyon Creeks. Active channel widths for the larger intermittent channels range between 3-25 feet. Channel stability for the larger intermittent streams is generally good, however some reaches of Clikapudi Creek and its tributaries have been impacted by both system and non-system roads. No culverts or constructed crossings occur on the road system located in the Clikapudi Valley. Streambank erosion and vegetation loss has occurred at numerous low water fords associated with system and non-system roads. In one location along Clikapudi Creek, the channel appears to have been ditched in order to prevent runoff from occurring on the valley bottom road system. Vegetation located within the valley intermittent channel Riparian Reserves was burned at similar intensities as the surrounding uplands.

Water Quality

Water quality in the Clikapudi Watershed is believed to be very good. Water quality problems within the stream channel network are limited to periods of winter runoff and most commonly associated with small increases in turbidity due to wet weather vehicle use and winter storms. An increase in stream channel turbidity was noted following the Jones Fire, however this increase was limited to the first series of storms that occurred in December and January. Field observations indicate that watershed turbidity appeared to diminish gradually over the winter. A discussion of water quality for Shasta Lake is beyond the scope of this analysis. Refer to the NRA Management Guide and the McCloud Arm Watershed Analysis for more information on water quality for Shasta Lake.

Riparian Reserves

Riparian Reserves in the Clikapudi Watershed are associated with intermittent stream channels and reservoir shoreline. The majority of the Riparian Reserve acreage in the watershed consists of intermittent stream channels. The drainage density for stream channels in the watershed is 8.6 mi/mi^2. Due to the high drainage density Riparian Reserves occupy 52 percent of the watershed area. Riparian Reserves in the Clikapudi Watershed were heavily impacted by high and moderate intensity burns. Approximately 600, 225 and 175 acres of riparian reserves burned at low, moderate and high intensities, respectively.

Vegetation in upland ephemeral drainages and along Clikapudi and Wildcat Canyon Creeks was completely consumed in many areas. Clikapudi and Wildcat Canyon Creeks are both intermittent with stream flow occurring from November through July in years of normal precipitation. Concerns with hillslope erosion, water quality impacts and increased runoff in the Jones Fire Analysis area were addressed by burn area emergency rehabilitation projects that included hillslope strip mulching and the construction of channel grade stabilization structures.

Chapter 4

Reference Conditions

4.1 Historic Overview

The Clikapudi Watershed has an extensive history of prehistoric use by Native Americans. Archaeological excavations indicate that the watershed was being used by Native Americans as early as 4,000 years before present. Native American inhabitants included the Yana and, much later, the Wintu. Evidence of prehistoric dwelling and campsites from these Native Americans is present along Clikapudi Creek. More extensive information on Native American uses in the Clikapudi Watershed can be found in the National Register of Historic Places Registration Form for the Clikapudi Prehistoric Archaeological district (2000, on file Shasta Lake District).

The Clikapudi drainage is somewhat unique in that it has relatively little evidence of historic disturbance. The section of land containing the Clikapudi Valley, along with most other odd-numbered sections in the area, was deeded in the late 1890's to the Central Pacific Railroad. The railroad is believed to have leased lands in the watershed for grazing (most likely sheep). Old fence lines spanning the north and south ridges provide evidence of past grazing activity in the valley. There is no record of any historic Euro-American residential use of the valley, however recent archeological surveys have found at least one potential homestead site. A rock well is the single historic feature other than a dirt jeep trail, probably post-dating 1945, which crossed through the lower part of the drainage to access Shasta Lake.[1]

Public lands in the Clikapudi Creek Watershed were acquired by the Federal government in the late 1930's in anticipation of the construction of Shasta Dam. The Backbone Ridge Road (34N02) was built in the late 1930's by the Civilian Conservation Corps. Grazing in the Clikapudi Valley is believed to have ended with the completion of Shasta Dam. The construction and filling of Shasta Lake cut off land access to the valley from the Pit River and altered patterns of human uses in the valley. Recreation development in the watershed began following the completion of Shasta Lake. Most of the recreation facilities including the Jones Valley Marina/boat ramps and campgrounds were developed and improved upon from 1950 to present. The Jones Valley boat ramp was constructed in 1974. The probable date for construction of the Clikapudi Trail is 1976. Visitor use in the watershed has increased steadily over the past 5 decades due to Shasta Lake and surrounding population growth. References conditions and the changes that occurred in the watershed with the advent of European settlement are summarized in Table 4-1.

[1] Taken directly from Clikapudi Prehistoric Archaeological District Application for National Register of Historic Places, 2000.

Core Topic	Pre-1850	1850-Present
Human Uses	Native American use is prevalent in watershed. Regular burning of watershed is common. Hunting and fishing for subsistence is common.	Decline in burning and natural wildfires due to fire suppression. Development of road systems in watershed. Overall human activity remains low. Increases in recreation use with creation of Shasta Lake and trail systems. Degradation of riparian areas and archeological site in the 1970's result in road closures and fencing of archeological sites.
Vegetation	Vegetation is believed to have consisted largely of open oak woodlands with scattered gray, ponderosa, sugar and knobcone pines. Patches of shrubs and understory shrubs occurred throughout the watershed. Pockets of Douglas fir would have existed in riparian areas and north slopes. Undergrowth such as shrubs and regenerating tree species would have been held in check by frequent fires, and perennial, native grasses that would have been abundant in upland and riparian meadows. Perennial grasses were adapted to fire. The grasses also had extensive root systems that controlled erosion.	Fire suppression leads to a build-up in vegetation. Type conversions from open to denser stands of shrubs, hardwoods and conifers occur in the watershed. Grazing introduces non-native plants to the watershed that replace many of the native grasses. Jones Fire burns 2,120 acres of watershed in 1999.
Species and Habitats	Species characteristic of open oak woodlands with scattered ponderosa pine were present. Species that were found in the watershed included deer, bear, lion, band-tailed pigeons, dove, squirrel, etc. Early seral habitats were abundant and large pine nest and perch trees for eagles and other raptors were common. Bald eagles may have nested along the five major drainage systems tributary to Shasta Lake.	Fire suppression results in reduced amounts of quality early seral habitats. Vegetation density prevents some wildlife movement across the landscape and full utilization of forage. Early seral habitat quality and quantity is reduced. Cover is more abundant. Impacts to species and habitats increase after 1850 with increased human recreation and increased road densities. Bald eagle habitat is increased with creation of Shasta Lake.
Erosion Processes	Erosion processes similar to current conditions.	Possible decrease in erosion due to lack of wildfires. Increase in erosion following Jones Fire.
Hydrology	No known information on hydrologic processes. Base and peak flows were probably similar to condition observed post-Jones Fire.	All stream channels below 1,065 feet in elevation are inundated by Shasta Lake.
Stream Channels	No known information on stream channel conditions. Clikapudi Creek and some tributaries may have been affected by Native American use and settlements.	Lower reaches of Clikapudi and other streams replaced by Shasta Lake. Stream bank erosion associated with road system.
Water Quality	No known information on water quality. Water quality was most likely good during periods of winter flow. Water quality was occasionally impaired due to erosion during winter floods and following wildfires and fires set by Native Americans.	Creation of Shasta Lake creates new water quality concerns associated with sedimentation of reservoir and shoreline erosion. Water quality remains good in streams due to low levels of human use.

Table 4-1: Reference conditions for core topics.

Chapter 5

Synthesis and Interpretation

The purpose of this chapter is to compare existing and reference conditions of specific ecosystem elements and to explain significant differences, similarities, or trends and their causes. The interaction of physical, biological, and social processes is identified. The capability of the system to achieve key management plan objectives is also evaluated.

This chapter addresses the issues and core topics listed in Chapter 2. Issues are addressed in two formats. In the first format the key questions developed for each issue in Chapter 2 are addressed in the form of a narrative summary. Influences and relationships between human uses and natural processes are discussed within the context of each issue. Key questions are answered where possible and data gaps and information needs are identified.

The issues addressed in this chapter are:

Vegetation Management for Public Safety, Fuels Reduction, Plant/Animal Habitat Diversity and Protection of Archaeological Sites.
Fire Protection Along Urban Interface
Riparian Reserve Management

The second format discusses each issue within the context of the core topics. Additional topics that are not related to the issues are also addressed here if they are deemed to be important for guiding future management direction for the watershed, or will result in a recommendation. Conversely, some topics addressed in Chapters 3 and 4 are not addressed in Chapter 5 because they are not related to the issues and are not currently important for the development of recommendations. Applicable core questions from the *Federal Guide for Watershed Analysis* are restated at the beginning of each section and are used to guide the analysis.

Core topics addressed in this chapter are:

Human Uses
Vegetation
Species and Habitats
Erosion Processes
Hydrology, Stream Channels, Water Quality

5.1 Vegetation Management for Public Safety, Fuels Reduction, Plant/Animal Habitat Diversity and Protection of Archaeological Sites

Key Questions:

- What is the desired future condition for vegetation in the analysis area?
- What actions can be taken to provide for public safety at recreational facilities and along roads and trails? How can these actions be mitigated to address other resource concerns?
- What types of vegetation treatments are needed to enhance wildlife habitat diversity and reduce fuels concentration in both burned and unburned portions of the analysis area?
- What vegetation management activities are acceptable and appropriate near archaeological sites, and within the area being proposed for designation as a Prehistoric Archaeological District?

Vegetation management in the Clikapudi Watershed is a complex issue due to several high profile resource concerns. Strategies for vegetation management must consider public safety, fire hazard and risk reduction, protection of significant archaeological sites and maintenance and enhancement of visual quality around Shasta Lake and the Clikapudi Trail. Vegetation management also needs to be conducted in such a way that plant and animal habitat diversity is maintained. The desired future condition for vegetation must incorporate all of the above resource concerns.

