3.6 Management Indicator Species Effects

3.6.1 Introduction

The following assessment is summarized from management indicator species report for the Freeman Project, which is incorporated here by reference (USFS PNF BRD 2006l). This report documents the effects of the Proposed Action (Alternative 1), No-action (Alternative 2) and two other action alternatives (Alternatives 3, 4) on selected Management Indicator Species (MIS) as a result of implementation of the Freeman Project. Description of the Freeman Project and all alternatives is found in Chapter 2 of the Freeman Project Environmental Impact Statement.

MIS shall be selected because their population changes are believed to indicate the effects of management activities. In the selection of management indicator species, five categories of species representation is described in the requirements and shall be represented where appropriate: 1) Endangered and threatened plant and animal species identified on State and Federal lists for the planning area; 2) species with special habitat needs that may be influenced significantly by planned management programs (Sensitive species); 3) species commonly hunted, fished, or trapped; 4) non-game species of special interest; and 5) additional plant or animal species selected because their population changes are believed to indicate the effects of management activities on other species of selected major biological communities or on water quality. On the basis of available scientific information, interdisciplinary teams shall estimate the effects of changes in vegetation type, timber age classes, community composition, rotation age, and yearlong suitability of habitat related to mobility of management indicator species. Where appropriate, measures to mitigate adverse effects shall be prescribed.

All of the Plumas MIS listed in Table 3.55 will be used for project-level analysis for the Freeman Project, with the exception of largemouth bass (no warmwater aquatic system present in the wildlife analysis area). This species does not have habitat in or adjacent to the project area and would not be affected (either directly or indirectly) by the Freeman Project. The remaining MIS have habitat that would be affected (directly or indirectly) by the Freeman Project.

Table 3.55 Non-TES Management Indicator Species – Plumas National Forest.

Species	Status*	Habitat Indicator
Deer	HA	early seral, shrub
Gray Squirrel	HA	oaks
Canada Goose	HA	wetlands
Woodpecker Group	M	snags
Golden Eagle	M	open forest
Prairie Falcon	M	early seral/cliff
Willow/Alder Comm.	M	riparian
Trout Group	HA	coldwater aquatic
Largemouth Bass	HA	warmwater aquatic

* HA – Harvest (category 3), M – Maintenance (category 4 & 5)

3.6.2 Summary

Table 3.56 indicates which species would benefit from DFPZs, and Group Selection harvest, which species would experience a reduction in habitat values and which species would not see a change in the value of habitat from these activities. In this table, CWHR values for current conditions (No-action alternative) are compared with expected changes in habitat that are numerically calculated by the CWHR program. Values were derived from the programmatic HFQLG EIS analysis and are not specific to this project but changes in HSI are reflective of opening up stands from dense forested stands.

Table 3.56 Changes in Habitat Suitability Index for MIS.

Species	% Change in habitat value* with Action Alternatives from Existing condition (Alt 2): DFPZ	% Change in habitat value* with Action Alternatives from Existing condition (Alt 2): Group Selection
Deer	+23%	+10%
Gray Squirrel	-9%	-45%
Pileated Woodpecker	-23%	-35%
Hairy Woodpecker	+19%	+7%
Golden Eagle	+6%	+9%
Prairie Falcon	+5%	+28%

*Values taken from HFQLGFRA FEIS analysis. Values above are an indicator of potential trends in habitat suitability, within treated areas, for the listed MIS with implementation of Alternatives 1, 3 and 4.

3.6.3 Scope of the Analysis

Geographic Analysis Area: The proposed treatment area is located in predominately Sierra mixed conifer forest habitat. The treatment area is defined as the area to be treated with fuels treatment, including DFPZs, approximately 3,066 acres, as well as up to 175 acres of group selections and access roads to the groups, and the 2,727 acres available to Area Thinning. The project area is defined as the treatment area plus an additional larger land base which encompasses all of the treatment area. This project area is located at elevations ranging from 5,600 feet at Humbug Creek to 7,693 feet at Smith Peak. For the purpose of this BA/BE, the wildlife analysis area is defined as the project area and treatment area plus an additional larger land base. The additional larger land base was determined by potential direct, indirect & cumulative effects on California spotted owl PAC and HRCA distribution. So the wildlife analysis area goes out to and encompasses the closest PACs/HRCAs to the project area. The wildlife analysis area totals approximately 46,039 acres (Figure 3.1) of which 41,388 acres are National Forest Lands. This wildlife analysis area is also being used for all other wildlife species analyzed in this MIS report since the effects of the project to those species will not extend beyond the analysis area boundary for the California spotted owl. All direct, indirect and cumulative effects discussed, occur within this 46,039 acre wildlife analysis area. The direct and indirect effects of each alternative, together with the additive or cumulative effects of each alternative, have been considered in evaluating impacts to MIS and MIS habitat.

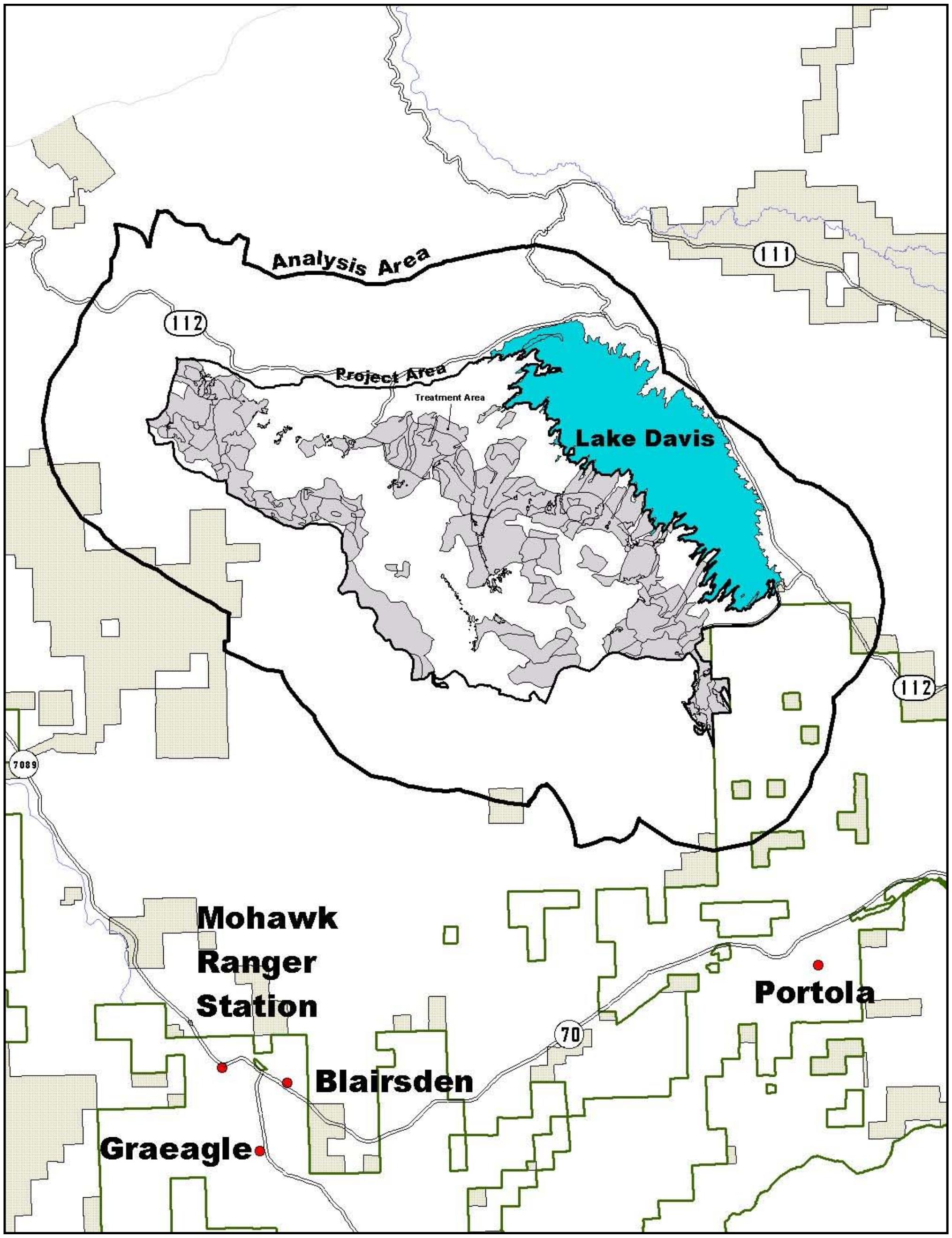

Figure 3.7 Freeman Wildlife Analysis Area, Project Area and Treatment Area (solid color).

Timeframe of Analysis: The timeframe used for determining cumulative effects depends on the length of time that lingering effects of the past actions would continue to impact the species in question. For the Freeman project, general information based on the history of the area and sight specific information based on available data, going back approximately 25 years and forward approximately 5 years, was incorporated

3.6.4 Analysis Methodology

The Freeman project was reviewed using aerial photographs, DOQs, GIS vegetation layers, GIS species specific coverages and known information to help determine the potential presence of MIS species (i.e. Deer, Woodpeckers, etc.). In the field, while conducting protocol surveys for TES species, any observations of MIS species are documented on 1:24000 scale quad maps. Species nest sites and locations are then entered into GIS based on the mapped locations or GPS points. For the analysis of effects, changes to suitable habitat were determined by using a GIS vegetation layer combined with type of treatments (i.e. mechanical thinning, grapple piling, hand thinning, etc.) and CWHR system.

3.6.5 General Affected Environment

The CWHR system was designed to be a planning tool to predict wildlife species habitat suitability for geographic locations and habitats in California. The CWHR system provides species' habitat suitability ratings for breeding, feeding, and cover, in varying habitat types and seral stages. These suitability ratings are converted to numeric values, and the three values are averaged to calculate overall habitat values for each habitat type and seral stage for each particular species. The CWHR system can be used to predict differences in habitat values between two habitat conditions and can indicate which species may be using habitat within a project area, as well as which may be negatively or positively affected by management actions, based on differences in habitat values between two habitat conditions. These values are not absolutes; they only provide an indicator of potential use of habitat by the species. CWHR Numerical values used in the system are: 1.0 = high suitability, optimal for species occurrence, 0.66 = moderate suitability, suitable for species occurrence, can support moderate population densities; 0.33 = low suitability, marginal for species occurrence, can support low population densities; 0.00 = unsuitable for species occurrence. Ratings were developed assuming that all special habitat elements were present in adequate amounts. Habitat suitability ratings for the selected Sierran Mixed Conifer (SMC) CWHR seral stages within the Freeman wildlife analysis area are provided for terrestrial MIS species.

For the Freeman wildlife analysis area the representative CWHR vegetation types are listed below in Table 3.57. Existing condition CWHR types were derived from vegetation layer (GIS) and 2000 aerial photo interpretation. Field analysis provided the basis for adjustments to the vegetative landbase.

Table 3.57 CWHR Habitat Types and Acres within Freeman Wildlife Analysis Area from the Vegetation Layer (all acres are approximate and all are National Forest).

CWHR Type*	Wildlife Analysis Area		CWHR Type*	Wildlife Analysis Area
AGS	1,045		PGS	2,258
ASP1M	11		PPN1	0
ASP1P	8		PPN3M	29
ASP1S	0		PPN3P	34
ASP2D	1		PPN3S	23
ASP2M	8		PPN4M	64
ASP2P	52		PPN4P	31
ASP2S	2		PPN4S	139
ASP3D	10		PPN5S	2
ASP3M	137		RFR1	0
ASP3P	151		RFR2S	398
ASP3S	11		RFR3D	50
ASP4P	14		RFR3M	23
BAR	201		RFR3P	27
EPN1	0		RFR3S	6
EPN2M	0		RFR4D	190
EPN2S	14		RFR4M	292
EPN3M	57		RFR4P	83
EPN3P	105		RFR4S	90
EPN3S	0		RFR5D	521
EPN4D	940		RFR5M	44
EPN4M	3,011		SGB	398
EPN4P	733		SGB1X	15
EPN4S	31		SGB3P	0
EPN5D	129		SMC1	27
EPN5M	783		SMC2D	4
EPN5P	73		SMC2M	17
JPN1	0		SMC2P	49
JPN2S	34		SMC2S	662
JPN3M	2		SMC3D	184
JPN3P	17		SMC3M	222
JPN3S	6		SMC3P	466
JPN4M	18		SMC3S	40
JPN4P	6		SMC4D	2,844
JPN4S	57		SMC4M	7,497
LAC	13		SMC4P	2,002
LPN1	0		SMC4S	129
LPN2S	56		SMC5D	2,418
LPN3D	29		SMC5M	1,382
LPN3M	48		SMC5P	170
LPN3P	53		SMC5S	35

CWHR Type*	Wildlife Analysis Area		CWHR Type*	Wildlife Analysis Area
LPN3S	6		SMC6D	94
LPN4D	284		Water	3,692
LPN4M	702		WFR1	0
LPN4P	223		WFR2S	153
LPN5D	144		WFR3D	286
LPN5M	0		WFR3M	132
MCP	460		WFR3P	45
MCP1X	103		WFR3S	83
MCP2X	4		WFR4D	1,319
MCP3M	8		WFR4M	1,423
MCP3P	0		WFR4P	338
MHC1	0		WFR4S	34
MHC3S	6		WFR5D	194
MHC4M	100		WFR5M	597
MHC4P	0		WFR5P	118
MHC5M	0		WTM	69
MRI	44		**Grand Total**	**41,388**

*1=Seedlings <1" diameter at breast height (dbh.), 2=saplings 1-6" dbh, 3=poles 6-11" dbh, 4=small 11-24"dbh, 5=medium/large >24"dbh. D= Dense Canopy Cover > 60%, M= Moderate Canopy 40-59%, P= Open Canopy Cover 25-39%, S=Sparse Canopy 10-24%. AGS = Annual Grassland, ASP = Aspen, BAR = Barren, EPN = Eastside Pine, JPN = Jeffrey Pine, LAC = Lacustrine, LPN = Lodgepole Pine, MCP = Montane Chaparral, MHC = Montane Hardwood-Conifer, MRI = Montane Riparian, PGS = Perennial Grassland, PPN = Ponderosa Pine, RFR = Red Fir, SGB = Sagebrush, SMC = Sierran Mixed Conifer, WFR = White Fir, WTM = Wet Meadow.

The CWHR habitat types present within the wildlife analysis area are reflective of those found within the westside mixed conifer and consist of Sierra Mixed Conifer, White fir, Red fir, Lodgepole Pine, Ponderosa Pine and Montane Riparian/ Meadow. All habitat types are described in *A Guide to Wildlife Habitat of California*, California Department of Forestry and Fire Protection, October 1988.

Section 3.2.3 within the SNFPA FSEIS 2004) provides an overview of the population trends of 32 of the total 72 MIS species identified in individual Forest Plans within the Sierra Nevada National Forests. This population trend data was derived from data collected primarily from state wildlife agencies and from breeding bird survey routes and other constant effort surveys within and adjacent to National Forest lands. Population data is generally lacking for the majority of the identified MIS species within the Sierra Nevada bioregion.

3.6.6 Mule Deer (*Odocoileus hemionus*)

3.6.6.1 Affected Environment

The Freeman wildlife analysis area falls within an area that provides summer range for the Sloat and Doyle Deer Herds. The Sloat and Doyle Deer Herds are managed under the guidance of deer herd management plans developed cooperatively between the California Department of Fish & Game and major land management agencies, including the Forest Service. This management plan provides deer population goals and habitat goals as well as identifies possible limiting factors to population growth. The management plans contain an action plan for all cooperating agencies to follow to achieve management goals.

The Plumas LRMP (USDA Forest Service, 1988), as amended, provides as an objective a deer population goal of approximately 24,000 deer across the Forest. Because of the lack of population monitoring data, it is unknown at what population level is currently being supported, but deer numbers are down in all Sierra Deer Herds (DFG, 1998).

The Sloat Deer Herd is composed primarily of Columbian black-tailed deer (*Odocoileus hemionus columbianus*) although there is some intermingling and hybridization with Rocky Mountain mule deer (*O.h. hemionus*) from the neighboring Doyle Deer Herd to the east. The wildlife analysis area is within hunting zones X6A and X6B, which allocated 380 (X6A) and 425 (X6B) deer tags in 2005. Within the wildlife analysis area there is approximately 19,101 acres of summer range for the Sloat Deer Herd (approximately 5% of total Sloat herd summer range) and 27,209 acres of summer range for the Freeman Deer Herd (approximately 6% of total Doyle summer range).

Within the wildlife analysis area, Sloat herd summer range (under the three proposed action alternatives) could be treated with approximately 999 to 1,026 acres of DFPZ, approximately 622 to 709 acres of AT w/biomass removal and 49 to 183 acres of GS and/or Aspen ETZs (Alternative1). Approximately 1,444 to 1,609 acres of DFPZ, approximately 2,116 to 2,275 acres of AT w/biomass removal and 124 to 376 acres of GS and/or aspen ETZs (Alternative 1) could occur within Doyle herd summer range.

The 1984 Sloat Deer Herd Management Plan called for a desired population goal of 5,500 animals at a buck to doe ratio of 20-25 bucks per 100 does, and a spring fawn to doe ratio of 40-45 fawns per 100 does. The 1982 Doyle Deer Herd Management Plan called for a desired population goal of 13,000 animals at a buck to doe ratio of 25-30 bucks per 100 does, and a spring fawn to doe ratio of 40-45 fawns per 100 does.

Statewide, it is thought that declines in deer populations are due to low fawn survival (DFG, 1998), but causal relationships have not been determined. Conversions of brushfields to conifer plantations, lack of prescribed fire, overstocked conifer stands, increased road densities, competition and displacement by livestock, predation, urban sprawl, and loss of productive riparian systems probably have all contributed to herd declines (Ibid). In the 1980s and 1990s, California had large increases in mountain lion populations. Pressure on the deer populations as a result of mountain lion predation may act to suppress deer numbers (SNFPA 2001). Population fluctuations are natural in wildlife and occur as a result of hard winters, droughts, floods, loss of habitat, and disease. Current population trends for mule deer is considered “variable” (Section 3.2.3 in the SNFPA FSEIS).

Open road density per square mile is an index used to predict at what level upland habitat would be effective in providing potential ungulate use of that habitat, referred to as a habitat effectiveness index. Higher road densities infer increased use by human users, which can result in changes in behavior and habitat use patterns by ungulate species (Lyon, 1979, Thomas 1979, Wisdom 1996). The higher the open road density per square mile, potentially the less the surrounding habitat will be fully used (Lyon, 1983). The Western Association of Fish & Wildlife Agencies Mule Deer Working Group identified removing the negative effects of roads by reseeding and limiting access as a means of improving habitat for mule deer in forests (WAFWA, 2002). Both the Sloat Deer Herd Management Plan and the Doyle Deer Herd Management Plan call for reducing road access to increase the values of habitats to deer by reducing disturbance and also reduce illegal kill. The open road density within the wildlife analysis area is approximately 2.9 miles/square mile, for a habitat effectiveness rating of 68 (or the effectiveness of deer habitat in obtaining optimum use of the maximum area is reduced about 18% by the presence of roads that are open to vehicular traffic) (Table 3.58).

Table 3.58 Existing Open Road Density/Habitat Effectiveness (Hef) for Deer within the Wildlife Analysis Area

Road Class	Analysis Area Road Density	Analysis Area Habitat Effectiveness*	
		Hef	% Decline
Main	0.2 mi/sq. mile	99%	-1
Secondary	2.7 mi/sq. mile	73%	-27
Total	2.9 mi/sq. mile	70%	-30

* Thomas, J.W. 1979 – Wildlife Habitat in Managed Forests the Blue Mountains of Oregon and Washington. Pg. 122

Disturbances within Sierran Mixed conifer usually results in a diverse, fire adapted shrub component consisting of species preferred as browse. Within the project area, preferred browse includes snowbrush ceanothus (*Ceanothus velutinous*), whitethorn ceanothus (*C. cordulatus*), deerbrush (*C. integerrimus*), bittercherry (*Prunus emarginata*), and greenleaf manzanita (*Arctostaphylos patula*), while winter forage is provided by wedgeleaf ceanothus (*C. cuneatus*) and silktassel (*Garrya fremontii*). Brushfields that develop on summer range after perturbations such as wildfire, logging, and broadcast burning have been found to be very important fawning areas, as well as providing highly nutritious forage, especially up to the first 10-12 years following the disturbance.

Within Plumas County, deer respond to manipulated habitats that set back the successional pattern of vegetation in a predictable manner. The first 10 years there are local increases in deer use and numbers within the disturbed area, whether it is created by logging or fire. Deer respond to the vegetative response of the disturbance, manifested by an increase in succulent shrub and forb growth. As habitat matures, and brush gets high and thick, fawning use starts to decline after about 15-25 years. Deer use can continue at lesser numbers than what was realized in the first 10 years, especially if natural openings and forested stands allow for movement. Planting the shrub areas with conifers accelerates the decline in deer use; thinning and release of conifers can result in a flush of new vegetative growth for deer browse up to the time that the conifers start shading out this growth. Somewhere between 25-50 years, the conifers within plantations or cutover areas dominate the site and browse is less available, but hiding and thermal cover is provided.

Shrub species may dominate and persist for up to 50 years or longer before conifer growth significantly reduce shrub growth through shading. This shrub stage has two characteristic successional sequences:

1. On poor, typically shallow soils, often overlaying bedrock, the shrubs tend to predominate to form a climax community.
2. On deeper forest soils, this shrub community represents secondary succession following disturbance.

The shrub species may exclude conifers for many years. However, these same species may facilitate the germination of shade tolerant conifer species by providing a protective cover, moderating microclimate, and improving soil conditions. If no conifer seed source exists, such as within the interior of a stand replacing fire, the shrub community can occupy the site for several decades beyond normal successional timeframes. In mature timber stands, shrub species mature and die due to insufficient light and are only present as a sparse understory. The shrub component provides important habitat, including winter range, for deer, as well as early seral habitat for shrub nesting species, such as green-tailed towhees, fox sparrows and mountain quail.

CWHR suitability ratings for deer reflective of selected Sierra Mixed Conifer types that would increase and or decrease with the action alternatives are displayed in Table 3.59.

Table 3.59 CWHR Suitability for Deer in Selected Sierra Mixed Conifer Types

Species	Key Habitat Features	CWHR Suitability Rating**
Mule Deer (includes blacktail) (*Odocoileus hemionus*)	Mosaic of early to intermediate seral stages of most forest, woodland and brush vegetation providing an interspersion of herbaceous openings, dense brush or tree thickets (critical for summer and winter thermal regulation), riparian areas and abundant edge. Moderate to dense shrublands near water needed for fawning.	SMC1 = 0.44 SMC2 = 0.89 SMC3P = 0.89 SMC4P = 0.66 SMC4M =0.77 SMC4D = 0.55 SMC5P = 0.66 SMC5M = 0.55

**CWHR Suitability rating: 1.0 = high suitability, optimal for species occurrence, 0.66 = moderate suitability, suitable for species occurrence, can support moderate population densities; 0.33 = low suitability, marginal for species occurrence, can support low population densities; 0.00 = unsuitable for species occurrence. SMC (Sierra Mixed Conifer)

Based on CWHR, the Freeman wildlife analysis area (NF) supports 5,856 acres of grass/forb, shrub, and early successional habitat (CWHR 1, 2, AGS, PGS, MCP, SGB, WTM) (Table 3.57). The majority of this habitat is due to the extensive meadow systems and past timber harvest. This habitat is important to a number of wildlife associates, including ground nesting birds, small mammals, several species of reptiles, and bats.

Forage for deer is defined as all CWHR vegetation types identified above as grass/forb, shrub, and early successional habitat, as well as all CWHR vegetation types with <40% canopy cover (S and P). These more open stands support some element of understory vegetation in varying degrees of species composition and availability that probably are used by deer for forage more so than for cover. Cover is supplied by CWHR types with canopy cover >40% (M and D). Based on Table 3.57 (excluding Water and Riparian), the analysis area supports approximately

11,287 acres of forage and 26,195 acres of cover for a forage:cover ratio of approximately 30:70. Desired forage: cover ratio within summer range is 50:50. Preferred forage is browse consisting of silktassel, wedgeleaf ceanothus, deer brush, mountain whitethorn; staple browse species consist of greenleaf manzanita, bittercherry, and black oak (*Quercus kelloggii*), including mast.

3.6.6.2 Environmental Consequences

Effects of the Action Alternatives

Directs and Indirect Effects

There may be direct effects to deer with the proposed action alternatives. The potential exists for increased mortality as a result of increased traffic along all roads during project implementation. Treatment activities could disrupt fawning activity that would be occurring between June and August. This disruption could include direct mortality to hiding fawns, as well as displacement of fawns and does which could increase fawn mortality through predation. There may be disturbances to individuals that may be foraging in habitat within or adjacent to units proposed for treatment, which results in animals moving out of the area while activity is going on.

The SMC in all seral stages (SMC1-SMC6) provides for breeding, cover, and feeding habitat suitability, with the highest habitat suitability for all life requisites achieved in the SMC2S, 2P and 3P (young tree, <40% canopy cover). The proposed action alternatives create more open forested habitat with creation of DFPZ and AT w/biomass removal (creating 3P habitats and 4M/5M type habitats with open understories); GS harvest units and aspen ETZs units increase the amount of early seral openings (SMC1 and SMC2) and increase within stand edge.

Changes in habitat suitability, as reflected by HSI in Table 3.59, indicate that changes to the CWHR in the mixed conifer as a result of the action alternatives would result in slight increases in habitat suitability when opening up denser stands (D & M). The largest increase in suitability comes from creating open, younger age stands (1 & 2), as both forage and brush cover is provided at higher levels than older and denser conifer stands.

The existing forage:cover ratio within the project area is 30:70. With the implementation of fuel treatments under Alternative 1 (including biomass), an additional 2,616 acres of foraging habitat (4M and 5M) could be created by opening up denser forested stands currently providing cover habitat and clearing out the understories. In addition, 559 acres of openings supporting CWHR 1 and 2 would be added to the forage base, resulting in an improvement in the forage:cover ratio to roughly 39:61. Alternative 3 will potentially create approximately 2,717 acres of foraging habitat (4M and 5M) by opening up denser forested stands currently providing cover habitat and clearing out the understories. In addition, 175 acres of openings supporting CWHR 1 and 2 would be added to the forage base, resulting in an improvement in the forage:cover ratio to 38:62 (slightly less than other action alternatives). Alternative 4 will potentially creating approximately 3,269 acres of foraging habitat (4M and 5M) by opening up denser forested stands currently providing cover habitat and clearing out the understories. In addition, 174 acres of openings supporting CWHR 1 and 2 would be added to the forage base, resulting in an improvement in the forage:cover ratio to 39:61.

Within the Sloat and Doyle Summer Ranges for Alternative 1, approximately 175 acres of group openings and 384 acres of aspen ETZs would be created for a total of 559 acres. The amount of open forested stands created by DFPZ and AT w/biomass removal implementation (mechanical, grapple pile/masticate and hand thin) in Alternative 1 could increase by approximately 5,264 acres. Alternative 3 would create approximately 175 acres of groups and approximately 5,425 acres of open forested stands through DFPZ and AT w/biomass implementation. Lastly, alternative 4 would create approximately 174 acres of groups and approximately 5,525 acres of open forested stands through DFPZ and AT w/biomass treatments.

The post project forage:cover ratio would persist for several years, and slowly change as brush quality for forage declines due to increased shade from developing conifers in DFPZ/AT and increased conifer growth within group selection/ETZ units. In 12-50 years it is predicted that the amount of forage would again decline. With reforestation, conifers would dominate the brush within group openings anywhere from 15-50 years, depending on site and aspect.

Aspen is a major component within the wildlife analysis area. Aspen thinning prescriptions would enhance aspen health and improve aspen productivity by reducing competition for limited resources. This enhanced health and improved productivity in the aspens stands would increase forage and cover for deer. Approximately 264 acres of aspen and 384 of aspen ETZ treatment would be implemented with Alternative 1. Alternatives 3 & 4 would implement approximately 233 acres of aspen treatment

Decommissioning 10 miles of road, as well as closing 1 mile of roads with proposed action alternatives would decrease open road density within the analysis area to about 2.7 miles/square mile providing for a slight increase in habitat effectiveness above pre-treatment levels (Table 3.60). These decommissioned/closed roads would recover habitat features, such as forbs, grass and browse, in 2-10 years. Closing roads would reduce potential roadkill, as well as reduce human accessibility into suitable habitat and making mule deer less susceptible to both illegal kill and hunter mortality. The action alternatives would construct approximately 2 miles of temporary road and 3 miles of system roads that would be closed post project. Approximately 16 miles of road would be reconstructed with the proposed action alternatives; reconstruction should not impact deer or deer habitat above existing levels.

Table 3.60 Post Project Implementation Open Road Density/Habitat Effectiveness (Hef) for Deer within Wildlife Analysis Area (all action alternatives)

Road Class	Analysis Area Road Density	Analysis Area Habitat Effectiveness	
		Hef	% Decline
Main	0.2 mi/sq. mile	99%	-1
Secondary	2.5 mi/sq. mile	77%	-23
Total	2.7 mi/sq. mile	73%	-27

* Thomas, J.W. 1979 – Wildlife Habitat in Managed Forests the Blue Mountains of Oregon and Washington. Pg. 122

All action alternatives would have Sporax (Borax) applied to pine stumps ≥14” dbh within the DFPZ and Area Thinning treatment units to minimize the susceptibility to Annosus root rot. Use rates would be one pound to 50 square feet of stump surface. Based on the Pesticide Fact Sheet prepared by Information Ventures, Inc. (1995), this rate is considered non-toxic to vertebrate species. Kliejunas (1991) presents data that suggests that the proper use of borax to prevent annosus root disease poses a very low risk of adverse environmental effects, which borax diffuses quickly into the stump and is not available for leaching into the ground surrounding the stump. Maximum doses of borax are estimated to be 17.9 mg/kg for deer and 42 mg/kg for rabbits. This estimate is based on a broadcast application of 10 lbs/acre. Actual doses resulting from stump treatments are expected to be lower in magnitude.

Cumulative Effects

The analysis of cumulative effects of the proposed action alternatives evaluates its anticipated impact on MIS wildlife from the existing condition (existing condition reflected by changes that have occurred in the past) within the wildlife analysis area. The past actions in the wildlife analysis area that contributed to the existing condition include grazing, timber harvest and recreation use.

The SNFPA EIS displayed that mule deer habitat utility declines under all alternatives, including implementation of the Standards and Guidelines outlined in the ROD (FEIS volume 3, part 4.2 page 26). This decline was based on the assumption that practices that open up canopies through mechanical treatments, like thinning, biomass, and salvage logging within green stands, do not generate dense understories of shrubs, forbs and grasses that provide deer foraging habitat. Current direction under the SNFPA emphasizes mechanical treatments in order to insure minimizing potential changes to canopy cover. Because of this, deer habitat declines by –5.6 to –6.6% over a five-decade period across the Sierra Nevada range. With the analysis of S2 in the SNFPA FSEIS in 2004, there was no projected difference in deer habitat from what the 2001 SNFPA analysis disclosed.

In the wildlife analysis area, foraging habitat for mule deer could be improved as a result of implementing all action alternatives and could provide higher quality habitat (from existing conditions) until brush is shaded out or becomes decadent in 12-50 years. With reforestation, brush would be set back through release and plantation thin treatments, allowed to recover and provide a small amount of new browse, and eventually are shaded out by the growing conifers at about 50-60 years

The action alternatives are designed to reduce the risk of future stand replacement fires and promote the reestablishment and development of a mature closed canopy mixed conifer forest. The long term cumulative effects of this action would fall in line with the analysis conducted for the SNFPA (described above) and contribute to the decline of mule deer within the wildlife analysis area, the Plumas NF, and the Sierra Nevada range.

The action alternatives implement positive habitat manipulations that tend to reduce possible identified limiting habitat factors for California deer herds (creation of brushfields, using prescribed fire, opening up overstocked conifer stands, reducing road densities). Within these treated areas there could be a short-term increase in deer utilizing the brush/forb regeneration that would flourish with group openings and any treated area that would be underburned, prescribed burned, masticated or grapple piled. This increase in deer use may be more reflective of changes in use patterns by deer than any major increase in animals. On the other hand, other identified limiting factors (predation) could also be increased by the action alternatives. Urban sprawl would not be affected by the proposed actions, although human access into deer habitat would be reduced.

Grazing would be expected to continue on private and National Forest lands at current levels. There are seven livestock grazing allotments (Grizzly Valley Community, Grizzly Valley, Humbug, Chase, Lake Davis, Long Valley and Willow Creek 2) that overlap into the wildlife analysis area of which four are active. Approximately 40 percent of the Humbug allotment is within the project area. Ninety five cow/calf pairs area authorized from June 1 thru August 1. One hundred percent of the Grizzly Valley allotment is within the project area. Five hundred cow/calf pairs are authorized from June 16 thru September15. Approximately 50 percent of the Grizzly Valley Community allotment is within the project area. One hundred fifty seven cow/calf pairs are authorized from June 16 thru September 30 and another One hundred and twenty cow/calf pairs are authorized from June 16 thru September15. The remaining four allotments only overlap the wildlife analysis area with the Chase allotment being the only active allotment. This activity would continue to compete with deer for the limited forage base.

The Westside Lake Davis Watershed Restoration Project would restore 50 headcuts and gullies within the project area. Implementation of this project would improve channel stability and reduce sedimentation within 20 stream channels. This action potentially improves the habitat for deer through increased quality of forage sources.

Future activities include on going work within the Humbug DFPZ, Long Valley KV, and hazard tree removal projects. Little to no change in overstory vegetation is anticipated with these projects. The proposed action for the Grizzly DFPZ, partly within the wildlife analysis area, is currently under development and could not be precisely evaluated at the time of this report however; the effects are expected to be similar to the Freeman project. Additional potential projects (tentatively identified as Cutoff and Mt. Ingalls), involve fuel treatments and fall partly within the wildlife analysis area near Bagley Pass and Crocker Cutoff. However, no site specific planning has occurred. Planning could potentially occur in 2007. These future projects would continue to thin, masticate, grapple pile and underburn deer habitat thus potentially improving habitat conditions for deer.

The Personal Use Firewood program on the Plumas National Forest is an ongoing program that has been in existence for years and is expected to continue. This program allows the public to purchase a woodcutting permit to remove firewood from National Forest lands. Much of this wood material either consists of down logs found in the forest, along forest roads, and within cull decks created by past logging operations, or as standing snags. The Freeman project area, as well as the wildlife analysis area (excluding the lake side of 24N10 and surrounding Lake Davis) is open to woodcutting. Snags and logs would continue to be removed, resulting in the cumulative loss of these habitat components across the landscape. Snags are recruited annually from live trees through natural processes at a rate that may sustain this loss within the wildlife analysis area; snag and log removal is most common along, or within a short distance from, open roads. More area would be accessible to woodcutting with the no action alternative, as no existing roads would be closed.

The past and future effect of these actions has and would be to shift forest successional stages to somewhat earlier stages, while generally retaining continuous forest cover. Future effects include persistence of the largest trees, retention of snags away from roads, and reduction in habitat losses due to large, damaging wildfires.

Recreational use is expected to continue at the current rate. The current rate includes approximately thirteen Special Use Permits that are within the wildlife analysis area. These include hunting outfitters & guides, fishing outfitters & guides, snowmobile poker runs, sled dog races, and film productions. The on going recreational activities would continue to affect deer behavior and movement patterns in the wildlife analysis area.

The Forest Service is chip sealing a portion of FS Road 24N10 from the intersection with West Street to the Camp 5 fishing access road turnoff. This entails widening the existing sub grade up to 30 feet (approximately 6-10 feet). The chip sealing of FS Road 24N10 will likely reduce airborne dust created by vehicles traveling over a gravel/dirt surface. This project has the potential to increase access into deer habitat by improving the road surface thus making it more accessible to all types of vehicles.