The DFC for vegetation is one of a more open under and overstory for all vegetation types. Early seral components for all vegetation types are found throughout the watershed. Early seral vegetation is maintained by prescribed fire. Late and mid seral vegetation is present for all types of vegetation in lesser quantities than early seral vegetation. Older stands of knobcone pine are more open and contain larger trees due to reduction of competition by prescribed fire. Prescribed fire is used to reduce competition and control fuel loads within mid and late seral knobcone stands. Large ponderosa pines are sparsely distributed on productive soils and around the perimeter of Shasta Lake. Fuel loads are low around large ponderosa pine located adjacent to Shasta Lake. Snag densities run approximately 2 snags greater than 16-inch DBH per acre. Riparian reserves contain mid to late seral conifers and oaks but are also relatively open and burned regularly. Natural openings in the Clikapudi Valley and on old landslide deposits are maintained by the use of prescribed fire. Stand understories are composed of a mosaic of grasses and early to mid-seral shrub species. Grasses are more common in the understory than prior to the Jones Fire.

There is a need to implement hazard tree reduction activities along roads, campgrounds and the Clikapudi Trail. All hazard trees should be felled as soon as possible. Excessive fuel loading caused by the felling of hazard trees should be addressed by a combination of the following treatments: Salvage felled hazard trees where condition permit (adjacent to existing roads or within planned treatment units), hand pile and burn/chip excessive slash and debris adjacent to the Clikapudi Trail. Used prescribed fire to treat addition concentrations of hazard trees that are not treated by salvage or hand treatments.

Early seral wildlife habitats would benefit from more frequent fire return intervals characteristic of the pre-suppression era. Protection of potential eagle nest trees and stands of existing Ponderosa Pine could be accomplished with low-intensity burning and some mechanical manipulation to remove fuel from the bases of selected large diameter pines. In addition to maintaining early seral habitats, prescribed fire and mechanical manipulation of vegetation could also be used to maintain small areas of mid and late seral habitats.

The desired future condition for vegetation within the proposed Prehistoric Archaeological District is nearly identical to the DFC for vegetation in the surrounding landscape. Vegetation within the proposed district should be managed to mimic reference conditions for vegetation prior to European influence. More specifically, vegetation within the valley should consist of a mosaic of open oak woodlands and meadows interspersed with relatively open conifer forests. Ground disturbing activities are not appropriate for Prescription 11 lands, however prescribed fire may be used to move the valley toward, and eventually maintain, the DFC described above.

5.2 Fire Protection Along Urban Interface

Key Question:

- What actions can be taken to protect the urban interface and reduce the hazard associated with fires on Backbone Ridge?

Due to its proximity to Shasta Lake and the Redding area, the Clikapudi Watershed is a high-risk area for human caused fires. The risk of human caused fire starts in the watershed will always be present, however several actions could reduce this risk considerably. A constructed and maintained fuel break on Backbone Ridge would reduce the risk of fire moving out of the drainage into the urban interface to the south. In order for the fuelbreak to be effective it must be constructed on both private and public lands along the ridgetop. At present no easement or maintenance agreement exists on the Backbone Ridge Road (34N02). Only about 2 of the 6 miles of this road within the project area are on National Forest land. The rest the road traverses multiple private ownerships.

Fuels treatments are also needed in the valleys and mid-slopes to the north of Backbone Ridge in order for the fuel break to be effective. Re-closure of the Clikapudi Road (33N15) and closure of other non-system roads and user created OHV trails will reduce the risk of future fire starts in the watershed.

The Jones Fire was classified as a "high-energy, wind driven fire." It is unlikely that, even with extensive fuels reduction, that any vegetation treatments would have been able to prevent the spread of the Jones Fire. The potential fuels and vegetation treatments discussed within this analysis will make conditions safer for firefighters by reducing fire hazard and will limit the fire severity and damage to forested areas, however the treatments will not be able to prevent the spread of a fire burning under similar weather conditions as the Jones Fire.

5.3 Riparian Reserve Management

Key Questions:

- What vegetation treatments are appropriate for Riparian Reserves.
- What is the desired future condition of Riparian Reserves.
- What actions can be taken to stormproof the road system in the Clikapudi Watershed and reduce impacts to water quality and stream channels?

Riparian Reserves in the Clikapudi Watershed have vegetation treatment needs that are similar to that of upland burned and unburned areas. Because the Jones Fire occurred in late-fall during a prolonged dry spell, vegetation in Riparian Reserves burned at similar intensities to upland areas. Both burned and unburned Riparian Reserves would benefit from fuels treatments designed to reduce the build-up of dead and down material and reduce dense understory vegetation. Vegetation management activities that could be used to treat Riparian Reserves include prescribed burning, hand piling and burning, chipping of felled hazard trees and limbs, thinning, and biomassing of smaller materials. These treatments could occur in Riparian Reserves provided that the proper mitigation measures were taken to minimize ground disturbance. Mitigation measures would include equipment exclusion zones around stream channels on steep slopes exceeding 30 percent and around intermittent streams in the Clikapudi valley bottom.

Vegetation treatments in Riparian Reserves should only be undertaken if they are needed to obtain the Desired Future Condition for Riparian Reserves. The DFC for Riparian Reserves varies according to channel location. The DFC for Riparian Reserves in the Clikapudi Watershed is generally described as follows:

Upland - ephemeral and intermittent channels: Riparian Reserves contain a mosaic of vegetation types, ages, densities and size classes that benefit a wide variety of plant and animal species. The density and distribution of conifers and hardwoods in Riparian Reserves is similar to upland areas except immediately adjacent to the stream channel (within ~20 feet of channel). Within 50 feet of the channels stand densities will be more variable and consist mostly of open areas to denser pockets of oaks and conifers. Conifers within Riparian Reserves are generally larger and more abundant than conifers on midslopes and ridgetops. Fuel loadings are similar to upland areas. Roads are generally not present within Riparian Reserves. Prescribed burns occur by allowing fires started in upland areas to burn down the slope into Riparian Reserves. Fuels concentrations are low around pockets of larger conifers. Stream channels are stable and stream canopy cover is moderate to high (70-90%).

Valley bottom – intermittent stream channels: Riparian Reserves contain a mosaic of vegetation types, ages, densities and size classes that benefit a wide variety of plant and animal species. Along the stream corridor, vegetation composition alternates between forested and open areas. Forested areas are relatively open and fuels concentrations are low. Open areas are vegetated by grasses and sparsely distributed hardwoods. Prescribed fire is used to control fuel loads and the distribution of early seral vegetation. Riparian Reserves contain trails but are mostly unroaded. Stream channels are stable and canopy cover varies greatly from approximately 80-90 percent in forested areas to less than 50 percent in open areas.

Riparian Reserves in the Clikapudi Watershed would benefit from road and OHV trail restoration activities. The density of user-created OHV trails should be reduced in order to limit conflicts with Riparian Reserve protection, heritage resource protection as well as the risk of future fire starts. Stream crossings should be stormproofed to limit bank erosion and winter water quality problems. System roads, primarily the Backbone Ridge Road (34N02), need to be maintained and/or reconstructed to fix problems with road surface erosion and hillslope gullying.

Management of Riparian Reserves is guided by the Aquatic Conservation Strategy. A summary of the Jones Fire effects on Aquatic Conservation Strategy objectives is presented below in Table 5-1.

Aquatic Conservation Strategy Objectives	Effects of Jones Fire
1. Maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features to ensure protection of the aquatic systems to which species, populations and communities are uniquely adapted.	The Jones Fire aided in the restoration of distribution, diversity and complexity of landscape-scale features by burning the vegetation in Riparian Reserves in a mosaic of high, moderate and low intensities. The fire will enable the re-establishment of an early seral vegetation component to upland swales located within Riparian Reserves.
2. Maintain and restore spatial and temporal connectivity within and between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia. These network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species.	The Jones fire aided in the restoration of spatial connectivity between adjacent watersheds and within the Clikapudi Watershed by burning dense pockets of vegetation and brush thickets, thereby opening up the understory and improving wildlife access.
3. Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations.	The physical integrity of the aquatic system was impacted by the Jones Fire. The loss of some large wood in the channel led to some temporary instability of the channel bed. Removal of vegetation resulted in small amounts of hillslope gullying and surface erosion that, in turn increased sedimentation in stream channels. Check-dams placed in the channels to prevent channel downcutting and trap sediments from burned areas also affected channel integrity.
4. Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individual composing aquatic and riparian communities.	The Jones Fire had short term negative impacts to water quality which only lasted through the first winter. Water quality impacts were in the form of increased turbidity and sediment movement/deposition within stream channels.
5. Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.	The Jones Fire had mixed effects on the sediment regime for the watershed. The fire is believed to have resulted in a pulse of sediments (during the first winter storms) much larger than what would occur naturally. However, much of this sediment had been held in place by vegetation that should have burned at decadal intervals. With the exception of the first few storms, the Jones Fire may have actually brought erosion processes closer to the natural range of variability than they were prior to the fire.
6. Maintain and restore instream flows sufficient to create	The Jones Fire has temporarily increased soil moisture and

Aquatic Conservation Strategy Objectives	Effects of Jones Fire
and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high and low flows must be protected.	runoff in the Clikapudi Watershed due to the removal of vegetation and loss of evapotranspiration. This increase, while temporary is perceived to be beneficial to the recovery of vegetation in the watershed.
7. Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands.	The Jones Fire had a neutral effect on this objective. There are no wetlands in the Clikapudi Watershed.
8. Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability.	The Jones Fire has aided in the restoration of species composition and structural diversity by burning vegetation in a mosaic of low, moderate and high intensities. The burn will allow for the re-establishment of early seral vegetation and the species that are dependent on them.
9. Maintain and restore habitat to support well-distributed populations of native plant, invertebrate, and vertebrate riparian-dependent species.	The Jones Fire resulted in a loss of woody debris in Clikapudi Creek, however it also created plenty of recruitment snags that will eventually replenish woody debris. The overall of effect of the fire on this objective is neutral.

Table 5-1: Effects of Jones Fire on Aquatic Conservation Strategy Objectives.

5.4 Human Uses

Core Questions (from WA Guide):

- What are the causes of change between historical and current human uses?
- What are the influences and relationships between human uses and other ecosystem processes in the watershed?

Present Condition	Causal Mechanisms	Trends
Vegetation Management		
In its present condition the Clikapudi Watershed is largely unsuitable for any type of timber management. Salvage opportunities are limited to isolated patches of knobcone and ponderosa pine. Ponderosa pine is present but is sparsely distributed and not found in great enough quantities to facilitate commercial removal. Some opportunities exist for harvest (commercial or non-commercial) of knobcone pine.	Poor soil productivity. Low elevation limits site capabilities. Hot, dry summers limit site capabilities. No easements on potential haul road.	Timber management will continue to not be emphasized in the Clikapudi Watershed.
Fire Management		
Approximately 3-5 fires per year are started by humans within and adjacent to the Clikapudi Watershed. The majority of these fires are due to arson. The number of fire starts per year is not expected to change in the near future.	Human caused fire starts.	Continued risk of human caused fires in Clikapudi Watershed.
Road Management		
The road system in the Clikapudi Creek drainage is in a degraded condition. Problems with roads include lack of outsloping, gullying of hillslopes below Backbone Ridge Road (34N02) and erosion at low water fords in the Clikapudi Valley on Clikapudi Road (33N15). Numerous non-system user created roads are present in the Clikapudi Creek drainage. Falling snags and rocks pose a hazard to hikers, bikers and motorists.	Lack of maintenance of road closures. Continued OHV use of system and non-system roads and trails. Lack of public road ownership or maintenance cooperative agreements in some portions of the watershed.	The trend for the condition of the road system is currently static. (Assumes no action).
Recreation Management		
Recreation use in the Clikapudi Watershed is very high. Use levels are expected to remain high despite loss of visual quality due to fire. Human uses in the Clikapudi Valley include horseback riding, hiking, biking, firearms practice, OHV and motorcycle use. Shasta Lake continues to be the primary recreation draw.	Proximity to urban interface. Shasta Lake.	The level of recreation activity in the watershed is expected to remain static or increase within the next decade.
Conflicts exist between multiple uses in the Clikapudi Valley. OHV use is occurring on user-created trails and on the Clikapudi Trail. OHV use on the Clikapudi Trail is not compatible with equestrian, biking and hiking uses.	OHV use. Lack of maintenance of road closures. Lack of Forest Service presence.	OHV use in the Clikapudi Valley will decline with enforcement of road closure.

Present Condition	Causal Mechanisms	Trends
Areas along the Clikapudi Trail and the Jones Valley inlet have problems associated with human waste. No restrooms are located on the lake or along the trail.	Boaters and trail users. No restrooms available for Clikapudi Trail users.	Continued sanitation problem if no action is taken.
Heritage Resources		
The Clikapudi Valley is in the process of being nominated for designation as a Prehistoric Archaeological District. At least 13 significant pre-historic archaeology sites have been documented within the Clikapudi creek drainage. One site was damaged by dozers during fire suppression activities. Fenced archeology sites were not maintained and were damaged prior to the fire occurring.	Lack of maintenance and vandalism are responsible for deterioration of archaeology sites.	Management of archaeological resources is currently static but should improve.

Conclusions:

- There is little to no opportunity for commercial timber management in the Clikapudi Watershed. Soil productivity and site quality are poor and not suited for propagation of commercial species. Other site attributes that inhibit propagation of commercial species include low elevation and the hot, dry summers. Intense competition from other species would make reforestation efforts very costly. Reforested areas would require frequent maintenance in order to reduce competition. Limited opportunities for timber salvage will occur periodically.

- The road system is in a degraded condition largely due to lack of gate maintenance and lack of enforcement of road closures. There is a need to enforce existing road management plans for the area. Enforcement of road closures in the Clikapudi Valley will accomplish the following:

    1. Preserve the integrity of the archeological sites in the proposed Historic District.
    2. Reduce impacts to Riparian Reserves and associated plant and animal species.
    3. Reduce the risk of human caused fire starts in the Clikapudi Watershed.
    4. Enhance the recreational experience of Clikapudi Trail users.

- Recreation use will continue to increase in the Clikapudi Watershed. There is a need for the Forest Service to have an active presence in the watershed, particularly in the Clikapudi Valley. Problems with human waste and sanitation along the Clikapudi Trail pose a hazard to human health and should be addressed.

- There is a need to improve management of heritage resources in the proposed Prehistoric Archaeological District. Damaged fences protecting archaeological sites should either be maintained or removed. Plans for managing heritage resources should be addressed in the Prehistoric Archaeological District proposal.

- There is a high risk of future human caused fires in the Clikapudi Watershed. There is a need to mitigate the risk by managing vegetation in the watershed to reduce fire hazard and to limit the threat of fire spread over Backbone Ridge into the urban interface to the south. It is recognized

vegetation treatments will not have a high probability of success in limiting the spread of fires occurring under weather condition similar to that of the Jones Fire.

5.5 Vegetation

Core Questions (from WA Guide):

- What are the natural and human causes of change between historical and current vegetative conditions?
- What are the influences and relationships between vegetation and seral patterns and other ecosystem processes in the watershed?

Present Condition	Causal Mechanisms	Trends
Vegetation has begun to recover throughout the area burned by the Jones Fire. Many trees that initially survived the fire are at risk to stress and insect infestations. Knobcone pine is regenerating in areas that burned at high and moderate intensity. Black oaks are resprouting throughout the burn area. Chaparral is beginning to recover and is expected to become the dominant vegetation component in the watershed.	Jones fire. Competition between recovering plants will favor the development of chaparral.	Vegetation will continue to naturally recover throughout the burn area.
The Jones fire has resulted in short term (next 3-5 years) reductions in fuel loadings in all vegetation types within the burn area. The risk of a recurrence of another high intensity fire has been temporarily reduced in the Clikapudi Watershed.	Short-term benefit of removal of light fuels from all vegetation types.	Increased fuel loading overtime will result in deteriorating fuels conditions.
Field assessments of stands of knobcone pine, ponderosa pine and gray pine indicate that fuel loadings will greatly increase in portions of these stands. Approximately 300 acres of decadent, unburned stands of knobcone pine occur within the watershed.	Increase in dead and down woody debris in high intensity burn areas. Additional conifer mortality from stress and insect infestation. Fire suppression.	Fuel loads will continue to increase in knobcone pine, gray pine and ponderosa pine.
Scattered pockets of large ponderosa pine (vegetation type 4S) were affected by the Jones Fire. Ponderosa pines located within dense stands of knobcone pine were killed by the intense fire. Stands of ponderosa pine (4S) located outside of the burn area are at risk to future fires.	Jones fire. Fire suppression	Potential increase in mortality in 4S ponderosa pine stands.
Areas of decadent chaparral not burned by the Jones Fire are present throughout the Clikapudi Watershed.	Fire suppression.	The trend for the distribution of decadent chaparral and brush is currently static.
Yellow-star thistle is abundant in open areas throughout the watershed. Many other types of noxious weeds occur within the watershed. Native grasses are very scarce within the watershed.	Introduction of star thistle by unknown source (most likely sheep grazing). Prolonged period of grazing is believed to have depleted native grasses.	Increased spread of yellow-star thistle if no action is taken. No change in native grasses if no action is taken.
Fuel loads within the Clikapudi Watershed currently range between 15-20 tons per acre. Fuel loads are very high in unburned areas due to absence of fire over the past 100 years.	Fire suppression. Jones Fire.	Fuel loads are expected to double in the next 5-10 years.

Conclusions:

- There is a long term increased potential for extreme fire behavior and increased resistance to control resulting in larger catastrophic fires. Fuel loads are expected to increase beyond desired levels over the next 5 years. The risk of more human caused fires in the watershed remains high. Fire hazard remains high and will increase over the next decade. Ground fuels will increase throughout the burn area as burned snags fall down and accumulate on the forest floor. Chaparral will become the dominant vegetation type in the watershed if no vegetation management occurs. There is a need to reduce the risk of future human caused fires and hazard associated with high fuel loads in the watershed.

- There is a need to preserve and enhance sparse populations of older ponderosa pine. Large pines will always be scarce in the watershed due the warm climate, poor soil productivity and competition from other species. Ponderosa pine should only be promoted if the quality of the site favors ponderosa pine and/or the pines are located within or adjacent to the Shasta Lake Riparian Reserve.

- Noxious weeds are well established in the watershed. Yellow star thistle occupies most natural openings and has replaced native grasses. There may opportunities to control yellow star thistle and restore native grasses in some of the higher profile (high-use) areas near the Clikapudi Trail.

5.6 Species and Habitats

Core Questions (from WA Guide):

- What are the natural and human causes of change between historical and current species distribution and habitat quality for species of concern in the watershed?
- What are the influences and relationships of species and their habitats with other ecosystem processes in the watershed?

Present Condition	Causal Mechanisms	Trends
Bald eagle habitat has diminished in the Clikapudi Watershed. Eagle nest trees were burned in the Reno Canyon/Panther Canyon Eagle territory.	Jones fire. Fire suppression	Less bald eagle habitat will be present for several decades.
Large ponderosa pines (eagle nesting trees) are declining in the Clikapudi Watershed. Large pines adjacent to Shasta Lake were destroyed by the fire due to high concentrations of fuels surrounding the pine trees. Other populations of ponderosa pine located outside of the fire area are also located within high fuel loads and are at risk to future stand replacing fires.	Jones fire. Distribution of ponderosa pine is naturally limited due to poor site quality. Fire suppression.	Continued decline in large ponderosa pine under current management.
Habitat for species dependent on early seral vegetation will increase throughout the area burned by the Jones Fire. The quality of forage for wildlife has also increased in burn area. Generalized predators should benefit from increase in prey production over next decade.	Jones fire.	Habitat for species dependent on early seral vegetation will continue to increase.
The number of large snags found within the watershed is naturally limited due to low site productivity. Fire suppression has encouraged competition between conifers. This has resulted in the creation of denser stands with suppressed trees. The fire has created and abundance of snags within the burned areas however many of these snags are smaller than the recommended DBH of 15-inches and will not last more than several years.	Low site productivity. Fire suppression. Warm climate	The number of large snags will always be low due to low site productivity and the warm climate.
Seasonal fish habitat in Clikapudi Creek is in a degraded condition.	Jones Fire. Wet weather vehicle use. Poor, non-maintained, user-created stream crossings.	Fish habitat will improve due to corrective actions or natural snag recruitment.