The California Department of Fish and Game is proposing to draw down the water level of Lake Davis and use the piscicide rotenone in an attempt to contain and eradicate the northern pike from the reservoir and its upstream tributaries. The drawdown and treatment are proposed to start in the fall of 2007. This project has a potential to limit the availability of water to deer that forage around Lake Davis.

Effects of Alternative 2 (No-action)

Direct, Indirect and Cumulative Effects

There should be no direct effects to this species. There would be no impact to Sierran Mixed Conifer habitat or Aspen habitat. There would be no change in the forage:cover ratio, and the existing forage conditions would continue to mature, decline in quantity and decrease in quality without any disturbance event.

Not treating existing fuels through thinning, DFPZs and AT w/biomass implementation would make potential wildfires in the area difficult to suppress and create a more intense burn, which could lead to increased rates of spread resulting in additional acres burnt. The existing fuel loads within the area could produce a very hot fire, which could kill re-sprouting species of shrubs, potentially create monocultures, provide a medium for noxious, invasive weeds, and burn minerals from the soil, leading to soil erosion and lower productivity.

There would be no reduction in the open road density within the analysis area.

The No-action alternative would do nothing to reduce the identified possible limiting habitat factors for California deer herds (loss of brush fields, lack of prescribed fire, overstocked conifer stands, increased road densities). The cumulative effects of no action could fall in line with the analysis conducted for the SNFPA (described above) and contribute to the decline of mule deer within the wildlife analysis area, the Plumas NF, and the Sierra Nevada range. In the short term, forested stands would not be opened-up through thinning and underburning, thus very little regeneration of foraging habitat would occur. On the other hand, no action could result in potential larger and more intense wildfires, which, depending on weather conditions and fuel loadings, could either, increase or decrease the productivity of foraging habitat.

3.6.7 Gray Squirrel (*Sciurus griseus*)

3.6.7.1 Affected Environment

The western gray squirrel is considered fairly common in mature stands of most mixed conifer-hardwood habitats. It continues to be managed as a game animal, with harvest season running about 6 months (August to end of January), and allowable take (bag limits) in 2005 being 4 per day, with 4 in possession. The estimated 2000 harvest was 74,888 (DFG FEIS, April 2002).

Simulation models have been developed for the western gray squirrel, using habitat suitability (Table 3.61) models from CWHR database, acreage of habitats from Forest and Rangeland Resource Assessment Program's 2002 version 1, and population density information from research investigations, to analyze, understand and predict the outcome of human caused events (hunting) on squirrel populations (DFG, FEIS, April 2002). Western Gray Squirrel occupies 24 CWHR habitat types in California consisting of 29,921,555 acres. The number of gray squirrels in suitable habitat ranges between 0.2 and 1.0 squirrels/acre. Using the simulation model, there is an average breeding population of approximately 18 million squirrels, which produce approximately 20.5 million young, resulting in an average total population of about 38.5 million gray squirrels in California (DFG FEIS, April 2002). No current population trends for western gray squirrel were identified in Section 3.2.3 in the SNFPA FSEIS.

The gray squirrel indicates the condition of hardwood-dependent species on the Plumas NF. Mature stands of trees are required for cover, mast, and availability of snags for denning. It is an opportunistic feeder. The diet varies with the availability of foods. It eats hypogeous fungi, acorns, fruits, forbs and other tender shoots and leaves. In the summer, fall and winter acorns are very important.

Black Oak, in particular, produces the squirrel's major food (acorns) and provides cavities for nesting. Based on CWHR types, the majority of the Freeman Project is typed as Sierra Mixed

Conifer. Black oak is a minor component of the mixed conifer. In addition there is approximately 106 acres typed as Montane Hardwood-Conifer forest, with black oak the dominant species. Black oak does best in open sites, but it can be maintained under adverse conditions such as shade, ridgetops, and south slopes where conifers may regenerate in its shade. Secondary succession following fire and cutting begins with a dense shrubby stage as a result of a flush of black oak sprout that will compete with surrounding brush for 20+ years. On mesic sites the conifer component overtakes the oaks more rapidly than on xeric sites, where the oak component is dominant longer, taking 60-90 years to mature. Managing and maintaining existing oaks and hardwoods as well as managing to promote increased hardwood vigor and recruitment would likely be crucial for managing the gray squirrel.

Table 3.61 CWHR Suitability for Gray Squirrel in Selected Sierra Mixed Conifer types

Species	Key Habitat Features	CWHR Suitability Rating**
Gray Squirrel (*Sciurus griseus*)	Within the Sierras, needs mature stands of mixed conifer and hardwood habitats, including within stand oak/conifer association. Cavities within trees and snags are used for denning, but can also create nests on branches. Up to 2.5acre home range.	SMC1 = 0.11 SMC2 = 0.11 SMC3P = 0.33 SMC4P = 0.33 SMC4M =0.66 SMC4D = 0.66 SMC5P = 0.66 SMC5M = 0.66

**CWHR Suitability rating: 1.0 = high suitability, optimal for species occurrence, 0.66 = moderate suitability, suitable for species occurrence, can support moderate population densities; 0.33 = low suitability, marginal for species occurrence, can support low population densities; 0.00 = unsuitable for species occurrence.

The Plumas LRMP, as amended by the HFQLG EIS, provides direction for black oak management:

> *"Where oak is present, retain an average 25 to 35 square feet basal area per acre of oaks over 15 inches dbh. Site specific planning will determine feasibility and specific needs. Retain smaller oaks, if determined to be necessary for future recruitment."*

There has been no monitoring effort on the Plumas NF for gray squirrel.

3.6.7.2 Environmental Consequences

Effects of the Action Alternatives

Direct Effects

There may be direct effects to gray squirrels with the action alternatives. The potential exists for increased mortality as a result of increased traffic along all roads during project implementation. Treatment activities would occur in suitable habitat so direct mortality could be expected from logging activity. There may be disturbances to individuals that may be foraging in habitat within or adjacent to units proposed for treatment, which could result in animals moving out of the area while activity is going on, subjecting squirrels to increased risk of predation.

The action alternatives (1, 3 & 4) could potentially open up the canopy cover on up to 5,525 acres in fuels treatment areas of dense conifer habitat (>40% canopy cover, becoming 40%

canopy cover), potentially creating stands that may release hardwoods within the treatment units. Hardwoods would be retained within throughout the wildlife analysis area.

The action alternatives could create up to 175 acres of gaps & openings through the group selection harvest method and up to 384 acres in Alternative 1 of openings around aspen through aspen extended treatment zone prescription. Retention of hardwoods within Group Selection harvests and aspen ETZ harvests could contribute to small patches of hardwood dominated openings for 15-50+ years. After the conifers start to dominate these groups, hardwoods should be of the larger size class, contributing to higher production of forage, contributing to stand decadence, and providing potential cavities.

Changes in Habitat suitability, as reflected by HSI in Table 3.61, indicate that changes to the CWHR in the mixed conifer as a result of the action alternatives would result in slight decreases in habitat suitability when opening up denser stands (M & D), as open stands provide little in the way of cover. Hardwood retention within DFPZ, AT and groups within the mixed conifer may provide adequate cover that would allow for squirrel use.

Indirect Effects

With reforestation, oaks, retained at between 25-35 square feet basal area per acre where they exist, would then compete with planted conifers. Under ideal growing conditions, black oaks may not get to a size to produce mast until about age 50, when trees are approximately 9 inches dbh and producing 5 lbs of acorns/tree. By age 80, acorn production has improved to 20 lbs/tree, and by year 100 the oak is 17 inches dbh and producing 60 lbs/tree (USDA Forest Service 1973). Cavities in oaks that gray squirrels can use for dens may start to develop by age 100.

With action alternatives, hardwoods are not targeted for removal. Any hardwoods that are cut would sprout back, and depending on the treatment of the stand, compete with residual conifers and/or brush. Reforestation within groups would accelerate the development of conifer cover, in association with any hardwood development that might occur. Thus SMC3 (trees 6-11” dbh) type habitat could develop between 20-40 years, providing low habitat suitability (HSI of 0.33) for breeding, cover and feeding (Table 3.61). By year 60+, size class 4 trees are expected to develop in the plantations, providing for higher breeding, cover and feeding habitat suitability (HSI of 0.66 for M stands). CWHR habitat suitability ratings for gray squirrel would decline slightly with the action alternatives in the short term, but with the retention of hardwoods (specifically oaks) habitat suitability should increase in the long term, as the surrounding mixed conifer trees mature and canopy cover increases.

Cumulative Effects

The analysis of cumulative effects of the proposed action alternatives evaluates its anticipated impact on MIS wildlife from the existing condition (existing condition reflected by changes that have occurred in the past) within the wildlife analysis area. The past actions in the wildlife analysis area that contributed to the existing condition include grazing, timber harvest and recreation use.

The proposed action alternatives include the treatment of excess fuels and reforestation of conifers by planting. These treatments are designed to reduce the risk of future stand replacing fires and promote the reestablishment and development of a mature, closed canopy, mixed conifer forest.

This project could enhance gray squirrel habitat within the wildlife analysis area as well as protect habitat outside the wildlife analysis area by reducing the risk of high intensity wildfire and by enhancing the growth of dominant and co-dominant trees, including black oak where present.

All action alternatives include road construction; decommissioning, closure and reconstruction (see alternative descriptions for mule deer above). Closing roads would reduce potential roadkill, as well as reduce human accessibility into suitable habitat and making gray squirrels less susceptible to hunter mortality and loss of habitat through woodcutting.

In 2005, gray squirrel hunting season in Plumas County is approximately 6 months long, with a daily bag and possession limit of 4 squirrels. Opening up stands could make squirrels more visible, thus more vulnerable to hunting mortality.

Effects of Alternative 2 (No-action)

Direct and Indirect Effects

There should be no direct effects to this species. There would be no impact to Sierran Mixed Conifer habitat or Hardwood habitats. Ultimately, conifer encroachment would eventually reduce oak from the mixed conifer sites without any kind of disturbance.

Indirect effects of no action include the potential for future wildfire and its impact on habitat. The high fuel loads that would be left by this alternative would make potential wildfires in the area difficult to suppress and create a more intense burn, which could lead to increased rates of spread resulting in additional acres burnt.

Hardwood loss through shading and conifer succession is expected to be higher with this alternative than with the action alternatives because the action alternatives are designed to release hardwoods from competition.

Cumulative effects

There would be no change from the existing condition in terms of human accessibility and gray squirrel susceptibility to roadkill, hunter mortality, and snag removal by woodcutting in suitable habitat, as the open road density would remain at existing levels. Hardwood recruitment into the larger size classes would not be improved if no vegetative manipulation were conducted to release hardwoods from conifer competition.

3.6.8 Canada Goose (*Branta Canadensis*)

3.6.8.1 Affected Environment

California Department of Fish and Game (CDF&G) reports that there have been no significant declines in this species population within the general area for the past three years (J. Lidberg, pers comm.). Canadian geese nest in wetlands and there nesting habitat is usually within 500 feet of reservoirs and lakes over 50 acres in size or larger streams/rivers. There is one body of water of this size within the wildlife analysis area where Canadian geese have been observed (Nickerson, pers. obs.) and that is Lake Davis. Foraging habitat consists of grasslands/meadows adjacent to large bodies of water.

3.6.8.2 Environmental Consequences – Canada Goose

Effects of the Action Alternatives

Direct and Indirect effects

There is suitable foraging habitat and potentially suitable nesting habitat within the wildlife analysis area. However, direct habitat modification is not expected because Canadian geese use wetland habitats that would not be treated. Disturbances associated with logging, temporary road building, or other associated activities within or adjacent to occupied habitat may disrupt nesting, fledging, and foraging activities. Implementing limited operating periods within occupied meadow habitats or within ½ mile of nesting sites would reduce or completely eliminate potential disturbance impacts to this species from the proposed action.

There have been several documented Canadian geese sightings within the wildlife analysis area and flying over the wildlife analysis area as the Canadian geese migrate south during fall migration. The only proposed treatment planned in or adjacent to Canada goose habitat in this area is aspen restoration which is expected to improve meadow hydrology thus improve potential nesting and foraging habitat.

Cumulative effects

Cumulative effects on the Canada goose could occur with the incremental loss of the quantity and/or quality of habitat for this species. Overall, increases in urbanization, increases in recreational use of Forest Service system lands, and the utilization of natural resources on private and federal lands may contribute to habitat loss for this species.

Grazing would be expected to continue on private and National Forest lands at current levels. There are seven livestock grazing allotments (Grizzly Valley Community, Grizzly Valley, Humbug, Chase, Lake Davis, Long Valley and Willow Creek 2) that overlap into the wildlife analysis area of which four are active. Approximately 40 percent of the Humbug allotment is within the project area. Ninety five cow/calf pairs area authorized from June 1 thru August 1. One hundred percent of the Grizzly Valley allotment is within the project area. Five hundred cow/calf pairs are authorized from June 16 thru September15. Approximately 50 percent of the Grizzly

Valley Community allotment is within the project area. One hundred fifty seven cow/calf pairs are authorized from June 16 thru September 30 and another One hundred and twenty cow/calf pairs are authorized from June 16 thru September15. The remaining four allotments only overlap the wildlife analysis area with the Chase allotment being the only active allotment. This activity would continue to impact meadow vegetation thus degrading potential foraging and nesting habitat.

The Westside Lake Davis Watershed Restoration would restore 50 headcuts and gullies within the project area. Implementation of this project would improve channel stability and reduce sedimentation within 20 stream channels. This action should improve the meadow hydrology thus potentially improving Canada goose foraging and nesting habitat.

Effects of Alternative 2 (No-action)

Direct and Indirect effects

There would be no direct or indirect effects on Canadian geese or Canada goose habitat, as no activities would occur that would cause disturbance to nesting or foraging birds, nor any impacts to the existing habitat conditions.

Cumulative effects

Since there are no direct or indirect effects to Canadian geese or its habitat, this project would not contribute to cumulative effects.

3.6.9 Woodpecker Group (Family *Picidae*)

3.6.9.1 Affected Environment

The condition of snag-dependent species is indicated by the woodpecker group, which includes 10 species on the Plumas NF. Current management for woodpeckers consists of applying a specific snag retention standard for the land allocation identified by the SNFPA. It is assumed that if this snag standard were met, viable populations of snag-dependent species would result.

Most all species of woodpeckers will utilize dead trees within both open and dense forested stands for foraging. Several woodpecker species can successfully utilize early seral, shrub-dominated habitats for nesting provided that snags of suitable size are present. These species include Northern flicker (*Colaptes auratus*), Lewis woodpecker (*Melanerpes lewis*) and hairy woodpecker (*Picoides villosus*). Other species require some form of live tree cover surrounding snag habitat for nesting (pileated woodpecker (*Dryocopus pileatus*), white-headed woodpecker (*Picoides albolarvatus*), and downy woodpecker (*Picoides pubescens*) as well as Williamson’s sapsucker (*Sphyrapicus thyroideus*)).

There is little population information available for woodpeckers on the Plumas NF and no monitoring of woodpecker populations or habitat has been conducted, except for a few post-project snag density determinations in the 1980’s. Current population trends for certain woodpeckers were identified in Section 3.2.3 in the SNFPA SFEIS: Stable (hairy woodpecker, Northern flicker), possibly decreasing to decreasing (pileated woodpecker, red-breasted sapsucker (*Sphyrapicus ruber*)), and possibly increasing (white-headed woodpecker).

Snags/Logs

Snags, particularly large ones (>24 inches dbh), are an important wildlife habitat component of forested stands. They provide habitat for primary cavity nesters such as woodpeckers and secondary cavity nesters such as flying squirrels and some Neotropical migratory birds, including the western bluebird (*Sialia mexicana*), violet-green swallow (*Tachycineta thalassina*), Vaux's swift (*Chaetura vauxi*), and American kestrel (*Falco sparverius*). Snags are also the main source of large downed woody debris. Past management practices, including logging, firewood cutting, road construction, and other activities, have probably led to a decline in the number of large diameter snags in the wildlife analysis area, with a detrimental effect on associated wildlife species. By contrast, it is likely that small diameter snags have increased somewhat due to the creation of densely stocked stands and resulting mortality, with a subsequent benefit to wildlife that use small-diameter snags.

The Plumas Forest LRMP, amended by the 2004 SNFPA FSEIS, Table 2, provides direction for snag densities. The proposed action alternatives would retain at least 4 of the largest snags per acre where they exist. Dead trees less than 15" dbh, for the most part, would be removed from all treatment areas. Snags that pose a hazard to operability would be removed.

Selected woodpecker species that could be present within the Freeman wildlife analysis area, are presented in Table 3.62. CWHR suitability ratings are provided for selected Sierra Mixed Conifer types that would increase and or decrease with the action alternatives.

Table 3.62 Selected Woodpeckers that Exist within Freeman Wildlife Analysis Area

Species	Key Habitat Features	CWHR Suitability Rating**
Pileated Woodpecker* (*Dryocopus pileatus*)	Prefers medium to large tree (>12” dbh), moderate to dense (>40% canopy closure) stands[1]; at least 0.14 snags/acre >20” dbh for maximum populations[2].	SMC1 = 0.0 SMC2 = 0.0 SMC3P = 0.33 SMC4P = 0.33 SMC4M =0.66 SMC4D = 0.66 SMC5P = 0.66 SMC5M = 1.0
Lewis’s Woodpecker (*Melanerpes lewis*)	Open stands; forages primarily on insects in spring and summer—60% aerial feeding, 30% ground-feeding, 10% foliage gleaning; late summer and fall, berries and fruits; winter, acorns [1]; at least 1.01 snags/acre >12” dbh for maximum populations [2]	SMC1 = 0.33 SMC2 = 0.55 SMC3P = 0.67 SMC4P = 1.0 SMC4M = 0.66 SMC4D = 0.33 SMC5P = 1.0 SMC5M = 0.66
Williamson’s Sapsucker (*Sphyrapicus thyroideus*)	Prefers medium to large tree (>12” dbh) stands; would use project area for wintering (nests at higher elevations); drinks sap and eats cambium from holes drilled into conifers; gleans insects from trunks and, to a lesser extent, drills for wood-boring insects[1]; at least 1.5 snags/acre >12” dbh for maximum populations[2]	SMC1 = 0.0 SMC2 = 0.0 SMC3P = 0.0 SMC4P = 0.66 SMC4M = 0.66 SMC4D = 0.44 SMC5P = 0.89 SMC5M = 0.89
White-headed Woodpecker (*Picoides albolarvatus*)	Prefers medium to large tree (>12” dbh) stands; often nests near edges of roads, natural openings, or small clearings; eats seeds and insects; gleans insects from needles or picks them from under bark flakes[1]; uses snags at least 24” dbh for nesting; at least 2.25 snags/acre >10” dbh for maximum populations[2]	SMC1 = 0.22 SMC2 = 0.33 SMC3P = 0.44 SMC4P = 0.55 SMC4M = 1.0 SMC4D = 0.66 SMC5P = 1.0 SMC5M = 1.0
Red-breasted Sapsucker* (Sphyrapicus ruber)	Prefers large tree (>12” dbh), sparse to moderately dense (<70% canopy closure) stands; typically nests near stream or meadow; eats insects from holes drilled usually in hardwoods, aerial insects, sap, and cambium[1]; once part of yellow-bellied sapsucker species; snag requirements for yellow-bellied sapsucker (determined before species were separated) were at least 1.5 snags/acre >10” dbh for maximum populations[2]	SMC1 = 0.44 SMC2 = 0.55 SMC3P = 0.66 SMC4P = 1.0 SMC4M = 0.89 SMC4D = 0.55 SMC5P = 1.0 SMC5M = 0.89
Downy Woodpecker* (*Picoides pubescens*)	Closely associated with riparian softwoods; frequents open hardwood and conifer habitats; eats beetles, ants, berries, fruits, nuts[1]; snag densities should be at least 3.0 snags/acre >6” dbh for maximum populations[2]	SMC1 = 0.11 SMC2 = 0.22 SMC3P = 0.55 SMC4P = 0.55 SMC4M = 0.44 SMC4D = 0.33 SMC5P = 0.55 SMC5M = 0.44

Species	Key Habitat Features	CWHR Suitability Rating**
Hairy Woodpecker* (*Picoides villosus*)	Uses relatively open or patchy stands of large, mature (>12” dbh) trees and snags of sparse to moderate density[1]; snag densities should be at least 1.8/acre > 10 inches dbh for maximum populations[2]	SMC1 = 0.22 SMC2 = 0.55 SMC3P = 0.55 SMC4P = 1.0 SMC4M = 1.0 SMC4D = 0.66 SMC5P = 1.0 SMC5M = 1.0
Northern Flicker* (*Colaptes auratus*)	Open forests and shrub habitat with abundant edges for feeding and snags for nesting; annual diet about 55% animal matter (insects) and 45% plant matter[1]; snag densities should be at least 0.4/acre > 12 inches dbh for maximum populations[2]	SMC1 = 0.33 SMC2 = 0.33 SMC3P = 0.66 SMC4P = 0.77 SMC4M = 0.77 SMC4D = 0.66 SMC5P = 1.0 SMC5M = 1.0

*Observed in the wildlife analysis area.
**CWHR Suitability rating: 1.0 = high suitability, optimal for species occurrence, 0.66 = moderate suitability, suitable for species occurrence, can support moderate population densities; 0.33 = low suitability, marginal for species occurrence, can support low population densities; 0.00 = unsuitable for species occurrence.
[1]California Department of Fish and Game 1999 and CWHR Version 8.0
[2]Thomas et al. 1979.

3.6.9.2 Environmental Consequences – Woodpecker Group

Effects of the Action Alternatives

Direct and Indirect effects

Woodpecker mortality could occur with the falling of snags when birds are within the cavity. This is especially true with immature birds in the nest. Falling snags that provide insects and larvae eaten by woodpeckers would reduce foraging habitat.

As per the action alternatives, at least 4 of the largest snags per acre would be retained where they exist. Dead trees less than 15” dbh, for the most part, would be removed from all treatment units, but snags would be removed that pose a hazard to operability.

Alternative 1 treats approximately 240 more acres than Alternative 3, while Alternative 4 treats about 46 acres less than Alternative 3. Assuming equal distribution and density of snags across the wildlife analysis area, Alternative 4 maintains more snags than all the other alternatives.

In Wildlife Habitats in Managed Forests, the Blue Mountains of Oregon and Washington, (Thomas, 1979), Thomas provided a summary of specific hard snag requirements (number per acre of certain size classes) for woodpeckers occurring in the Blue Mountains of Oregon. Woodpecker species and snag requirements were associated with specific plant communities. Thomas also provided research findings in regard to the numbers and sizes of snags needed to maintain primary cavity nesters at population levels ranging from 10-100% of potential.

Bull et al, in Trees and Logs Important to Wildlife in the Interior Columbia River Basin, (May 1997), discussed several research studies that presented new data suggesting that some of the assumptions and data used in the Thomas model are not valid, and that the prescribed snag densities need to be revised upward. Thomas snag densities are based on the number of snags needed for roosting and nesting and did not include additional snags needed for foraging. The Thomas model provided only two roost trees per year per pair of woodpeckers, where studies are showing that many more roost trees are used by a pair within a year (in Bull et al 1997). Radio telemetry studies have shown home ranges to be larger than those used in the Thomas model for at least three woodpecker species. "The Thomas model did not take into account the habitat needs of some of the secondary cavity nesters, like bats and brown creepers, that use such snag features as loose bark" (in Bull et al 1997). Bull and others concluded that "the snag numbers presented by Thomas and others (1979) are not adequate to support the populations intended because of a lack of foraging strata and invalid assumptions used in the model".

Based on research by Bull and others, the Pacific Northwest Research Station, USDA Forest Service, concluded that "current direction for providing wildlife habitat on public forest lands does not reflect findings from research since 1979; more snags and dead wood structures are required for foraging, nesting, and roosting than previously thought" (Science Findings, PNW, issue twenty, November 1999).

Snag densities, based on snags 10 inches dbh or greater, recommended by Bull (from various studies in Idaho and Oregon) for mixed conifer range from 2.5/acre in open canopy (defined as <30% canopy cover), with 1.8/acre of these snags greater than 20" dbh, to 9/acre in closed canopy (>30%), with 3.5/acre of these snags greater than 20" dbh. Bull also states in her review that "Published data suggest that populations of cavity nesters were viable in stands of ponderosa pine and mixed-conifer forests that contained about four snags per acre, a large component of old growth stands, and abundant logs" (Bull et al, 1997). Cavity nesters as a group selected clumps of snags rather than snags that were retained in uniform, evenly spaced distributions, and they selected larger diameter and more heavily decayed snags (Saab & Dudley, 1997).

Based on the above information, as well as the analysis of effects for the snag guidelines required in the SNFPA EIS and ROD (2001 and 2004), the proposed snag densities for each of the action alternatives would provide for habitat needs of woodpeckers that would use the analysis area post fuels reduction.

CWHR habitat suitability ratings for woodpeckers identified in Table 3.62 above indicate that there would be slight changes to woodpecker habitat suitability: habitat suitability for the pileated woodpecker and white-headed woodpecker would decline with opening up stands, while the rest of the woodpeckers would have slight increases or no change in habitat suitability. These changes in habitat suitability assume the key habitat element (snag) would be provided for each CWHR habitat type. Of the species listed on Table 3.62, all but the pileated woodpecker and Williamson's Sapsucker would use the group selection harvest areas, although both species have been observed nesting in clearcuts and/or natural openings (Rotta, personal observations on Plumas NF).

All action alternatives would have Sporax (Borax) applied to pine stumps ≥14" dbh within the DFPZ to Area Thinning treatment units to minimize the susceptibility to Annosus root rot.

Use rates would be one pound to 50 square feet of stump surface. Based on the Pesticide Fact Sheet prepared by Information Ventures, Inc. (1995), this rate is considered non-toxic to vertebrate species, including birds. Borax does not build up (bioaccumulate) in fish, inferring no build up occurs in other vertebrate species. Thus Sporax applied to stumps should not affect avian species, including woodpeckers.

Cumulative effects

The analysis of cumulative effects of the proposed action alternatives evaluates its anticipated impact on MIS wildlife from the existing condition (existing condition reflected by changes that have occurred in the past) within the wildlife analysis area. The past actions in the wildlife analysis area that contributed to the existing condition include grazing, timber harvest and recreation use.

Proposed vegetation treatments are designed to reduce the risk of future stand replacement fires and promote the reestablishment and development of a mature closed canopy mixed conifer forest. Fuels reduction should create conditions that would lessen the risk for future stand replacement fires, thus providing the opportunity to retain structural elements likes snags for a longer period of time.

All action alternatives include road construction; decommissioning, closure and reconstruction (see alternative descriptions for mule deer above). Closing roads would reduce potential availability of snags for becoming hazard trees or being available for firewood.

Future activities include on going work within the Humbug DFPZ, Long Valley KV, and hazard tree removal projects. Little to no change in overstory vegetation is anticipated with these projects. However, all snags that present hazards to road traffic, regardless of size, are being, or would be, removed. Removal of these snags would have a negative effect on individual animals that use snags, yet these hazard trees make up a very small amount of the total snag component in the wildlife analysis area.

The proposed action for the Grizzly DFPZ, partly within the wildlife analysis area, is currently under development and could not be precisely evaluated at the time of this report however; the effects are expected to be similar to the Freeman project. Additional potential projects (tentatively identified as Cutoff and Mt. Ingalls), involve fuel treatments and fall partly within the wildlife analysis area near Bagley Pass and Crocker Cutoff. However, no site specific planning has occurred. Planning could potentially occur in 2007. These future projects would maintain between 2-6 snags/acre.

The Personal Use Firewood program on the Plumas National Forest is an ongoing program that has been in existence for years and is expected to continue. This program allows the public to purchase a woodcutting permit to remove firewood from National Forest lands. Much of this wood material either consists of down logs found in the forest, along forest roads, and within cull decks created by past logging operations, or as standing snags. The Freeman project area, as well as the wildlife analysis area (excluding the lake side of 24N10 and surrounding Lake Davis) is open to woodcutting. Snags and logs would continue to be removed, resulting in the cumulative loss of these habitat components across the landscape. Snags are recruited annually from live trees through natural processes at a rate that may sustain this loss within the wildlife analysis area; snag and log removal is most common along, or within a short distance from, open roads. More area would be accessible to woodcutting with the no action alternative, as no existing roads would be closed.

The past and future effect of these actions has and would be to shift forest successional stages to somewhat earlier stages, while generally retaining continuous forest cover. Future effects include persistence of the largest trees, retention of snags away from roads, and reduction in habitat losses due to large, damaging wildfires.

Recreational use is expected to continue at the current rate. The current rate includes approximately 13 Special Use Permits that are within the wildlife analysis area. These include hunting outfitters & guides, fishing outfitters & guides, snowmobile poker runs, sled dog races, and film productions. Continued public use within areas used by woodpeckers and cavity dependent species, especially during the nesting season, could cause disturbance that could disrupt and preclude successful recruitment of young.

Thus the cumulative effects in the Freeman wildlife analysis area would be a decrease in snag numbers, with snags in the wildlife analysis area being retained at four snags per acre. This reduction in snags across the landscape could limit the availability of suitable nesting cavities thus affecting woodpecker breeding success. However, the retention of four snags per acre across the wildlife analysis area is expected to maintain a supply of snags suitable for cavity nesting wildlife.

Effects of Alternative 2 (No-action)

Direct and Indirect effects

There would be no direct effects with this alternative. Indirect effects of the No-action Alternative include the potential for future wildfire and its impact on habitat maintenance and development. The existing fuel loads that would be left by this alternative would make potential wildfires in the area difficult to suppress and create a more intense burn, which could lead to increased rates of spread resulting in additional acres burnt and the premature loss of the largest snags still present.

CWHR habitat suitability ratings for woodpeckers identified in Table 3.62 would not change as a result of Alternative 2 (No-action). With time, as snag fall down proceeds, the loss of snags would decrease habitat suitability until new snags >15” dbh are recruited from the forested stands through natural mortality or wildfire.

Cumulative effects

Hazard tree removal on NFS lands along roads has been an ongoing and continuing action. All snags that present hazards to road traffic, regardless of size, are being, or will be, removed. Removal of these snags would have a negative effect on individual animals that use snags.

With the current Plumas National Forest woodcutting program, the project area (excluding the lake side of 24N10 and surrounding Lake Davis) would be open to public woodcutting 12 months a year, limited only by available access. Uncontrolled public use within areas used by woodpeckers and cavity dependent species, especially during the nesting season, could cause disturbance that could disrupt and preclude successful recruitment of young. No roads would be closed or decommissioned with this alternative, allowing for continued access for woodcutting and hazard tree removal, resulting in loss of snags.

3.6.10 Golden Eagle (*Aquila chrysaetos*)

3.6.10.1 Affected Environment

Golden eagles nest within the Plumas in coniferous timber stands adjacent to large, open valleys or in rock cliffs along river drainages. The Plumas has had as many as 9 known golden eagle nesting territories. The Beckwourth RD has had at least 3 known nest sites in the past; these 3 have become inactive, as the nest, and nesting birds, have disappeared over time. Monitoring of nest sites has declined over the last 10 years, so it is difficult to state with certainty as to the status of these nesting areas. The Plumas LRMP stated that the Forest had the potential to supply habitat for approximately 20 nesting pairs. There is no known golden eagle nesting territories within the wildlife analysis area.

Within the context of the SNFPA bioregion, golden eagle has been lumped into a broad elevational distribution/open habitat use group of raptors; golden eagle primarily foraging in open vegetation types such as grasslands, alpine types, blue oak woodlands, and eastside shrub types. Golden eagles rarely forage within the conifer forest zone (Ibid). Forest management activities likely have minimal or indirect effects to these species because of the use of open, non-forested habitats, although a threat to the golden eagle is the loss of large trees used for nesting (SNFPA 2001). The majority of nest sites on the Plumas are within trees (7 of 9 known sites). Sightings of golden eagles have been documented throughout the wildlife analysis area. Sightings within the wildlife analysis area are often of individuals soaring high above Grizzly Ridge, Lake Davis and Turner Ridge.

No current population trends for golden eagle were identified in Section 3.2.3 in the SNFPA FSEIS.

Neither nesting nor foraging habitat seems to be a limiting factor for the golden eagle population that inhabits the forested stands on the Plumas, as both are abundant and well distributed across the landscape. Habitat suitability values for selected CWHR types affected by the proposed action are listed in Table 3.63.

Table 3.63 Habitat Suitability Ratings for Golden Eagle for Selected CWHR Types within the Freeman Wildlife Analysis Area

Species	Key Habitat Features	CWHR Suitability Rating**
Golden Eagle (*Aquila chrysaetos*)	Open terrain for hunting rodents and rabbits; includes early successional stage of forest and shrub. Nests in cliffs and large trees in open forest.	SMC1 = 1.0 SMC2 = 1.0 SMC3P = 1.0 SMC4P = 1.0 SMC4M =0.89 SMC4D = 0.78 SMC5P = 1.0 SMC5M = 0.89

**CWHR Suitability rating: 1.0 = high suitability, optimal for species occurrence, 0.66 = moderate suitability, suitable for species occurrence, can support moderate population densities; 0.33 = low suitability, marginal for species occurrence, can support low population densities; 0.00 = unsuitable for species occurrence.

3.6.10.2 Environmental Consequences

Effects of the Action Alternatives

Direct and Indirect effect

There are no known golden eagle nesting territories within the wildlife analysis area or project area, thus there would be no direct effect to the population of golden eagles on the Forest. No 30”+ dbh trees would be cut, and the largest snags would be retained (snag retention standards for each alternative are described above under woodpecker section). Thus large perches and potential large nest trees would be present across the landscape at pre-treatment densities.

The SMC in all seral stages (SMC1-SMC6) provides for breeding, cover, and feeding habitat suitability, with the highest habitat suitability for all life requisites achieved in the earlier successional, open stages (SMC1, SMC2, 3P and 4P (young/mature tree, <40% canopy cover), which would increase in amount and distribution within the wildlife analysis area with implementation of DFPZs, area thinning w/biomass and group selections.

More acres of open forested habitat would be created with the action alternatives, including up to 175 acres of openings as the result of group selection units (depending on alternative) and up to an addition 384 acres of openings as a result of aspen ETZs (Alternative1), thus habitat suitability would theoretically increase. Prey species fed on by golden eagles (rodents and rabbits) could increase with these vegetative treatments, but such responses would be short term. Small openings, averaging about 1.5 acres in size distributed amongst dense forested stands, are probably too small to offer any long-term sustainability of foraging habitat to support a golden eagle nesting territory.

All action alternatives would have Sporax (Borax) applied to pine stumps ≥14” dbh within the DFPZ to Area Thinning treatment units to minimize the susceptibility to Annosus root rot. Use rates would be one pound to 50 square feet of stump surface. Based on the Pesticide Fact

Sheet prepared by Information Ventures, Inc. (1995), this rate is considered non-toxic to vertebrate species, including birds. Borax does not build up (bioaccumulate) in fish, inferring no build up occurs in other vertebrate species. Thus Sporax applied to stumps should not affect golden eagles directly, or any avian and mammalian prey species.

Cumulative effects

The analysis of cumulative effects of the proposed action alternatives evaluates its anticipated impact on MIS wildlife from the existing condition (existing condition reflected by changes that have occurred in the past) within the wildlife analysis area. The past actions in the wildlife analysis area that contributed to the existing condition include grazing, timber harvest and recreation use.

The proposed action would have no effect on known golden eagle nest sites, nor would cause any change in population distribution across the Plumas National Forest or the Sierra Nevada range.

As the conifer habitat gets older and thicker, habitat suitability of all stages of SMC for foraging declines with canopy cover >60%; as the trees gets thicker with time, suitable foraging habitat declines.