Conclusion:

- There has been a loss of bald eagle nest trees and habitat in the Reno Canyon/Panther Canyon Bald Eagle Territory. Approximately 80 acres of bald eagle habitat have been lost. Other Ponderosa Pine (4S – bald eagle habitat) stands are at risk to catastrophic fire. Current trends in fire suppression and vegetation management in the Clikapudi Watershed will lead to more losses of the ponderosa pine nest/perch component at Shasta Lake. There is a need to identify the most suitable sites for regeneration and maintenance of existing ponderosa pine populations close to Shasta Lake that meet criteria for suitable bald eagle habitat. Once identified these areas should be managed for 4S ponderosa pine stands and bald eagle habitat.

- The number of existing wildlife snags per acre does not meet the Forest Plan recommended snag densities for maintenance of healthy populations of cavity nesters across the landscape. The majority of the watershed has soils with low productivity that are not suitable for production of large ponderosa pine. Where ponderosa pine does occur, natural snag densities for trees greater than 15-inch DBF average 1-2 per acre. This does not meet the Forest retention guidelines of three hard snags per acre greater than 15" (preferably >20" DBH if present) across the landscape (where they occur). There has been a slight impact to large diameter wildlife perch snags because of fire and fire restoration activities. There is a need to retain 1-2 hard snags per acre greater than 15” (preferably >20” DBH if present) across the landscape where they occur. This retention requirement needs to be met on a per-40-acre basis.

- The Jones Fire had a positive overall effect on wildlife habitat conditions in the Clikapudi Watershed. Habitat for species dependent on early seral vegetation was lacking prior to the fire. Stands were decadent, affording cover but little to no palatable forage for wildlife species inhabiting the watershed. The development of post-fire early seral vegetation will eventually result in the creation of a more diverse mosaic of both early seral and late seral vegetation in the watershed. More diverse vegetation should also increase wildlife biodiversity. The chaparral habitats and mixed conifer-oak woodlands in this watershed will support the following management indicator species (MIS): Black-tailed deer, black bear, Western grey squirrel, jackrabbit, brush rabbit, band-tailed pigeon, California quail, wild turkey and mourning dove.

- The Jones Fire impacted some populations of Survey and Manage Species. During spring, 2000 approximately 800 acres of high, moderate and low intensity burn areas were surveyed for SM mollusks. A total of 940 SM snails were found: 936 *Monadenia Churchii* and four *Trilobopsis roperii*. Of this total, only 1 snail was found alive. The rest were burned shells. Additional survey and inventory needs in the watershed include: Snails, shrimp, invertebrates, amphibians and old-growth associated vascular plants, lichens, fungi, and bryophytes.

- There is a need to tier wildlife habitat improvement projects to fuels management plans for the Clikapudi Watershed. Vegetation in the watershed needs to be managed to provide for a mosaic of vegetation types, ages and densities. The proportions of habitat components for species dependent on late and early seral vegetation types should remain balance rather than at one extreme or the other.

5.7 Erosion Processes

Core Questions (from WA Guide):

- What are the natural and human causes of change between historical and current erosion processes in the watershed?
- What are the influences and relationships between erosion processes and other ecosystem processes (e.g., vegetation, woody debris recruitment)?

Present Condition	Causal Mechanisms	Trends
Surface erosion has increased in areas of the watershed burned by the Jones Fire that were not treated with burn area emergency rehabilitation projects.	Jones Fire.	Surface erosion should decrease rapidly from post-fire conditions.
Ancient and dormant rotational and translational landslides are present in association with natural openings in the watershed.	Mass-wasting processes.	Static.
Erosion is a problem on portions of the Backbone Ridge road and on user created OHV trails.	Lack of maintenance. OHV use.	Static.
Surface erosion and channel sedimentation have been minimized due to burn area emergency rehabilitation projects.	BAER treatments. Channel check dam construction. Hillslope mulching.	Trend is static. Erosion control treatments functioned for first winter following fire.

Conclusion:

- Hillslope erosion increased over the area burned by the Jones Fire during the winter of 1999-2000. It is not known whether the amount of erosion fell within the natural level of variability. The amount of material eroded may have been greater that what would have occurred in past fires due to 95 years of successful fire suppression and the build-up of erodible materials on the slopes in the absence of fire. Erosion rates are believed to be within their natural range of variability in unburned areas of the watershed.

- There is a need to reduce road and OHV trail erosion and hillslope gullying.

5.8 Hydrology, Stream Channels, Water Quality

Core Questions (from WA Guide):

- What are the natural and human causes of change between historical and current hydrology, stream channel and water quality processes in the watershed?
- What are the influences and relationships between hydrology, stream channel and water quality processes and other ecosystem processes (e.g., vegetation, woody debris recruitment)?

Present Condition	Causal Mechanisms	Trends
The Jones fire has altered hydrologic conditions in Riparian Reserves. Base flows may be slightly higher than normal and may persist later into the summer. Increased hillslope erosion is occurring in areas of the fire that burned at high and moderate intensities. Increased deposition of fine sediments has been noted in intermittent stream channels. Increases in all of the above are believed to within the range of natural variability following fire.	The removal of vegetation by the fire has temporarily decreased the amount of water used by vegetation. More water is available to maintain and augment streamflow. Loss of vegetative cover and soil organic matter has resulted in increased hillslope erosion and deposition of fine sediments in stream channels.	Base flows, hillslope erosion and sedimentation are all diminishing rapidly as vegetation recovers.
Riparian Reserves are recovering rapidly from fire impacts. Hillslope erosion and channel sedimentation are diminishing. Vegetation is recovering rapidly in oak woodlands and at a slower pace in mixed conifer forest.	Rapid recovery of vegetation in riparian reserves.	Continued recovery of riparian reserves over time.
Burn area emergency rehabilitation treatments have mitigated erosion concerns in high intensity burn areas.	Hillslope mulching has reduced hillslope erosion and limited the amount of sediment transferred into intermittent stream channels. Channel grade control structures have trapped sediment in the channel bed and limited downstream movement of sediment to Shasta Lake.	Decreased hillslope erosion as vegetation recovers.
Large woody debris is lacking in Clikapudi Creek. Loss of large woody debris has resulted in loss of channel structure and cover which has decreased the quality of seasonal fish habitat.	Jones Fire burned woody debris out of channel.	Woody debris concentrations will increase as snags fall into the creek.
The Clikapudi Creek and the lower reaches of its intermittent tributaries are in a degraded condition due to low water fords and winter use of roads and user-created OHV trails. Problems associated with low water road crossings include bank erosion, channel sedimentation and loss of riparian/streamside vegetation. Clikapudi Creek is ditched near the 33N15 low water ford.	Winter OHV use of user-created trails. Lack of maintenance and enforcement of 33N15 road closure. Low water fords and drainage ditches.	The trend for the condition of stream channels at low water fords is static. Stream channels remain in a degraded condition.

Conclusions:

- The Jones Fire had temporary negative impacts to Riparian Reserves. Impacts included increased turbidity and sedimentation, loss of riparian vegetation and canopy cover, and loss of large woody debris. Vegetation within Riparian Reserves is recovering rapidly and no further fire-related impacts are expected.

- Riparian Reserves associated with intermittent tributary streams to Clikapudi Creek burned at the same intensity as the surrounding uplands. Fuel accumulations in these Riparian Reserves are similar to that of upland areas. There is a need to treat future fuel loads in Riparian Reserves.

Chapter 6

Recommendations

The purpose of this chapter is to bring the results of the previous steps to conclusion, focusing on management recommendations that are responsive to the issues and watershed processes identified in the analysis. Monitoring activities are identified that are responsive to the issues and key questions. Data gaps and limitations of the analysis are also documented.

This chapter is organized by focusing on needs and opportunities identified in the "Conclusions" sections at the end of each item in Chapter 5.

Recommendation topics in this chapter include the following:

Vegetation Management for Public Safety, Fuels Reduction and Plant/Animal Habitat Diversity
Fire Protection Along the Urban Interface
Riparian Reserve Management
Other Resource Recommendations

This chapter closes with a list of potential projects developed from the analysis.

6.1 Desired Future Conditions

The NRA Management Guide provides a description of the Desired Future Condition for all lands in the National Recreation Area. This description is provided below. Comments in italics provide additional information and insight specific to the Clikapudi Watershed. All recommendations for the watershed should move the ecosystem toward the DFC described below.

Desired Future Condition (Specific To Shasta Management Unit of the NRA).

The Shasta Unit of this MA is managed as a showcase recreation area. It provides high quality recreation opportunities at a variety of lake levels. *[This DFC is being realized. The Jones Valley Marina, Upper and Lower Jones Valley Campgrounds, and the Clikapudi Trail provide quality recreation experiences.]* Associated scenic, scientific, and historical values are conserved and interpreted through an actively managed interpretive program. *[The Clikapudi Valley has a high potential for interpretive programs due to its prehistoric values. Currently no interpretive program exists.]* Management and utilization of renewable resources is compatible with public recreation or other values contributing to public enjoyment. *[No management of renewable resources (timber, minerals) occurs in the Clikapudi Watershed.]* The unit is managed according to the current NRA

Management Plan. This Plan is reviewed every 5 years in order to meet public needs and demands and to support natural resource values.