The action alternatives are designed to reduce the risk of future stand replacement fires and promote the reestablishment and development of a mature closed canopy mixed conifer forest. Thus future large openings created by wildfire may be reduced potentially limiting the availability of foraging habitat for golden eagles how hunt rodents and rabbits in early successional environments.

Effects of Alternative 2 (No-action)

Direct and Indirect effects

There would be no direct effects to golden eagles with his alternative.

Indirect effects of the No-action Alternative include the potential for future wildfire and its impact on habitat development. It is common on the Plumas to observe golden eagles perched within, as well as soaring over, recent burns (burns up to 15 years in age) that still support a mosaic of open brush habitat that is not closed in, such as >70% canopy (Rotta, personal observation). It is expected that wildland burning would stimulate more grass/forb growth and browse sprout, which should improve forage conditions for prey species, primarily large rodents and rabbits. This increased foraging quantity and quality typically associated with more open forest stands and prescribed fire (Lotan and Brown 1985) that golden eagles prefer. Thus wildfires, which burn in a mosaic leaving residual trees and snags for perches, could be better habitat areas for golden eagles than protected forests.

The existing fuel loads that would be left by this alternative would make potential wildfires in the area difficult to suppress and create a more intense burn, which could lead to increased rates of spread resulting in additional acres burnt. It is likely that National Forest system lands would burn again, resulting in wildfire setting back successional pattern of vegetation development, creating much more open expanses of foraging habitat for golden eagle than currently exist or that would be created by the action alternatives.

Cumulative effects

This action would have no affect on known golden eagle nest sites, nor would cause any change in population distribution across the Plumas National Forest or the Sierra Nevada range.

3.6.11 Prairie Falcon (*Falco mexicanus*)

3.6.11.1 Affected Environment

Prairie falcons nest on the Plumas NF on rock cliffs within forested habitats throughout the transition and eastside zones. These rock cliffs are often associated with large, open areas. The Plumas NF has at least nine nesting eyries. The Beckwourth RD has five known eyries and one suspected site. Monitoring of sites has been so sporadic that it is unknown how many of these sites are currently active. One known site is within the wildlife analysis area but approximately a half mile outside of the project area. No nesting activity has been observed at this sight in the last three years; however, multiple sighting have been documented throughout the wildlife analysis area.

Within the context of the SNFPA bioregion, the prairie falcon has been lumped into a broad elevational distribution/open habitat use group of raptors. The prairie falcon primarily forages in open vegetation types such as grasslands, alpine types, blue oak woodlands, and eastside shrub types. Prairie falcons rarely forage within the conifer forest zone (SNFPA 2001). Forest management activities likely have minimal or indirect effects to these species because of their use of open, non-forested habitats. Habitat suitability values for selected CWHR types affected by the proposed action were listed in Table 3.64.

No current population trends for prairie falcon were identified in Section 3.2.3 in the SNFPA FSEIS.

Table 3.64 Habitat Suitability Ratings for Prairie Falcon for Selected CWHR Types within the Freeman Wildlife Analysis Area

Species	Key Habitat Features	CWHR Suitability Rating**
Prairie Falcon (*Falco mexicanus*)	Requires cliffs for nesting that overlook large open areas; requires open terrain for foraging.	SMC1 = 1.0 SMC2 = 0.78 SMC3P = 0.89 SMC4P = 0.78 SMC4M = 0.78 SMC4D = 0.78 SMC5P = 0.89 SMC5M = 0.78

**CWHR Suitability rating: 1.0 = high suitability, optimal for species occurrence, 0.66 = moderate suitability, suitable for species occurrence, can support moderate population densities; 0.33 = low suitability, marginal for species occurrence, can support low population densities; 0.00 = unsuitable for species occurrence.

3.6.11.2 Environmental Consequences

Effects of the Action Alternatives

Direct effects

There is a known prairie falcon territory within the wildlife analysis area and many records of prairie falcon sightings within, or adjacent to, the wildlife analysis area. However, the project area lacks suitable cliff nesting habitat, but there is cliff habitat suitable for nesting adjacent to the project area. Since there is known nesting activity in the wildlife analysis area but no suitable nesting habitat within the project area, project activities would not affect prairie falcons directly. There would be no impact on the population of prairie falcons on the Plumas NF.

All action alternatives would have Sporax (Borax) applied to pine stumps ≥14” dbh within the DFPZ to Area Thinning treatment units to minimize the susceptibility to Annosus root rot. Use rates would be one pound to 50 square feet of stump surface. Based on the Pesticide Fact Sheet prepared by Information Ventures, Inc. (1995), this rate is considered non-toxic to vertebrate species, including birds. Borax does not build up (bioaccumulate) in fish, inferring no build up occurs in other vertebrate species. Thus Sporax applied to stumps should not affect prairie falcon directly, or avian and mammalian prey species.

Indirect effects

Open habitat created by the three proposed action alternatives may cause a shift of avian species diversity within the wildlife analysis area, as birds that favor open habitats would replace those dependent on forested habitats. The majority of these species that would increase would be those that prefer early seral habitats. There would be a shift in use by birds as those species preferring shrub habitats would replace those that preferred mature conifer forest habitats. Small group openings, averaging about 1.5 acres in size, are probably too small to offer any long term sustainability to support a prairie falcon nesting territory or to provide much in the way of open, expansive foraging habitat required by the species.

Even though there is a known prairie falcon eyrie in the wildlife analysis area and multiple sightings of prairie falcons throughout the wildlife analysis area, this potential change in prey availability is expected to have little effect on this species.

Cumulative effect

The action alternatives would have no affect on the known nest sites, nor would cause any change in population distribution across the Plumas National Forest or the Sierra Nevada range. Since there would be no direct or indirect effect to this species, the action alternatives would not contribute to adverse cumulative effects to populations of this species.

Effect of Alternative 2 (No-action)

Direct, Indirect and Cumulative effects

There are no direct, indirect or cumulative effects to this species with this alternative.

3.6.12 Willow/Alder Community

3.6.12.1 Affected Environment – Willow/Alder Community

This indicator group represents riparian-dependent wildlife species. Riparian areas include perennial stream channels and water bodies, areas of riparian vegetation (willows, alders, aspen, cottonwood, etc) floodplains, and wetlands including wet meadows. Forest Service policy, as reinforced in the LRMP as amended by the HFQLG EIS, and the SNFPA, is to manage riparian areas to favor riparian-dependent resources over other resources. The HFQLGFRA EIS requires the use of RHCAs as prescribed by the SAT guidelines (HFQLGFRA EIS Table 2.6 and 2.7). These SAT guidelines apply to the Freeman Project. Implementation of RHCAs should allow for protection/management of riparian areas to favor riparian dependent species. Actions that will remove excessive fuel loadings within RHCAs will reduce future threats of stand replacing fires which could degrade channels, lower water table and site productivity, and remove and alter species composition of the riparian vegetation.

Riparian habitats, along with the associated aquatic environments, provide habitat for willow flycatcher, greater sandhill crane, northwestern pond turtle, fish, amphibians, and other aquatic organisms. Riparian communities add landscape diversity and often serve as movement corridors for numerous wildlife species. Usually this habitat exists as a narrow, often dense grove of broad-leaved, winter deciduous trees along streams and lakes. Species consist of white alder, willow, aspen, cottonwood, bigleaf maple and dogwood. Much of this habitat exists as alder and/or willow stringers along perennial streams & seeps. The transitional ecotone between riparian and adjacent non-riparian vegetation is often abrupt. The shape of many riparian zones, particularly the linear nature of streams, maximizes the development of edge, which is so highly productive for wildlife. Riparian areas serve as elevational and habitat corridor links for wildlife movement. The predominance of riparian communities present within the wildlife analysis area are not all mapped as separate vegetation polygons but are inclusions within the dominant habitat type polygon, thus acreage figures of riparian in Table 3.57 is a conservative figure.

Wet meadows occur where water is at or near the surface most of the growing season, following spring runoff. Perennial grasses, juncus, and sedge usually dominate wet meadows. Overgrazed meadows usually have more forbs and fewer grasses/grass-like plants present. Dry meadows usually occur on better-drained soils, are lower in herbaceous production and higher in brush production, and usually result from some sort of disturbance that has lowered wet meadow production, such as a lowering of water table. Meadows are usually associated with forested ecotones in all vegetation types, and usually exist indefinitely unless hydrologic regimes are altered. An ecotone is a transition or transitional zone between two adjacent ecological communities with some characteristics of each. Meadow ecotones within the wildlife analysis area exist where other forest types encroach into more mesic sites supporting grass/sedge/forb-dominated vegetation. Meadows are an important component of many montane riparian communities. Wet meadows are found extensively throughout the Freeman wildlife analysis area.

Riparian/aquatic and wet meadow habitats are disproportionately important to wildlife, typically having greater species diversity (floral and faunal) than surrounding uplands (Kondolf et al in SNEP, 1996). Of the total 401 Sierran species of mammals, birds, reptiles, and amphibians combined, 21% depend on riparian areas near water, while many more use it occasionally or regularly to find food, water and shelter (Graber 1996). Graber also identifies 83 terrestrial vertebrate species considered to be dependent upon riparian (including meadow and lakeshore) habitat to sustain viable Sierran populations; twenty-four percent of these species dependent on the riparian community area are at risk of extinction (Graber 1996). The vegetation structure in riparian habitat within the project area is similar to that described in SNEP (Volume II Chapter 36). Riparian habitat has been fragmented to some degree by a decrease in width and loss of connectivity and simplified by the loss of large trees and deciduous understories, replaced by younger, conifer-dominated forest. As a result, riparian habitat is likely less productive for associated species. The effectiveness of riparian areas as corridors for wildlife movement has also likely been decreased.

Approximately 48 miles of perennial streams supporting riparian habitat are within the wildlife analysis area. Species composition of the riparian vegetation is primarily alder, willow, cottonwood, and aspen. Aspen is a major plant community within the wildlife analysis area. Additional riparian habitat exists along meadow edges, springs, and seeps.

Riparian Bird assemblages that indicate willow/alder community are listed in Table 3.66. Bird assemblages can be easily monitored and thus are good representative species for riparian-dependent wildlife species.

3.6.12.2 Environmental Consequences – Willow/Alder Community

Effects of the Action Alternatives

Direct and Indirect effects

The willow/alder community is not identified as a vegetation type slated for fuel treatments or group selection, yet standing conifers within RHCAs would be removed to reduce fuel loadings within the RHCA, thus reducing the risk of future wildfire from occurring within the stream/riparian environment. Several treatment areas are located within aspen stands that would have some conifer removal that would create more favorable growing conditions for the aspen. CWHR habitat suitability ratings for bird species identified as being within the riparian bird assemblage identified in Table 3.66 would not change as a result of the action alternatives, as the key habitat element (riparian vegetation) would not be modified with any alternative.

Fuels reduction within DFPZs and area thinning should create conditions that would lessen the risk of future stand replacing fires, thus providing the opportunity to retain vegetative diversity within riparian habitats for a longer period of time than without treatment.

Increasing the amount of open forest, as well as small openings and increased edge may increase the risk of brood parasitism by brown-headed cowbirds on various bird species that nest in riparian habitat. Very little brown-headed cowbird presence within the National Forest portion of the wildlife analysis area has been documented. Three active livestock grazing allotment are present within the wildlife analysis area. Some facilities that are often associated with brown-headed cowbirds, including pack stations, supplemental feeding stations, holding facilities, or corrals are present. Because cowbirds are present in the wildlife analysis area there is some risk that brood parasitism could increase above existing levels within the wildlife analysis area as cowbirds respond to increased open habitat and edges.

All action alternatives would have Sporax (Borax) applied to pine stumps ≥14" dbh within the DFPZ to Area Thinning treatment units to minimize the susceptibility to Annosus root rot. Use rates would be one pound to 50 square feet of stump surface. Based on the Pesticide Fact Sheet prepared by Information Ventures, Inc. (1995), this rate is considered non-toxic to vertebrate species, including birds. Borax does not build up (bioaccumulate) in fish, inferring no build up occurs in other vertebrate species. Thus Sporax applied to stumps should not affect various bird species that nest in the willow/alder community directly, or avian and mammalian prey species.

Cumulative effects

The analysis of cumulative effects of the proposed action alternatives evaluates its anticipated impact on MIS wildlife from the existing condition (existing condition reflected by changes that have occurred in the past) within the wildlife analysis area. The past actions in the wildlife analysis area that contributed to the existing condition include grazing, timber harvest and recreation use.

Grazing would be expected to continue on private and National Forest lands at current levels. There are seven livestock grazing allotments (Grizzly Valley Community, Grizzly Valley, Humbug, Chase, Lake Davis, Long Valley and Willow Creek 2) that overlap into the wildlife analysis area of which four are active. Approximately 40 percent of the Humbug allotment is within the project area. Ninety five cow/calf pairs area authorized from June 1 thru August 1. One hundred percent of the Grizzly Valley allotment is within the project area. Five hundred cow/calf pairs are authorized from June 16 thru September15. Approximately 50 percent of the Grizzly Valley Community allotment is within the project area. One hundred fifty seven cow/calf pairs are authorized from June 16 thru September 30 and another One hundred and twenty cow/calf pairs are authorized from June 16 thru September15. The remaining four allotments only overlap the wildlife analysis area with the Chase allotment being the only active allotment.

Opening up forested stands with the proposed action alternatives could result in a flush of grasses and forbs that would serve as transitory range within the allotments. With small conifer removal within RHCAs, there could be an increase in willow/alder growth that could be browsed on by both livestock & deer. No cottonwood, aspen, or other hardwood is proposed for removal within the wildlife analysis area. Livestock and deer browsing within the wildlife analysis area may have some short-term impacts (retard potential growth) to the vegetative response of thinning within RHCAs, but it is expected that growth will exceed animal consumption.

The Westside Lake Davis Watershed Restoration Project would restore 50 headcuts and gullies within the project area. Implementation of this project would improve channel stability and reduce sedimentation within 20 stream channels. This action potentially improves the habitat for various bird species that nest in riparian habitat by promoting an increase in willow/alder and aspen growth.

Future activities include on going work within the Humbug DFPZ, Long Valley KV, and hazard tree removal projects. Little to no change in overstory vegetation is anticipated with these projects. The proposed action for the Grizzly DFPZ, partly within the wildlife analysis area, is currently under development and could not be precisely evaluated at the time of this report however; the effects are expected to be similar to the Freeman project. Additional potential projects (tentatively identified as Cutoff and Mt. Ingalls), involve fuel treatments and fall partly within the wildlife analysis area near Bagley Pass and Crocker Cutoff. However, no site specific planning has occurred. Planning could potentially occur in 2007. These future projects would continue to thin, masticate, grapple pile and underburn around willow/alder habitat thus potentially improving habitat conditions and increasing willow/alder growth.

The Personal Use Firewood program on the Plumas National Forest is an ongoing program that has been in existence for years and is expected to continue. This program allows the public to purchase a woodcutting permit to remove firewood from National Forest lands. Much of this wood material either consists of down logs found in the forest, along forest roads, and within cull decks created by past logging operations, or as standing snags. The Freeman project area, as well as the wildlife analysis area (excluding the Lake side of 24N10 and surrounding Lake Davis) is open to woodcutting. Snags and logs would continue to be removed, resulting in the cumulative loss of these habitat components across the landscape. Snags are recruited annually from live trees through natural processes at a rate that may sustain this loss within the wildlife analysis area; snag and log removal is most common along, or within a short distance from, open roads. More area would be accessible to woodcutting with the no action alternative, as no existing roads would be closed.

The past and future effect of these actions has and would be to shift forest successional stages to somewhat earlier stages, while generally retaining continuous forest cover. Future effects include persistence of the largest trees, retention of snags away from roads, and reduction in habitat losses due to large, damaging wildfires.

Recreational use is expected to continue at the current rate. The current rate includes approximately 13 Special Use Permits that are within the wildlife analysis area. These include hunting outfitters & guides, fishing outfitters & guides, snowmobile poker runs, sled dog races, and film productions. The on going recreational activities would continue to affect riparian bird behavior and movement patterns in the wildlife analysis area due to human disturbance.

The Forest Service is chip sealing a portion of FS Road 24N10 from the intersection with West Street to the Camp 5 fishing access road turnoff. This entails widening the existing sub grade up to 30 feet (approximately 6-10 feet). The chip sealing of FS Road 24N10 will likely reduce airborne dust created by vehicles traveling over a gravel/dirt surface. This project has the potential to decrease stream sediment thus improving the riparian conditions for a potential increase in willow/alder production.

The California Department of Fish and Game is proposing to draw down the water level of Lake Davis and use the piscicide rotenone in an attempt to contain and eradicate the northern pike from the reservoir and its upstream tributaries. The drawdown and treatment are proposed to start in the fall of 2007. This project has a potential to cause down cutting in the streams thus damaging the existing willow/alder habitat.

Effects of Alternative 2 (No-action)

Direct, Indirect and Cumulative effects

There would be no direct effect on willow/alder communities, along with species dependent on this community. Indirect effects of the No-action Alternative include the potential for future wildfire and its impact on habitat. The existing fuel loads that would be left by this alternative, especially within the RHCAs, would make potential wildfires in the area difficult to suppress and create a more intense burn, which could lead to increased rates of spread resulting in additional acres burnt. A more intense burn within the RHCA could lead to soil damage, reduction in site class productivity, and a change in species composition that would not maximize the potential of the streamside environment. The willow/alder community could be eliminated with such an intense burn.

3.6.13 Trout Group (Family *Salmonidae*)

3.6.13.1 Affected Environment – Trout Group

As MIS, trout represent the habitat requirements of coldwater fish species. Three species of trout are present within the Freeman wildlife analysis area. Rainbow, brown and brook trout are present in Lake Davis and several creeks, including Big Grizzly, Freeman and Cow Creeks (Table 3.65).

Trout within the lake and creeks are recruited with natural reproduction and stocking. The State conducts very little stocking in the tributaries anymore around Lake Davis.

Rainbow Trout (*Oncorhynchus mykiss*)

The rainbow trout is a native Californian game species with no official status. It is the most widely distributed and abundant salmonid in California. Suitable habitat for the rainbow trout includes perennial lakes, ponds, and steams with cool water temperatures (0-26°C), high oxygen concentrations (can survive oxygen concentrations as low as 1.5-2.0 mg/l, but normally concentrations close to saturation are required for growth), and clean, well oxygenated gravel substrate for breeding (Behnke 1992). Rainbow trout deposit eggs in gravel nests (redds) in the late winter to early summer (February through June). Most eggs hatch within 80 days after fertilization, with hatch date dependent on water temperature and spawning date. The newly hatched alevins remain within the interstices of redd and depend on yolk for food. Most of the yolk is depleted within 7-15 days, and the young trout (fry) emerge from the gravel and begin exogenous feeding. Rainbow trout mortality rates are often high during the fry life stage. Therefore, fry survival is considered critical to maintaining sustainable population densities. Optimal fry habitat includes cool, clear, fast-flowing permanent streams and rivers where riffles predominate over pools, where there is ample cover from riparian vegetation or undercut banks, and where invertebrate life is diverse and abundant (Moyle 2002). Headwaters are extremely important to the overall stream condition and structure, particularly with respect to sediment loading and stream temperature.

Table 3.65 Perennial Fish Bearing Streams and Lakes

Stream	Miles of Fishery within Wildlife Analysis Area	Type of Fishery
Lake Davis	4,081 acres or 6 area miles	Stocked and resident, rainbow, brook and brown trout fishery- supplemented with stocking by CDF&G
Big Grizzly Creek	9 miles	Resident, self sustaining rainbow/brown trout fishery
Little Grizzly Creek	1 mile	Resident rainbow trout fishery
Freeman Creek	5 miles	Resident rainbow & brook trout fishery
Cow Creek	4 miles	Resident rainbow & brook trout fishery
Dan Blough Creek	½ mile	Resident rainbow trout fishery
Little Long Valley Creek	4 mile	Resident rainbow trout fishery
Blakeless Creek	2 miles	Resident rainbow trout fishery
Oldhouse Creek	3 miles	Resident rainbow & brook trout fishery

Rainbow trout are highly aggressive in establishing and defending feeding territories. They are sit-and-wait predators that feed mostly on drifting aquatic organisms and terrestrial insects, but they will also take active benthic invertebrates (Moyle 2002)

Optimal feeding habitat is slow, deep, cool water (pools) downstream from riffle habitat.

Brook Trout (*Salvelinus fontinalis*)

The brook trout is a non-native game species. The brook trout is the most widely distributed and abundant non-native trout in California. Suitable habitat for the brook trout includes lakes, ponds, and steams with cool water temperatures, high oxygen concentrations, and clean, well oxygenated gravel substrate for breeding (Elliott and Jenkins 1972). Brook trout deposit eggs in gravel nests (redds) in the late fall to early winter (September through December). Most eggs hatch within 120-150 days after fertilization, with hatch date dependent on water temperature and spawning date. The newly hatched alevins remain within the interstices of redd and depend on yolk for food. Most of the yolk is depleted within 7-15 days, and the young trout (fry) emerge from the gravel and begin exogenous feeding. Brook trout mortality rates are often high during the fry life stage. Therefore, fry survival is considered critical to maintaining sustainable population densities.

Brook trout are highly aggressive in establishing and defending feeding territories. They are sit-and-wait predators that feed mostly on drifting aquatic organisms and terrestrial insects, but they will also take active benthic invertebrates (Moyle 2002)

Optimal feeding habitat is slow, deep, cool water (pools) downstream from riffle habitat.

Brown Trout (*Salmo trutta*)

The brown trout is a non-native trout in the western hemisphere. It has acquired adaptations to a wide range of habitat conditions. These adaptations include the ability to tolerate higher water temperatures and more turbidity than other trout species. Suitable habitat for the brown trout includes lakes, ponds, and steams with cool water temperatures, high oxygen concentrations, and clean, well oxygenated gravel substrate for breeding. Brown trout deposit eggs in gravel nests (redds) in the late fall to early winter (September through December). Most eggs hatch within 120-150 days after fertilization, with hatch date dependent on water temperature and spawning date. The newly hatched alevins remain within the interstices of the redd and depend on the yolk for food. Most of the yolk is depleted within 7-15 days, and the young trout (fry) emerge from the gravel and begin exogenous feeding. Brown trout mortality rates are often high during the fry life stage. Therefore, fry survival is considered critical to maintaining sustainable population densities (Kalish 2001).

Brown trout are the most aggressive salmonid in California in establishing and defending feeding territories. They are sit-and-wait predators that feed mostly on drifting aquatic organisms and terrestrial insects, but they will also take active benthic invertebrates (Moyle 2002). Optimal feeding habitat is slow, deep, cool water (pools) downstream from riffle habitat.

3.6.13.2 Environmental Consequences – Trout Group

Effects of the Action Alternatives

Direct effects

There is the potential for a loss of individual fish due to harvesting practices within the drainages, but this would be very rare. In general, there would be no direct effect to MIS trout species with implementation of the action alternatives. No group selection would occur within RHCAs. The only mechanical treatment within RHCAs would occur in aspen stands with an equipment exclusion zone of 25' on each side of the stream.

All action alternatives would have Sporax (Borax) applied to pine stumps ≥14" dbh within the DFPZ to Area Thinning treatment units to minimize the susceptibility to Annosus root rot. Use rates would be one pound to 50 square feet of stump surface. Based on the Pesticide Fact Sheet prepared by Information Ventures, Inc. (1995), this rate is considered non-toxic to vertebrate species, including birds. Borax does not build up (bioaccumulate) in fish. Thus Sporax applied to stumps should not affect fish, or any species that feeds on fish.

Indirect effects

Proposed actions under Alternatives 1, 3 and 4 should not significantly increase sediment delivery to aquatic habitats and may help reduce sediment transport. Through the design of the action alternatives, and by implementation of SOPs for soils and streamside management ground disturbance activities will be minimized. However, fuels reduction harvesting in fish bearing RHCAs could decrease wood available for ground cover and sediment traps in the RHCAs.

The SAT guidelines and BMPs would be followed. Implementation of BMPs designed to minimize upslope erosion, should serve to minimize sedimentation of the streambed and subsequent degradation of downstream aquatic habitats. Equipment exclusion zones will act as buffers designed to trap sediment that may become mobile. Stream restoration work is planned within the project area in 2006. This work will mitigate on going accelerated erosion. All this combined will mean there would be no measurable downstream effects on beneficial uses due to sediment from the proposed action alternatives, thus no indirect effects on MIS fish species will occur downstream.

Fuels reduction harvesting in non-fish bearing RHCAs and on upland slopes would lower risk of future wildfire and reduce the probability that retained snags, woody debris and live vegetation in RHCAs would be consumed by future fire. Fuels reduction harvesting some trees within RHCAs will reduce fuel loading and the potential for a stand replacing fire.

Cumulative effects

The analysis of cumulative effects of the proposed action alternatives evaluates its anticipated impact on MIS wildlife from the existing condition (existing condition reflected by changes that have occurred in the past) within the wildlife analysis area. The past actions in the wildlife analysis area that contributed to the existing condition include grazing, timber harvest and recreation use.

Fuel loads would be significantly reduced by all action alternatives, reducing the potential for high severity wildfires. Any additional acres burned at high intensity could contribute to increased sedimentation, which would adversely affect aquatic and riparian habitats aquatic MIS fish species require.

Grazing would be expected to continue on private and National Forest lands at current levels. There are seven livestock grazing allotments (Grizzly Valley Community, Grizzly Valley, Humbug, Chase, Lake Davis, Long Valley and Willow Creek 2) that overlap into the wildlife analysis area of which four are active. Approximately 40 percent of the Humbug allotment is within the project area. Ninety five cow/calf pairs area authorized from June 1 thru August 1. One hundred percent of the Grizzly Valley allotment is within the project area. Five hundred cow/calf pairs are authorized from June 16 thru September15. Approximately 50 percent of the Grizzly Valley Community allotment is within the project area. One hundred fifty seven cow/calf pairs are authorized from June 16 thru September 30 and another One hundred and twenty cow/calf pairs are authorized from June 16 thru September15. The remaining four allotments only overlap the wildlife analysis area with the Chase allotment being the only active allotment. The grazing would continue to have a negative impact on water quality and channel condition (Drake 2006).

The Westside Lake Davis Watershed Restoration Project would restore 50 headcuts and gullies within the project area. Implementation of this project would improve channel stability and reduce sedimentation within 20 stream channels. This project would potentially improve the trout fisheries habitat through the restoration of the stream banks and channel.

Future activities include on going work within the Humbug DFPZ, Long Valley KV, and hazard tree removal projects. Little to no change in overstory vegetation is anticipated with these projects thus little to no changes in shading of the RHCAs.

The proposed action for the Grizzly DFPZ, partly within the wildlife analysis area, is currently under development and could not be precisely evaluated at the time of this report however; the effects are expected to be similar to the Freeman project. Additional potential projects (tentatively identified as Cutoff and Mt. Ingalls), involve fuel treatments and fall partly within the wildlife analysis area near Bagley Pass and Crocker Cutoff. However, no site specific planning has occurred. Planning could potentially occur in 2007.

The Personal Use Firewood program on the Plumas National Forest is an ongoing program that has been in existence for years and is expected to continue. This program allows the public to purchase a woodcutting permit to remove firewood from National Forest lands. A 10-year average (1991-2000) indicates that 3,273 permits were issued annually resulting in the annual sale of 10,417 cords of wood on the Plumas. Since 1993 there has been a declining trend in both number of permits and cords sold (for the year 2000, 2,227 permits issued selling 6,392 cords, while in 2003, 819 permits were sold for a total of 2,154 cords). Much of this wood material either consists of down logs found in the forest, along forest roads, and within cull decks created by past logging operations, or as standing snags. The Freeman project area, as well as the wildlife analysis area (excluding the Lake side of 24N10 and surrounding Lake Davis) is open to woodcutting. Snags and logs would continue to be removed, resulting in the cumulative loss of these habitat components across the landscape. Snags are recruited annually from live trees through natural processes at a rate that may sustain this loss within the wildlife analysis area; snag and log removal is most common along, or within a short distance from, open roads. More area would be accessible to woodcutting with the no action alternative, as no existing roads would be closed.

The past and future effect of these actions has and would be to shift forest successional stages to somewhat earlier stages, while generally retaining continuous forest cover. Future effects include persistence of the largest trees, retention of snags away from roads, and reduction in habitat losses due to large, damaging wildfires.

Recreational use is expected to continue at the current rate. The current rate includes approximately 13 Special Use Permits that are within the wildlife analysis area. These include hunting outfitters & guides, fishing outfitters & guides, snowmobile poker runs, sled dog races, and film productions. These recreation activities would continue to utilize the trout fisheries in this area.

The Forest Service is chip sealing a portion of FS Road 24N10 from the intersection with West Street to the Camp 5 fishing access road turnoff. This entails widening the existing sub grade up to 30 feet (approximately 6-10 feet). The chip sealing of FS Road 24N10 will likely reduce airborne dust created by vehicles traveling over a gravel/dirt surface thus potentially reducing sediment in Dan Blough Creek and improving fish passage with the replacement of culverts along this stretch of road.

Treatment to eradicate the Pike from Lake Davis is being proposed and assessed by the State of California. The Proposed Action and alternatives are currently under development and could not be precisely evaluated at the time of this report. Preliminary analysis shows there are potential negative effects to the fishery, macroinvertebrate, and water quality in all the streams within the Freeman project area from both the eradication and the lowering of the lake. The Forest Service is proposing the following associated actions, 1) issuance of a special use permit for access through, and use of National Forest lands to lake Davis and it's tributaries for the implementing the pike eradication program, 2) a Forest order to close the entire area to the public during this procedure and to close access to the lake bed as the lake level lowers.

Effects of Alternative 2 (No-action)

Direct effects

There would be no direct effects to trout species or their habitat, as no activities would occur that would cause disturbance to individuals, populations, nor any impacts to the existing habitat conditions.

Indirect effects

All trees providing cover to aquatic and riparian habitats would be retained. In the long-term 25 to 40+ years, accumulations of downed and standing wood in RHCAs, in combination with new vegetation and similar upslope conditions would result in a very high wildfire risk. Dead wood of all sizes in combination with new vegetation would add to fuel loading including fuel ladders.

Conditions would be set for fire ignition, spread, crowning and torching of dead and live vegetation in the RHCAs.

Ground cover provided by tree limbs, boles, cones, and new vegetation will help reduce soil erosion and sediment delivery to stream channels. Alternative 2 would retain potential materials for ground cover in RHCAs.

Cumulative effects

Existing fuel loads left by this alternative would make potential wildfires in the area difficult to suppress and create a more intense burn, which could lead to increased rates of spread resulting in additional acres burned. Any additional acres burned at high intensity could contribute to increased sedimentation, which would adversely affect the aquatic and riparian habitats aquatic MIS species require.

3.7 Neotropical Migratory Birds

3.7.1 Affected Environment – Neotropical Migratory Birds

Neotropical Migratory birds (NTMB) are defined as species whose breeding area includes the North American temperate zones and that migrate in many cases south of the continental United States during non-breeding seasons (Hunter et al 1993). The Breeding Bird Survey (BBS) coordinated by the US Fish and Wildlife Service indicates that certain populations of NTMB species in California have been declining over the past 26 years (1996 data). Although there appear to be multiple causes for declines, habitat fragmentation and decreases in habitat quantity and quality, caused by changes in land use, seem to be largely responsible (Sherry and Holmes 1993, Terborgh 1992).

Saab and Rich (1997) found that Neotropical migrant species with decreasing population trends tend to be those which nest in shrub layers, and species with increasing population trends tend to nest in tree canopies. Within the 1996 RDEIS Managing California Spotted Owl Habitat in the Sierra Nevada National Forests of California: An Ecosystem Approach, a summary table of Sierran Neotropical Migratory Bird species with measurable population declines based on Breeding Bird Surveys conducted in coordination with the U.S. Fish and Wildlife Service indicates that 32 species showing population declines have some habitat association with grassland/shrubland/open forest and/or riparian.

The PSW (Region 5) Land Bird Monitoring Implementation Plan (USDA Forest Service 1996) identified certain migratory birds as having a high priority for monitoring and mitigation efforts. Within the SNFPA FEIS, terrestrial birds were classified as having high, moderate and low vulnerability (high vulnerability species are at greatest risk to loss of viability within the Sierra Nevada bioregion (SNFPA FEIS, APP. R). Forty land bird species (not all neo-tropical migrants) that are of particular concern and are a high priority for monitoring efforts in the Sierra Nevada bioregion were identified within the SNFPA FSEIS (chapter 3, page 173). Twelve neo-tropical migrants identified on this list are analyzed below.

Table 3.66 provides a list of selected species that occur within the analysis area that are included in the above-mentioned categories. They have been grouped according to habitat type. Some species fall into more than one group. The assumption is that, if the effects on several species within one group are analyzed, the effects on all species that belong to that group are analyzed.

In 2001, Executive Order 13186 was issued to outline responsibilities of federal agencies to protect migratory birds under the Migratory Bird Treaty Act (66 FR 3853-3856). This order directs federal agencies to work with the USFWS to promote conservation of migratory bird populations. The Forest Service and the USFWS entered into an interim memorandum of understanding (MOU) to strengthen migratory bird conservation. This interim MOU expired on January 15, 2003, yet the conservation measures that are contained within the MOU are still applicable for use in environmental planning (SNFPA FSEIS, 2004, Ch. 3, p.172). The MOU recognized that direct and indirect actions taken by the Forest Service in the execution of duties and activities as authorized by Congress may result in the take of migratory birds, and that short-term negative impacts are balanced by long-term benefits.

Table 3.66 Selected High Priority Migratory Birds within Freeman Wildlife Analysis Area

Habitat Group	Species	Key Habitat Features	CWHR Suitability Rating*
Open Water Obligate			
	Osprey (*Pandion haliaetus*)	Uses large snags and trees near fish-bearing river or lake[1]	SMC1 = 0.11 SMC2 = 0.22 SMC3P = 0.55 SMC4P = 0.89 SMC4M = 0.89 SMC4D = 0.89 SMC5P = 0.89 SMC5M = 0.89
Riparian Bird Assemblages			
	Belted kingfisher (*Ceryle alcyon*)	Usually excavates a burrow in a steep bank of sandy or other friable soil for nest, usually near water, but can be up to 1 mile away[1]	No values for SMC
	Swainson's thrush (*Catharus ustulatus*)	Rare in Sierras; prefers large tree (>24" dbh), moderate to dense (>40% canopy closure) stands; nest is an open cup in willow or alder, 2-20 feet above ground; eats mostly insects and spiders in litter under shrubs or on forest floor; gleans from shrubs; rarely flycatches[1]	SMC1 = 0 SMC2 = 0 SMC3P = 0 SMC4P = 0 SMC4M = 0.55 SMC4D = 0.55 SMC5P = 0 SMC5M = 0.55
	Warbling vireo (*Vireo gilvus*)	Prefers small to large tree (>6" dbh), sparse to moderately dense (<70% canopy closure) stands; frequents wooded areas with tall trees, open to intermediate canopy, and a substantial shrub understory; nest usually 4-12 feet above ground; gleans insects and spiders from foliage; sometimes eats aerial insects[1]	SMC1 = 0 SMC2 = 0.33 SMC3P = 0.89 SMC4P = 0.89 SMC4M = 0.89 SMC4D = 0.33 SMC5P = 0.89 SMC5M = 0.89
	Yellow warbler (*Dendroica petechia*)	Prefers small to medium tree (6-24" dbh), open to moderate (20-69% canopy closure) stands; substantial shrub understory usually present; nest is an open cup 2-16 feet above ground in a deciduous sapling or shrub; gleans and hovers for insects and spiders; occasionally eats aerial insects [1]	SMC1 = 0 SMC2 = 0.75 SMC3P = 0.89 SMC4P = 0.89 SMC4M = 0.89 SMC4D = 0.66 SMC5P = 0.55 SMC5M = 0.55
	Yellow-breasted chat (*Icteria virens*)	Prefers sapling tree (<6" dbh), moderate to dense (>40% canopy closure) stands; nest usually 2-8 feet above ground in dense brush along stream or river; gleans insects and berries from foliage[1]	No values for SMC

	White-crowned sparrow (*Zonotrichia leucophrys*)	Breeds in montane meadows and along stream courses with shrubs or conifers; seed-eater; nest on ground or at base of shrub or on limb, usually within 1.3 feet of ground; winters in open areas near shrubs or other cover; eats primarily seeds; also eats insects; feeds on ground[1]	SMC1 = 0.22 SMC2 = 0.22 SMC3P = 0 SMC4P = 0 SMC4M = 0 SMC4D = 0 SMC5P = 0 SMC5M = 0
Brush Species			
	Common poorwill (*Phalaenoptilus nuttallii*)	Inhabits all stages of shrub areas, preferring clearings and open stages for foraging; insects for prey; nest is a scrape on the ground; feeds on insects caught in the air, also some on insects on the ground[1]	SMC1 = 0.33 SMC2 = 0.33 SMC3P = 0.33 SMC4P = 0.33 SMC4M = 0.11 SMC4D = 0.11 SMC5P = 0.33 SMC5M = 0.11
	Lazuli bunting (*Passerina amoena*)	Occupies open brush lands and thickets of willows, other shrubs or trees, tall weeds, or vines; eats insects and seeds taken from foliage or ground; sometimes takes aerial insects; nest usually 1.5-4 feet above ground[1]	SMC1 = 0.11 SMC2 = 0.33 SMC3P = 0.33 SMC4P = 0 SMC4M = 0 SMC4D = 0 SMC5P = 0 SMC5M = 0
Forest Species			
	Olive-sided flycatcher (*Contopus cooperi*)	Prefers large tree (>24” dbh) stands; most numerous in montane conifer forest where tall trees overlook canyons, meadows, lakes, or other open terrain; nests 5-70 feet above ground; feeds on aerial insects, especially honey bees[1]	SMC1 = 0.33 SMC2 = 0.33 SMC3P = 0.77 SMC4P = 0.77 SMC4M = 0.77 SMC4D = 0.77 SMC5P = 1.0 SMC5M = 1.0
	Western wood-peewee (*Contopus sordidulus*)	Prefers medium to large tree (>12” dbh) stands; most numerous in woodlands or forests, with sparse to moderate canopy cover, which border on meadows, streams, lakes, and other moist, open areas; nest usually 13-80 feet above ground; feeds mostly on flying insects; occasionally gleans insects from foliag[1]	SMC1 = 0.33 SMC2 = 0.44 SMC3P = 0.77 SMC4P = 1.0 SMC4M = 1.0 SMC4D = 1.0 SMC5P = 1.0 SMC5M = 1.0
	Red crossbill (*Loxia curvirostra*)	Prefers large tree (>24” dbh), open to moderate (20-69% canopy closure) stands; availability of mature conifer seeds more important than kind of conifer; in Sierra Nevada, most numerous where conifer canopy with open to moderate canopy border meadows, lakes, or streams; nests 5-80 feet above ground, usually high up[1]	SMC1 = 0 SMC2 = 0 SMC3P = 0.22 SMC4P = 0.44 SMC4M = 0.44 SMC4D = 0.44 SMC5P = 0.77 SMC5M = 0.77

	Evening grosbeak (*Coccothraustes vespertinus*)	Prefers medium to large tree (>12" dbh), moderate to dense (>40% canopy closure) stands; usually nests in forests dominated by firs; most important foods are seeds of fir, pine, and other conifers, and buds of hardwoods such as oak, willow, and maple; usually nests more than 35 feet above ground, but can nest 7-100 feet above ground[1]	SMC1 = 0 SMC2 = 0.11 SMC3P = 0.22 SMC4P = 0.77 SMC4M = 1.0 SMC4D = 1.0 SMC5P = 0.77 SMC5M = 1.0
	Vaux's swift (*Chaetura vauxi*)	Prefers large tree (>24" dbh), moderate to dense (>40% canopy closure) stands; feeds exclusively on flying insects [1]; minimum tree size for nesting is 20" dbh; minimum nesting height is 31 feet [2]	SMC1 = 0.44 SMC2 = 0.44 SMC3P = 0.44 SMC4P = 0.44 SMC4M = 0.44 SMC4D = 0.44 SMC5P = 0.44 SMC5M = 0.44
	Western bluebird (*Sialia mexicana*)	Prefers medium to large tree (>12" dbh), open (<40% canopy closure) stands; usually nests in old woodpecker cavity in snag, tree, or stump; availability of snags frequently limits population density; captures insects on ground or foliage; occasionally eats aerial insects[1]	SMC1 = 0.22 SMC2 = 0.22 SMC3P = 0.33 SMC4P = 0.66 SMC4M = 0.44 SMC4D = 0 SMC5P = 0.66 SMC5M = 0.44
	Band-tailed pigeon (*Columba fasciata*)	Prefers medium to large tree (>12" dbh) stands; prefers multi-layered forests with a light understory; dense thickets often used for breeding; feeds on acorns and fruits of several species[1]	SMC1 = 0 SMC2 = 0 SMC3P = 0.55 SMC4P = 0.77 SMC4M = 1.0 SMC4D = 1.0 SMC5P = 1.0 SMC5M = 1.0
Forest and Grassland Species			
	Common nighthawk (*Chordeiles minor*)	Prefers open (<40% canopy closure) stands; breeders most common where suitable nesting sites (e.g., barrens, burns, lava flows) occur near favorable foraging areas (e.g., meadows, lakes, other mesic, insect-rich habitats); eats aerial insects; lays eggs on bare ground; trees usually in vicinity of nest[1]	SMC1 = 1.0 SMC2 = 0.89 SMC3P = 0.89 SMC4P = 0.89 SMC4M = 0.33 SMC4D = 0.33 SMC5P = 0.89 SMC5M = 0.33
	Chipping sparrow (*Spizella passerina*)	Prefers open (<40% canopy closure) stands; frequents woodlands with sparse herbaceous cover and few shrubs, if any, for breeding; often forages in open shrub or grassland habitat nearby; gleans insects and seeds from ground and foliage; usually nests 1-6 feet above ground[1]	SMC1 = 0.55 SMC2 = 0.75 SMC3P = 0.89 SMC4P = 1.0 SMC4M = 0.66 SMC4D = 0.33 SMC5P = 0.66 SMC5M = 0.66

*CWHR Suitability rating: 1.0 = high suitability, optimal for species occurrence, 0.66 = moderate suitability, suitable for species occurrence, can support moderate population densities; 0.33 = low suitability, marginal for species occurrence, can support low population densities; 0.00 = unsuitable for species occurrence.
[1]California Department of Fish and Game 1999, and CWHR Version 8.0
[2]Thomas et al. 1979.

3.7.2 Environmental Consequences – Neotropical Migratory Birds

3.7.2.1 Effects of the Action Alternatives

Direct, Indirect and Cumulative effects

Actions that open up forest stands thru thinning, such as with the proposed DFPZ - thinning prescriptions and AT w/biomass removal, would result in projected increases in habitat trends for several species listed in Table 3.66 (warbling vireo, chipping sparrow, lazuli bunting, white-crowned sparrow, western bluebird, common nighthawk and common poorwill). These species respond favorably to opening up the forested canopy, allowing for increased understory plant diversity. Of the birds listed in3.66, Swainson's thrush appears to be adversely affected by thinning that convert closed forested stands to open forested stand. Olive-sided flycatcher and evening grosbeak also appear to have projected decrease in habitat suitability. Most of the rest of the species have changes in habitat suitability that are relatively neutral. Alternative 3 would create less open stands across the analysis area and subsequently maintains more habitats for the Swainson's thrush, olive- sided flycatcher and evening grosbeak.

Actions that create openings within the forested landscape with group selection harvests and aspen ETZs (Alternative 1) to the point that they have projected declines in species habitat trends include osprey, Swainson's thrush, warbling vireo, yellow warbler, western wood-peewee, evening grosbeak, red crossbill, and band-tailed pigeon. Approximately 3 species listed in3.66 have projected increase in habitat suitability. That is they respond favorably to habitat conditions that create small gaps in the forest landscape (white-crowned sparrow, lazuli bunting, and common nighthawk).

It is unknown at what threshold the amount of edge to interior habitat results in use, marginal use or non-use by Neotropical bird species. Alternative 1 creates 175 acres of groups across approximately 3,966 available acres of mechanical harvest treatment area equaling a group density of approximately 4.4%. Alternative 3 creates 175 acres of groups across 3,723 acres of mechanical harvest treatment area equaling a group density of approximately 4.7%, while Alternatives 4 creates fewer acres of groups (174 acres) across 4,514 acres of mechanical harvest treatment area equaling a group density of approximately 3.9%. Thus groups are more dispersed across the landscape with Alternatives 4 than with Alternatives 1 & 3, with groups more clumped in the landscape with Alternative 3. Within stand fragmentation caused by high density placement of groups would increase edge effects created by groups, reducing effective interior forest habitat and potentially create unsuitable forest interior habitat within that planning area for certain neotropical migrants. Neotropical migrants favoring forest interior habitat (Swainson's thrush, western wood-peewee, evening grosbeak, red crossbill, and band-tailed pigeon) would have reduced habitat capability with all action alternatives implementing groups and aspen ETZs (Alternative 1), with alternative 3 & 4 providing overall more interior forest between groups than alternative 1.

The cumulative effect of Group Selections, aspen ETZs (Alternative 1) AT w/biomass removal and DFPZs on forested conditions supporting Neotropical birds listed in Table 3.66 would be that habitat capability would overall be improved for birds that prefer openings and open canopied habitat across the landscape. Based on the CWHR model Swainson’s thrush, evening grosbeak and red crossbill would have decreased habitat suitability. The remainder of the listed birds are relatively unaffected by the proposed action alternatives.

In addition to habitat modification and its affect on Neotropical migratory birds, direct effects on nesting birds can occur as a result of tree removal, mastication, and prescribed burning, killing young birds in the nest that cannot fly. It is recognized that the proposed project, when implemented during the breeding season (April-September) could directly impact nesting birds. It is unknown as to what the overall effect on Neotropical migrant species populations might be.

As mentioned earlier, increasing the amount of open forest, as well as small openings and increased edge may increase the risk of brood parasitism by brown-headed cowbirds on various bird species that nest in riparian habitat. Very little brown-headed cowbird presence within the National Forest portion of the wildlife analysis area has been documented. Three active livestock grazing allotment are present within the wildlife analysis area. Some facilities that are often associated with brown-headed cowbirds, including pack stations, supplemental feeding stations, holding facilities, or corrals are present. Because cowbirds are present in the wildlife analysis area there is some risk that brood parasitism could increase above existing levels within the wildlife analysis area as cowbirds respond to increased open habitat and edges.

All action alternatives would have Sporax (Borax) applied to pine stumps ≥14” dbh within the DFPZ to Area Thinning treatment units to minimize the susceptibility to Annosus root rot. Use rates would be one pound to 50 square feet of stump surface. Based on the Pesticide Fact Sheet prepared by Information Ventures, Inc. (1995), this rate is considered non-toxic to vertebrate species, including birds. Borax does not build up (bioaccumulate) in fish, inferring no build up occurs in other vertebrate species. Thus Sporax applied to stumps should not affect Neotropical migratory birds.

3.7.2.2 Effects of Alternative 2 (No-action)

Direct, Indirect and Cumulative effects

There would be no direct effect to Neotropical birds with this alternative.

Indirect effects of the No-action Alternative include the potential for future wildfire and its impact on habitat maintenance and development. The high fuel loads that would be left by this alternative would make potential wildfires in the area difficult to suppress and create a more intense burn, which could lead to increased rates of spread resulting in additional acres burnt. Any additional acres burnt would likely result in the loss of the largest trees and snags, an increase in large scale fragmentation of forested landscapes, loss of large riparian structures, and simplification of habitat diversity.

Some Neotropical migrants utilize early successional habitats that develop following wildfire. These early successional habitats would be at a much larger, homogenous pattern across landscapes as a result of wildfire; smaller, more heterogeneous patterns and patch sizes of this habitat would be created with the action alternatives, which should improve the distribution of this habitat type within the landscape (SNFPA FSEIS 2004).

3.8 Watershed and Soil Resources

3.8.1 Introduction

The following assessment is summarized from the cumulative watershed effects and soils assessment for the Freeman Project, incorporated here by reference (USFS PNF BRD 2006f). This effects assessment addresses impacts to both the watershed resource and the soil resource. A cumulative impact, as defined in 40 CFR 1508.7 is:

> *The impact on the environment which results from the incremental impact of the action when added to other past, present and foreseeable future actions regardless of what agency (Federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (CEQ 1971).*

Cumulative impacts may occur off-site and, in the case of the water resource, may affect downstream beneficial uses of water. Effects can be either beneficial or adverse and result from the synergistic or additive effects of multiple management activities within a watershed (USDA Forest Service 1988a, MacDonald 2000). Table 3.67 lists the specific measures used to examine the cumulative watershed and soil effects.

Cumulative watershed effects (CWE) analyses have traditionally focused on impacts to downstream beneficial uses. These include aquatic habitat, hydroelectric power generation and domestic water supplies. Information has come to light that places considerable emphasis on near-stream disturbances and their site-specific biological effects as well as the downstream physical effects (Menning et al. 1996, McGurk and Fong 1995). This CWE analysis addresses effects to both near-stream and downstream uses by using the Region Five Cumulative Off-site Watershed Effects Analysis method (USDA Forest Service 1988a). This method is based on the concept of ERA, which is described under 4.1 of the methods section.

Procedures for assessing the effects of cumulative impacts on Forest and Rangeland soils are addressed in the Region Five Soil Management Handbook (FSH2509.18). It describes soil quality analysis standards that may be used as a measure to insure that soil productivity; soil hydrologic function and soil buffering capacity, important soil parameters, are maintained or improved.

Soils provide the nutrient and hydrologic foundation necessary to sustain terrestrial ecosystems. Soil productivity is generally considered to be the capacity of soils to produce plants. Indicators of soil productivity include soil cover, soil porosity and organic matter. Maintenance of soil cover is important to prevent accelerated soil erosion. Soil porosity is used to assess soil compaction. Organic matter in the soil and on the soil surface stores nutrients used by plants and organisms that inhabit the soil. Together, these factors address important physical, chemical and biological soil properties. Soil quality standards provide threshold values that indicate when changes in soil properties and soil conditions would result in long-term losses in inherent productivity or hydrologic function of the soil. Detrimental soil disturbance may result when threshold values are exceeded for certain soil properties. This assessment will evaluate cumulative impacts of past, present and future actions on the soil resource. In addition, standard soil mitigation measures are described which apply to all action alternatives and can be referenced in Appendix B.

3.8.2 Summary of Effects

3.8.2.1 Alternative 1 (Proposed Action)

By following the standards contained in the PNF LRMP and USDA Forest Service Region 5 soil standards, there would be a lower risk that soil productivity would be impaired. In general Alternative 1 would have a moderate amount of mechanical treatment, so there would be a moderate amount of ground disturbance from equipment, skid trails and landings. Five watersheds would have a substantial amount of mechanical treatments (increase over existing of greater than one third of the subwatershed), so there would be a considerable amount of ground disturbance. Impacts on soil resources would be greater than Alternatives 2, 3 and 4. Approximately 31 percent of the subwatersheds analyzed or 3772 acres would be treated mechanical. Within individual watersheds the percent mechanical treatment ranges from 9 to 82, eight subwatersheds are between 9 and 40 percent.

The cumulative ERA values would not exceed the threshold of concern (TOC) in any subwatershed. Two subwatersheds would be at high risk for cumulative effects (TOC of 9 percent in sensitive and 12 percent in upland). ERA increases would leave three subwatersheds at moderately high risk of cumulative effects (6 percent or greater TOC in sensitive and greater than 9 percent in the upland). Low to moderate increases in six other subwatersheds means those subwatersheds would be at higher risk of cumulative effects. However, these subwatersheds would still be within a low to moderate risk of cumulate effects.

Eight hundred and forty acres of RHCA would be treated mechanically. RHCA widths were delineated at 150 feet, the height of a site potential tree.

Five hundred and nine acres of aspen would be treated, 350 of which would be in RHCAs. Aspen treatments include a 75-foot extended treatment zone. Aspen treatments in RHCAs would be limited to slopes of 15 percent or less.

There would be 1,848 to 6,160 hand piles generated in this alternative.

The enhanced ability of fire management to suppress, control and contain fires that impact or start in fuel treatments under 90th percentile weather conditions would produce long-term benefits for soil productivity and watershed values that would otherwise remain more vulnerable to the damaging effects of future severe wildfires.

There would be about 16-miles of system road re-construction, 0.3-miles of road relocation, 8-miles of road decommissioning and 2-miles of temporary road construction. Decommissioning 10-miles of roads approximately 8 from this Decision and approximately 2 from a previous decision would result in long-term benefits to watershed resources resulting from a reduction in road density. One watershed, Riz, would improve over the existing condition in the sensitive portion of the watershed. Road obliterations would result in a two percent reduction in this watershed. Seven other watersheds would experience offsets from the impacts of the Proposed Action thru the decommissioning of these roads.

3.8.2.2 Alternative 2 (No-action)

The lack of fuel treatment in Alternative 2 would leave soil productivity and watershed values vulnerable to the damaging effects of future severe wildfires.

No road decommissioning would occur, so associated long-term beneficial watershed effects would not be realized.

3.8.2.3 Alternative 3

By following the standards contained in the PNF LRMP and USDA Forest Service Region 5 soil standards, there would be a lower risk that soil productivity would be impaired. Impacts on soil resources would be less than other action alternatives. Alternative 3 would reduce the amount of mechanical treatments by approximately 200 acres to 3574, so there would be less ground disturbance from equipment, skid trails and landings. Approximately 29 percent of the subwatersheds analyzed would be treated mechanical. Within individual watersheds the percent mechanical treatment ranges from 8.5 to 61, eight subwatersheds are between 8.5 and 40 percent.

The cumulative ERA values would not exceed the TOC in any subwatershed. ERA increases would leave four subwatersheds at moderately high risk of cumulative effects (greater than 6 percent TOC in sensitive and greater than 9 percent in the upland). Moderate increases in four subwatersheds would raise the disturbance levels to a moderate risk of cumulative effects. Increase in three subwatersheds means while they are at a higher risk, they are at a low risk for cumulative effects.

Seven hundred and fifty acres of RHCA would be treated mechanically. RHCAs widths were delineated at 150 feet, the height of a site potential tree unless the outer edge of the riparian vegetation was greater. By using these criteria for RHCA width delineation there was a 47 acre increase in the RHCAs, all of which would be treated mechanically.

One hundred eighty one acres of aspen would be treated, all of which would be in RHCAs. Aspen treatments in RHCAs would be limited to slopes of 35 percent or less.

There would be 972 to 3,240 hand piles generated in this alternative.

The enhanced ability of fire management to suppress, control and contain fires that impact or start in fuel treatments under 90th percentile weather conditions would produce long-term benefits for soil productivity and watershed values that would otherwise remain more vulnerable to the damaging effects of future severe wildfires.

The same road actions would occur for all action alternatives. Decommissioning 10-miles of roads would result in long-term benefits to watershed resources resulting from a reduction in road density. Eight watersheds would experience offsets from the impacts of this action alternative thru the decommissioning of these roads.

3.8.2.4 Alternative 4 (Preferred Alternative)

By following the standards contained in the PNF LRMP and USDA Forest Service Region 5 soil standards, there would be a lower risk that soil productivity would be impaired. Impacts on soil resources would be less than Alternative 1 but greater than 2 and 3. Alternative 4 would reduce the amount of acres treated mechanical by 265 acres from the Proposed Action and 65 acres from Alternative 3 to 3,507, so there would be less ground disturbance from equipment, skid trails and landings. However, there is more mechanical thinning and less grapple piling and mastication in this alternative and mechanical thinning is more ground disturbing than the other two activities. Approximately 28.5 percent of the subwatersheds analyzed would be treated mechanical. Within individual watersheds the percent mechanical treatment ranges from 8 to 54, eight subwatersheds are between 8 and 40 percent. Alternative 1 and 3 have one more group select unit than this alternative.

The cumulative ERA values would not exceed the TOC in any subwatershed. The upland portion of four watersheds would be at threshold. As a result one subwatershed would be at high risk for cumulative effects (TOC of 9 percent in sensitive and 12 percent in upland). ERA increases would leave the other three subwatersheds at moderately high risk of cumulative effects (greater than 6 percent TOC in sensitive and greater than 9 percent in the upland). Increases in four other subwatersheds means those subwatersheds would be at higher risk of cumulative effects and would be at a moderate risk for cumulative effects. Three subwatersheds would have increases in the ERA but would remain at a low risk of cumulate effects.

Seven hundred and forty seven acres of RHCA would be treated mechanically. RHCAs widths were delineated at 150 feet, the height of a site potential tree unless the outer edge of the riparian vegetation was greater. By using this criterion for RHCA width delineation there was a 47 acre increase in the RHCAs. All 47 acres would be treated mechanically.

One hundred eighty one acres of aspen would be treated, all of which would be in RHCAs. Aspen treatments in RHCAs would be limited to slopes of 35 percent or less.

There would be 1,644 to 5,480 hand piles generated in this alternative.

The enhanced ability of fire management to suppress, control and contain fires that impact or start in fuel treatments under 90th percentile weather conditions would produce long-term benefits for soil productivity and watershed values that would otherwise remain more vulnerable to the damaging effects of future severe wildfires.

The same road actions would occur for all action alternatives. Decommissioning 10-miles of roads would result in long-term benefits to watershed resources. Eight watersheds would experience offsets from the impacts of this action alternative thru the decommissioning of these roads.

3.8.3 Scope of the Analysis

This section describes the geographic and temporal boundaries utilized in this assessment. These areas differ for the watershed effects analysis and the soil assessment area. Table 3.67 lists the specific measures used to examine the cumulative watershed and soil effects.

Table 3.67 Summary of Environmental Indicators and Measures Examined in This Assessment

Key ecosystem element	Environmental indicators	Variable Assessed
Water Quality	Chronic sedimentation, accelerated hillslope erosion	Equivalent roaded acres
Soil Productivity	Organic matter losses	Surface fine organic matter
	Soil loss	Effective soil cover
	Detrimental compaction	Skid trails and landings

3.8.3.1 Cumulative Watershed Effects Analysis

Geographic Analysis Area: The geographic area examined for the cumulative watershed effects analysis consists of 11 subwatersheds, which encompass approximately 12,315 acres or about 3% of the Beckwourth Ranger District (Figures 3.7 and 3.8). With one exception only subwatersheds greater than 400 acres where proposed treatments would occur on at least 1% of the subwatershed area were considered for this effects analysis. One subwatershed less than 400 acres was evaluated because there was a significant amount of activity proposed within the subwatershed. Ten subwatersheds lie within the Freeman Hydrologic Unit Code 6 (HUC 6) watershed; the remaining subwatershed is within the Big Grizzly Creek HUC 6 watershed (Figure 3.8). Both HUC6 watersheds are contained within the Lake Davis/Long Valley HUC 5 watershed.

Timeframe of Analysis: The temporal bounds of the watershed effects analysis are typically 25 years. However, this value varies depending on the type of disturbance activity contributing to cumulative effects. Timber harvests were considered recovered after 25 years, so harvests occurring prior to 1980 were excluded from the effects model. No temporal component was included for existing roads, regardless of when they were constructed.

3.8.3.2 Soil Assessment

Geographic Analysis Area: Current soils conditions were assessed at the treatment unit scale. Soils related information was collected within 70 of the treatment units described in the Proposed Action (Figure 3.9). Four of these units were subsequently dropped from the project so they are absent from the effects discussion of this report. Within each sampled unit, data was collected on line transects which traversed portions of the unit.

Timeframe of Analysis: The current soil condition reflects the cumulative effects of past activities, regardless of when they took place. For example, if multiple activities have occurred in a given treatment unit over the past 50 years, it is not necessarily possible to separate the effects of older treatments from more recent ones. As a result, it is not practical to set a time constraint on those effects. The future timeframe for the soils analysis must extend until the resource has recovered from the impact of the proposed activities. The persistence of soil effects into the future can vary widely. For example, ground cover may recover within one to two years following a treatment. Soil compaction, however, may last for decades. Thirty years was chosen as a future timeframe for soil effects. After this time, the degree and variability of soil conditions are expected to be similar to the No-action alternative.

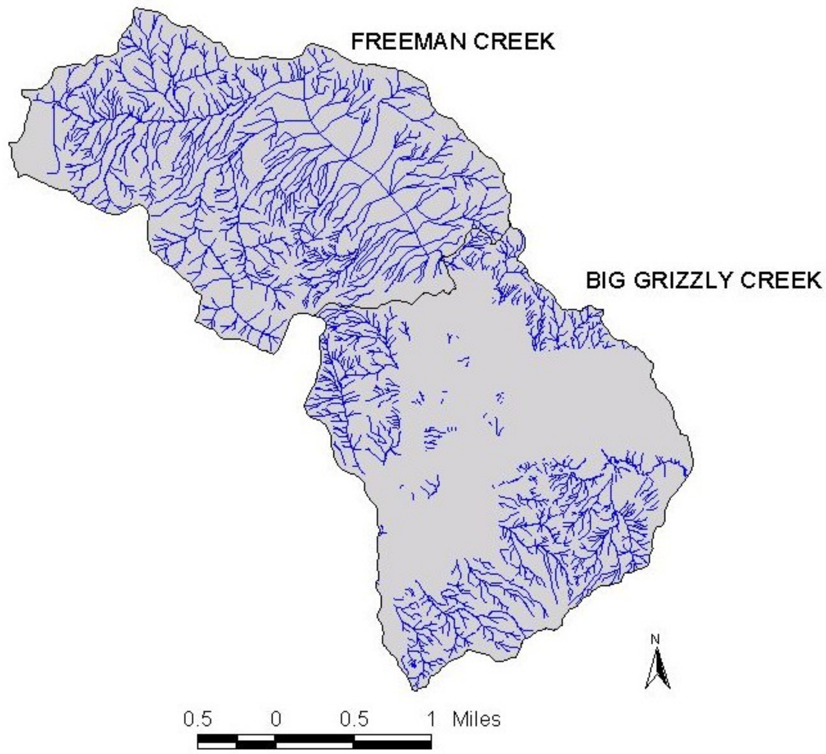

Figure 3.8 The two HUC 6 watersheds that encompass the Freeman assessment area.

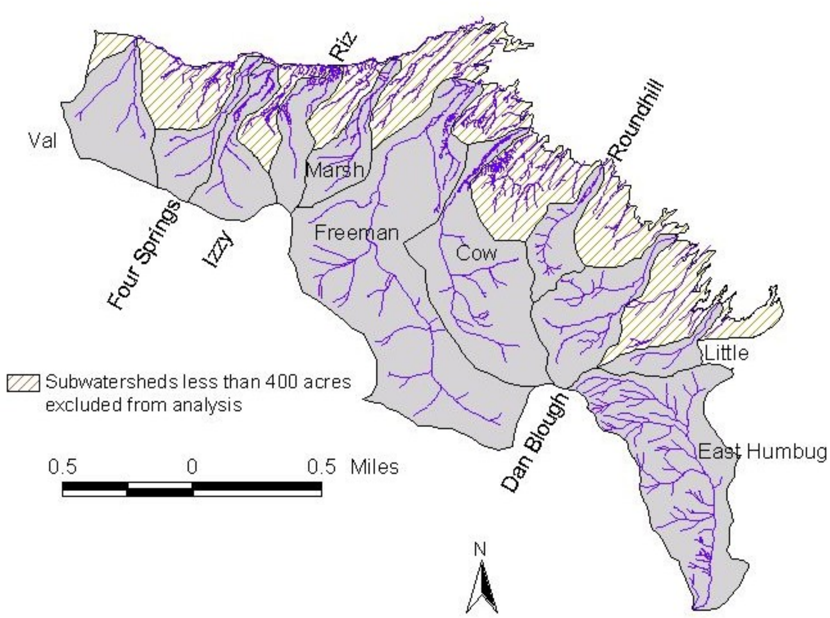

Figure 3.9 The analysis subwatersheds examined for cumulative watershed effects

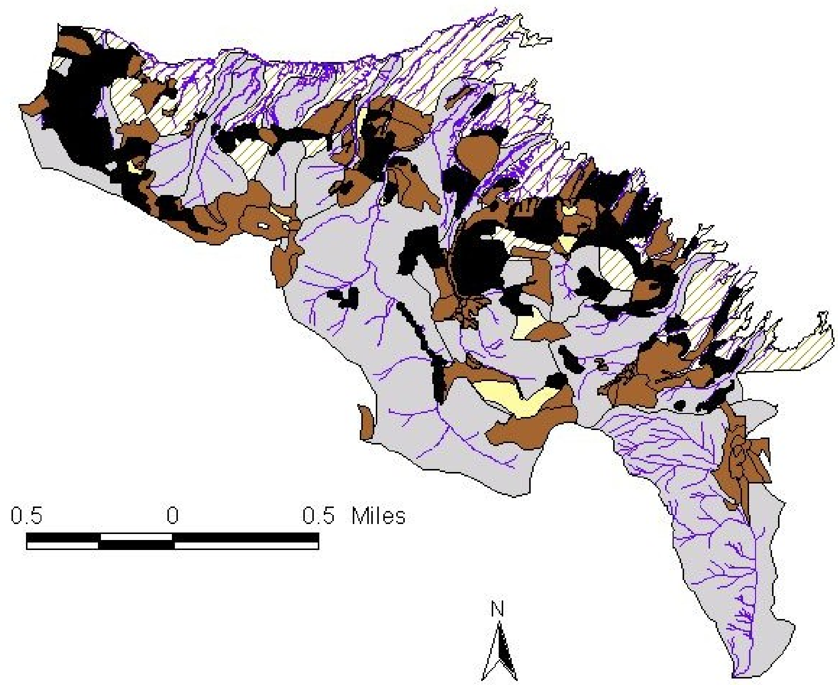

Figure 3.10 Proposed treatment units including, proposed treatment units that were sampled for soil information. Units in black were sampled. Units in brown were not sampled and units in yellow were not sampled but are not proposed for mechanical treatment.

3.8.4 Analysis Methods

3.8.4.1 Cumulative Watershed Effects Methods

There are numerous methods for assessing the effects of land use activities on the landscape. A discussion and comparison of different methodologies can be found in documents such as, A Scientific Basis for the Prediction of Cumulative Watershed Effects, Cumulative Watershed effects: Applicability of Available Methodologies to the Sierra Nevada and Research and Cumulative Watershed Effects. (Dunn et al. 2001, Berg et al. 1996, Reid 1998, USDA Forest Service 1988a). For the purpose of this CWE, the effects of past, present and reasonably foreseeable future impacts were assessed using the Region Five Cumulative Off-site Watershed Effects Analysis (USDA Forest Service 1988a). Under this approach, the impacts of land management activities were evaluated on the basis of equivalent roaded acres.

“Equivalent roaded acres” (ERA) is a conceptual unit of measure used to assess ground-disturbing activities. One acre of road surface equals one ERA. Numeric coefficients are used to convert acres of management activities such as timber harvest, underburning and grazing to ERAs. For example, 1 acre of underburning equals 0.05 ERA. In a given watershed, disturbances are added together to determine a cumulative ERA for that watershed. This value is often expressed as a percentage of the TOC. The TOC is an indicator used to assess the risk of cumulative watershed effects. The TOC is generally expressed as a percentage of watershed area. When the total ERA in a watershed exceeds the TOC, susceptibility for significant adverse cumulative effects are high. The cumulative ERA in a watershed is often expressed as a percent of the TOC. For example, in a 1,000-acre watershed where the TOC is 12 percent of the watershed area, 100 percent of the TOC represents a condition where the amount of disturbance is similar to 120 acres of road surface, 600 acres of mechanical harvest or 343 acres of group selects.

Table 3.68 Disturbance coefficients used to calculate ERA values in the Freeman Project.

Treatment Activity	ERA coefficient	Treatment Activity	ERA coefficient
Clearcut		**Slash treatment, site preparation**	
tractor yard, tractor pile, burn piles	0.35	activity fuels burn	0.05
tractor yard, broadcast burn	0.3	burn of activity fuels piles	0.03
Skyline yard, no site prep	0.15	mechanical site prep for planting	0.25
Skyline yard, broadcast burn	0.2-0.25	burning site prep for planting	0.08
Seed-tree cut		**DFPZ treatments** mechanical treatment, prescribed fire	
tractor yard, tractor pile, burn piles	0.35	above with tractor yard	0.2
tractor yard, broadcast burn	0.3	above with skyline yard	0.1
Overstory removal		above with helicopter yard	0.05
tractor yard, tractor pile, burn piles	0.25	biomass, prescribe fire	0.08
tractor yard, underburn	0.18	prescribe fire	0.05
Skyline yard	0.1	**Aspen treatments** mechanical treatment, prescribed fire	
Single-tree selection		above with tractor yard	0.25
tractor yard, tractor pile, burn piles	0.15-0.2	above with skyline yard	0.15
tractor yard, hand pile, burn piles	0.1	above with helicopter yard	0.05
Group selection		**Individual tree selection**	
Tractor yard, tractor pile burn piles	0.35	tractor yard	0.1-0.2
Skyline yard, underburn	0.2	skyline yard	0.05
helicopter yard, underburn	0.1	helicopter yard	0.02
Shelterwood, seed step		**Mastication**	0.04
tractor yard, tractor pile, burn piles	0.35	**Grapple piling**	
Shelterwood, removal step		non- aspen	0.1-0.05
tractor yard	0.25	aspen	0.15
Commercial thin		**Roads**	
tractor yard	0.2	existing	1
Sanitation and Salvage		new construction	1
tractor yard	0.1-0.2	obliteration	-1
Precommercial thin		**Grazing**	0.1-0.25
tractor yard	0.1-0.2		

The assessment area for the Freeman project is contained within of two 6th field (Hydrologic Unit Code, or HUC 6) watersheds. Freeman is 28,110 and Big Grizzly is 30,310 acres in size. With one exception within each HUC6 watershed, analysis subwatersheds ranging from about 440 to 3,750 acres were delineated. Past management activities were analyzed to determine the cumulative amount of land disturbance that has occurred within each subwatershed. The area of land subjected to past management activity was converted to an equal area of road surface, resulting in a measure of ERA. Numeric disturbance coefficients were used to convert these management effects to equivalent road effects in terms of the pattern and timing of surface runoff. Plumas National Forest watershed staff developed disturbance coefficients based on visual observations, field surveys, published studies, transects and aerial photo interpretation. Coefficients vary by management activity, silvicultural prescription, site preparation methods, type of equipment utilized and fire line intensity. The disturbance coefficients used in this analysis are shown in Table 3.68.

The assessment of past timber harvest activities was restricted to events within the last 25 years. These values reflect the period of time required for site recovery following these types of activities and events. Beyond this time frame, vegetation has generally had ample opportunity to reestablish and develop adequate crown cover to provide organic material to the soil. Together, crown and litter cover provide physical protection against soil erosion. In addition, roots have reoccupied the soil mantle and most effects from compaction have been negated except along established roadways. These factors tend to moderate peak flows and therefore diminish adverse effects on channel condition and water quality. A linear recovery coefficient was incorporated into the analysis to reduce the disturbance coefficients over a 25 year time period, an example of a 30 year recovery is shown in Figure 3.10.