Facilities are constructed and maintained to a high standard with universal access a priority for funding. *[Recreation facilities managed by the Forest Service include Jones Valley Boat Ramp, Upper and Lower Jones Valley Campgrounds and associated hard-surfaced roads. The Upper and Lower Jones Valley campgrounds were improved in 1999. Improvements are being planned for boat ramps in Jones Valley.]* A wide variety of high quality recreation opportunities are provided at all lake and economic levels. This includes adequate low water access via roads, ramps, and trails. Large, modern campgrounds have replaced small, scattered sites, which were not cost effective to operate and maintain. *[The DFC for campgrounds has been obtained in the Clikapudi Watershed.]* An innovative interpretive services program has been implemented and excellent interpretive services are available. *[No interpretive program is currently in place at the campgrounds, marina or in the Clikapudi Valley.]* Dispersed camping opportunities, for those seeking a less managed and more tranquil recreation experience are plentiful, especially those areas accessible by boat. *[Dispersed camping occurs in the Jones Valley Arm of Shasta Lake. Dispersed camping is not emphasized in the Clikapudi Arm of Shasta Lake. A de-emphasis of this DFC for the Clikapudi Arm is appropriate for the watershed due to close proximity of the urban interface, presence of established campgrounds and the risk of human caused fires at dispersed campsites that are not accessible by road.]* Management activities maintain the visual quality at a level, which provides for a landscape in which human activities are subordinate to the natural landscape.

Vegetation is managed to a level that results in healthy forest stands, maintenance of wildlife habitat, good scenic quality, public health and safety, and reduction of fire hazards. Within designated conservation areas and bald eagle and peregrine falcon nest territories, vegetation is managed for habitat enhancement to retain critical habitat elements over the long term. *[No active vegetation management had occurred in the Clikapudi Watershed. The DFC for vegetation management is not being obtained due to lack of vegetation management activities and fire exclusion in areas not burned by the Jones Fire.]*

Fish habitat is managed to enhance inland coldwater and warm water fisheries for sport fishing and a wildlife prey base. *[The Shasta Lake fishery in the Clikapudi inlet is in excellent condition. Seasonal fish habitat and in Clikapudi Creek could be improved.]* Quality fisheries and wildlife habitat is maintained and enhanced for indicator and emphasis species at various lake levels. An innovative information and education program promotes increased awareness and appreciation of fish and wildlife resources in the management unit. Potential conflicts between lake users and wildlife needs are anticipated and resolved to ensure public enjoyment and safety as well as to provide for viable wildlife populations.

Threatened, endangered, and sensitive species management focuses on protecting, enhancing, and restoring their habitat. *[Bald eagle habitat is in a degraded condition in the watershed due to loss of nesting trees. High fuel loads surrounding surviving trees pose a continued risk to Eagle habitat.]* Species Management Guides have been developed and are being implemented for plant species of interest. The spread of weed plant populations has been arrested and native plants are being reintroduced where suitable. *[Star thistle is abundant in the Clikapudi Valley. No attempts have been made to eradicate star thistle.]*

Water quality remains excellent and is managed cooperatively with the Central Valley Water Quality Control Board. *[The water quality of Shasta Lake is very good.]*

Full service resorts are permitted and managed to meet current recreation demands while allowing for appropriate protection of other resource values. Private landowners, residents, and small communities within the forest boundary are educated and informed about local forest resources and issues. Four summer home tracts, with a total of 160 homes, are managed to meet established standards and not detract from the quality of the NRA. *[There are no summer home tracts in the Clikapudi Watershed under special use permits.]*

An active law enforcement program provides a visible presence in the management unit while providing protection and security for visitors, facilities, and resources. *[A visible law enforcement presence is lacking in the Clikapudi Valley and on Backbone Ridge. Law enforcement or some other type of presence is needed to enforce road closures, woodcutting and OHV regulations as well as reduce the risk of human caused fires.]* The emphasis on habitat protection, under the Endangered Species Act, and boating safety has resulted in significant improvements in implementing special programs. These programs are designed to meet the needs of both wildlife and National Forest users. Cultural resources are managed to specified standards. Sites include: Clikapudi, Squaw Creek, Hirz Mountain Lookout, Dog Creek Bridge and Potter and Samwel Caves. *[The Clikapudi Valley is an important archeological area. Due to its prehistoric values the valley is being considered for nomination as a Prehistoric Archaeological District.]*

From Part B: Desired Future Condition: Entire NRA

Twenty-four percent of the Management Area is Matrix and Adaptive Management Area and it is all Management Prescription III which emphasized recreation and visuals, 20% is Late-Successional Reserve, 21% is allocated to Administratively Withdrawn Areas, and 33% is Riparian Reserve, a large portion of which is lake.

Forest stand densities are managed to 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. Stand understories appear more open with less growth particularly in stands on sites where wildfire plays a key role in stand development. *[The natural role of fire needs to be restored in the Clikapudi Watershed. Achieving a more open understory in all vegetation types will benefit heritage resources, wildlife, recreationists and support fire suppression and risk reduction activities. The Jones Fire has begun the process of removing fuels and creating an open understory, however more vegetation treatments are needed in order to actually achieve and maintain an open understory in selected areas of the watershed.]* The actual target stand densities depend upon stand species, site quality, stand age, and stand objectives (i.e., stand densities are maintained at lower levels to grow larger old trees within Late-Successional Reserves). Management Prescription III areas are often located around high use recreation areas and travel corridors. Management activities are evident but subordinate to the view within this area. There is no scheduled timber harvest from Management Prescription III in the Shasta Unit and minimal scheduled harvest from the Trinity Unit.

Riparian Reserves are applied along both sides of rivers, streams, lakes and wetlands. Riparian Reserves appear as natural corridors throughout the Matrix. *[Over 50 percent of the Clikapudi Watershed is located within Riparian Reserves.]*

6.2 Vegetation Management for Public Safety, Fuels Reduction and Plant/Animal Habitat Diversity and Protection of Archaeological Sites.

Topic: Vegetation Management For Public Safety

Recommendation:

Fell all trees killed by the fire or by insects that pose a hazard to the public. This action should occur along the Clikapudi Trail, in campgrounds and adjacent to high-use roads. Once felled evaluate potential for commercial or non-commercial disposal of hazard trees. Dead and down vegetation that is not removed should be treated (chipped or burned) to reduce fuel loadings and improve visual quality adjacent to roads and trails.

Rationale/Objective: Standing dead trees located in close proximity to trails and roads are a hazard to the public. Trees killed by insects pose a hazard to campers in the Jones Valley Campground. Felling of hazard trees will improve public safety on trails and roads. It is expected that fuel loading will be unacceptably high along some portions of the Clikapudi Trail following felling of hazard trees. Because the trail is a potential high risk ignition area for future fires dead and down fuels should either be removed, chipped or burned. Fuels treatment will improve visual quality along the Clikapudi Trail.

Topic: Vegetation Management for Fuels Reduction

Recommendation:

Underburn excessive fuel loadings in medium, poorly stocked conifer stands in the vicinity of the Jones Valley Road.

Rationale/Objective: Underburning of medium and poorly stocked conifer stands will reduce fuel loadings, increase habitat diversity, and lower the risk of future fire starts. Existing fire lines created during fire suppression activities could be maintained and used as anchor points for future prescribed burning activities.

Recommendation:

Use vegetation treatments to reduce fuel loading in burned and unburned knobcone pine stands and adjacent areas. Biomass and harvest mature knobcone pine stands within and outside of burn areas. Consider non-commercial removal of knobcone pine if funding is available. Use other vegetation treatments such as prescribed fire to reduce fuel loadings in and adjacent to burned knobcone stands if harvest of knobcone is not feasible. Manage for 1-2 15-inch (plus) DBH snags per acre.

Rationale/Objective: Pockets of knobcone that burned at high and moderate intensities experienced high rates of mortality. Opportunities exist to treat concentrations of fire killed timber through biomass, commercial or non-commercial removal. Removal of fire killed trees followed by prescribed burning and/or other fuels treatments will reduce the risk of future catastrophic fires in the Clikapudi and surrounding watersheds.

Recommendation:

Use prescribed fire to control germinating of knobcone pine in burned and salvaged knobcone stands. Fell all knobcone pine snags prior to burning (excepting those left for wildlife habitat). Do not attempt vegetation type conversions in burned or unburned knobcone stands located on sites unsuitable for ponderosa pine. Manage for more open stands of knobcone in all seral stages by applying prescribed fires at varying intensities.

Rationale/Objective: Knobcone pinecones are serotinous and open in response to indirect radiant heat, however the seeds are not fire resistant. Prescribed fire can be used to burn out young knobcone pine that germinated after the Jones Fire. Felling knobcone pine stands prior to burning will further reduce the seed source and slow knobcone regeneration. Burning knobcone on a regular basis will create knobcone pine stands that are more open than fire-suppressed stands. More open conditions will allow knobcone to grow larger and live longer. This will, in turn, create good roosting habitat for birds such as turkeys.

Vegetation type conversions of knobcone pine to ponderosa pine are not economically viable if soil productivity is poor. Knobcone pine stands located on poor sites for ponderosa pine should be managed for early to mid-seral knobcone. Prescribed burning will be required to maintain early to mid-seral knobcone stands. The amount of knobcone pine regeneration can be controlled by varying the intensity of the prescribed fire. Occasional high intensity prescribed fires, needed to promote germination, will be necessary if the objective to perpetuate the knobcone pine stand.

Recommendation:

Use prescribed fire to treat decadent manzanita brushfields in the watershed. Mechanically crush brush prior to treatment where necessary.

Rationale/Objective: Expansive and decadent manzanita brushfields occur in portions of the watershed. These brushfields have culminated, present a fuels hazard, and do not benefit wildlife. Establishing early seral brushfields will create more forage for game species and reduce fuels and the threat of high intensity fire.

Topic: Vegetation Management for Animal/Plant Diversity

Recommendation:

Enhance bald eagle habitat along shoreline of Shasta Lake. Remove excessive fuels accumulations around eagle nest trees. Emphasize protection and regeneration of ponderosa pine on suitable sites. Use vegetation treatments such as manual release hand piling and burning, prescribed fire, biomassing or thinning from below to create suitable eagle nesting and foraging habitat. Priority sites for bald eagle habitat enhancement projects are sites containing stands of mature ponderosa pine and black oak on productive soils and gentle slopes in both burned and unburned areas within 100 yards of Shasta Lake. Consider regeneration of ponderosa pine on suitable sites located within high and moderate intensity burn areas.