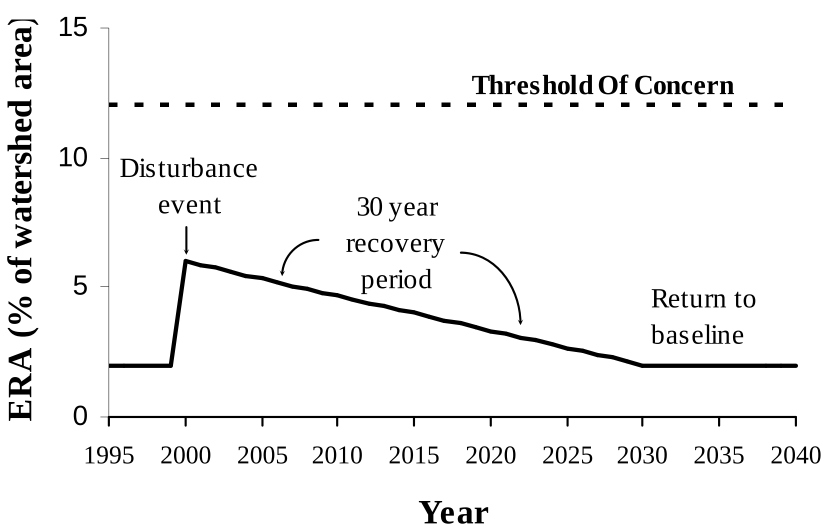

Figure 3.11 Conceptual disturbance and recovery model.

Dividing the total ERA by the size of the watershed yields the percent of the watershed in a hypothetically roaded condition. This value can serve as an index to describe impacts to downstream water quality. An increase in the road density of a watershed can result in greater impacts to water quality downstream.

Watersheds and their associated stream systems can tolerate some level of land disturbance, but there is a point at which land disturbances begin to substantially impact downstream channel stability and water quality. This upper estimate of watershed "tolerance" to land use is called the threshold of concern (TOC). For this analysis, the TOC was assessed for each subwatershed in terms of the percent of the area in a hypothetically roaded condition. As disturbances approach the TOC, there is an increased loss of soil porosity and soil cover, resulting in greater runoff potential and peak flows. Above the TOC, water quality may be degraded to the point where the water is no longer available for established uses, such as municipal water supplies or no longer provides adequate habitat for fisheries. In addition, stream channels can deteriorate to the extent that riparian and meadowland areas become severely degraded.

Another phrase used frequently in cumulative impact assessments is the expression **"natural watershed sensitivity"** which is an estimate of a watershed's natural ability to absorb land use impacts without increasing the effects of cumulative impacts to unacceptably high levels. Watersheds with a high natural sensitivity can tolerate less land disturbance and require greater care when planning land use activities than watersheds with low sensitivity. Measures used to evaluate watershed sensitivity include the potential for 1) soil erosion, 2) high intensity and/or long duration precipitation events, including rain-on-snow, 3) landslides and debris flows and 4) channel erosion within alluvial stream channels.

Higher equivalent roaded acre values are generally associated with higher peak flows that are more erosive and can lead to increased channel scour and higher sediment transport off-site. Stream channels in poor condition tend to be more sensitive to increases in peak flow since they are frequently lacking an effective root mass to bind streambanks and large organic debris to trap and retain the sediment moving through the system. These channels frequently become downcut (erode below the stable grade of the channel) so all flow is confined within the channel, unable to access the floodplain. Given these conditions, sediment is more readily eroded from these channels with subsequent deposition of sediment downstream.

As a guide to the CWE assessment, when planned activities within forest watersheds result in increases in equivalent roaded acres of 25 to 30% of the TOC, we generally realize relatively small increases in peak flows. Given that the ERA threshold for the subwatersheds in this analysis is 12% of the watershed area, this would likely result from an increase of 3 to 4% ERA. In watersheds where streams are stable and ERA values (watershed disturbances) are not approaching threshold, such increases generally do not stress the system. However, where increases in ERA approach 40 to 50% of threshold (5 to 6% ERA or higher), stream channels are in poor condition, or ERA values are approaching thresholds of concern, a closer look at the activities planned within the watershed is important.

3.8.4.2 CWE Model Assumptions

The CWE method used in this analysis is a mathematical model that expresses land disturbance in terms of a common variable, ERA. To calculate the ERA, acres of past ground disturbing activities were converted to ERA values based on disturbance coefficients multiplied by treatment area. Coefficients were applied to similar activities regardless of soil type, slope conditions, season of operation, or specific equipment characteristics. In calculating ERA contributions due to roads, all roads were assumed equal regardless of surface material (i.e., paved, graveled, native surfaced). Acres of roads were calculated by assuming that all roads were 25 feet wide. Urban or developed areas are included because their impervious surfaces such as roofs and paved driveways would affect infiltration and runoff around these areas. There are no major developments within this analysis area Landslide prone areas occur within the analysis area, portions of units 24, 25, 48, 88, 95, 100–102 and 107 are located within or adjacent to these landslide prone areas. Landslides were not included in this CWE model. According to the fire history no large fires have occurred in the project area within the last 25 years, therefore no fires were assessed for this analysis.

Disturbances were calculated with Geographic Information System programs, using Plumas National Forest modified corporate data files. While substantial efforts are made to keep revising these data files, as new information becomes available, site-specific field verification is required to more accurately capture attributes within the analysis area. Roads and stream channels are the emphases of this verification because professional estimates conclude that there may be up to 20% more roads on the landscape, than are depicted, in the corporate data. Conversely, the corporate data tends to over predict the presence of ephemeral streams and occasionally fails to predict the presence of some stream segments. Where treatment activities are proposed field data was collected to verify the presence or absence of stream courses and additional roads within the treatment units. These field-verified files were used when calculating ERA contributions. Stream miles, road densities and road-stream crossing information presented in Table 3.71 are based on a combination of corporate data files and field verified data.

Past public harvest activities were summarized from the Stand Record System database, timber atlases and sale contracts. Activities were verified using the hardcopy Stand Record System cards. This provided our quality control. Where harvest methods were not provided, activities were assumed to be yarded by tractor. Harvest activities on private lands were provided from California Department of Forestry. These records only included information for harvest plans submitted since 1994 and locations were described by township, range and section. Unless specified, all private activities were assumed to be tractor yarded, which is considered more ground disturbing than other yarding methods (Table 3.68). Reasonably foreseeable future activities that are expected to be completed in 2005, were included in the ERA calculations for the current condition. All others were assessed separately and their effects are discussed in the Reasonably Foreseeable Future Activities portion of this report.

In general while calculating the ERA contribution by the proposed harvest activities, all areas of treatment units were assumed to be treatable. For example, no compensations were made for rock outcrops, or open areas. Treatment units containing a combination of mastication and prescribed fire treatments were analyzed as though mastication would occur over the entire area. The location of individual treatments within these combination units was not specified, so the mastication coefficient was used because it was considered more disturbing than prescribed underburns (Table 3.68). The precise location of group selects units were not determined at the time of this report, therefore the following assumptions were made. Group select treatments would not occur in RHCAs. When a unit that contained group select fell in more than one watershed the aerial photos were reviewed to estimate the most likely placement for the groups. For treatment units where prescriptions included treatment of the RHCA, designated 25, 50 and 100 foot equipment exclusion zones and slopes greater than 15 percent were assumed not treated. For Alternatives 3 and 4 it was assumed Aspen Units would be treated on slopes up to 35 percent. Therefore, the remaining area within the RHCAs were assumed to be treated by hand, piled then burned. Where prescribed fire was proposed within RHCAs, no contribution was assessed for the equipment exclusion zone because no active ignitions would occur in this area and it was assumed that the disturbance would be mosaic in nature and limited to occasional creep. Where watersheds approached threshold as a result of the proposed activity refinement of the analysis occurred. In these cases compensation was given to open areas and a no treatment area was assigned. In other cases where stand density was light or patchy the coefficient was reduced to reflect the difference in the amount of ground accessed mechanically.

3.8.4.3 Soil Assessment Methods

Soil quality standards and guidelines that apply to this project exist at both the regional level (USDA Forest Service 1995) and forest level (USDA Forest Service 1988b). These standards focus on protection and improvement of National Forest System Lands for continuous forest and rangeland productivity and favorable water flows. To address these standards, this soil assessment focused on soil productivity measures including surface fine organic matter, soil cover and compacted soils.

Surface fine organic matter consists of organic material on top of mineral soil and includes plant litter, duff and woody material less than 3 inches in diameter (USDA Forest Service 1995). According to Forest Service Region 5 soil quality standards (1995), fine organic matter should cover at least 50% of the area. In addition, effective soil cover must be maintained to avoid detrimental accelerated erosion. Effective ground cover includes living vegetation, plant and tree litter, surface rock fragments and applied mulches. The forest-wide soil standards and guidelines (USDA Forest Service 1988b) provide a guide for prescribing effective ground cover based on the Region 5 Soil Erosion Hazard Rating system (USDA Forest Service 1990). Minimum effective ground cover for soils with erosion hazard ratings of low, moderate, high and very high, are 40, 50, 60 and 70%, respectively. To avoid land base productivity loss due to soil compaction, the forest level soil standards (USDA Forest Service 1988b) indicate that the area dedicated to landings and permanent skid trails should not exceed 15% of a timber stand unit. Detrimental compaction exists when soil porosity is reduced by more than 10%, relative to natural conditions (USDA Forest Service 1995).

In addition to soil productivity, soil hydrologic function and soil buffering capacity are also addressed in this assessment. The former is determined by the CWE analysis and the latter is addressed in the discussion of the action alternatives.

A field crew assessed soil productivity measures in the proposed treatment units during the summer of 2004. Site specific treatment locations within units, such as placement of group selection harvest sites, are currently unknown, which prevented soils assessment in the specific locations where treatment would occur. Treatment units were stratified first by maximum soil erosion hazard rating (USDA Forest Service 1988c). In a given treatment unit, the number of point transects sampled in each erosion hazard rating class was determined by the total acres in each class.

Within each unit to be sampled, transects were randomly selected. To prevent locating transects parallel to skid trails and thereby inadequately sampling them, transects were intentionally located so as to not run directly up and down a slope. In addition, transects were placed between system roads in order to concentrate sampling in the ground disturbing activity areas.

Transects had 25 to 100 sample points dependant on unit size. Transect length often varied and one to three transects were covered in each unit sampled. Transect were placed between the roads according to the slope conditions described above when a sampling area was bound by two system roads. Sample points were evenly distributed along the transect. At each point, the type of ground cover was determined. Cover categories included three depth classes of duff and litter, three size classes of woody debris, live vegetation, rock, or bare soil. If bare soil was encountered, an assessment was made to categorize the location as disturbed or undisturbed by management activities, showing evidence of erosion or deposition, or recently burned. To estimate the extent of compacted soils, an assessment was made to determine whether or not each sample point was located on a skid trail, landing, or road. This data was used to estimate the percent cover of fine organic matter, effective soil cover and ground occupied by skid trails, landings and non-system roads.

3.8.5 Affected Environment

The Freeman Defensible Fuel Profile Zone (DFPZ) and Group Select (GS) Project is located on the Beckwourth Ranger District within Lake Davis/Long Valley Watershed. The project area ranges in elevation from 5,800 feet to 7,200 feet. Within the analysis area there are 10 drainage basins over 400 acres in size. There are twenty-nine-miles of perennial, twenty-seven-miles of intermittent and seventy-nine-miles of ephemeral streams within the analysis area (Table 3.71). Main drainages within the project area include Big Grizzly, Cow and Freeman Creeks. Many of the small tributaries flowing into Lake Davis originate from springs situated in their headwaters. Small watersheds comprise seventy percent of the Lake Davis watershed, so land management activities within these smaller watersheds play a substantial role in maintaining water quality within the lake. Big Grizzly Creek flows from Lake Davis into the Middle Fork of the Feather, a Federally designated Wild and Scenic River. Approximately 300 acres of land situated in the western portion of the project area drain into Little Grizzly Creek and thence to Indian Creek and the East Branch North Fork of the Feather River.

Freeman, Cow and Big Grizzly Creeks are relatively sensitive stream systems with high fishery values. Spawning and rearing of trout within these streams supplement the lake's annual stocking program by the California Department of Fish and Game. The lower reaches of these streams are in poor to fair condition; however, within the last fifteen years numerous improvements have been made to improve stream channel condition and enhance trout habitat.

Watershed sensitivity analyses for the HFQLG planning watersheds were reported in the HFQLG Forest Recovery Act Final Environmental Impact Statement (USDA Forest Service 1999). Results applicable to this project are duplicated in Table 3.69. Numeric scores were expressed in a categorical fashion (i.e., low, moderate, high) as per the HFQLG FRA FEIS. The sensitivity rating was based on the erosion potential, slope steepness, amount of alluvial channels, risk of rain-on-snow and/or thunderstorms and on the ability to revegetate. The watersheds included in this analysis received moderate sensitivity ratings. For each subwatershed analyzed in this assessment, the ERA threshold of concern is 12% of the watershed area (Table 3.3).

Table 3.69 Cumulative Watershed Effects Analysis Subwatersheds and the HUC 6 and HFQLG Watersheds that Encompass Them.

HUC 6 Watershed	HFQLG Watershed		Analysis subwatershed	Subwatershed Acres	Established TOC for the subwatershed
	ID#	Sensitivity			
Freeman	110131	Moderate	Val	876	12
			Four Springs	489	12
			Izzy	649	12
			Riz	467	12
			Marsh	491	12
	110104	Moderate	Freeman	3744	12
			Cow	1749	12
			Round Hill	440	12
			Dan Blough	958	12
			Little	298	12
Big Grizzly	110197	Moderate	East Humbug	2153	12

3.8.5.1 Precipitation

Average annual precipitation varies from 40 to 50 inches in the lower elevations of the analysis area and between 50 and 70 inches along Grizzly Ridge (Pacific Regional Information System). Annual precipitation is relatively consistent throughout the project area yielding approximately 12,000 acre feet of runoff. Most surface waters within the project area drain to Lake Davis. Precipitation falls primarily as snow above 600 feet, with yearly snowfall total approaching 62 inches at 6,900 feet. Snow estimates are a 10 year average from the Grizzly Snow course. Precipitation distribution is characteristic of the Mediterranean climate, with most precipitation occurring between October and May. About half of the annual precipitation falls during December, January and February. Surface runoff depends upon the snowmelt regime, which normally extends into late spring and early summer.

3.8.5.2 Soils and Parent Materials

The project area is a composite of different geologic types. The main formations within the analysis area are, Bonta, Penman and Ingalls, with intrusions of columnar hornblende andesite. These formations are volcanic conglomerates and mudflow breccias from the Miocene, Eocene and Oligocene periods. Generally parent rock materials within the units are andesitic volcanics that have a pyroclast composition. Geology in some of the units consists of Quaternary lake deposits many of which are covered by more recent alluvium deposits. Other units within the project area are composed of Cretaceous and Mesozoic granitics, quartz diorite or granodiorite. There are minimal inclusions of greenstone or metarhyolite.

Soils derived from volcanic parent materials, including pyroclastic andesite generally are more developed and less erosive, but have a tendency for mass instability, compaction, rilling and road maintenance problems. In contrast, soils developed from granitics are shallow to moderately deep, poorly developed, loosely consolidated and highly erosive. Ground cover retention is an important factor on these soil types. Given their large component of course sands, there is a low tendency toward compaction. In comparison, lake deposits soils are a deep, well formed, mix of interbedded fine silt and sand with occasional gravel lenses. In general, alluvium deposits within the analysis area are highly permeable, crudely stratified, poorly sorted sands, gravels and silts with occasional clay lenses. Barren, rocky areas occur throughout the analysis area.

Streamflow is responsive to rainfall and snowmelt events once the soils become saturated, but peak flows are not "flashy" in nature. The soil and geology of the area result in a watershed condition where summer flows are generally very low or nonexistent within streams draining the project area. Riparian vegetation is generally abundant along most perennial streams, providing shade and bank stability to stream channels, with exceptions within some meadow environments. The soil types by subwatershed are listed in Table 3.70. For a full listing of soil type by unit refer to Appendix F.

Table 3.70 Predominate soil types by watershed in the Freeman Project area.

Watershed	Map unit component	Slopes (%)	Max. erosion hazard rating	Compaction potential
Val (A)	Ramelli	0 to 2	L	slightly to moderately
	Etchen-Woodseye	2 to 30	H	Slightly
	Goodlow, Haplaquolls complex	0 to 10	M	Slightly
	Inville-Woodseye-Goodlow	10 to 50	M	slightly
	Waca-Woodsey	30 to 50	H	slightly
Four Springs (B)	Ramelli	0 to 2	L	slightly to moderately
	Inville-Woodseye-Goodlow	10 to 50	M	slightly
	Waca-Woodsey	30 to 50	H	slightly
Izzy (C)	Dotta	2 to 5	L	slightly to moderately
	Ramelli	0 to 2	L	slightly to moderately
	Bonta-Toiyabe	2 to 30	H	slightly
	Inville-Woodseye-Goodlow	10 to 50	M	slightly
	Waca-Woodsey	30 to 50	H	slightly
Riz (D)	Dotta	2 to 5	L	slightly to moderately
	Ramelli	0 to 2	L	slightly to moderately
	Bonta-Toiyabe	2 to 30	H	slightly
	Haypress-Sattley	10 to 50	H	slightly to moderately - moderately
	Inville-Woodseye-Goodlow	10 to 50	M	slightly
	Waca-Woodsey	30 to 50	H	slightly
Marsh (E)	Dotta	2 to 5	L	slightly to moderately
	Ramelli	0 to 2	L	slightly to moderately
	Haypress-Sattley	10 to 50	H	slightly to moderately - moderately
	Waca-Woodsey	30 to 50	H	slightly
Freeman (F)	Badenaugh, Bieber complex	2 to 5	L	slightly to moderately
	Dotta	2 to 5	L	slightly to moderately
	Ramelli	0 to 2	L	slightly to moderately
	Aiken	50 to 70	H	highly
	Fopiano-Franktown	0 to 30	H	slightly to moderately - highly
	Fapiano-Waca	0 to 30	H	highly to slightly
	Fapiano-Waca	30 to 50	H	highly to slightly
	Fapiano-Waca	50 to 70	H	highly to slightly
	Goodlow, Haplaquolls complex	0 to 10	M	slightly
	Haypress-Sattley	10 to 50	H	slightly to moderately - moderately
	Haypress-Toiyabe	2 to 30	H	highly
	Hurlbut-Holland	30 to 70	H	moderately
	Waca-Woodsey	0 to 30	M	slightly
	Waca-Woodsey	30 to 50	H	slightly
Cow (G)	Badenaugh, Bieber complex	2 to 5	L	slightly to moderately
	Dotta	2 to 5	L	slightly to moderately

	Ramelli	0 to 2	L	slightly to moderately
	Aiken	50 to 70	H	highly
	Fopiano-Franktown	0 to 30	H	highly to slightly
	Fopiano-Franktown	30 to 50	H	highly to slightly
	Haypress-Sattley	10 to 50	H	slightly to moderately - moderately
Cow (G) Cont.	Haypress-Toiyabe	2 to 30	H	highly
	Haypress-Toiyabe	30 to 50	H	highly
	Hurlbut-Holland	30 to 70	H	moderately
	Waca-Portola	30 to 50	M	slightly
	Waca-Woodsey	0 to 30	M	slightly
	Waca-Woodsey	30 to 50	H	slightly
Round Hill (H)	Badenaugh, Bieber complex	2 to 5	L	slightly to moderately
	Fopiano-Franktown	0 to 30	H	highly to slightly
	Haypress-Toiyabe	2 to 30	H	highly
	Haypress-Toiyabe	30 to 50	H	highly
	Toiyabe-Haypress	30-70	VH	highly
	Waca-Portola	30 to 50	M	slightly
	Waca-Woodsey	30 to 50	H	slightly
Dan Blough (I)	Badenaugh, Bieber complex	2 to 5	L	slightly to moderately
	Ramelli	0 to 2	L	slightly to moderately
	Fopiano-Franktown	0 to 30	H	highly to slightly
	Fopiano-Franktown	30 to 50	H	highly to slightly
	Fapiano-Waca	50 to 70	H	highly to slightly
	Haypress-Sattley	10 to 50	H	slightly to moderately - moderately
	Haypress-Toiyabe	30 to 50	H	highly
	Tallac-Inville-Goodlow	15-65	M	slightly
	Toiyabe-Haypress	30-70	VH	highly
	Waca-Portola	30 to 50	M	slightly
	Waca-Woodsey	30 to 50	H	slightly
Little (J)	Badenaugh, Bieber complex	2 to 5	L	slightly to moderately
	Ramelli	0 to 2	L	slightly to moderately
	Delleker-Fugawee, rubble land	10 to 70	H	moderately
	Fopiano-Franktown	0 to 30	H	highly to slightly
	Fopiano-Franktown	30 to 50	H	highly to slightly
	Fapiano-Waca	50 to 70	H	highly to slightly
	Haypress-Sattley	10 to 50	H	slightly to moderately
	Haypress-Toiyabe	30 to 50	H	slightly
	Tallac-Inville-Goodlow	15 to 65	M	slightly
	Waca-Portola	30 to 50	M	slightly
	Waca-Woodsey	30 to 50	H	slightly
East Humbug	Badenaugh, Bieber complex	2 to 5	L	slightly to moderately
(K)	Bucking, Haplaquolls complex	2 to 30	M	slightly to moderately
	Chaix-Holland	2 to 50	H	slightly to moderately - moderately
	Chaix, rock outcrop complex	50 to 70	H	moderately to slightly
	Chaix-Wapi	30 to 50	H	slightly
	Delleker-Fugawee, rubble land	10 to 70	H	moderately
	Fapiano-Waca	50 to 70	H	highly to slightly
	Gibsonville-Waca	50 to 75	H	slightly

	Haypress-Toiyabe	2 to 30	H	slightly
	Haypress-Toiyabe	30 to 50	H	slightly
	Haypress-Toiyabe, rock outcrop	2 to 50	H	slightly
	Tallac-Inville-Goodlow	15 to 65	M	slightly
	Waca-Portola	30 to 50	M	slightly
	Waca-Woodsey	30 to 50	H	slightly

3.8.5.3 Stream Channels and Road Density

Stream Channels

Stream channels in the analysis area exhibit a range of types. Generally streams flow from moderately steep forested areas through low gradient meadows. There was typically no riparian vegetation component associated with upland ephemeral streams. According to the corporate database there are approximately 29-miles of perennial streams, 27-miles of intermittent streams, 79-miles of ephemeral streams and 6-miles of stream that are unclassified. A watershed crew field verified all the channels within the project area and identified 101-miles of RHCAs and 19-miles of non-RHCAs leaving 22-miles of stream outside of the project area but within the analysis area unclassified. The channels within the project area tend to be low velocity. Discharge data was collected on Cow, Big Grizzly and Freeman Creeks in 2002, the cubic feet per second (cfs) was 2.2, 2.5 and 2.7 respectively.

Known trout fisheries within the project area include tributaries of Freeman, Cow, Big Grizzly and Dan Blough creeks. Field surveys conducted for this project identified a number of springs, seeps and seasonal wetlands that are a part of the drainage network. Existing and abandoned roads, skid trails, or historic ditches have disturbed or diverted channels throughout the project area, this has caused some channels to abruptly stop, change direction or lose connectivity with the channel network. This is especially true of ephemeral stream types, the result of which is a limited function of these channels to transport water, wood, or sediment to lower reaches of the drainage network. Most stream channels are in fair condition. During field verification of the streams over 50 active headcuts and gullies were identified. Restoration of these headcuts and gullies will occur in 2005 as part of the Westside Lake Davis Restoration Categorical Exclusion (CE).

Road Density and Stream Crossings

Road density within the analysis subwatersheds ranges from 0.01 to 0.03 mi^2 and averages about 0.020 mi^2 (Table 3.71). The HFQLG Pilot Project rates road density as low – less than 1 mile per square mile; moderate – 2 to 3-miles per square mile; and high – greater than 3-miles of road per square mile of land. Most subwatersheds contain moderate to high road densities. Road-stream crossing density ranges from less than one per mi^2 to more than 12 per mi^2. Streams crossings are a frequent source of sediment supply to streams. Road densities and road-stream crossing range from low to high (Table 3.71).

Table 3.71 Subwatershed characteristics and description of road impacts in the Freeman Project area.

Analysis subwatershed	Subwatershed area mi^2	Miles of stream by type			Number of road-stream crossings	Miles of road	Road density mi^2/mi^2
		perennial	intermittent	ephemeral			
Val	1.37	1.0	1.1	1.3	7	5.9	.020
Four Springs	0.76	1.2	2.5		5	2.6	.016
Izzy	1.01	1.6	3.4		5	5.7	.027
Riz	0.73	4	0.4	0.5	2	4.5	.029
Marsh	0.76	2.1	0.2	2.5	8	2.0	.013
Freeman	5.85	10.9	5.6	4.4	13	27.2	.022
Cow	2.73	6.2	1.5	4.2	12	12.2	.021
Round Hill	0.69	2	4.4		1	1.4	.010
Dan Blough	1.5	2.1	0.8	0.7	12	5.6	.018
Little	0.47	1.3	3		2	2.3	.023
East Humbug	3.36	10.7	4.1	2.4	29	8.0	.011

3.8.5.4 Beneficial uses

Existing beneficial uses of surface waters within the Freeman landscape assessment area are found in the Central Valley Region Water Quality Control Plan (California Regional Water Quality Control Board 2004). This plan identifies beneficial uses for specific water bodies in the Central Valley Region and states that those uses generally apply to the tributary systems of those water bodies. Big Grizzly Creek flows from Lake Davis, part of the State Water Project, into the Middle Fork of the Feather a Federally designated Wild and Scenic River. Approximately 300 acres of land situated in the western portion of the project area drain into Little Grizzly Creek and thence to Indian Creek and the East Branch North Fork of the Feather River. Beneficial uses as listed in the in the Plan are identified in the Watershed and Soils Report (USFS PNF BRD 2006f).

3.8.5.5 Water Quality

Water quality data was collected in the project area as early as 1987. Temperature data and macroinvertebrates were collected and assessed to determine existing water quality and changes to water quality over a 15 year period.

Water Temperature

Water temperature increase is primarily an impact to cold-water fisheries and may occur both at the site of disturbance and downstream due to the additive effects of stream canopy removal through harvest operations, livestock grazing, wildfire or debris flows. Physical alterations of stream channels within meadows through over grazing have lead to wide shallow channels that intercept greater influxes of incident radiation than the narrow deep channels, which were once common throughout the meadowlands. Stream temperatures were collected for Cow, Grizzly and Freeman Creeks in 1987, 1988 and 2002 and are presented in Table 3.72.

Table 3.72 Temperature data by stream for 1987, 1988 and 2002

Creek Name	Data Collection Year	Range for Maximum Temperature in Degrees F	Range for Minimum Temperature in Degrees F	Average Temperature in Degrees F Max Min
Cow	1987	86.2-56.7	61.2-40.8	72.3-48.6
Grizzly		86.9-62.8	65.5-47.1	72.4-53.8
Lower Freeman		80.4-58.5	63.3 45.0	67.9-52.9
Cow	1988	83.3-64.2	57.0-42.1	76.2-52.1
Grizzly		82.6-62.6	59.7-46.6	77.4-54.6
Lower Freeman		77.7-60.8	64.6-50.2	72.2-59.9
Cow	2002	73.4-61.1	58.8-42.8	70.8-52.3
Grizzly		76.1-60.8	67.1-53.4	69.8-61.7
Lower Freeman		71.2-53.8	63.1-48.0	65.1-57.7
Upper Freeman		68.4-50.9	54.1-41.0	65.1-57.7

Note: Temperature data was collected from July through September. Data loggers were programmed to collect data every hour.

The data indicates there has been a steady decline in the temperature. This can be attributed in part to the restoration and revegetation work that has occurred along these stream corridors. Cold water fish like trout become stressed when stream temperatures rise above 72 degrees F. The data would suggest that the fisheries within these streams are improving.

Macroinvertebrates

Another way to assess water quality is by conducting macroinvertebrate analysis. Freshwater macroinvertebrate are everywhere; even the most polluted or extreme fast-running water habitats usually contain some representatives of this diverse and ecologically important group of organisms. The term macroinvertebrate refers to invertebrate fauna retained by a 500 mm net or sieve. Understanding the range of tolerance of individual species of invertebrate has provided an additional tool for assessing the effects of management activities in watersheds. The biological data presented in this report provides indicators of water quality and habitat as it relates to aquatic biota, including fish. Macroinvertebrate analyses were conducted by the National Aquatic Ecosystem Monitoring Center Laboratory.

Cow Creek

The 1987 analysis of the macroinvertebrate sampled in Cow creek indicated warm water with a high sediment load and few exposed gravels. Channel conditions were reported to be poor with lower dissolved oxygen levels. Channels exhibiting these conditions generally have less diverse populations of taxa most of which are sediment tolerant. Out of a total of 26 species found, Diptera, commonly found associated with poor water quality was the dominant species and represent greater than 75 percent of the overall population.

In 1995 conditions in Cow creek were comparative to 1987. Of the 27 macroinvertebrate species, the dominating types were sediment and organic enrichment tolerant. According to the report, the analysis indicates severely stressed conditions usually associated with the impacts of grazing. Biodiversity has improved and is rated good. The species composition indicates there is some potential for fish even though the species composition is an indication of very limited spawning substrate.

In the 1998 report the overall condition of Cow Creek upgraded from a past value of “severe stress conditions” to a value of “poor conditions”. Some clean water taxa were present and “indicated fairly good water quality” (Mangum 1998). The species composition in some areas indicated the riparian habitat was in good condition. Eight macroinvertebrate species were missing from the data normally found in past years. Some of those eight species are sediment tolerant. According to the analyzer their absence may be attributed to rotenone, which was applied in 1997, as a means to eradicate pike in Lake Davis and its contributing tributaries. Potential for fish and the possibility for limited suitable spawning gravels are indicated.

In the 2003 report, sample results indicate a similar population as 1998. A total of 19 species were found, Diptera continues to be the dominate taxa. Grazing impacts continue to have a negative impact on water quality and channel condition.

Freeman Creek

The 1987 analysis of the macroinvertebrate sampled in Freeman Creek found a total of 28 species. Just under half of the population consisted of taxa which live in environments of moderate to higher water quality. Diptera, commonly found in warm water, sediment and nutrient loaded environments represented the rest of the macroinvertebrate population.

In 1991 a total of 39 macroinvertebrate species were found in lower Freeman Creek. Lower Freeman Creek is the portion of the reach east of Forest Route 10 and west of the lake. The upper portion of Freeman Creek is west of Forest Route 10. The majority of species were tolerant of moderate water quality conditions. A lesser number of high water quality tolerant species where found. The 1991, Annual Progress Report states that the water quality conditions show a negative trend compared to data from 1987. There is a higher level of diversity at this time, but areas of “fair condition and poor maintenance capability could be improved upon” (Mangum 1991). The macroinvertebrate biomass indicates it “could provide nutrients for a fairly good fishery” and some areas seem to indicate suitable substrate for spawning.

In 1991 upper Freeman Creek was found to have a total of 46 macroinvertebrate species. The report suggested water quality in the upper section of the creek was superior to the lower reach. The upper reach had moderately tolerant taxa, which indicate some organic enrichment and moderate amounts of sedimentation. The overall analysis indicated good water quality. It was reported there was excellent diversity of species. The large biennial stonefly has a 2 year nymphal stage confirming that this stream is perennial and indicating support for larger fish in the community. Clean water taxa indicates some suitable spawning substrate.

As of 1995, sediment and organic nutrients continue to be found in lower Freeman Creek. Conditions appear to be slightly better than 1991 but are still of lower quality than the conditions found in 1987. The macroinvertebrate biomass indicates support for a limited size and quantity of fish. Low populations of clean water species continues to indicate limited spawning gravels.

Sediment tolerant species continue to dominate, good biodiversity is indicated and the riparian habitat condition is reported to be at least in fair condition.

The upper reach of Freeman Creek in 1995 showed continued existence of clean water taxa, indicating good water quality and good instream substrate. Riparian habitat is rated good to excellent. Diversity continues to be high but macroinvertebrate biomass numbers are slightly lower. The clean water species found indicate availability of suitable spawning gravels.

In 1998 for both upper and lower reaches of Freeman Creek water quality was similar to previous years. The resident populations of macroinvertebrate species would normally indicate ecosystem instability however this indication of instability may be explained by the 1997 rotenone application in this stream. Nineteen species appear to be absent compared to the previous years. The number and size of fish may be limited due to the low number of clean water species.

The 2003 report for upper Freeman indicates a slight drop in water quality as compared to 1998. Clean water taxa indicate water quality is still good but there has been a decline in taxa diversity, thirty-four species as compared to 37. Biomass indicates adequate nutrients for fish. Clean water species composition indicates availability of suitable spawning gravels.

Grizzly Creek

In 1991Grizzly Creek supported a total of 33 species of macroinvertebrate most of which tolerate poor water quality condition. Although the stream indicates good diversity it is noted that the clean water taxa have lower population ratios than the sediment tolerant species present. The existing conditions were not good when compared to the poor conditions indicated in 1987. As of 1991, the overall condition of this creek has dropped to “severely stressed” (Mangum 1991). The potential for fish appears to be fair but the stream may have limited spawning substrate due to sedimentation.

In 1998 Grizzly Creek water quality was similar to previous years; resident populations of macroinvertebrate could normally indicate ecosystem instability. However, this indication of instability may be explained by the 1997 application of rotenone. Nineteen of the species appear to be absent when compared to previous analysis. “High numbers of Simuliids indicate organic nutrient loading which is often associated with grazing activities. Clean water species had low numbers indicating poor habitat conditions although fish habitat and suitable spawning substrate are possible. Biodiversity indicates a rating of fair. Number and size of fish may be limited due to the low number of clean water species.

The 2003 Grizzly analysis indicates that 40 species were found. There is a greater diversity than in previous years. There was a slight increase in the clean water taxa but the overall population is weighted to the sediment tolerant species. Water quality is slightly better than the “severely stress” rating of 1998. The potential for fish appears to be good but there is still indication of limited spawning gravels.

3.8.5.6 Past, Present and Reasonably Foreseeable Future Actions

Past Activities

Resources within the project area have long been utilized. Land use in Freeman prior to the turn of the century was limited to sustenance use by hunting and gathering Mountain Maidu. Grazing (cattle and sheep) and logging have been recorded as early as 1860. Most small dairies did not survive into the 1900s and by the mid 1880s the emphasis within Grizzly Valley appears to have changed to ranging beef cattle (Kliejunas and Elliott 2006). By 1920 R.T. Jenkins had acquired at least some of the lands formerly held by George Mapes. Jenkins established a camp and ran thousands of head of sheep from this time until at least the early 1960s (Kliejunas and Elliott 2006). During the mid 1920s, concerns of overgrazing lead to increased restrictions resulting in increased cattle grazing and allotments being managed by the Plumas National Forest. Many of these allotments remain active today, although the numbers of cattle have been substantially reduced over the years. Currently, no sheep graze in Grizzly Valley but the overall pattern of seasonal range use has occurred for at least 130 years. With this intensive grazing the meadowlands became compacted and experienced substantial surface erosion resulting in meadow stream systems that experienced degradation. Meadowlands were intensively grazed resulting in compaction and substantial surface erosion in the meadows and as a result meadow stream systems experienced degradation. Since that time period, most watersheds have experienced a slow recovery.

The history of logging in the project area is quite extensive and has been dated to the late 1920s. When the Western Pacific Railroad was completed through Plumas County in 1909 many sawmills were developed along the new route. Among these was the Feather River Lumber Company (FRLC), who in 1915 began using a narrow gauge railroad to bring logs to its mill located in Delleker. By the end of the decade, FRLC had penetrated the southwest end of Grizzly Valley and had constructed miles of temporary railroad spurs throughout the area. The company used caterpillar tractors and big wheels rather than steam donkeys due, in larger part to the comparatively gentile topography of much of the area (Kliejunas and Elliott 2006). Railroad logging operations ended in 1940 and by the early 1950s, the old mainline grade along the western end of the valley was converted into the main road way 24N10 (Kliejunas and Elliott 2006). Between 1926 and 1992 it is estimated from Beckwourth Ranger District Timber Atlases and sale contracts that 90 percent of the project area was harvested using a combination of overstory removal, single tree and group selection. More recent timber harvests within the project area include the Freeman Timber project which was harvested in the mid-eighties. The Threemile, Summit and Westside Timber projects were harvested in the early-nineties. These recent projects harvested approximately 20 million board feet of timber through regeneration harvests, overstory removal and sanitation silvicultural prescriptions. Much of the area was salvage logged in 1990 and 1996. Timber harvesting had impacts on soils in several ways; compaction resulting from road, skid and landing construction; removal or displacement of topsoil; loss of soil due to mass movement or surface erosion. Mass movement is triggered by misplaced logging roads, because of raised piezometic pressures (Gray and Megahan 1981) and by reduced root tensile strength from decaying root systems of harvested trees. Loss of soil was generally caused by increased overland flow resulting from roads and landings and yarding operations. Changes to soil temperature have resulted from increased solar radiation, soil moisture because of decreased evapotranspiration and interception. Soil chemical and biological processes were probably altered. For example, incorporation of large volumes of fresh organic matter in to the soil can shift the C/N ratios, while piling or chipping and removing organic matter from the site can reduce the nutrient available to the soil.

Present or Reasonably foreseeable future projects

Future activities include on going work within Humbug DFPZ, Long Valley KV and a hazard tree removal project. The effects associated with these projects are included in the analysis of cumulative effects as part of the existing condition. Public wood cutting would continue and would result in negligible increases in ERA. Analysis areas and temporal bounds differ dependant on resource area. For example, effects to soils and water are considered where more than 1 percent of the watershed is being impacted in watersheds greater than 400 acres. For this reason the cumulative effects discussed in this section may not completely address the entire list provided in Chapter 3 of the Freeman DEIS.

The Grizz DFPZ Proposed Action is currently under development and could not be precisely evaluated at the time of this report. Preliminary analysis shows that approximately 73 acres of that project would fall within Val Watershed. Considering the proposed activity and the size of the watershed the estimated change in the overall Threshold of Concern (TOC) would be approximately 2 percent. The Existing condition TOC is currently 5 percent in the upland and 4 percent in the sensitive area. After the implementation of the Freeman DFPA and Group Select Project the TOC for the watershed would be some where between 11.4 and 12.3 percent depending in which alternative is selected. Implementation of the Grizz PA within this watershed would cause the TOC to be exceeded. The Grizz DFPZ Environmental Impact Statement will further assess the effects of both projects on the water and soil resources.

Treatment to eradicate the Pike from Lake Davis is being proposed and assessed by the State of California. The Proposed Action and alternatives are currently under development and could not be precisely evaluated at the time of this report. Preliminary analysis shows there are potential negative effects to the fishery, macroinvertebrate and water quality in all the streams within the Freeman project area from both the eradication and the lowering of the lake. The Forest Service is proposing the following associated actions, 1) issuance of a special use permit for access through and use of National Forest lands to lake Davis and it’s tributaries for the implementing the pike eradication program, 2) a Forest order to close the entire area to the public during this procedure and to close access to the lake bed as the lake level lowers.

Westside Lake Davis Watershed restoration Project would occur in 2005. Under this action 50 headcuts and gullies would be restores within the Freeman project area. Implementation of this project will improve channel stability and reduce sedimentation within 20 stream channels.

Grazing would be expected to continue on private and National Forest lands at current levels. Approximately 40 percent of the Humbug Allotment is within the Freemen Creek Watershed. Ninety-five cow-calf pairs are authorized for June to August. One hundred percent of Grizzly Valley is within the Freemen Creek Watershed. Five hundred and five cow-calf pairs are authorized for June to September. Approximately 50 percent of the Grizzly Valley Community Allotment is within the Freemen Creek Watershed. One hundred fifty seven pairs are authorized for June to September. One hundred and twenty pairs are authorized for June to September. The Lake Davis Allotment is within the Freemen Creek Watershed, it is currently vacant.

3.8.6 Environmental Consequences

The cumulative watershed effects analysis and soils assessment are presented in this section. The existing condition is presented first, followed by the No-action and each action alternative. For each alternative, anticipated effects to the environmental variables shown in Table 3.67 are discussed in turn.

3.8.6.1 Alternative 1 (Proposed Action)

Cumulative watershed effects analysis

While fire ignitions are expected to continue following the activities proposed in Alternative 1, fuel treatments are designed to give wildland fire managers "…a higher probability of successfully attacking a fire" (Agee et al. 2000) A future severe wildfire would have the effects described under Alternative 2, but implementation of the Alternative 1 should reduce the likelihood of such an event. This would be due to the enhances ability of fire management to suppress, control and contain fires that impact or start in the fuel treatments under 90th percentile weather conditions.

Under Alternative 1, the increase in ERA values range from 4 to 78% of the TOC, depending on the subwatershed. This would result in cumulative ERA values ranging from 28 to 103% of the TOC when sensitive and uplands are assessed separately. The TOC of any given subwatershed when the entire subwatershed is assessed together remains below threshold and values range from 35 to 96. As a result, there are lower, moderate and higher risks that these treatments may stress the hydrologic system within individual subwatersheds (Table 3.77, Figures 3.11 and 3.12).

Direct Effects—ERA

Mechanical treatment would occur on 3772 acres of the watersheds analyzed. Eight hundred and forty acres of RHCA would be treated mechanically. RHCAs widths were delineated at 150 feet, the height of a site potential tree. Aspen treatment would occur on 509 acres of which 350 acres would be in RHCAs. Equipment would be otherwise excluded from the RHCAs except at approved crossings, which would generally be located on existing skid trails. No skid trails were proposed within the RHCA. Instead, mechanical equipment would be required to transport material out of the RHCA to established skid trails. There is a 25 foot equipment exclusion zone for all aspen treatments within RHCAs. A 15 percent slope restriction would be applied to all mechanical treatments within the RHCAs. Hand thinning, piling and underburn or underburn only would occur within the remaining RHCA's within the project area.

Under Alternative 1, there would be about 16-miles of system road re-construction, 0.3-miles of road relocation, 10-miles of road decommissioning and 2-miles of temporary road construction. Reconstruction and construction would increase ERA values, while road decommissioning would decrease ERA values. Temporary rod construction would have a short term impact. This impact would be mitigated through the subsoiling of all temp roads after use.

Figures 3.11 and 3.12 show the modeled increase in disturbed area to each analysis subwatershed due to the treatment activities proposed in Alternative 1.

Indirect Effects—ERA

Road decommissioning may entail culvert removal, subsoiling of the roadbed, recontouring the hillslope and/or seeding the affected area. These measures help initiate revegetation and recovery of the road area. Over time, decommissioned roads produce less sediment and surface runoff to adjacent streamcourses. As a result, their contribution towards the ERA of a watershed is reduced. Kolka and Smidt (2004) reported that recontouring hillslopes significantly reduced soil compaction, surface runoff and sediment production compared to subsoiling or cover cropping. Road construction would create new sources of sediment and disruption of hydrologic continuity on affected hillslopes. Reconstruction would consist of brushing, blading the road surface, improving drainage and replacing or upgrading culverts where needed. Short term increases in sediment may be offset by long term improvements to water quality as a result of improved road drainage and stream crossings. Harvest activities may locally alter soil moisture regimes and subsequent water yield due to altered interception and evapotranspiration. Harvested areas would be more susceptible to erosion and sediment transport to the channel network. Implementation of Best Management Practices would help mitigate these effects.

Cumulative Effects—ERA

Detrimental effects that may result from increases in ERA include fluvial erosion from treated hillsides, resulting in chronic sedimentation. Primary factors leading to this are reduction of canopy cover, ground disturbance (particularly due to road effects) and loss of ground cover. Silvicultural prescriptions for the project include harvests, underburning, grapple piling and mastication. Under these prescriptions, there would be canopy retention and surface vegetation recovery that would provide inputs to ground cover. The group selection treatment would create small forest openings with associated disturbance from skid trails, site preparation and transportation needs, such as temporary roads. The most likely effect of increased fluvial erosion is a decline in coldwater fish habitat quality via infilling of pools, embedding of spawning gravels and related effects to aquatic insect communities. The risk of detrimental effects in the analysis subwatersheds are described below.

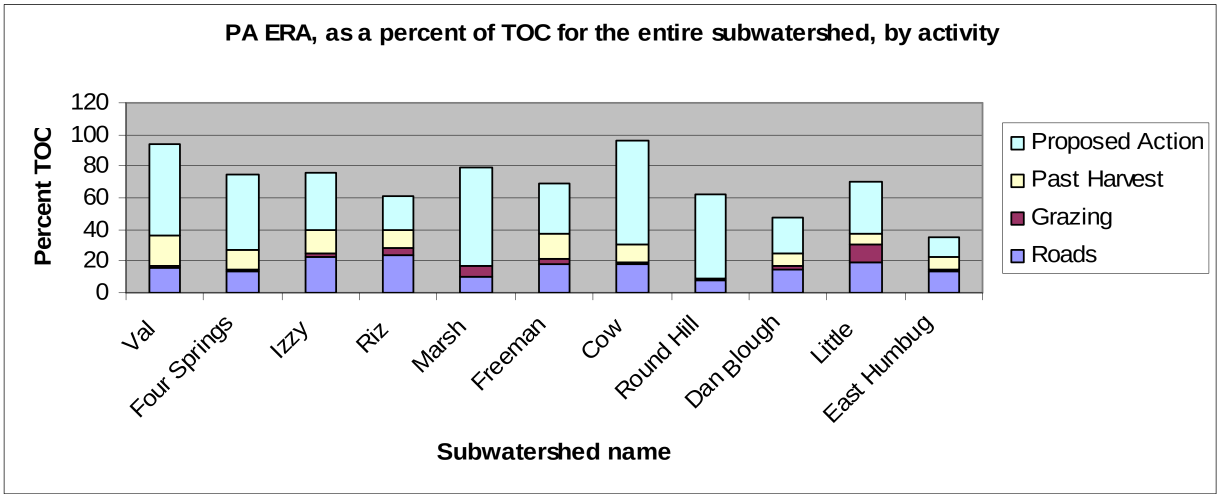

Figure 3.12 Alternative 1, the Proposed Action: Equivalent roaded acres (ERA), shown as a percent area for each analysis subwatershed, broken down by land use. Analysis subwatersheds are shown by entire subwatershed.

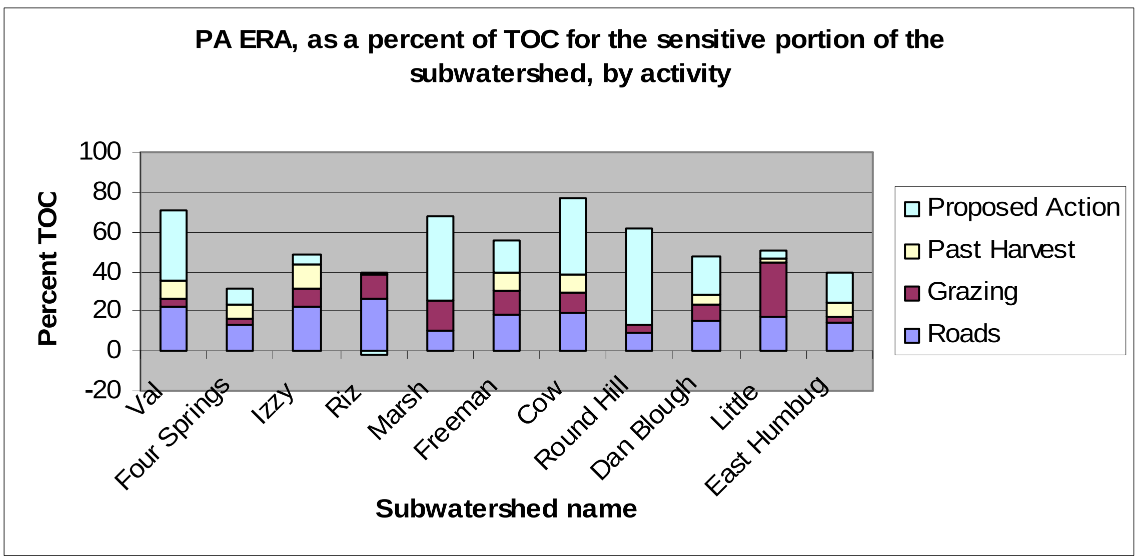

Figure 3.13 Alternative 1, the Proposed Action: Equivalent roaded acres (ERA), shown as a percent area for each analysis subwatershed, broken down by land use. Analysis subwatersheds are shown for the sensitive portion of the subwatershed.

Two subwatersheds would be at high risk for cumulative effects (TOC of 9 percent in sensitive and 12 percent in upland). ERA increases would leave three subwatersheds at moderately high risk of cumulative effects (6 percent or greater TOC in sensitive and greater than 9 percent in the upland). Low to moderate increases in six other subwatersheds means those subwatersheds would be at higher risk of cumulative effects. However, these subwatersheds would still be within a low to moderate risk of cumulate effects. Expected increases in ERA in the all subwatersheds are greater than 34% of the TOC, Figure 3.11 .

Soil Assessment

By following the standards contained in the PNF LRMP and USDA Forest Service Region 5 soil standards, there would be a lower risk that soil productivity would be impaired. Alternative 1 would have a moderate amount of mechanical treatment, so there would be a moderate amount of ground disturbance from equipment, skid trails and landings. Five watersheds would have a substantial amount of mechanical treatments (increase over existing of greater than one third of the watershed), so there would be a considerable amount of ground disturbance. Impacts on soil resources would be greater than alternatives 2, 3 and 4. Soil Quality Standards direct us to manage annual rate of loss through sufficient soil cover to prevent accelerated soil erosion from exceeding the rate of soil formation (The long-term average is approximately one ton/acre/year). One ton per acres is equivalent to the thickness of two sheets of paper. Accelerated soil erosion applies to human caused disturbance and does not account for the other disturbances, such as wildfire. It is not expected that hillside erosion over any given treatment area would exceed one ton per acre, however, as discussed above, on a site specific basis this erosion rate may be exceeded on individual landings, roads or stream channels. Modeling erosion rates requires a substantial amount of time; so two locations were selected within mechanical treatment areas where erosion rates were expected to be high because of geological type and length of slope.

One erosion response unit was selected from each a major soil type (Volcanic, Granitic) to assess erosion. As Elliot (2000) discusses, utilizing the WEPP model is considered an excellent model for estimating erosion, but as with all erosion models, estimates within ± 50 percent are good. Within cow watershed on erosive weathered granitics the existing erosion rate is estimated to be .04 tons per acres on well-forested sites (80 to 90 percent) with average slopes of 20 percent. Following treatment, the WEPP model predicted that erosion rates would increase by 60 percent to .10 tons per acre. Within Freeman watershed on volcanic soils the existing erosion rate is .06 tons per acre, on this forested site with 70 percent ground cover and slopes of 20 percent. Following treatment, the WEPP model predicted that erosion rates would increase by 30 percent to .09 tons per acre. None of these values approach 1 ton per acre.

Soil cover

Direct Effects—Soil Cover

It is difficult to accurately predict treatment effects on effective ground cover. Harvest operations may increase activity fuels and effective ground cover, while pile burning and underburning reduces the cover of these materials. Mastication would increase soil cover as materials are broadcast away from the machine. Westmoreland (2004) conducted post-harvest monitoring for ground cover in thinned units and areas harvested with group selection silvicultural techniques on the Plumas and Tahoe National Forests. Pre-treatment cover conditions were similar to those found within this project. Westmoreland reported an average absolute decrease in soil cover of 9%. Assuming the Freeman units undergo the same decrease, 13 additional units may not meet the standard. Approximately 43 percent of the area was sampled. The acres represented by these units equate to 35 percent of the sample area and 15 percent of the project area. The sampled portion of the project area would experience a decrease in area meeting or exceeding the standard from 83 percent to 61 percent. While differences in sampling method and intensities, as well as harvest and site preparation practices, complicate this type of comparison, it is reasonable to assume that effective ground cover would be decreased. Implementation of mitigation methods such as leaving chips on site would ensure the standards would still be met. There is a moderate risk that treated units would not meet the Regional standard following treatment.

Under Alternative 1 mechanical treatment would occur within units where slopes are equal to or less than 35 percent and 15 percent or less in the RHCAs.

The potential for erosion is also increased as ground cover is reduced. Skid trails void of vegetation tend to concentrate and direct flow. Burn piles are another way ground cover is reduced. However, concentrated flow is not associated with burn piles because even though they lack ground cover vegetation they are islands contained within vegetation. There is greater potential for vegetation loss associated with pile burning in Alternative 1 because it has the greatest amount of burn piles. Burn pile estimates range from 12 to 40 per acre, this would equate to 1848 to 6160 piles. Ground cover lost is in the form of dispersed islands where sediment transport may be trapped by the surrounding vegetation and is not of the same concern as larger barren strips created from skid trails. Acres affected are presented in Table 3.73.

Table 3.73 Potential for Erosion due to Loss of Ground Cover Comparison by Alternative

Type of Disturbance	Method of Disturbance	Acres by Disturbance Alternative	Range of Percent Acres Impacted	Duration of impact in years	Rationale
Loss of Ground Cover, Vegetation	Mechanical	Alt 1 3,772 Alt 3 3,574 Alt 4 3,507 Alt 2 0	12 to 25 percent	1 to 5	Recolonization is slower because the ground is compacted
Loss of Ground Cover, Vegetation	Hand Pile and Burn	Alt 1 154 Alt 3 81 Alt 4 137 Alt 2 0	0.5 to 2% at 12 piles per acres 5ft to 10ft in diameter 1.8 to 7% at 40 piles per acres 5ft to 10ft in diameter	0.5 to 5	Easily recolonizes from surrounding area
Loss of Ground Cover, Vegetation	Wildfire	Alt 1 Alt3 Alt4 Alt 2	0 to 100 percent of the project area. Risk would be reduced by acres treated. 0 to 100 of project area, analysis area or greater.	1 to 3	Recolonization dependant on fire intensity, some recolonization from surrounding area Large threat for invasive species Stand structure permanently altered

The potential for sediment transport to the stream channel would be greater in Alternative 1 because 841 acres of mechanical treatment would occur within 25, 50 or 100 feet of the stream channels. Of those acres a minimum of 350 would be within 25 feet. The proximity of mechanical treatment to the stream channel increases the risk of sediment transport into the channel.

In all alternatives sediment transport to the channels would decline because 10-miles of roads would be decommissioned. All other road actions are presented under Alternative 1.

Indirect Effects—Soil Cover

A reduction in effective ground cover would increase the risk of erosion in affected areas. The amount and type of erosion depends on the character of the area. For example, patches of ground cover across a large area would be more effective at intercepting surface water than large areas devoid of cover.

Cumulative Effects—Soil Cover

A reduction in ground cover is likely to be short lived if nearby overstory trees remain intact. Over time, litter from trees and shrubs would contribute to the development of effective ground cover in bare areas. A wildfire entering a treated area may result in a greater reduction in ground cover than the proposed treatments alone. See the discussion under Alternative 2, above.

Soil Porosity and Detrimental Compaction

Direct Effects—Soil Porosity and Detrimental Compaction

It is difficult to accurately predict treatment effects on detrimental compaction. The use of logging equipment and reoccurring stand entries increases the potential for soil compaction (Powers 1999). The relationship between compacted and heavily disturbed ground to the decline in soil productivity over time is well documented (Horwath, et al. 2000, Grigal 2000). The degree of soil compaction varies with soil texture and moisture content, while plant responses to compaction depends strongly on changes in the soil water regime (Gomez et al. 2002). Timber harvest and biomass removal would require the use of skid trails and landings.

Because the areas proposed for treatment have been harvested before, it is expected that as many as half the existing skid trails would be used for the proposed harvest. This would reduce the area disturbed by the creation of new skid trails. These reused skidtrails would be subsoiled as part of the Freeman project. As a result the existing condition would be improved. However, monitoring on the Plumas, Lassen and Tahoe has shown this subsoiling to be only 66 percent effective. Table 3.74 shows the expected increase in skid trails and landings for each treatment unit surveyed. Although treatment prescriptions vary among the action alternatives, it is assumed that all action alternatives would require the approximately same amount of skid trails and landings to service the treated acres. As a Standard Operating Procedure (also referred to as Standard Management Requirement (SMR)), all landings would be subsoiled after use to mitigate compaction effects.

Soil monitoring for HFQLG pilot projects has shown an absolute increase in detrimental compaction of 8 percent following thinning and group selection treatments (Westmoreland 2004).

For any mechanical harvest, the extent and degree of compaction depends on site-specific soil conditions such as texture and stoniness, moisture content at the time of operations and harvest equipment features. In addition to subsoiling, Freeman Project SOPs include other soil protection measures, such as wet weather standards, to minimize soil compaction. By following the SOPs, utilizing existing skid trails where feasible and adhering to the estimates of new skid trails, increases in detrimental compaction due to skid trails are expected to be minimized. In their existing condition, three units 1, 9, 48 and 74 are over 15 percent compacted. Assuming the Freeman units undergo the same decrease and assuming 100 percent subsoiling effectiveness 2 additional units would have compaction exceeding 15 percent of the unit. The acres represented by the existing plus the associated increase from these 2 units is 4 percent of the sample area and 2 percent of the project area. Assuming the Freeman units undergo the same decrease and assuming 66 percent subsoiling effectiveness 15 additional units may experience increase over 15 percent. The acres represented by the existing units plus the associated increase from these 15 units is 30 percent of the sample area and 13 percent of the project area. The sampled portion of the project area would experience an increase in area exceeding 15 percent compaction from 96 percent to between 92 and 66 percent dependant on subsoiling effectiveness Table 3.76. Following treatment, these units would be reevaluated and additional subsoiling would occur in skid trails, landings and/or group selection areas to reduce the extent of detrimental compaction below the existing, pre-project condition.

The potential for erosion is increased when equipment operates on slopes greater than 25 percent so higher erosion rates would be expected under Alternative 1. Skid trail density and the steeper slopes contributes to the higher erosion rates on these lands. When ground based harvesters operates over 25 percent, skid trails are installed perpendicular to the contour unless cut into the slope on a diagonal. Vertical skid trails require a much closer spacing. This results in an increase in bare soil and more disturbance of the soil between the skid trails. These skid trails are too steep to be subsoiled so soil porosity is decreased and the potential for erosion is increased.

Table 3.74 Existing and predicted percent increase of unit area in skidtrails and landings.

Unit	Percent of Transect in Skid Trail or Landing	Predicted Percent of Unit in Skid Trail or Landing Assuming 50 % reuse, 100 % Subsoiling Effectiveness and 8 Percent Increase	Predicted Percent of Unit in Skid Trail or Landing Assuming 50 % reuse, 66 % Subsoiling Effectiveness and 8 Percent Increase	Unit	Percent of Transect in Skid Trail or Landing	Predicted Percent of Unit in Skid Trail or Landing Assuming 50 % reuse, 100 % Subsoiling Effectiveness and 8 Percent Increase	Predicted Percent of Unit in Skid Trail or Landing Assuming 50 % reuse, 66 % Subsoiling Effectiveness and 8 Percent Increase
1	0.18	0.17	0.20	51	0.14	0.15	0.17
4	0.07	0.11	0.12	52	0.07	0.11	0.12
5	0.04	0.10	0.11	53	0.14	0.15	0.17
6	0.04	0.10	0.11	53	0.02	0.09	0.09
7	0.13	0.15	0.17	56	0.13	0.15	0.17
8	0.12	0.14	0.16	57	0.18	0.17	0.20
9	0.20	0.18	0.21	57	0.02	0.09	0.09
10	0.12	0.14	0.16	61	0.10	0.13	0.15
12	0.02	0.09	0.09	62	0.05	0.11	0.11
13	0.02	0.09	0.09	63	0.02	0.09	0.09
17	0.13	0.14	0.16	66	0.06	0.11	0.12
19	0.07	0.11	0.12	67	0.10	0.13	0.15
20	0.02	0.09	0.09	67	0.12	0.14	0.16
21	0.01	0.09	0.09	70	0.05	0.11	0.11
22	0.03	0.10	0.10	72	0.15	0.16	0.18
23	0.03	0.10	0.10	74	0.17	0.16	0.19
24	0.08	0.12	0.13	76	0.01	0.09	0.09
26	0.02	0.09	0.09	77	0.08	0.12	0.13
29	0.05	0.11	0.11	90	0.04	0.10	0.11
30	0.12	0.14	0.16	92	0.07	0.12	0.13
32	0.06	0.11	0.12	94	0.03	0.10	0.10
32	0.04	0.10	0.11	95	0.06	0.11	0.12
34	0.02	0.09	0.09	97	0.08	0.12	0.13
35	0.02	0.09	0.09	98	0.12	0.14	0.16
37	0.08	0.12	0.13	99	0.03	0.09	0.10
38	0.06	0.11	0.12	108	0.12	0.14	0.16
41	0.12	0.14	0.16	111	0.05	0.11	0.11
42	0.03	0.10	0.10	113	0.13	0.14	0.17
48	0.20	0.18	0.21	124	0.08	0.12	0.13

Indirect Effects—Soil Porosity and Detrimental Compaction

Increases in compacted areas are expected due to the need for new skid trails. In these areas, compaction may reduce the infiltration capacity, reduce available water in the soil, impede root growth and alter nutrient uptake and tree growth.

Cumulative Effects—Soil Porosity and Detrimental Compaction

Table 3.74 shows the predicted cumulative level of skid trail and landing cover for the treatment units. Four units have cumulative levels of compaction greater than 15 percent in their existing condition. Following the proposed activities, these same units would still be above 15 percent and

2 to 15 units would also experience increases sufficient to move them above 15 percent. Additional subsoiling of legacy skidtrails within these units will reduce compaction and leave them in an improved state, as discussed above under “Direct effects”.

Organic matter

Direct Effects—Organic Matter

Accurate prediction of treatment effects on surface fine organic matter is difficult. Mastication treatments are expected to increase cover of organic matter as masticated debris is broadcast away from the machine. Under this alternative organic matter and soil nutrients may be affected by this project though soil displacement via road and landing construction, prescribed burns, burn piles and removal of vegetative material from the site.

Underburn treatments may reduce organic matter, but burning is expected to occur under prescribed conditions that would not result in complete combustion of the duff and litter layers. Pile burning and would decrease surface fine organic matter locally, but over time adjacent trees and shrubs would provide litter to cover the burned area. Fireline construction around prescribed burn areas and handpiles would create bare soil conditions. Over time, adjacent trees and shrubs would provide organic cover. Cover of fine organic matter is expected to remain relatively similar to the existing condition. To meet standards additional fine organic matter will need to be left on site.

Indirect Effects—Organic Matter

Local reductions in surface fine organic matter may have local effects on soil temperature. Large reductions in organic matter may result in greater temperature extremes in the soil, as previously discussed. Removal of canopy cover may result in increased temperatures at the forest floor as well as reduced moisture content of surface fine organic matter (Erickson et al. 1985).

Cumulative Effects—Organic Matter

Following the proposed treatments, organic matter on the soil surface would decrease in some areas, due to mechanical displacement or consumption by fire, while organic matter would increase in other areas due to additions of masticated material. This may result in greater heterogeneity of the forest floor. Patches of organic matter would provide habitat for soil invertebrates and microorganisms. Patches of bare areas would be susceptible to local erosion. Increases in woody materials on the forest floor due to mastication may cause short term changes in decomposition and carbon and nutrient dynamics in affected areas. Microorganisms that decompose wood would immobilize nitrogen and other nutrients while decaying the woody material. As the wood decomposes, those nutrients would be released and made available to plants and other organisms (Swift 1977). Microclimate changes at the forest floor due to reduced canopy cover can alter rates of decomposition and nutrient turnover in the surface fine organic matter of harvested stands (Edmonds 1985). Under Alternative 1, 39 percent of the sample area and 17 percent of the projects area may not meet the standard for fine organic matter. Table 3.75 displays a comparison of the effects to soil productivity by alternative. Table 3.76 summarizes the existing condition and changes to ground cover, compaction and fine organic matter by alternative.

Table 3.75 Soil productivity comparison of Freeman Project alternatives.

Soil Productivity Indicator	Type of Disturbance	Acres of treatment by Alternative	Impact	Duration of impact in	Rational
Microbes	Mechanical	Alt 1 3772 Alt 3 3574 Alt 4 3507 Alt 2 0	Displacement or death	1 to 5 years	Recolonization is slower because the ground is compacted
Microbes	Hand Pile and Burn	Alt 1 154 Alt 3 81 Alt 4 137 Alt 2 0	No effect, displacement or death	0.5 to 5 years	This effect is based on temperature intensity and duration of burn Recolonization occurs fairly quickly from the surrounding area
Nutrient Loss	Mechanical	Alt 1 3772 Alt 3 3574 Alt 4 3507 Alt 2 0	Approximately a direct proportion to the weight of the timber harvested	Can be long term	Returns in proportion as vegetation returns and litter and duff layers establish
Nutrient Loss	Hand Pile and Burn or	Alt 1 154 Alt 3 81 Alt 4 137 Alt 2 0	100 to 900 lbs per acre	Short term	Effect is localized

Table 3.76 Existing Condition and Changes to Ground Cover, Compaction and Fine Organic Matter by Alternative.

	Total acres proposed for treatment	Acres sampled	Percent area sampled	Acres outside of standard for ground cover (gc)	Percent area outside of standard for project area gc	Acres outside of standard for skid trails and landings (sl)	Percent area outside of standard for project area sl	Acres outside of standard for fine organic matter (fom)	Percent area outside of standard for project fom
Alt 2	5800	2490	0.43	414	0.07	92	0.02	971	0.17
PA	5794	2490	0.43	870	0.15	217	0.04	971	0.17
Alt 3	5579	2490	0.45	766	0.14	210	0.04	822	0.15
Alt 4	5488	2490	0.45	870	0.16	226	0.04	924	0.17

Soil Buffering Capacity and Sporax Effects

Soil buffering capacity is expected to remain largely unchanged by Alternative 1. Pile burning and underburning may cause short-term alterations to soil pH and nutrient cycling at a relatively small scale (Raison 1979). Sporax (common name borax; chemical name sodium tetraborate decahydrate) is not expected to change soil buffering capacity. Sporax is generally active in the soil. Boron from Sporax is adsorbed by the mineral portion of the soil and is absorbed from the soil by plants. Boron is an essential plant nutrient which naturally occurs in the soil at concentrations of 5 to 150 parts per million. Sporax remains unchanged in the soil for varying lengths of time, depending on soil acidity and rainfall. The average persistence is 1 or more years. Sporax is less persistent in acid soils and in areas with high rainfall. Soils in the project area are slightly acidic. Soil microorganisms do not break down Sporax. Sporax is partially soluble in water and the potential for leaching into ground water or surface water contamination is low (Information Ventures Inc. 1995). Alternative 1 treats 7.2 sq. feet per acres over 1,254 acres. This is approximately 0.14 pounds of borax per acre or a total of 176 pounds across the project.

3.8.6.2 Alternative 2 (No-action)

Cumulative Watershed Effects Analysis

Table 3.77 illustrates the changes in ERA values for the analysis subwatersheds over the range of action alternatives proposed for the Freeman DFPZ and GS Project. Existing ERA values, expressed as percent of the TOC, are shown in Alternative 2. Values for the action alternatives are shown as Alternative 1, 3 and 4. The TOC serves as a warning that cumulative watershed impacts may exist within a given watershed, which may adversely impact peak flows, water quality and/or channel stability. A value of 100% TOC indicates that the watershed is at its threshold. Values less than 100% indicate that the watershed is below its threshold, while values greater than 100% indicate that the watershed has exceeded its threshold. The Region Five Soil and Water Conservation Handbook (USDA Forest Service 1988a) states, the TOC does not represent the exact point at which cumulative watershed effects will occur. Rather, it serves as a “yellow flag” indicator of increasing susceptibility for significant adverse cumulative effects occurring within a watershed. Susceptibility of disturbing activities increase as a watershed approaches or is impacted beyond the TOC. If the watershed is approaching or above the TOC, a more thorough investigation of the activities planned within the watershed is necessary.

Existing ERA values for the analysis subwatersheds currently range from 7 to 46% of the TOC (Table 3.77-Alternative 2). The percent of TOC varies across subwatersheds because past land management practices and natural disturbance events such as wildfire differ in type and intensity. Figures 3.13 and 3.14 show how the major land use activities contributed to the total ERA for each subwatershed. These activities include the existing transportation system, past public harvests, past private harvests and grazing. Past wildfires had no contribution to the ERA within any subwatershed and so they were not considered a major land use activity for this analysis. Reasonably foreseeable future projects were analyzed separately.

Table 3.77 Equivalent roaded acres by watershed in the Freeman Project area, presented as the percent of the threshold of concern for each alternative.

Analysis subwatershed by sensitive andupland (S) or (U)	ERA (% of Threshold of Concern)			
	Alt 1 (Proposed Action)	Alt 2 (No-action)	Alt 3	Alt 4
Val (S)	71	36	68	66
Val (U)	103	40	95	100
Four Springs (S)	32	23	31	29
Four Springs (U)	97	29	92	99
Izzy (S)	48	44	45	45
Izzy (U)	89	39	88	104
Riz (S)	37	39	48	48
Riz (U)	74	39	69	63
Marsh (S)	68	25	76	75
Marsh (U)	89	11	81	82
Freeman (S)	55	39	47	49
Freeman (U)	74	38	72	72
Cow (S)	76	38	62	78
Cow (U)	103	28	94	102
Round Hill (S)	61	13	65	70
Round Hill (U)	62	7	51	54
Dan Blough (S)	47	29	45	47
Dan Blough (U)	48	23	40	42
Little (S)	50	46	59	59
Little (U)	99	46	93	98
East Humbug (S)	42	24	41	55
East Humbug (U)	28	19	25	24

Currently each analysis subwatershed is well below the TOC (Figure 3.13 and 3.14). ERA values for the entire subwatershed range from 9 to 40 percent of threshold; contributing percents by land use activity are presented in Figure 3.13 and 3.14. Roads account for about 8 to 24% of the TOC in each subwatershed. Relatively little public or private timber harvests have occurred in these subwatersheds in the past decade. Harvest accounts for 0 to 20 percent of the disturbance within the subwatersheds. Grazing contributes 3 to 27 percent of the TOC. Large fires have not occurred within the analysis area in the past 25 years so they have no contribution to the TOC.

Since 1996 our ERA calculations have focused on the importance of near stream activities with respect to sediment yields and peak flows. Clearly, it has been shown throughout the literature over the past century that most sediment delivery originates within close proximity to stream courses, whether they are perennial, intermittent or ephemeral streams. To build more sensitivity into the ERA analysis, the Plumas National Forest's cumulative watershed effect assessments now focus on the sensitive areas near the stream channel network including riparian areas, meadows and wetlands, as well as the total ERA values presented above and in Table 3.75.

Direct Effects—ERA

Under the No-action alternative, the existing condition would be maintained. Given the assumption that fire, timber harvest, road construction and other watershed disturbance other than those listed in the Reasonable and Foreseeable Future Actions portion of this paper, do not occur, watersheds would continue to regain their inherent hydrologic character as stand growth continues, ground cover conditions improve and porosity of compacted soils increases, therefore ERA values would slowly decline to a baseline level over time. Improvements would not be made to the transportation system and no roads would be obliterated or relocated out of riparian areas, so watershed benefits and reductions in ERA values would not be realized. An opportunity will be foregone to treat heavy concentrations of fuels that would reduce the fire hazard and potential for large fires.