Rationale/Objective: Large trees for bald eagles are scarce in the Clikapudi Watershed. Where they do occur they are often surrounded by dense stands of knobcone pine or brush. Because their distribution is limited, areas that have productive soils that favor pine development should be managed for the development of large ponderosa pine. Many ponderosa pine in the 4S size class were killed by the Jones Fire. Large ponderosa pine are naturally limited in the watershed due to poor soils, low elevation and the hot climate. Ponderosa pine should be regenerated only in areas where the site and soils are suitable.

Recommendation:

Develop a fuels management program that manages vegetation in the Clikapudi Watershed for a variety of early and late seral ages. Incorporate wildlife habitat considerations into fuels management planning for the proposed Historic District and fuel break. Manage for 1-2 15-inch (plus) DBH snags per acre where possible.

Rationale/Objective: There is a potential for fuels management activities to improve wildlife habitat in the watershed. Incorporating wildlife habitat needs into fuels management plans will increase the number of benefits resulting from the fuels management program and possibly result in additional funding sources for fuels management activities.

Topic: Vegetation Management For Protection of Archeological Sites

Recommendation:

Implement vegetation treatments compatible with Prescription XI standards and guidelines for heritage resource management (LMP, 4-50). Design vegetation treatments such as prescribed burning to be compatible with protection of the proposed historic district (i.e. no ground disturbance). Activities that are compatible with Prescription 11 lands include prescribed burning and hand piling and chipping/burning of vegetation. All vegetation treatments should be designed to create vegetative conditions similar to 1850 (pre-fire suppression). Continue to explore possibility of nominating 150 acres in Clikapudi Creek drainage for designation as a Prehistoric Archaeological District.

Rationale/Objective: Opportunities exist to treat vegetation in the proposed Clikapudi Prehistoric Archaeological District. Vegetation treatments such as prescribed burning can benefit the district by creating a more open understory similar to conditions prior to European settlement. These treatments will also reduce fuels and fire hazard in the valley and benefit Riparian Reserves along Clikapudi Creek.

Topic: Noxious Weeds and Restoration of Native Plants

Recommendation:

Evaluate opportunities and feasibility for control of yellow star thistle and restoration of native grasses in meadow areas within Clikapudi Valley.

Rationale/Objective: Yellow star thistle and other noxious plants are abundant throughout the Clikapudi Valley. Native grasses are very scarce. Opportunities may exist to restore native grasses in some of the higher profile meadow areas located along the Clikapudi Trail. Restoration of native grasses would benefit plant diversity, decrease erosion, and benefit interpretive values associated with restoration of native plants and the proposed National Historic District. Potential treatments that may be used for control of star thistle include grazing with goats, burning, irrigating and reseeding with native grasses.

6.3 Fire Protection Along Urban Interface

Recommendation:

Work with cooperators in an interagency framework to establish a DFMZ (defensible fuel management zone) along both sides of Backbone Ridge Road (Road 34N02) starting in T33N., R3W., Section 17 and ending in T33N., R3W., Section 12. Implementation of recommendations in Section 6.1 will increase the effectiveness of the proposed DFMZ.

Rationale/Objective: The Backbone Ridge Road (34N02) is a logical division between the NRA and the ever-expanding urban interface area adjacent to the south. The area north of the ridge is a high-use recreation area both in the Clikapudi drainage and along the Shasta Lake shoreline. The risk of another fire starting in the watershed and a repeat of the Jones Fire scenario is very high. A functional DFMZ along the Backbone Ridge Road would provide ground and aerial suppression forces with a possible location to halt the southward spread of fires originating in the Clikapudi Watershed. While it could not stop the spread of a fire occurring under similar weather conditions as the Jones Fire, a functional DFMZ would increase the probability of limiting the spread of most fires southward into the surrounding urban interface. Maintenance of a DFMZ is an economic issue, however the task of obtaining funding and labor for maintenance is not insurmountable. A Conservation Camp located 15 minutes from the proposed DFMZ could provide crews for fuelbreak construction and maintenance. A DFMZ on Backbone Ridge would also provide the Redding Smokejumpers and Redding Interagency Hotshot Crew with an ideal training site for fire suppression activities. The California Department of Forestry should be consulted throughout this project, and perhaps CDF could be the catalyst for arranging or coordinating some kind of road use permit (for fuel break maintenance) from the various private landowners along the Backbone Ridge Road (34N02).

6.4 Riparian Reserve Management

Recommendation:

Apply vegetation and fuels management treatments to Riparian Reserves to develop desired future conditions for Riparian Reserves as described in section 5.1.3. Use prescribed fire, chipping and hand piling and burning to achieve DFC for Riparian Reserves located within the proposed National Historic District (i.e. no ground disturbing activities). Manage for 1-2 15-inch (plus) DBH snags per acre in Riparian Reserves. Coordinate all vegetation treatments in Riparian Reserves with Recreation, Heritage Resources, Fuels, Wildlife, and Hydrology specialists to insure that activities are benefiting multiple resources.

Rationale/Objective: Riparian Reserves in the Clikapudi Watershed have similar treatment needs as many of the upland areas. Carefully planned vegetation management activities will move Riparian Reserves towards their desired future condition as well as benefit multiple resources. For example, the creation of a more open understory in portions of the Clikapudi Watershed would accomplish the following:

Heritage Resources: An open understory was most likely present in the Clikapudi Valley prior to 1850. Establishing an open understory would create conditions similar to prehistoric time that would be in concert with management of the valley as a Prehistoric Archaeological District.

Fuels: Establishing an open understory would reduce fuel loadings in high use areas along the Clikapudi Trail. A decrease in fuels in the valley bottom would decrease the fire intensity and reduce damage to conifers and hardwoods within and adjacent to the valley bottom.

Recreation: An open understory would improve the recreation value of the trail by enhancing visual quality (due to removal of dead and down fuels) and increasing the interpretive value of the trail as part of the proposed National Historic District.

Wildlife: Establishment of an open understory would create more forage for game species such as deer, bear, quail, rabbit and mourning dove.

Recommendation:

Decommission all non-system trails in the Clikapudi Creek Riparian Reserve and re-close Road 33N15.

Rationale/Objective: OHV use of user created roads in the Clikapudi drainage is not compatible with other uses. OHV use conflicts with Aquatic Conservation Strategy objectives for Riparian Reserve management. Hiking, biking and horseback riding on the Clikapudi Trail are compromised by OHV use on the trail and adjacent to the trail within the Riparian Reserve. OHV trails create bank erosion, increase turbidity and denude channel sideslopes. OHV use on and off designated trails also increases the risk of fire starts and damage to archeological sites. Previous attempts to block vehicle access with a gate on Road 33N15 have failed. While complete

elimination of ATV and motor cycle use is unrealistic given the terrain and open conditions, a comprehensive plan to decommission non-system trails, in conjunction with re-closing Road 33N15 more effectively, should at least reduce use from the full-size vehicles which appear to be causing the most damage at present.

Recommendation:

Restore road drainage on Road 34N02 (Backbone Ridge Road) where possible to reduce gullying, turbidity and sedimentation in ephemeral channels.

Rationale/Objective: The road system in the Clikapudi Watershed is in a degraded condition, but most of it lies on private land. For example, the Backbone Ridge Road (34N02) is approximately 6 miles long within the project area, of which only about 2 miles is across National Forest land. Most of the more severe problems are on the private segments, including damaged culverts, rutting, and unmaintained dips and overside drains. The Forest Service has limited ability to address these problems because no easements or maintenance agreements exist with multiple private landowners along the 34N02 road. Any commercial use of this road and corresponding road reconstruction and/or maintenance would improve these conditions, pending acquisition of these agreements.

Recommendation:

Improve seasonal fish habitat in Clikapudi Creek by restoring large woody debris to channel.

Rationale/Objective: Large woody debris, important for channel stabilization and maintenance of fish habitat was burned out of Clikapudi Creek by the Jones Fire. Large woody debris is needed to stabilize eroding stream banks, trap sediment, and create pools. Excessive amounts of dead and down wood will be present along Clikapudi Creek and trail following hazard tree felling. Use of large wood for fish habitat enhancement will have parallel benefits of improving visual quality and reducing amounts of dead and down woody debris adjacent to the trail and channel.

6.5 Other Resource Recommendations

Recommendation:

Reduce human sanitation problems along the Clikapudi Trail by constructing a restroom at the Clikapudi Trailhead.

Rationale/Objective: Human waste is a problem along the Clikapudi Trail, particularly along the portion that spans the Clikapudi Creek arm of Shasta Lake. Human waste along the trail is unsightly and poses a health concern to all trail users. The construction of a restroom at the trailhead may reduce some of the problems associated with human waste.