Indirect Effects—ERA

In the short term, water quality and downstream beneficial uses would remain unchanged. As watersheds recover from past management activities, there may be small improvements in water quality. Some sections of streams within these watersheds in poor to fair conditions would experience a very gradual, long-term improvement in channel stability as peak flows and sedimentation rates moderate. However, in the absence of road improvements, decommissioning or obliteration, the transportation system would continue to be a large contributor of sediment to the stream network. The density of roads and road-stream crossings would continue to impact the hydrologic regime in these subwatersheds.

Given the current fuel loading and subsequent increase in fuel loading resulting from the mortality caused by disease, insects or overstocking there is the probability that a large, intense wildfire would occur. Such a fire would be intense, destroying vegetation, ground cover and large organic debris within stream channels. As a result of these fires peak flows may increase five to ten times above existing levels and sediment loads could increase up to 50 to 100 fold.

On-site fishery habitat may be destroyed or severely reduced as the stream becomes devoid of cover, large organic debris and aquatic food. Jackson Creek, which burned in the Layman Fire in 1989, is a good example of the effects of intense wildfire on a native trout fishery. Native trout populations have dropped substantially since the fire. The decline is related the increase in water temperatures and suspended sediment. As sediment transported throughout the system settles out of the water column it in fills spawning gravels. Elevated temperatures resulting from loss of vegetative cover adversely affects egg survival and the growth of both juvenile and adult trout. Watershed and fishery impacts from large wildfires are discussed in further detail for the Jackson, Cottonwood and Clarks burns in the Tri-Forest Eastside Assessment available at the Plumas, Lassen or Tahoe National Forest Supervisor Offices. Seven stand replacing fires between 3,970 40,000 acres in size have occurred on the Beckwourth District since 1977, most still have visible scars.

RHCA’s would continue to function as unique habitat for wildlife and botanical diversity, but aspen stands would continue to decline in health and would continue to disappear from the landscape.

Cumulative Effects—ERA

In the event of a future severe wildfire, affected areas may be highly susceptible to erosion and generate large pulses of sediment to stream channels (Elliot and Robichaud 2001). Sediment may be stored in channels for many years until peak flows mobilize the materials and move them downstream. Large runoff events often follow severe wildfires, resulting in increased peak flows.

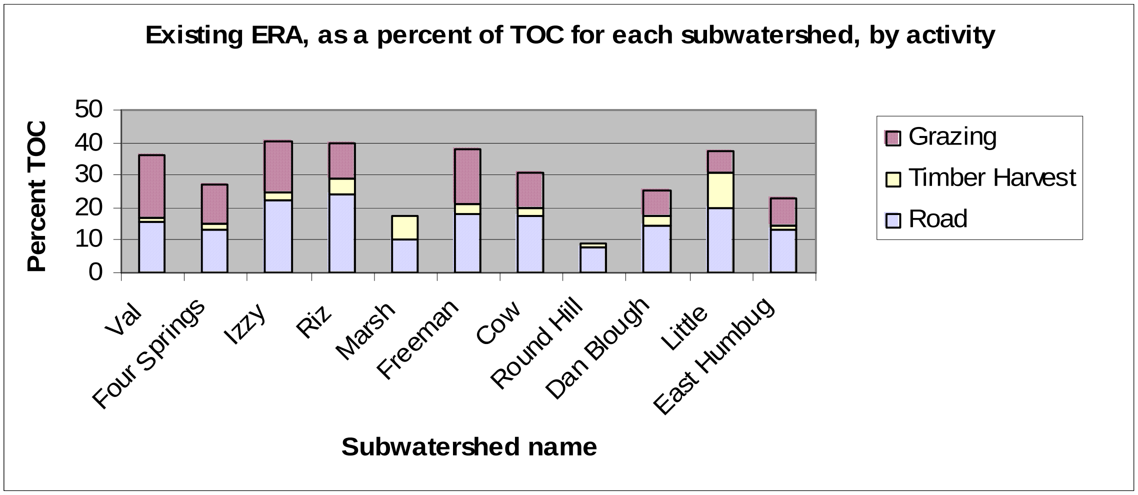

Figure 3.14 Alternative 2, the existing condition: Equivalent roaded acres (ERA), shown as a percent of TOC for each analysis subwatershed, broken down by activity. Analysis subwatersheds are shown by entire subwatershed.

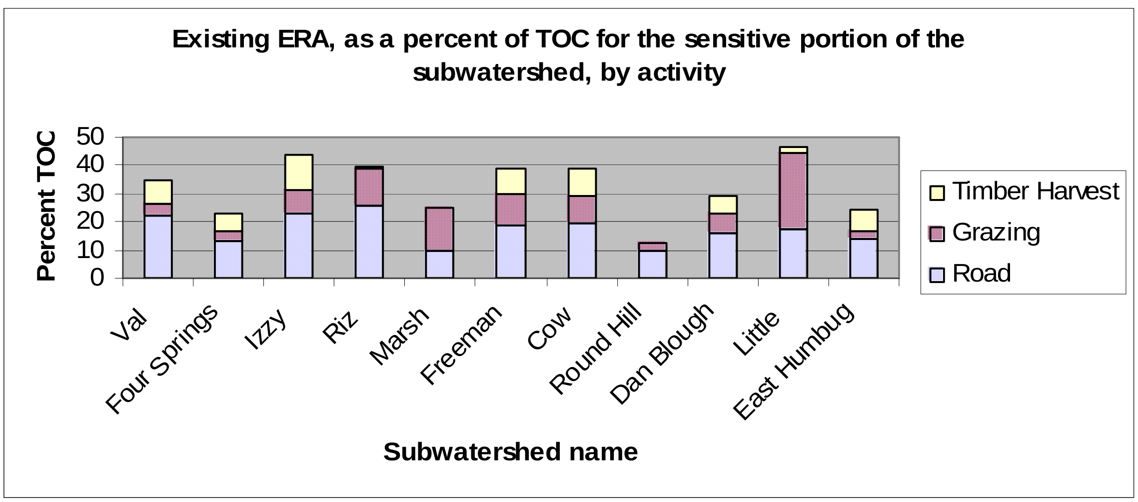

Figure 3.15 Alternative 2, the existing condition: Equivalent roaded acres (ERA), shown as a percent of TOC for each analysis subwatershed, broken down by activity. Analysis subwatersheds are shown for the sensitive portion of the subwatersheds.

Soil Assessment

Soil Cover

Effective ground cover is necessary to prevent accelerated soil erosion. Table 3.78 displays the current effective ground cover assessment in the 66 treatment units equaling 2,490 acres. The

LRMP standards and guidelines for effective ground cover vary by the soil erosion hazard rating. For highly erodible soils the effective ground cover should be maintained at 60%. For moderately erodible soils effective ground cover should be maintained at 50%. For very highly and those less than moderately erodible the effective ground cover should be maintained at 70 and 40 percent respectively. Currently, on average, 55 treatment units meet the ground cover standard by meeting or exceeding these thresholds. However, 10 treatment units, 1, 19, 29, 35, 51, 52, 56, 58, 63 and 66 do not meet the standard. The acres represented by these units are 17 percent of the sampled area and 7 percent of the project area. The sample area represents 43 percent of the project area 3.76).

Direct effects—Soil Cover

Under the No-action alternative, soil cover can be expected to increase as organic materials accumulate on the soil surface.

Indirect Effects—Soil Cover

As a result of increased soil cover, the risk of soil erosion may decline on forested hillslopes. Soil cover dissipates the energy of falling raindrops by through interception. At higher velocities falling rain causes rain splash, a force that sets soil grains in motion. The litter layer acts as a sponge increasing storage capacity and slows the velocity of overland flow. At high velocities overland flow results in rain-wash another erosive force. Without vegetative cover, an intense storm can generate huge quantities of sediment from hillsides (Cawley 1990). Reduced soil erosion helps retain soil nutrients and a favorable growth medium on site.

Cumulative Effects—Soil Cover

Under the No-action alternative, soil cover can be expected to increase as organic materials accumulate on the soil surface. This description of limited disturbance within watersheds assumes that fires are controlled to spots less than 5 acres over the next 20 to 30 years.

However, a future catastrophic wildfire, or a high severity fire, would likely consume organic materials on the forest floor and reduce soil cover below the LRMP standard in the affected area. If soil cover is reduced to bare soil following a wildfire, the soil would be more susceptible to erosion (Table 3.78 and 3.73). In addition, fire can volatilize organic compounds in the soil, some of which migrate down a temperature gradient and condense on soil particles below the surface (DeBano 1990). As a result, hydrophobicity (a non-wettable layer) can develop below the surface This repellant layer can greatly reduce infiltration rates. During a precipitation event, soil above the non-wettable layer can become saturated and erode downslope due to rill formation and raindrop splash. Factors such as soil texture, slope and post-burn precipitation intensity will affect the degree and type of post-fire erosion. Dry, coarse grained soils are particularly susceptible to this type of fire-induced hydrophobic condition (Clark 1994).

Soil Porosity

Soil porosity is the volume of voids compared to solids for a given volume of soil. The porosity of the soil is important for gas exchange and water movement into and through the soil. Ground based management activities can potentially reduce porosity or compact the soil. The actual effects depend upon soil type, equipment and operational factors. To limit the extent of compaction, the LRMP standards and guidelines indicate that no more than 15% of a stand should be dedicated to landings and permanent skid trails. Therefore, at least 85% of a stand should be in a non-compacted, productive state that is not a skid trail or landing. Table 3.79 shows the results of the compaction assessment in the 66 treatment units equaling 2490 acres. On average, 62 units are currently below 15 percent compacted. However, one transect in unit 57 is above 15 percent. When averaged with the other transect in the respective unit, is below 15 percent. In units 1, 9 54 and 74 the percent unit area in skidtrails and landings is greater than 15 percent. The acres represented by these units are 4 percent of the sampled area and 2 percent of the project area 3.76).

Direct effects—Soil Porosity

Under the No-action alternative, the extent and degree of compaction are expected to decline slowly over time. This process may take several decades in forested environments (Grigal 2000). Root penetration, extension and decay, along with the burrowing action of soil dwelling animals, would contribute to the increase in soil porosity and decrease in compaction. In addition, incorporation of organic matter into the soil by biological processes such as invertebrate and vertebrate soil mixing and decomposition, would help reduce soil bulk density and the degree of compaction in affected areas over time.

Cumulative Effects—Soil Porosity

In the absence of future timber harvests, road construction, or other compacting activities, soil compaction is expected to decline as described above. In the event of a future wildfire, severe soil heating may cause physical changes in soils, including a reduction in soil porosity (Clark 1994).

Organic Matter

Surface organic matter serves as a nutrient reservoir for plants and other organisms that inhabit the soil. As it is incorporated into the soil, it contributes positively to water-holding capacity, nutrient retention, infiltration and hydrologic function of the soil. Surface organic matter acts as a buffer to moderate extremes of soil temperature. The LRMP states that 50% cover of surface fine organic matter should be retained in all stands. Table 3.80 displays the results of the surface organic matter assessment in the 66 treatment units equaling 2490 acres. Currently, on average, 56 percent of the units meet or exceed the LRMP standard. When more than one transect was conducted in a unit those transects were averaged. Six units 1, 7, 53, 61, 108 and 113 had less than 5 percent departure from the standard. Additionally seven units 26, 29, 34, 38, 41, 42 and 98 were less than or equal to a 10 percent departure. Eighteen units, 5, 9, 19, 22, 24, 35, 44, 47, 49, 51, 52, 56, 58, 59, 66, 67, 90 and 124 had departures ranging from 12 to 30 percent of the standard. In summary, 37 of the 66 units currently meet the standard. The acres represented by these units are 39 percent of the sampled area and 17 percent of the project area.

Table 3.78 Soil productivity assessments in sampled Freeman Project treatment units for average percent effective ground cover.

Unit	Erosion Hazard	Unit by Erosion Hazard (%)	LMP Ground Cover Standard	Existing Effective Ground Cover	Below Standard (%)	Unit	Erosion Hazard	Unit by Erosion Hazard (%)	LMP Ground Cover Standard	Existing Effective Ground Cover	Below Standard (%)
1	M		50	48	2	51	M	90	50	44	6
3	M		50	96		51	H	10	60	44	16
4	M		50	87		52	M	95	50	47	3
5	M	50	50	68		52	H	5	60	47	13
5	H	50	60	68		53	M		50	54	
6	M		50	92		56	M	93	50	51	
7	M		50	87		56	H	7	60	51	9
8	M		50	76		57	M		50	69	
9	M		50	70		58	M		50	48	2
10	M		50	74		59	M		50	60	
12	M		50	94		61	M	20	50	74	
13	M		50	88		62	M	80	50	80	
14	M		50	100		62	H		60	80	
17	M		50	68		63	H		60	55	5
19	M		50	47	3	64	H		60	83	
20	M	92	50	84		66	H		60	40	20
20	H	8	60	84		67	M	44	50	65	
21	M		50	91		67	H	56	60	65	
23	M	38	50	76		69	M		50	60	
23	H	62	60	76		72	M		50	83	
24	M	79	50	50		73	M		50	98	
24	H	21	60	50		74	M		50	70	
26	M		50	50		76	M		50	91	
29	M		50	44	6	77	M	20	50	73	
30	H		60	73		77	H	80	60	73	
31	M	88	50	70		78	M	88	50	89	
31	H	12	60	70		78	H	12	60	89	
34	M		50	50		79	M	58	50	81	
35	M		50	36	14	79	H	42	60	81	
35	H		60	36	24	90	H		60	60	
37	M		50	54		92	H		60	79	
38	M	83	50	62		94	H		60	67	
38	H	17	60	62		95	H		60	82	
41	M	88	50	62		96	H		60	95	
41	H	12	60	62		97	H		60	85	
42	M	97	50	80		98	M		50	83	
42	H	3	60	80		99	H		60	98	
44	M		50	38		108	H		60	70	
45	M		50	86		111	M	39	50	67	
47	M		50	57		111	H	61	60	67	
48	M	77	50	84		113	M		50	77	
48	H	23	60	84		124	M	40	50	73	
49	M		50	38		124	H	60	60	73	

Table 3.79 Results of soil field surveys for compaction in sampled Freeman Project treatment units.

Unit	Points Along Transect in a Skid Trail	Points Along Transect in a Landing	Number of Points in the Transect	Percent of Transect in Skid Trail or Landing	Unit	Points Along Transect in a Skid Trail	Points Along Transect in a Landing	Number of Points in the Transect	Percent of Transect in Skid Trail or Landing
1	9	0	50	0.18	51	6	1	50	0.14
4	6	0	90	0.07	52	4	0	60	0.07
5	2	0	50	0.04	53	7	0	50	0.14
6	2	0	50	0.04	53	1	0	50	0.02
7	8	0	60	0.13	56	7	2	69	0.13
8	6	0	50	0.12	57	9	0	50	0.18
9	10	0	50	0.20	57	1	0	50	0.02
10	4	2	50	0.12	61	5	0	50	0.10
12	1	0	50	0.02	62	3	0	60	0.05
13	1	0	60	0.02	63	1	0	60	0.02
17	5	0	40	0.13	66	3	0	50	0.06
19	2	0	30	0.07	67	6	0	60	0.10
20	2	0	100	0.02	67	4	3	59	0.12
21	1	0	80	0.01	70	3	0	60	0.05
22	3	0	100	0.03	72	6	0	40	0.15
23	3	0	90	0.03	74	5	0	30	0.17
24	4	0	50	0.08	76	1	0	90	0.01
26	1	0	50	0.02	77	4	0	51	0.08
29	5	0	100	0.05	90	2	0	50	0.04
30	6	0	51	0.12	92	5	0	70	0.07
32	3	0	50	0.06	94	1	0	30	0.03
32	2	0	50	0.04	95	3	0	50	0.06
34	1	0	60	0.02	97	8	0	100	0.08
35	1	0	50	0.02	98	3	0	25	0.12
37	4	0	50	0.08	99	1	0	40	0.03
38	3	0	50	0.06	108	7	0	60	0.12
41	3	3	50	0.12	111	3	0	60	0.05
42	2	0	60	0.03	113	9	0	70	0.13
48	14	0	70	0.20	124	4	0	50	0.08

Direct effects—Organic Matter

Under the No-action alternative, surface organic matter can be expected to increase as organic materials accumulate on the soil surface.

Indirect Effects—Organic Matter

The continued accumulation of organic matter on the forest floor would contribute to increased ground and surface fuel loads, which may lead to increased fire severity and intensity during a fire event.

Table 3.80 Results of soil field surveys for fine organic matter in the Freeman Project area.

Unit	Duff & Litter				Woody Debris	Points in Transect	Percent Fine Organic Matter	Percent Departure From Standard
	.5-1"	1-2"	>2"	Mix of Size Classes	.25-3"			
1	16	7	0	0	1	50	48	-2
3	8	26	11	1	14	80	75	
4	7	20	8	2	23	90	67	
5	4	1	1	0	4	50	20	-30
6	8	13	5	2	11	50	78	
7	8	4	5	3	9	60	48	-2
8	10	6	3	1	11	50	62	
9	4	5	1	1	8	50	38	-12
10	8	3	1	2	11	50	50	
12	7	12	4	0	11	50	68	
13	12	10	5	2	9	60	63	
14	7	16	6	1	11	50	82	
17	8	7	0	3	2	40	50	
19	2	2	4	0	0	30	27	-23
20	18	16	6	0	12	100	52	
21	10	21	13	0	13	80	71	
22	19	3	0	0	1	100	23	-27
23	16	18	6	1	7	90	53	
24	10	4	1	1	3	50	38	-12
26	5	5	2	2	6	50	40	-10
29	27	8	4	3	1	100	43	-7
30	17	8	7	4	5	51	80	
31	14	8	2	1	4	50	58	
32	21	13	5	3	8	50	100	
34	19	2	4	0	1	60	43	-7
35	10	2	2	0	1	50	30	-20
37	19	3	1	1	1	50	50	
38	3	3	1	0	13	50	40	-10
41	5	3	6	0	7	50	42	-8
42	10	6	4	0	4	60	40	-10
44	22	0	0	0	0	60	37	-13
45	5	12	18	0	2	50	74	
47	1	1	2	1	7	47	26	-24
48	11	9	2	5	13	70	57	
49	7	0	0	0	1	50	16	-34
51	8	0	3	0	3	50	28	-22
52	12	4	1	0	6	60	38	-12
53	9	7	5	4	3	50		
53	12	2	1	0	5	50	48	-2
56	13	8	2	0	2	69	36	-14
57	15	8	4	0	5	50	64	
57	12	9	1	1	3	50	52	
58	8	3	0	0	0	50	22	-28
59	2	2	0	0	1	19	26	-24
61	13	6	4	1	8	50		
61	6	2	3	0	3	50	46	-4
62	28	5	4	0	6	60	72	

Unit	Duff & Litter				Woody Debris	Points in Transect	Percent Fine Organic Matter	Percent Departure From Standard
	.5-1"	1-2"	>2"	Mix of Size Classes	.25-3"			
63	9	4	10	1	6	60	50	
64	12	12	3	0	2	40	73	
66	11	0	0	0	3	50	28	-22
67	8	1	2	0	5	60	27	
67	2	3	1	0	5	59	19	
67	1	10	12	2	14	60	37	-13
69	13	5	1	4	4	50	54	
70	21	9	0	5	1	60	60	
72	18	36	13	2	2	40	178	
73	9	10	2	1	17	60	65	
74	3	7	2	0	6	30	60	
76	23	25	11	5	5	90	77	
77	18	11	2	1	4	51	71	
78	6	14	6	0	8	55	62	
79	19	12	5	1	6	85	51	
90	5	0	0	1	3	50		
90	8	4	1	0	7	59	27	-23
92	15	9	3	4	12	70	61	
94	16	13	1	0	4	30	113	
95	15	6	7	2	8	50		
95	19	9	1	0	6	75	58	
96	5	16	4	1	8	60	57	
97	19	18	10	2	16	100	65	
98	4	3	2	0	1	25	40	-10
99	4	6	0	0	20	40	75	
108	8	7	0	1	12	60	47	-3
111	12	8	1	2	12	60	58	
113	9	14	3	4	3	70	47	-3
124	10	2	1	0	0	41		
124	1	1	5	0	3	50	25	-25

Cumulative Effects—Organic Matter

Under the No-action alternative, surface organic matter can be expected to increase as organic materials accumulate on the soil surface. However, a future wildfire could consume organic horizons on the forest floor, creating a non-wettable layer, as described above. Immediately following a fire, the affected stand may not meet the LRMP standard of 50% cover of organic matter. However, within several months a thin layer of needlecast from scorched trees would increase cover of organic matter (Pannkuk and Robichaud 2003) Fires short-circuit the decomposition pathway, rapidly oxidizing organic matter and releasing available nutrients to plants and soil organisms. When organic matter burns, essential nutrients can be transferred to the atmosphere through volatilization and ash convection (Raison et al. 1984). Nutrients may also be lost following fire due to leaching (Boerner 1982). Some nutrients are returned relatively quickly by terrestrial cycling pathways. Compared to the pre-burn condition, a large reduction in the organic matter covering the soil would reduce the insulating effect this layer has on soil temperature. Under a reduced organic layer, soils experience greater temperature extremes. In addition, a blackened surface, due to partially combusted organic materials, would absorb more light and become warmer than a soil without a dark surface (Ahlgren and Ahlgren 1960). Soil temperatures may be elevated for months or years depending on the degree of organic matter consumption (Neary et. al. 1999). Such changes in the soil temperature regime would affect rates biological activity in the soil, resulting in altered nutrient cycling regimes.

3.8.6.3 Alternative 3

Cumulative watershed effects analysis

While fire ignitions are expected to continue following the activities proposed in Alternative 3, fuel treatments are designed to give wildland fire managers “a higher probability of successfully attacking a fire” (Agee et al., 2000) A future severe wildfire would have the effects described under Alternative 2, but implementation of the Alternative 3 should reduce the likelihood of such an event. This would be due to the enhances ability of fire management to suppress, control and contain fires that impact or start in the fuel treatments under 90th percentile weather conditions.

Under Alternative 3, the increases in ERA values were predicted to range from 2 to 69% of the TOC, depending on the subwatershed. This would result in cumulative ERA values ranging from 25 to 95% of the TOC when the sensitive and uplands are assessed separately. The TOC in any given subwatershed when the entire watershed is assessed together is below threshold and values range from 33 to 96 percent. As a result there are lower, moderate and higher risks that these treatments may stress the hydrologic system within individual subwatersheds (Table 3.77 Figure 3.15 and 3.16).

Direct Effects—ERA

Alternative 3 would reduce the amount of mechanical treatments by approximately 200 acres to 3,574, so there would be less ground disturbance from equipment, skid trails and landings. Seven hundred and fifty acres of RHCA would be treated mechanically. RHCAs widths were delineated at 150 feet, the height of a site potential tree unless the outer edge of the riparian vegetation was greater. By using these criteria for RHCA width delineation there was a 47 acre increase in the RHCAs. Aspen treatment would occur on 181 acres, all of which would be in RHCAs. Aspen treatments in RHCAs would be limited to slopes of 35 percent or less.

Decommissioning 10-miles of roads would result in long-term benefits to watershed resources resulting from a reduction in road density. Eight watersheds would experience offsets from the impacts of this action alternative thru the decommissioning of these roads. Road actions are presented in Alternative 1 and are the same for all action alternatives.

Indirect Effects—ERA

Indirect effects are expected to be the same under all action alternatives. Please see the discussion under Alternative 1, above.

Cumulative Effects—ERA

Detrimental effects that may result from increases in ERA include fluvial erosion from treated hillsides, resulting in chronic sedimentation. Primary factors leading to this are reduction of canopy cover, ground disturbance and loss of ground cover. Silvicultural prescriptions for the Freeman Project include harvests, underburning and mastication. Under these prescriptions, there would be canopy retention and surface vegetation recovery that would contribute to rebuilding ground cover. The group selection treatment would create small forest openings with associated disturbance from skid trails, site preparation and transportation needs, such as temporary roads. The most likely effect of increased fluvial erosion is a decline in coldwater fish habitat quality via infilling of pools, embedding of spawning gravels and related effects to aquatic insect communities. The risk of detrimental effects in the analysis subwatersheds are displayed below.

The cumulative ERA values would not exceed the TOC in any subwatershed. ERA increases would leave four subwatersheds at moderately high risk of cumulative effects (greater than 6 percent TOC in sensitive and greater than 9 percent in the upland). Moderate increases in four subwatersheds would raise the disturbance levels to a moderate risk of cumulative effects. Increase in three subwatersheds means while they are at a higher risk, they are at a low risk for cumulative effects.

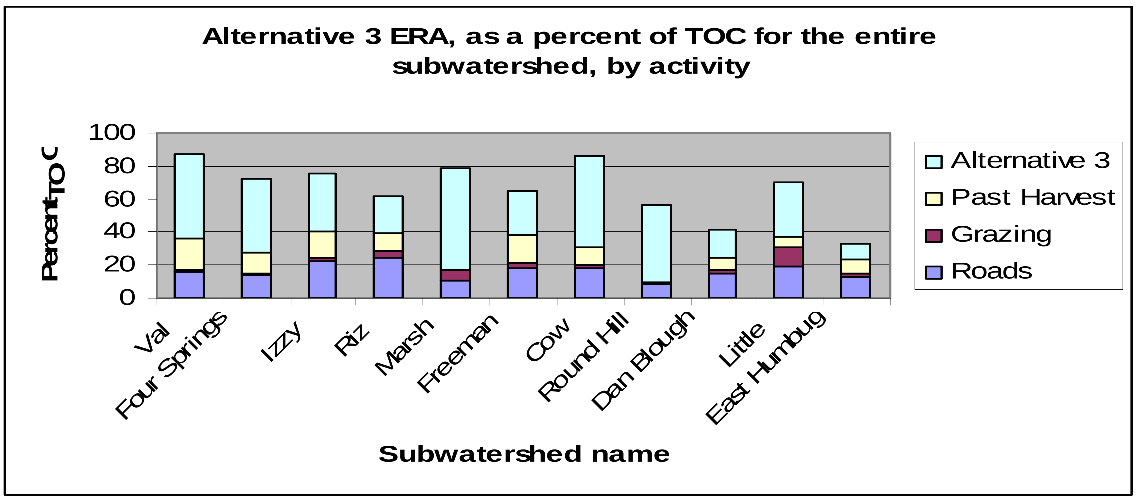

Figure 3.16 Alternative 3, the Proposed Action: Equivalent roaded acres (ERA), shown as a percent area for each analysis subwatershed, broken down by land use. Analysis subwatersheds are shown by entire subwatershed.

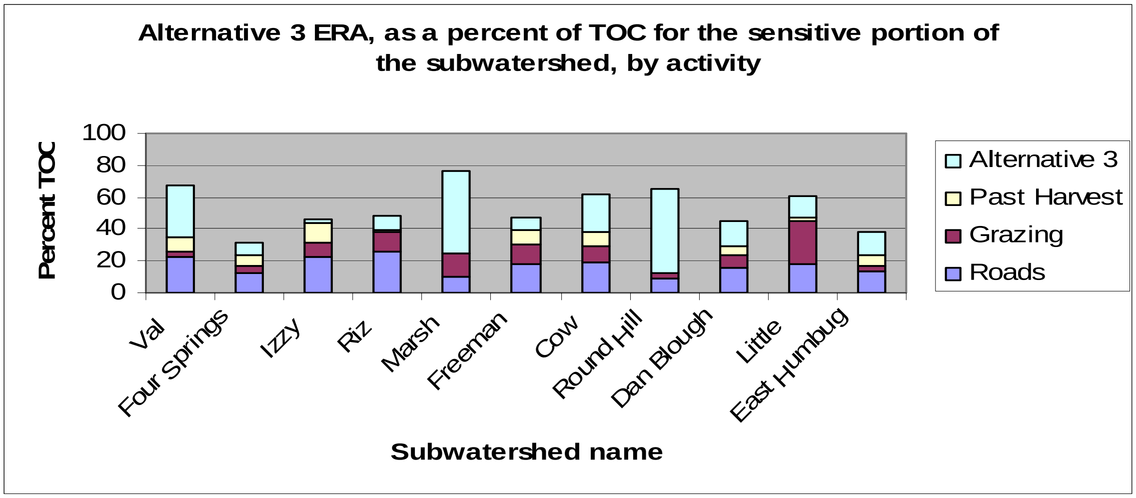

Figure 3.17 Alternative 3, the Proposed Action: Equivalent roaded acres (ERA), shown as a percent area for each analysis subwatershed, broken down by land use. Analysis subwatersheds are shown for the sensitive portion of the subwatershed.

Soil Assessment

By following the standards contained in the PNF LRMP and USDA Forest Service Region 5 soil standards, there would be a lower risk that soil productivity would be impaired. Alternative 3 would have a moderate amount of mechanical treatment, so there would be a moderate amount of ground disturbance from equipment, skid trails and landings. This alternative would reduce the amount of mechanical treatments by approximately 200 acres to 3574, so there would be less ground disturbance from equipment, skid trails and landings. Approximately 29 percent of the subwatersheds analyzed would be treated mechanical. Within individual watersheds the percent mechanical treatment ranges from 8.5 to 61, eight subwatersheds are between 8.5 and 40 percent. Six watersheds would have a substantial amount of mechanical treatments (increase over existing of greater than one third of the watershed), so there would be a considerable amount of ground disturbance. Impacts on soil resources would be greater than Alternative 2 but less than 1 and 4.

Soil Cover

Direct Effects—Soil Cover

The sampled portion of the project area would experience a decrease in area meeting or exceeding the standard from 83 percent to 69 percent. Acres within units predicted to experience decreases in effective ground cover below the standard are 14 percent of the project area and 31 percent of the sample area. While differences in sampling method and intensities, as well as harvest and site preparation practices, complicate this type of comparison, it is reasonable to assume that effective ground cover would be decreased. Implementation of mitigation methods such as leaving chips on site would ensure the standards would still be met. There is a moderate risk that treated units would not meet the Regional standard following treatment.

There is reduced potential for vegetation loss associated with pile burning in Alternative 3 because of the number of burn piles. It is estimated there would be 972 to 3240 piles generated by this alternative. Acres affected are presented in Table 3.73.

Under Alternative 3 mechanical treatment would occur within units where slopes are equal to or less than 35 percent and 15 percent or less in the RHCAs. Mechanical treatment would occur within aspen units where slopes are equal to or less than 35 percent. The potential for sediment transport to the stream channel would be reduced in Alternative 3 because 750 acres of mechanical treatment would occur within 25, 50 or 100 feet of the stream channels. Of those acres a minimum of 181 would be within 25 feet. The proximity of mechanical treatment to the stream channel increases the risk of sediment transport into the channel.

In all alternatives sediment transport to the channels would decline because of the decommissioning of 10-miles of roads.

Indirect Effects—Soil Cover

Indirect effects to soil cover are expected to be the same under all action alternatives. Please see the discussion under Alternative 1, above.

Cumulative Effects—Soil Cover

Cumulative effects to soil cover are expected to be the same under all action alternatives. See the discussion under Alternative 2 and 1, above.

Soil porosity and Detrimental Compaction

Direct Effects

In their existing condition, three units 1, 9, 48 and 74 are greater than 15 percent compacted. Assuming the Freeman units undergo an 8 percent decrease and subsoiling is 100 percent effective 2 additional units may exceed 15 percent compacted. Assuming the Freeman units undergo an 8 percent decrease and subsoiling is 66 percent effective 15 additional units may have compaction representing more than 15 percent of the unit. The acres represented by the existing plus the associated increase from these two units is 4 percent of the sample area and 8 percent of the project area. The acres represented by the existing plus the associated increase from these 15 units is 27 percent of the sample area and 12 percent of the project area. The project area would experience an increase in area exceeding 15 percent compacted from 96 percent to 84 to 69 percent dependant of subsoiling effectiveness. Following treatment, these units would be reevaluated and additional subsoiling would occur in skid trails, landings and/or group selection areas to reduce the extent of detrimental compaction below the existing, pre-project condition.

Indirect Effects

Indirect effects to soil porosity and detrimental compaction are expected to be the same under all action Alternatives. Please see the discussion under Alternative 1, above.

Cumulative Effects

Cumulative effects to soil porosity and detrimental compaction are expected to be the same under all action Alternatives. Please see the discussion under Alternative 1, above.

Organic Matter

Direct Effects—Organic Matter

Accurate prediction of treatment effects on surface fine organic matter is difficult. Mastication treatments are expected to increase cover of organic matter as masticated debris is broadcast away from the machine. Under this alternative organic matter and soil nutrients may be affected by this project though soil displacement via road and landing construction, prescribed burns, burn piles and removal of vegetative material from the site.

Underburn treatments may reduce organic matter, but burning is expected to occur under prescribed conditions that would not result in complete combustion of the duff and litter layers. Pile burning and would decrease surface fine organic matter locally, but over time adjacent trees and shrubs would provide litter to cover the burned area. Fireline construction around prescribed burn areas and handpiles would create bare soil conditions. Over time, adjacent trees and shrubs would provide organic cover. Cover of fine organic matter is expected to remain within acceptable threshold values.

Indirect Effects—Organic Matter

Indirect effects to organic matter are expected to be the same under all action alternatives. Please see the discussion under Alternative 1, above.

Cumulative Effects—Organic Matter

Cumulative effects to organic matter are expected to be the similar under all action alternatives. Please see the discussion under Alternative 1, above. Under Alternative 3, 33 percent of the sample area and 17 percent of the project area may not meet the standard for fine organic matter.

Soil Buffering Capacity and Sporax Effects

Impacts to soil buffering capacity and Sporax treatments effects are expected to be the same under all action alternatives. Please see the discussion under Alternative 1, above. Alternative 3 treats 7.3 sq. ft. per acre over 1,333 acres. This is approximately .14 pounds of borax per acre or a total of 187 pounds of borax across the project.

3.8.6.4 Alternative 4 (Preferred Alternative)

Cumulative Watershed Effects Analysis

Under Alternative 4, the increase in ERA values were predicted to range from 2 to 74% of the TOC, depending on the subwatershed. This would result in cumulative ERA values ranging from 24 to 104% of the TOC when sensitive and uplands are assessed separately. The TOC in any given subwatershed when assess together remains below threshold and values range from 39 to 96. As a result, there are lower, moderate and higher risks that these treatments may stress the hydrologic system within individual subwatersheds (Table 3.77).

While fire ignitions are expected to continue following the activities proposed in Alternative 4, fuel treatments are designed to give wildland fire managers “a higher probability of successfully attacking a fire” (Agee et al., 2000) A future severe wildfire would have the effects described under Alternative 1, but implementation of the Alternative 4 should reduce the likelihood of such an event. This would be due to the enhances ability of fire management to suppress, control and contain fires that impact or start in the fuel treatments under 90th percentile weather conditions.

Direct Effects—ERA

Alternative 4 would reduce the amount of acres treated mechanical by 265 acres from the Proposed Action and 65 acres from Alternative 3 to 3,507, so there would be less ground disturbance from equipment, skid trails and landings. However there is more mechanical thinning and less grapple piling and mastication in this alternative.

Seven hundred and forty seven acres of RHCA would be treated mechanically. RHCAs widths were delineated at 150 feet, the height of a site potential tree unless the outer edge of the riparian vegetation was greater. By using this criterion for RHCA width delineation there was a 47 acre increase in the RHCAs.

One hundred eighty one acres of aspen would be treated, all of which would be in RHCAs. Aspen treatments in RHCAs would be limited to slopes of 35 percent or less.

Under Alternative 4, there would be 10-miles of road decommissioning.

Indirect Effects—ERA

Indirect effects for Alternative 4 are expected to be the same as Alternative 1 and 3 please see previous discussion.