6.6 Possible Management Practices

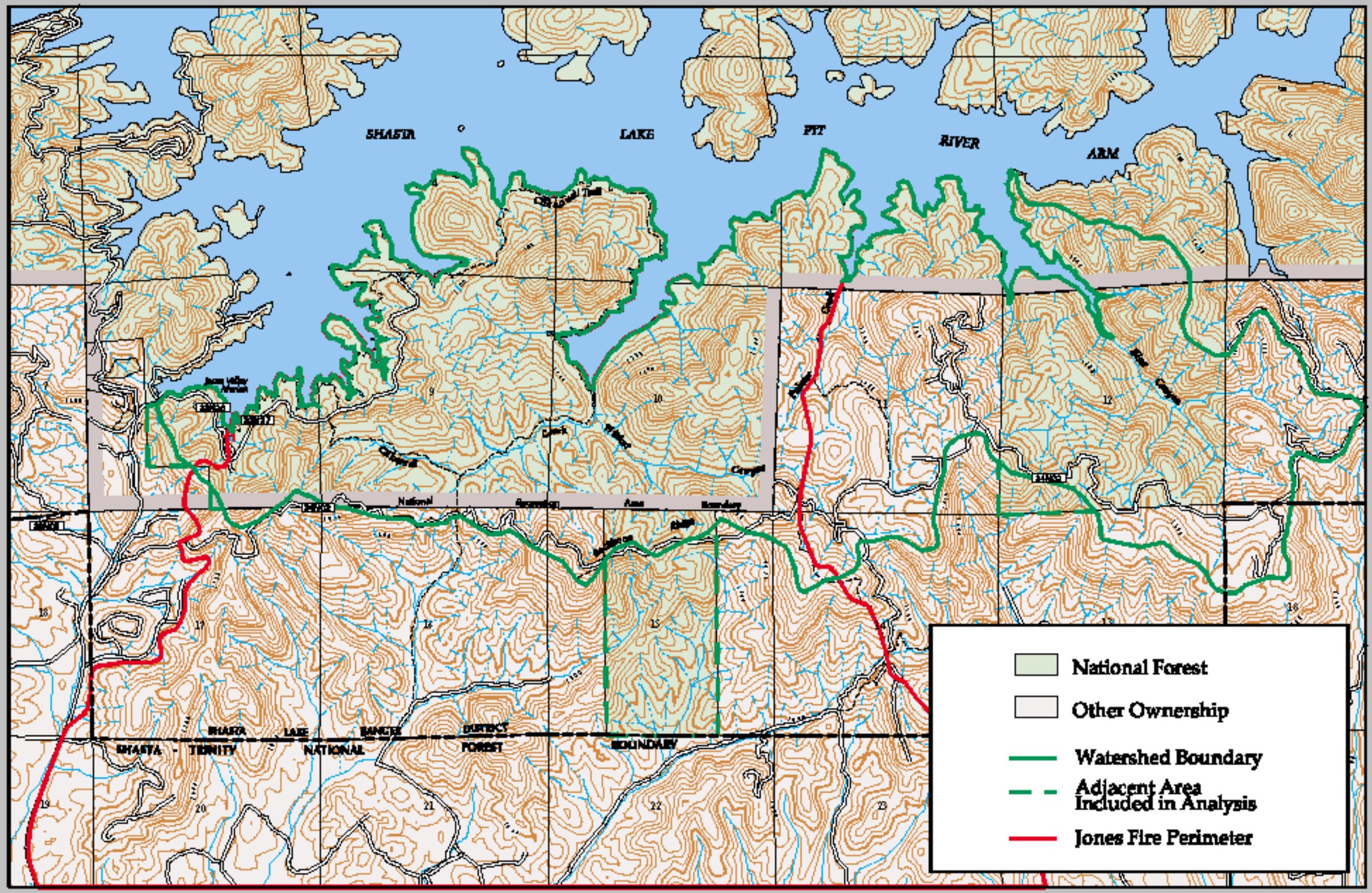
WA Recommendation	Possible Management Practices	Linkages	NEPA
A. Land Management			
1a. Fell all fire killed trees adjacent to roads, trails and facilities that pose a threat to the safety of the public.	Fell trees and leave on site. Harvest hazard trees with commercial value provided they are accessible.	2a, 5a, 7a, 9a	CE
2a. Improve visual quality along Clikapudi Trail.	Handpile and burn or chip excessive debris from felling of hazard trees.	1a, 3a, 5a, 7a, 9a, 10a, 11a, 1b, 3b	CE
3a. Close and block user created OHV trails in the Clikapudi Valley. Restore and enforce road closure of Road 33N15 into Clikapudi Valley and road closures in Jones Valley Cove.	Installation of barriers (includes gates, logs and boulders). Use visual effect of multiple barriers to discourage use by OHVs. Place felled hazard trees on OHV trails to disrupt travel ways.	2a, 5a, 10a, 1b, 3b	CE
4a. Improve Backbone Ridge Road (34N02).	Reconstruct and/or maintain to better standard pending agreement with private landowners. (See B. Watershed Planning (2b.) below.)	2b, 5a	CE/EA
5a. Implement fuel management plan to protect urban interface from fire starts originating in the Clikapudi Watershed.	Prescribed fire within all vegetation components to reduce fuels build-up. Fuel break construction on backbone ridge. Road closures and law enforcement presence to reduce risk of fire starts. Biomass or non-commercial treatments of small fuels throughout watershed.	2a, 3a, 4a, 6a, 7a, 8a, 11a, 2b	EA
6a. Implement fuels management and vegetation treatments to protect populations of ponderosa pine. Introduce ponderosa pine in potential eagle habitat areas on suitable sites. Restore ponderosa pine on suitable sites in burned areas.	Biomass of small material around nest trees in both burned and unburned areas. Hand piling and burning of small material around large ponderosa pine. Planting of ponderosa pine in burned and unburned areas on suitable sites. Prescribed fire around ponderosa pine stands following other fuel treatments.	1a, 5a, 1c	EA/CE
7a. Restore open understory component to Clikapudi Valley area.	Prescribed fire to burn out fuel accumulations in understory in burned and unburned areas. Hand piling and burning or chipping of small material along Clikapudi Trail and within proposed National Historic District.	1a, 2a, 5a, 11a, 1b	EA/CE
8a. Restore early seral chaparral and early seral knobcone component to watershed. Reduce fuels hazard and improve wildlife habitat in areas of decadent chaparral and knobcone pine.	Mechanical crushing of vegetation. Prescribed fire. Recommend infrequent, high intensity fires to encourage germination of young knobcone (germination of knobcone will not occur in low intensity fires.	2a, 5a	EA
9a. Restore large woody debris to Clikapudi Creek for seasonal fish habitat.	Woody debris can be placed into Clikapudi Creek to prevent bank erosion and create pools during the winter runoff season. Felled hazard trees along the Clikapudi Trail could be used for this project.	1a, 2a, 7a	CE

WA Recommendation	Possible Management Practices	Linkages	NEPA
10a. Reduce human sanitation problem along Clikapudi Trail and inlet.	Construct restroom at Clikapudi Trailhead.	2a, 3a, 3b	CE
11a. Pursue eradication of star thistle in open meadow areas of Clikapudi Valley.	Evaluate potential for burning and reseeding of small meadow areas (discing is not feasible due unacceptable disturbance to proposed National Historic District). Consider use of goats for control of star thistle and other noxious weeds in selected meadow areas. Consider irrigation as means of controlling star thistle.	2a, 5a, 7a	CE/EA
12a. Improve developed recreation facilities for better lake access in Jones Valley.	Rehabilitate Jones Valley Boat Ramps 1, 2 and 3.	No link.	CE
B. Watershed Planning			
1b. Explore possibility of designation of Clikapudi Valley and associated archeological sites as Prehistoric Archaeological District.	Develop management plan for Prehistoric Archaeological District. The plan should include a description of how sites will be protected and managed. An analysis of the interpretive potential of the valley should also be included. The plan should also provide a description of the DFC for vegetation in the Prehistoric Archaeological District. A DFC developed by Heritage Resource specialists will help in the planning of other fuels and vegetation management projects for the watershed.	2a, 3a, 5a, 7a, 9a, 10a, 11a	NA
2b. Assess the potential of a multi-agency/landowner cooperative group for managing a defensible fuels management zone on Backbone Ridge, including provisions for use of the Backbone Ridge Road (34N02).	Contact local land owners and cooperators such as CDF to determine if they would be interested in supporting and participating in the construction and maintenance of a DFMZ on Backbone Ridge spanning private and public lands.	4a, 5a, 6a, 7a, 8a	NA
3b. Analyze law enforcement needs for public lands in the watershed.	Evaluate effectiveness of current law enforcement presence in Clikapudi Watershed. Assess the need for further law enforcement in order to reduce resource degradation associated with illegal activities. Increase law enforcement presence if warranted.	2a, 3a, 10a, 2b	NA
C. Research Inventory and Monitoring			
1c. Monitor Bald Eagle nesting sites.	Continue surveys of Bald Eagles to determine number of nest sites in the watershed. Assess changing habitat conditions based on future Eagle nest distribution. Monitor effects of habitat improvement projects.	6a	NA
2c. Continue monitoring effectiveness of BAER treatments.	Monitor effectiveness of hillslope mulching and channel gradient control structures. Assess need to repair or remove dysfunctional channel structures if they are having a negative effect on Aquatic Conservation Strategy objectives.	No link.	NA

NA - No Environmental Assessment required. EA - Environmental Assessment required.
CE - Categorical Exclusion is probably adequate. EA/CE - Scope of the project will determine which documentation is appropriate.

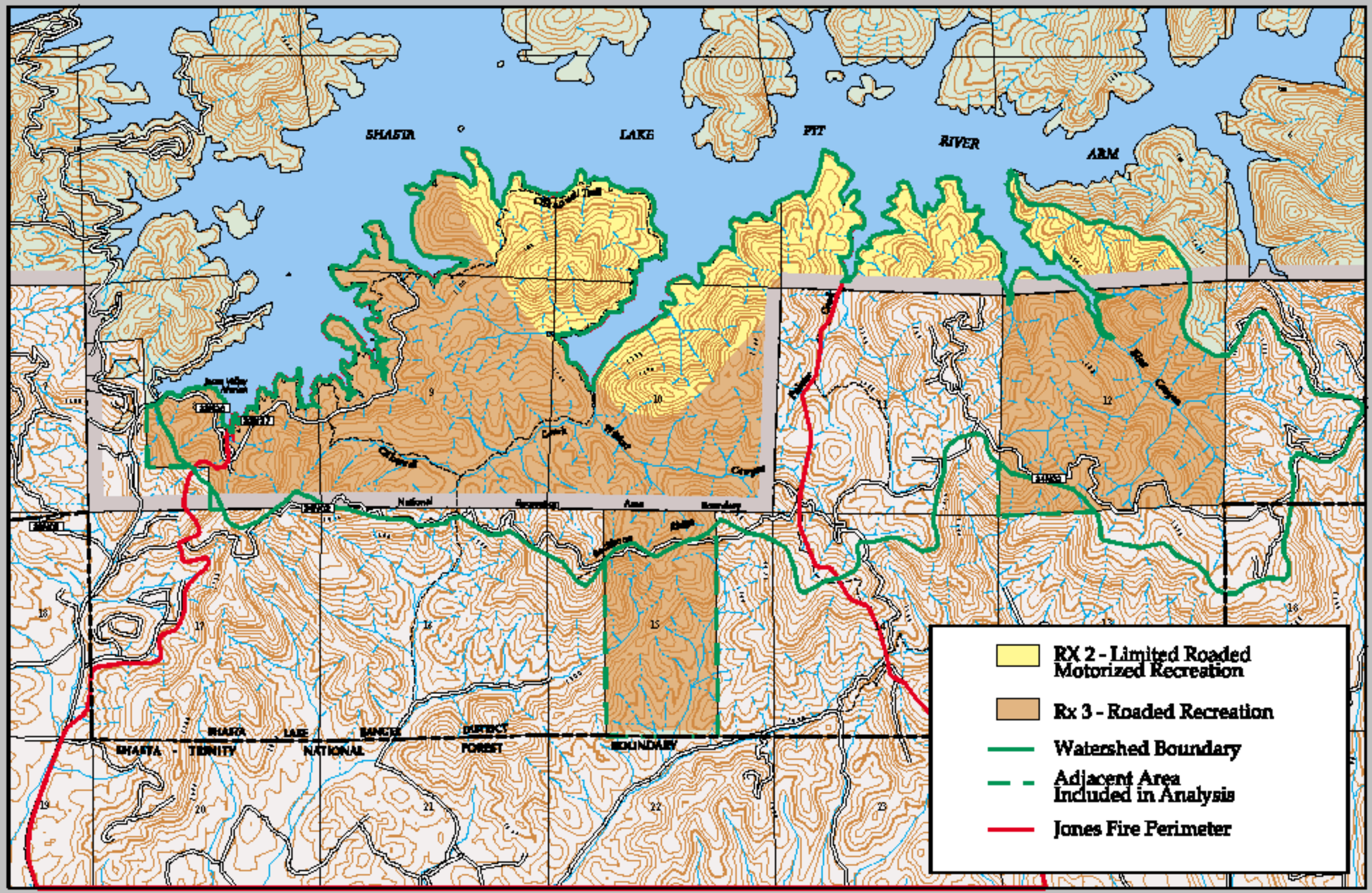
CLIKAPUDI WATERSHED ANALYSIS

Map 1. Vicinity Map



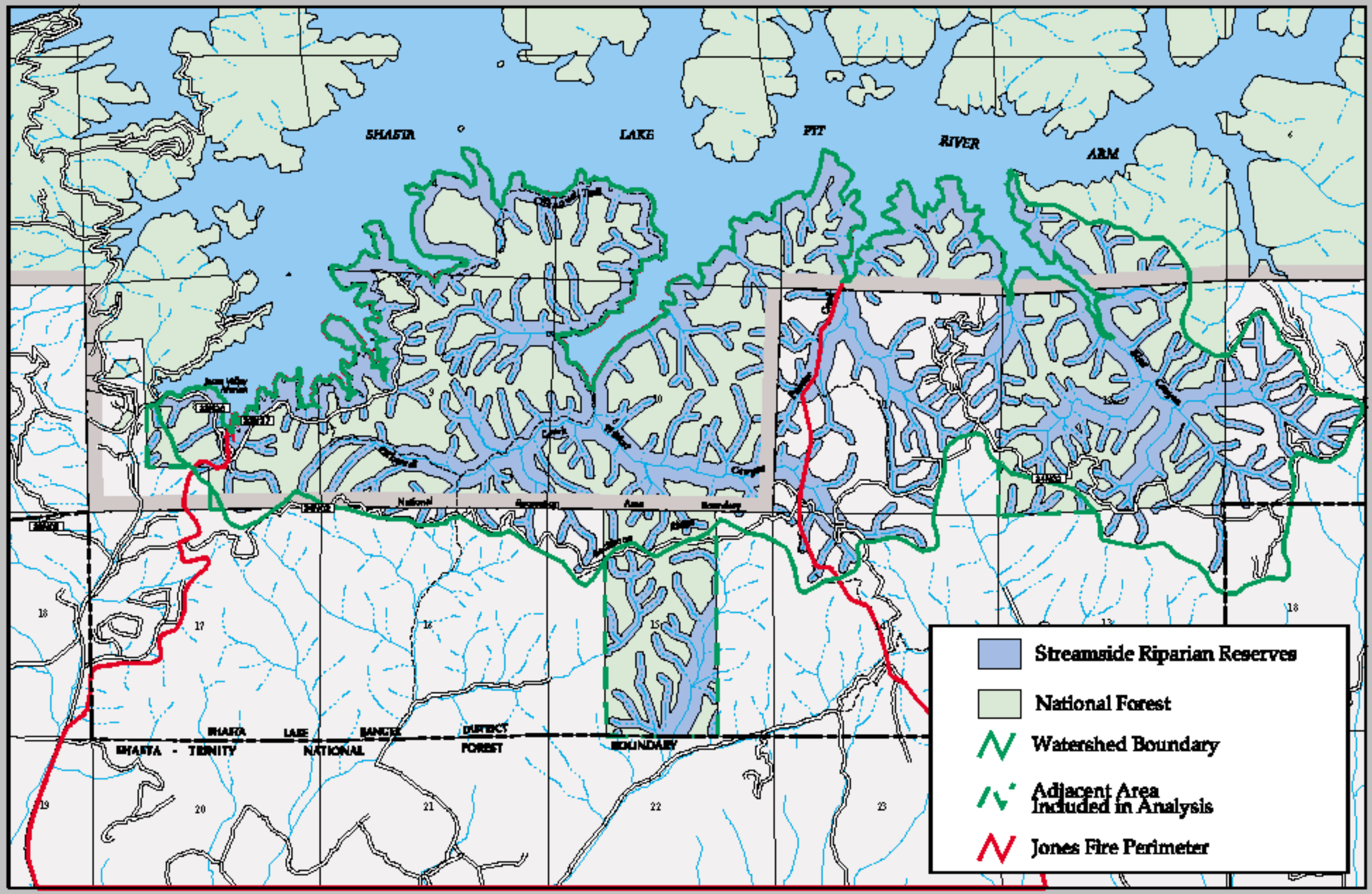
CLIKAPUDI WATERSHED ANALYSIS

Map 2. Management Prescriptions



CLIKAPUDI WATERSHED ANALYSIS

Map 3. Riparian Reserves



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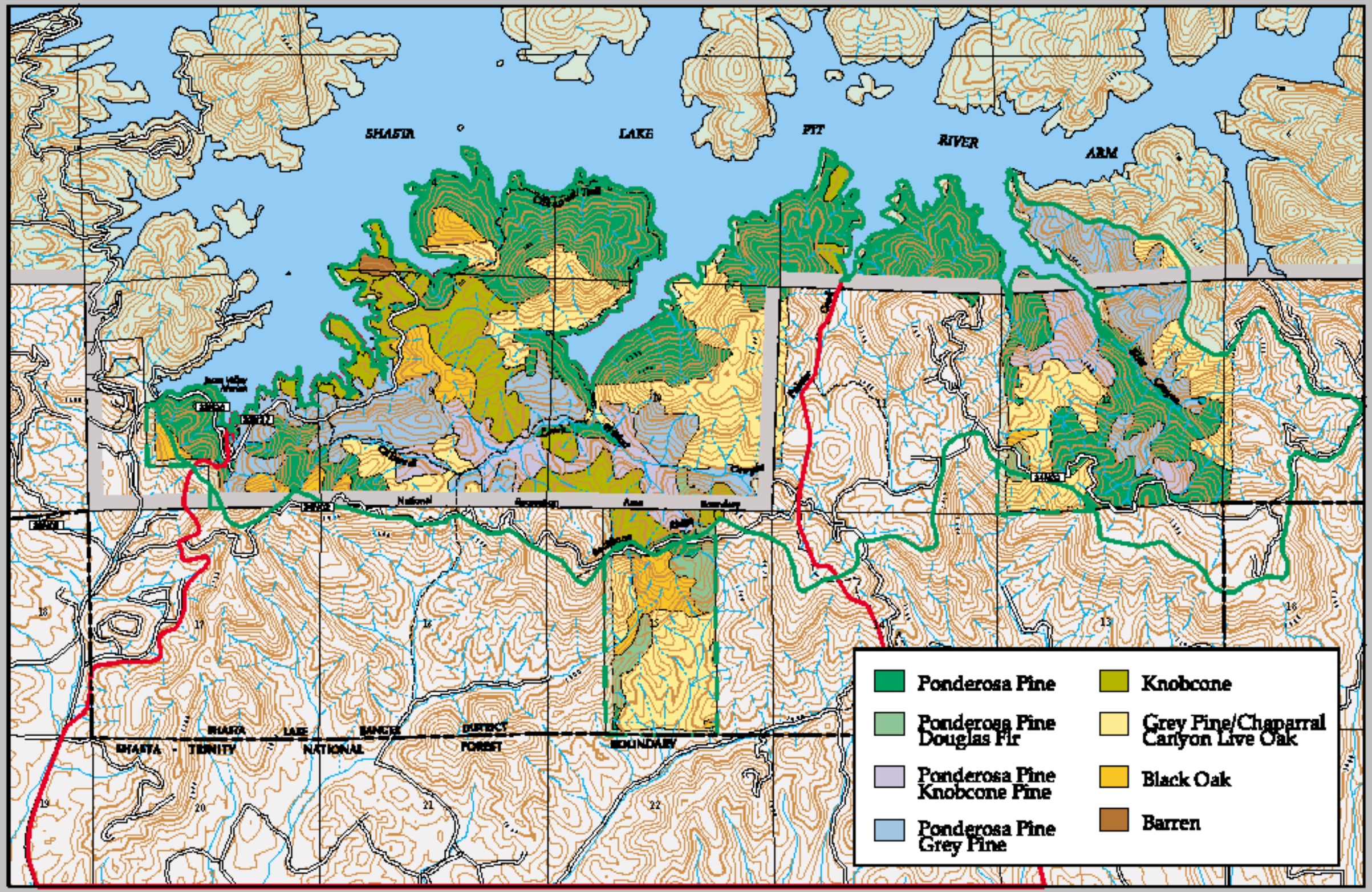
Map 4. Vegetation Types



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Map 5. Burn Intensity