Cumulative Effects—ERA

Detrimental effects that may result from increases in ERA include fluvial erosion from treated hillsides, resulting in chronic sedimentation. Primary factors leading to this are reduction of canopy cover, ground disturbance (particularly due to road effects) and loss of ground cover. Silvicultural prescriptions include harvests, underburning and mastication. Under these prescriptions, there would be some canopy retention and surface vegetation recovery that would contribute to rebuilding ground cover. The group selection treatment would create small forest openings with associated disturbance from skid trails, site preparation and transportation needs, such as temporary roads. The most likely effect of increased fluvial erosion is a decline in coldwater fish habitat quality via infilling of pools, embedding of spawning gravels and related effects to aquatic insect communities. The risk of detrimental effects in the analysis subwatersheds are described below.

The cumulative ERA values would not exceed the TOC in any subwatershed. The upland portion of four watersheds would be at threshold. As a result one subwatershed would be at high risk for cumulative effects (TOC of 9 percent in sensitive and 12 percent in upland). ERA increases would leave the other three subwatersheds at moderately high risk of cumulative effects (greater than 6 percent TOC in sensitive and greater than 9 percent in the upland). Increases in four other subwatersheds means those subwatersheds would be at higher risk of cumulative effects and would be at a moderate risk for cumulative effects. Three subwatersheds would have increases in the ERA but would remain at a low risk of cumulate effects (Table 3.77, Figure 3.17 and 3.18).

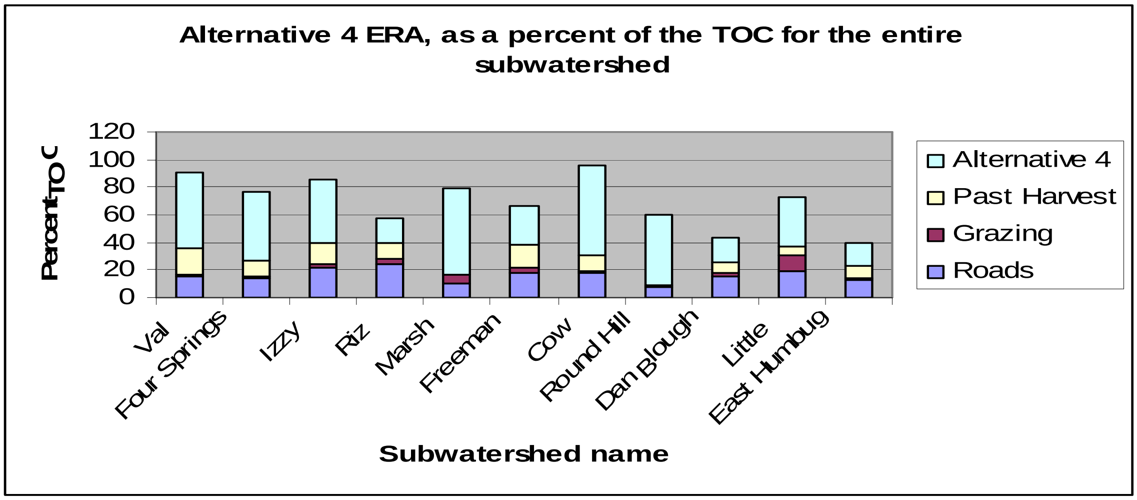

Figure 3.18 Alternative 4, the Proposed Action: Equivalent roaded acres (ERA), shown as a percent area for each analysis subwatershed, broken down by land use. Analysis subwatersheds are shown by entire subwatershed

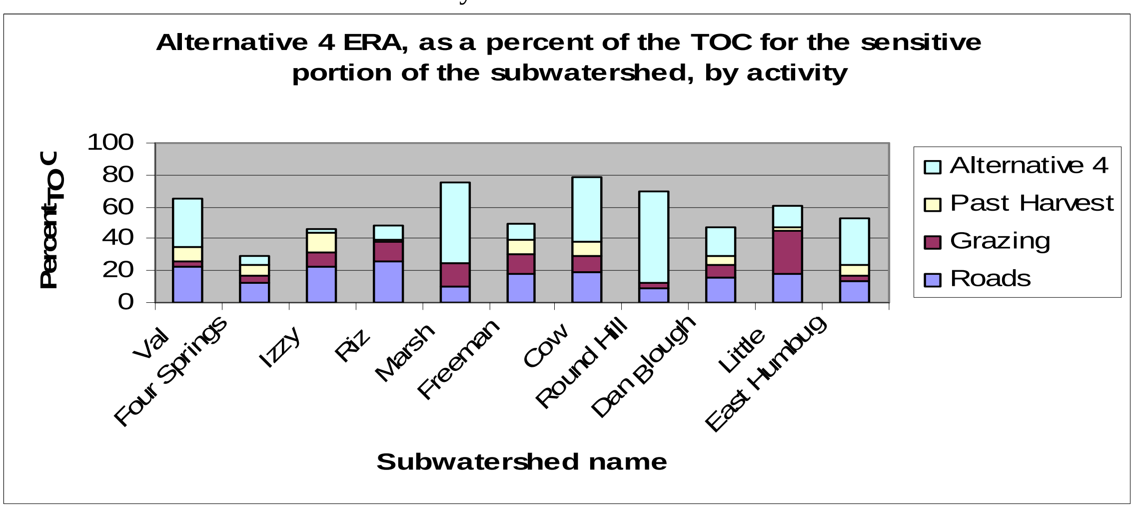

Figure 3.19 Alternative 4, the Proposed Action: Equivalent roaded acres (ERA), shown as a percent area for each analysis subwatershed, broken down by land use. Analysis subwatersheds are shown for the sensitive portion of the subwatershed.

Soil assessment

By following the standards contained in the PNF LRMP and USDA Forest Service Region 5 soil standards, there would be a lower risk that soil productivity would be impaired. Impacts on soil resources would be less than Alternative 1 and 3 but greater than 2. Alternative 4 would reduce the amount of acres treated mechanical by 265 acres from the Proposed Action and 65 acres from Alternative 3 to 3507, so there would be less ground disturbance from equipment, skid trails and landings. However there is more mechanical thinning and less grapple piling and mastication in this alternative. Approximately 28.5 percent of the subwatersheds analyzed would be treated mechanical. Within individual watersheds the percent mechanical treatment ranges from 8 to 54, eight subwatersheds are between 8 and 40 percent. Alternative 1 and 3 have one more group select unit than this alternative.

Soil cover

Direct effects—Soil Cover

The sampled portion of the project area would experience a decrease in area meeting or exceeding the standard from 83 percent to 61 percent. Acres within units predicted to experience decreases in effective ground cover below the standard are 16 percent of the project area and 35 percent of the sample area. There is a moderate risk that treated units would not meet the Regional standard following treatment.

Under Alternative 4 mechanical treatment would occur within units where slopes are equal to or less than 35 percent and 15 percent or less in the RHCAs. Mechanical treatment would occur within aspen units where slopes are equal to or less than 35 percent.

Burn piles are another way ground cover is reduced. There is greater potential for vegetation loss associated with pile burning than Alternative 3 but less than Alternative 1 in Alternative 4 because of the number of burn piles. It is estimated there would be 1644 to 5480 piles generated by this alternative. Acres affected are presented in Table 3.73.

The potential for sediment transport to the stream channel would be reduced in Alternative 3 because 747 acres of mechanical treatment would occur within 25, 50 or 100 feet of the stream channels. Of those acres a minimum of 181 would be within 25 feet. The proximity of mechanical treatment to the stream channel increases the risk of sediment transport into the channel.

In all action alternatives sediment transport to the channels would decline because of the decommissioning of 10-miles of roads.

Indirect Effects—Soil Cover

Indirect effects to soil cover are expected to be the same under all action alternatives. Please see the discussion under Alternative 1, above.

Cumulative Effects—Soil Cover

Direct effects to soil cover are expected to be the same under all action alternatives. Please see the discussion under Alternative 1, above.

Soil Porosity and Detrimental Compaction

Direct Effects—Soil Porosity

In their existing condition, three units 1, 9, 48 and 74 are more than 15 percent compacted. Assuming the Freeman units undergo the same decrease as reported in the HFQLG monitoring, 2 to 15 additional units may exceed 15 percent compaction depending on subsoiling effectiveness. The project area would experience an increase in area exceeding 15 percent compaction from 96 percent to 84 to 69 percent assuming 100 and 66 percent effectiveness. Following treatment, these units would be reevaluated and additional subsoiling would occur in skid trails, landings and/or group selection areas to reduce the extent of detrimental compaction below the existing, pre-project condition.

Indirect Effects

Indirect effects to soil porosity are expected to be the same under all action alternatives. Please see the discussion under Alternative 1, above.

Cumulative Effects

Direst effects to soil porosity are expected to be the same under all action alternatives. Please see the discussion under Alternative 1, above.

Organic matter

Direct Effects—Organic Matter

Direct effects to organic matter are expected to be the same under all action alternatives. Please see the discussion under Alternative 1 and 3, above.

Indirect Effects—Organic Matter

Indirect effects to organic matter are expected to be the same under all action alternatives. Please see the discussion under Alternative 1, above.

Cumulative Effects—Organic Matter

Cumulative effects to organic matter are expected to be the similar under all action alternatives. Please see the discussion under Alternative 1, above. Under Alternative 4, 37 percent of the sample area and 18 percent of the project area may not meet the standard for fine organic matter.

Soil Buffering Capacity and Sporax Effects

Impacts to soil buffering capacity and Sporax treatments are expected to be the same under all action alternatives. Please see the discussion under Alternative 1, above. Alternative 4 treats 6.1

sq. ft. per acre over 1,837 acres. This is approximately .12 pounds of borax per acre or a total of 220 pounds of borax across the project.

3.9 Threatened, Endangered and Sensitive Plant Species

3.9.1 Introduction

The following assessment is summarized from the botany biological evaluation (BE) for threatened, endangered and sensitive plants species for the Freeman Project, incorporated here by reference (USFS PNF BRD 2006a). Forest Service Manual 2672.42 specifies that a biological evaluation (BE) be prepared to determine if a project may effect any Forest Service sensitive species or U.S. Fish and Wildlife Service (USFWS) threatened, endangered, or proposed species. The purpose of the BE is to describe the effects of the proposed project on all threatened, endangered and sensitive (TES) plant species of record in the analysis area. The BE is the source of the information found here in section 3.8 of this document. It is located in the project record.

3.9.2 Summary of Effects

3.9.2.1 Action Alternatives

The proposed activities would not affect any federally listed threatened, endangered, or candidate plant species because none of these species are known or are expected to occur within the analysis area.

Occurrences of the sensitive species Astragalus lentiformis, Botrychium minganense, Ivesia sericoleuca, Meesia uliginosa, and Pyrrocoma lucida are known to exist within the analysis area. There will be no direct effects to these occurrences because they will be flagged and avoided. There is potential for indirect and cumulative effects. These effects will be minimized by flagging and avoiding known occurrences. These effects will be negligible and are not likely to lead toward federal listing.

3.9.2.2 Alternative 2 (No-action)

There will be no direct effects to threatened, endangered, or sensitive plant species. Indirect effects will be those associated with ongoing activities such as recreation and woodcutting. Lens-pod milk-vetch (*Astragalus lentiformis*) is a disturbance following species that may be adversely affected by the absence of treatment. The risk of a high intensity fire will continue to pose a threat to sensitive plants.

3.9.3 Scope of the Analysis

Geographic Analysis Area: The geographic boundary for analyzing cumulative effects to sensitive plants is the project boundary. Sensitive plants are managed according to the PNF Interim Management Prescriptions (Hanson 2005). All known ecology, habitat, range, and distribution information is considered in creating these prescriptions, and they are periodically reviewed and updated by forest service botanists. Therefore, an analysis area equal to the project area insures adequate conservation.

Timeframe: The timeframe for determining cumulative effects depends on the length of time that lingering effects of the past action will continue to negatively impact the species in question. This will vary widely between species because some rare plants require and tolerate disturbances that would harm others. Past actions that occurred in the area of each sensitive plant occurrence are included in this evaluation if information is available. Where site-specific information is lacking, the general discussion of cumulative effects addresses the effects of disturbances likely to have occurred.

3.9.4 Analysis Method

The Freeman Project area was reviewed using aerial photographs, soils maps and known occurrences to help determine potential habitat for rare species. In the field, areas identified as potential habitat were surveyed at a high level of intensity (complete survey). Areas identified as potential habitat include openings in the forest, serpentine soils, meadows, riparian areas, seeps, and springs. Other areas with little to no potential habitat were surveyed at a less intense level (cursory survey). Plant location data were recorded using Global Positioning Systems, and the data were then entered into a Geographic Information System (GIS). Treatment units were added to the GIS to analyze proximity to rare species and identify potential detrimental treatments and designate “Controlled Areas.” Areas of concern were brought forward at planning meetings, and appropriate mitigations will be enacted.

3.9.5 Affected Environment

Occurrences of the sensitive species *Astragalus lentiformis*, *Botrychium minganense*, *Ivesia sericoleuca*, *Meesia uliginosa*, and *Pyrrocoma lucida* were found within the analysis area. The following briefly summarizes the survey, habitat and distribution information about the threatened, endangered and sensitive species listed in relation to the project area.

Astragalus lentiformis (lens-pod milk-vetch): There are 55 documented occurrences of this perennial herb, all of which are located within the boundaries of the PNF. These occurrences are restricted to the Beckwourth Ranger District of the PNF. This plant is found on volcanic soils, between 4,500 and 6,500 feet in elevation in eastside pine, eastside pine/sagebrush scrub, or sagebrush scrub/grassy flats. It occurs in the edaphic specialists guild. This plant is known to grow in Plumas County from Squaw Valley, Lake Davis, and Claireville Flat east to Frenchman Lake. The trend for this narrow endemic is unknown. Botanists on the Plumas National Forest have observed that it is a disturbance follower that probably evolved with the natural disturbance of fire. Threats from management activities include fire suppression, livestock grazing, timber harvest, road construction, mining, reservoir construction, and utility line construction. However, as mentioned above, certain levels of soil displacement and disturbance may be beneficial. Four occurrences are known to exist in the project area, representing 7.2% of the known occurrences of this species on the PNF.

Table 3.81 Habitat potential of the proposed project area for sensitive plants known or suspected to occur

Species	Known occ.	potential habitat	No habitat	Habitat unsuitable based on the following:
Allium jepsonii			X	No serpentine outcrops in the project area.
Arabis constancei			X	No serpentine outcrops in the project area.
Astragalus lentiformis	X			
Astragalus pulsiferae var.*coronensis*		X		
Astragalus pulsiferae var. pulsiferae		X		
Astragalus pulsiferae var. suksdorfii		X		
Astragalus webberi		X		
Botrychium ascendens		X		
Botrychium crenulatum		X		
Botrychium lineare		X		
Botrychium lunaria		X		
Botrychium minganense	X			
Botrychium montanum		X		
Botrychium pinnatum		X		
Bruchia bolanderi		X		
Calycadenia oppositifolia			X	Proposed project is too high in elevation.
Calystegia atriplicifolia ssp. buttensis			X	Proposed project is too high in elevation.
Clarkia biloba ssp. *brandegeae*			X	Proposed project is too high in elevation.
Clarkia gracilis ssp. *albicaulis*			X	Proposed project is too high in elevation.
Clarkia mosquinii			X	Proposed project is too high in elevation
Cypripedium fasciculatum		X		
Cypripedium montanum		X		
Frittilaria eastwoodiae			X	Proposed project is too high in elevation.
Hydrothyria venosa		X		
Ivesia aperta var. aperta		X		
Ivesia sericoleuca	X			
Ivesia webberi		X		
Lewisia cantelovii		X		
Lupinus dalesiae		X		
Meesia triquetra		X		
Meesia uliginosa	X			
Monardella follettii			X	No serpentine outcrops in the project area.
Monardella stebbinsii			X	No serpentine outcrops in the project area.
Oreostemma elatum		X		
Packer eurycephalus var.			X	No serpentine outcrops in the

Species	Known occ.	potential habitat	No habitat	Habitat unsuitable based on the following:
lewisrosei (*Senecio eurycephalus* var. *lewisrosei)*				project area.
Packera layneae (Senecio layneae)			X	No serpentine in the project area. Project area is too high in elevation.
Penstemon personatus		X		
Pyrrocoma lucida	X			
Rupertia hallii		X		
Scheuchzeria palustris var. *americana*			X	No floating bog or fen habitat in project area.
Sedum albomarginatum			X	No serpentine outcrops in the project area.
Silene occidentalis ssp. longistipitata		X		
Vaccinium coccinium		X		

Botrichium minangense (moonworts): The moonworts are small inconspicuous, perennial ferns. They are distributed across North America (*B. ascendens* to British Columbia and Nevada, *B. crenulatum* to Washington and Utah, and *B. montanum* to British Columbia and Montana) but nowhere are they abundant. According to some experts (Wagner and Devine, 1989) they should be regarded everywhere as threatened species. Overall plant numbers in California are low, i.e. occurrences often consist of only a few plants. It is difficult to tell the various *Botrychium* species apart. *B. crenulatum* and *B. ascendens* are known from two adjacent drainages, *B. montanum* from a single drainage on the Lassen National Forest near the Plumas National Forest. *B. lineare* is known in California from Fresno County. *B. ascendens* and *B. crenulatum* grow in moist meadows, while *B. montanum* is found in shaded coniferous forest areas near streams. They grow in moss, grasses, sedges, and rushes and other vegetation. The *Botrychiums* can be hidden by the taller grasses and other vegetation growing with them. Moonworts are sensitive to drought and may not appear in dry years. *Botrychiuum* are closely associated with mycorrhizal fungi at all life stages, so the most important habitat requirements are probably maintaining shade, soil moisture, and organic matter, and avoiding disturbance such as defoliation or root/ mycorrhizal disruption. Surveys for these species have been conducted on the Plumas National Forest since 1994 and one occurrence of *Botrychium crenulatum* has been found. Four occurrences of *B. minangense* were found in the project area.

Ivesia sericoleuca (Plumas ivesia): This plant is found in the vernally wet parts of meadows and alkali flats, and in vernal pools. These habitats are not widespread and are sensitive to changes in hydrology and to erosion. It is known to occur on National Forest system and private lands in Plumas, Placer, Sierra, and Nevada Counties. Occurrences are known from the Plumas and the Tahoe National Forests. This plant has a downward trend across its range due to lack of reproduction, and levels of disturbance that are occurring at known sites. Threats from management activities include recreation activities, off-road vehicle use, fuelwood gathering, target shooting, livestock grazing, mining, fire suppression, military practice camps, timber harvest activities such as landings, activity that changes the hydrology and/or increases erosion. The Tahoe, Plumas, and Humboldt-Toiyabe National Forests have a conservation strategy in place for management of this plant. The most common management prescription is for protection from direct and indirect impacts. Three occurrences of this species were found in the project area (these three occurrences consist of a total of 12 sub-occurrences).

Meesia uliginosa (broad-nerved hump moss): *Meesia uliginosa* is strongly tied to montane fens within the Sierra Nevada bioregion. There are 22 known occurrences that have been documented in California since 1980 with the majority in the Sierra Nevada Mountains. In addition, there are occurrences that have not been rediscovered since 1980. One of the historical occurrences outside of the Sierra Nevada Mountains appears to be extirpated. The two most critical factors affecting the abundance and distribution of fen species such as *M. uliginosa* are hydrology and the nutrient concentration of incoming water. Changes in hydrology can occur through ditching, either intentional or inadvertent through road or trail construction or cattle trails. Direct trampling by livestock has also been identified as a threat. One occurrence is known to exist in the project area.

Pyrrocoma lucida (sticky Pyrrocoma): This plant is found in meadows and alkali flats in Plumas, Sierra, and Yuba Counties. Occurrences are found on Plumas and Tahoe National Forest System and private lands. It is assigned to meadow, seep, and vernally wet guilds. The trend for this plant is that it appears to be in decline. Sticky Pyrrocoma grows in habitats similar to *Ivesia sericoleuca*. These habitats are fewer in number. Also, most occurrences are either unprotected on private land or repeatedly grazed on National Forest System lands. Threats from management activities include reservoir development, meadow restoration, off-road vehicle use, recreation activities, fire suppression camps, military camps, prescribed burning and other fuel treatments, timber harvest associated activities such as landings, fuelwood gathering, and land exchange. One occurrence of this species was found in the project area.

The following sensitive species have potential habitat in the project area but were not found during botanical surveys: *Astragalus pulsiferae* var. *coronensis, Astragalus pulsiferae* var. *pulsiferae, Astragalus pulsiferae* var. *suksdorfii, Astragaulus webberi, Botrychium ascendens, B. crenulatum, Botrychium lineare, B.lunaria, B. montanum, B. pinnatum,, Bruchia bolanderi, Cyrpipedium fasciculatum, Cypripedium montanum, Hydrothyria venosa, Ivesia aperta* var. *aperta ,Ivesia webberi, Lewisia cantelovii, Lupinus dalesiae, Meesia uliginosa, Oreostemma elatum, Penstemon personatus, Rupertia hallii, Silene occidentalis* ssp. *longistipitata,* and *Vaccinium coccineum.* The potential habitat of the above species may be treated under the Proposed Action since no occurrences were found. Although adequate botanical surveys have been performed in the project area, it is possible that isolated individuals may be present. Therefore, undiscovered individuals may be impacted inadvertently. For this reason (potential impact to undiscovered individuals) a determination of "may impact individuals but not likely to cause a trend toward federal listing or loss of viability" has been made for these species. However, if any of these species with potential habitat but no known occurrences in the project area are found during project implementation they will be protected by applying the standard operating procedures (SOP's), such as flagging and avoidance or a limited operating period (LOP). They will not be further analyzed in this document.

Occurrences of the sensitive species *Astragalus lentiformis*, *Botrychium minganense, Ivesia sericoleuca*, *Meesia uliginosa*, and *Pyrrocoma lucida* are found within the analysis area. Following is a discussion of the direct, indirect, and cumulative effects of the Alternatives.

3.9.6 Environmental Consequences

An effects analysis is a part of the biological evaluation process, and is required in cases where sensitive plants have been found within or near proposed project areas. Effects are described as direct, indirect, and/or cumulative. The following summarizes the direct, indirect, and cumulative effects of the project on the sensitive-status plant species listed in the introduction.

3.9.6.1 Alternative 2 (No-action Alternative)

Direct Effects

There would be no direct effects from the No-action Alternative other than those associated with current ongoing actions, e.g. grazing, recreation, and woodcutting.

Indirect Effects

Indirect effects from the No-action Alternative would be those associated with continued habitat succession, ongoing activities (woodcutting and recreation), the current and future threats of noxious weed infestation and the current and future threat of wild fire. The effects of successional progression on the sensitive plants identified for this analysis area is not clear. There is a mix of seral stages within the analysis area. Those species residing in habitat currently meeting their ecological needs may maintain their current populations or experience a decline as forest canopies continue to close and more shade tolerant species out-compete these sensitive plant species for light and other resources. With the No-action alternative, habitat succession could adversely affect the sensitive plant species in the analysis area. *Astragalus lentiformis* prefers earlier successional stages and would have to rely on natural disturbance factors under the No-action alternative.

Woodcutting and recreation are anticipated to continue in the area and likely will continue to impact occasional individual sensitive plants. The degree of this impact is currently not preditable but is assumed to be similar to the present use.

Noxious weeds are known to occur in the project area in isolated locations and along roadsides. Ongoing use of forest roads and terrain by woodcutters and recreationalists is expected to continue contributing to the risk of noxious weed introduction. See Appendix B of the Botany Report, the noxious weed risk assessment for additional information on noxious weeds.

The No-action Alternative would not prescribe any fire; the risk of wildfire would remain. Wildfire is unpredictable, but given the fire history of the analysis area it is likely that wildfires will occur. As the effects of wildfire to sensitive plants in the analysis area are not fully known, predicting the effects of wildfire to sensitive plant populations is uncertain. From past experience the effects of fire suppression can have a larger effect than the wildfire itself. The overall effect depends on fire timing and intensity, which sensitive species are located in the analysis area, and how those sensitive species are distributed. Thus, the response to wildfire would be species-dependant. Fire exclusion allows conifers seedlings to establish in forest openings and at the edges of meadows. Several sensitive plant species of the PNF grow in meadows and forest openings. The No-action Alternative can indirectly cause a loss of habitat for these plant species.

Cumulative Effects

Probably the most important factors contributing to potential cumulative effects of the No-action Alternative would include those associated with the potential for wildfire to act in excess of its historical intensity and the degree of successional progression to later seral stages. The project area has stands exhibiting signs of past timber management intermingled with stands exhibiting signs of fire exclusion. Quantifying the threat of wildfire to sensitive plant species is difficult but a wildfire threat exists to some extent in the project area. There is some potential for the lack of prescribed fire under the No-action Alternative to contribute toward declining habitat suitability for *Astragalus lentiformis* which has historically relied on some level of disturbance to maintain its place in the plant community.

3.9.6.2 General Effects of the Action Alternatives

Direct Effects

Direct effects occur when sensitive plants are physically impacted by activities associated with fuels management, mechanical or hand treatment. Direct impacts can physically break, crush or uproot sensitive plants by driving over them, by covering them, by falling trees on them, or by burning them. Direct impacts to sensitive plants can physically damage the sensitive plant or the habitats where they grow. When too much of an individual plant is damaged, that plant may experience altered growth and development, and reduced or eliminated seed-set and reproduction. If the disturbance is severe, it can kill sensitive plants. These impacts to individual plants can reduce the growth and development, population size, and potentially the viability of a sensitive plant species across the landscape. For annual plant species, the timing of impacts is critical. Management actions which take place after annuals have set seed have much less impact than management actions performed prior to seed-set. Direct effects being considered in this discussion include those associated with: timber falling, skidding, yarding, hand mechanical fuels treatment, skid trail ripping, road construction, prescribed fire, prescribed fire control lines, and slash pile burning.

Hand and mechanical treatment could cause detrimental effects to all of the sensitive species found in the project area. Mastication, mechanical and hand thinning have the potential to directly impact sensitive plants by crushing plants, displacing soil and plants, or smothering plants with slash or soil. Even those sensitive species which may benefit from a more open canopy could suffer adverse direct effects as a result of hand or mechanical treatment.

Direct effects to the known populations of *Astragalus lentiformis*, *Botrychium minganense*, *Ivesia sericoleuca*, and *Meesia uliginosa* will be minimized by flagging and completely avoiding these populations. It is unlikely that there will be any direct effects to these four species. Standard management requirements common to all action alternatives will minimize or eliminate potential adverse direct impacts.

Prescribed fire may also cause detrimental direct effects. Any of the sensitive plant species might be burned or scorched. Burning hand piles could potentially eliminate the herbaceous layer below the pile for years after the pile has burned. Fire lines could also cause direct effects to all sensitive plant species in the project area if not located outside of sensitive plant occurrences.

Borax Application

Boron, the main break-down product of borax, is a naturally occurring element that plants need, although large amounts of borax can be toxic to plants and microorganisms. Terrestrial plants are normally rich sources of boron and boron is an essential trace element for higher plants (Eisler 1990).

Sensitive Plants

It is unlikely that application of borax in the project area will affect sensitive plant populations. Although individual plants may be affected, it is unlikely to lead to a loss of population viability. This possibility is mitigated by the protection of sensitive plant populations in designated control areas (see Appendix C, the Botany Protection Plan). The use of the control areas is in accordance with the PNF Interim Management Prescriptions (Hanson 2005) for sensitive plant species. Borax will not be applied within these control areas.

There is potential for one sensitive plant species, *Meesia uliginosa*, to be affected by borax application. Bryologists have surveyed the project area and one occurrence of *Meesia uliginosa* has been found. This moss species has been found growing on soil at the base of lodgepole pine stumps in the project area. The occurrence will be protected by flagging and avoiding; it will not be disturbed. No other sensitive plant species are known to occur on conifer stumps, and therefore are unlikely to be affected by the application of borax. In California, *Meesia uliginosa* has only been found in fen or “wet meadow” habitats (Dillingham 2005). Fens and wet meadows will not be disturbed by Freeman project activities.

Indirect Effects

Fuels management, mechanical or hand treatment can indirectly impact sensitive plants by causing changes in vegetation composition and successional pathways of that vegetation, changing local hydrologic patterns in sensitive plant habitat, changing the fire regime or by changing the soil characteristics of the habitat. Some of these changes may result from shifts in hydrologic, solar, and soil characteristics of their habitat. Management actions can also lead to changes in forage condition, and this can lead to changes in the foraging behavior of livestock and wildlife within the analysis area. New use patterns can result in different potential impacts to sensitive species. Indirect effects can also occur from noxious weed invasion or from impacts to pollinators or mycorrhizae associated with sensitive plant species. Indirect impacts can have positive or negative effects.

Some indirect effects, such as noxious weed invasion, potentially pose a highly negative impact to all plant habitats, although different habitats may be invaded by different species of noxious weeds. In riparian areas or wet meadows, Canada thistle (*Cirsium arvense)* and perennial pepperweed (*Lepidium latifolium*) may invade with potentially catastrophic results. Upland areas may be invaded by a host of noxious weeds such as yellow star thistle (*Centaurea solstitialis*), the knapweeds (*Centaurea* spp.), or annual grasses such as medusahead (*Taeniatherum caput-medusae*). These noxious weeds can lead to habitat changes that are detrimental to sensitive plant species. Noxious weeds, once established, could indirectly impact sensitive plant species through allelopathy (the production and release of plant compounds that inhibit the growth of other plants), changing the fire regime, or direct competition for nutrients, light, or water. Subsequent weed control efforts such as hand-pulling, hoeing, mowing, or herbicide application could also negatively impact sensitive plants.

Prescribed Fire

Indirect effects from prescribed fire could impact sensitive plant species by causing noxious weed invasion, changes in vegetation structure, and changes in local hydrological function. These potential effects result from removal of vegetation and opening up the area to additional light. The level of indirect effects from fire may vary depending on the seasonal timing of the fire, the intensity of the fire, and the sensitivity of the individual species to fire. While fire is detrimental to some species (particularly those which inhabit the interior forest), fire suppression is detrimental to plants which inhabit forest openings. No single fire regime would be advantageous to all species. Thus, response to fire will be highly species-dependent with changes being beneficial to some sensitive plant species and detrimental to others.

Hand or Mechanical Treatments

Some sensitive plant species may benefit from mechanical or hand treatment. These species colonize open areas, multiply rapidly, and persist for a short while. They may be out-competed by other colonizers, or they may persist until woody species move in and shade them out. They are well adapted to take advantage of the high-light intensities found in forest openings. These species have become less common as result of fire suppression. Mechanical or hand treatment may have a beneficial effect on these species since such treatment will maintain areas in a more open condition. However, beneficial indirect effects could easily be overcome by negative direct effects (trampling), excessive soil disturbance (leading to soil erosion or degradation of the seedbed), and noxious weed introduction and spread.

By contrast, species which inhabit the interior forest are adapted to closed canopy forests and low light conditions. Such species thrive in cool, moist and shaded conditions. Changing the vegetation structure to more open, warmer, and drier conditions, regardless of the method, would be detrimental to these species. Furthermore, many of these species, (particularly the *Cypripedium* spp.), have complex mycorrhizal associations. Mycorrhizae require organic matter found in the duff layer, and mechanical treatment is much more likely to disturb and disrupt the duff layer.

Changes in hydrologic function resulting from the use of hand or mechanical treatment could potentially impact sensitive plant species. Concerns regarding changes in hydrologic function resulting from the use of hand or mechanical treatment are similar to those from prescribed fire. The primary difference is the level of soil disturbance resulting from the use of mechanical equipment. Some areas (those that are particularly steep or have loose soils) would be at more risk than others. Heavy soil disturbance exacerbates soil erosion and sedimentation. A more open environment with increased runoff could increase erosion in the uplands as well as peak flows, scouring, and sedimentation in the riparian zones. Erosion in the uplands could remove organic matter and soil cover leading to changes in microclimates. Increased flows could result in stream downcutting and the subsequent drying of adjacent areas. Sedimentation could affect seed germination and recruitment.

Indirectly, prescribed fire, mechanical and hand treatment activities have the potential to enhance or impair sensitive plant habitat through modifications resulting from changes in the canopy coverage (increasing light distribution and intensity) and the moisture regime. If the species is one that prefers early or mid- seral conditions (such as *Astragalus lentiformis* or *Lupinus dalesiae*) then the proposed activities could enhance habitat for these species. Early seral species would benefit from increased light on the forest floor, and in some cases from mild disturbance creating a mineral seedbed. If however, the species is one that prefers late seral conditions (such as *Cypripedium fasciculatum*) then the proposed activities could be detrimental. Late seral species grow under conditions of less light intensity, higher moisture, and higher levels of organic material in the soil. Some of the late-seral species (including *Cypripedium fasciculatum*) are dependent upon mycorrhizal associates. These mycorrhizal associates grow in thick organic matter and decreasing the moisture levels (by opening the stand) or reducing the duff layer (by prescribed fire or increased temperatures) would be detrimental to both the *Cypripedium* and the mycorrhizal associate. Thus, the indirect effects would be species-dependant. The same is true for under burning. Fire has the additional dimension of thermal effects to the soil/duff layer, its seed bank biology, and nutrient cycling (generally, but not necessarily positive effects). The effects of spring burning versus fall burning to sensitive plant habitats are not well documented. However, since a fall burn seems to be more similar to the natural fire regime it is assumed that the plant species would be more adapted to a fall burn.

It is possible that potential habitat for several sensitive species of moonworts (*Botrychium* species) may be affected by thinning treatment in riparian areas. These riparian areas may include moonwort habitat. *B. minganense* is usually associated with riparian areas, small streams or fens running throughout coniferous forests. The area has been adequately surveyed by qualified botanists. Any known moonwort populations will be protected. They will not be disturbed. Details of protections can be found in Appendix C, the Botany Protection Plan. Standard Operating Procedures will be followed and require that equipment be excluded from within 25 feet of any stream course in an aspen treatment area.

The potential to introduce noxious weeds with machinery traveling through the project area also presents a threat to sensitive plants. Noxious weeds can also be brought into the area in road materials and mulch. Once established, noxious weeds can be difficult to control and eliminate from an area. Noxious weeds displace native plant habitat and degrade watershed functions. If the standards and guidelines such as inventory, avoiding noxious weed areas with timber and fuels management activities, cleaning equipment, using weed free material and mulch, and avoiding spread are followed the threat from noxious weeds will be greatly minimized.

Cumulative Effects

Past and current activities have altered sensitive plant populations and their habitats. The effects of past activities are built in to this analysis in that they are largely responsible for the existing landscape. It is unclear if the sensitive species included in this analysis have always been rare or were once more common but currently rare due to past land use practices. Very little is known about population dynamics and metapopulations (a population of populations) of sensitive species such as how long individuals live, how long colonies persist, how often are new colonies formed, and how long seeds persist in the seed bank. A thorough understanding of species population dynamics and metapopulations would be necessary in order to accurately assess the cumulative impacts of past, present, and future projects on a species. This cumulative effects analysis is based on what is known about species distribution, ecology, and life history. Current management direction is designed to eliminate or reduce possible negative cumulative impacts by protecting sensitive plant species from direct and indirect impacts. The following discussion provides an explanation of why this type of management is effective in reducing cumulative impacts to sensitive plants.

MacDonald (2000) reports that a critical step in cumulative effects analysis is to compare the current condition of the resource (in this case sensitive plants) and the projected changes due to management activities (in this case fuels management, mechanical or hand treatment) with the natural variability in the resources and processes of concern. This is difficult for sensitive plants since long-term data are often lacking, and many sensitive plant habitats have a long history of disturbance, i.e. an undisturbed reference is often lacking. For some species, particulary those which do not tolerate disturbance or are found under dense canopy conditions, minimizing on-site changes to sensitive plants is an effective way of reducing cumulative impacts. "If the largest effect of a given action is local and immediate, then these are the spatial and temporal scales at which the effect would be easiest to detect. If one can minimize the adverse effects at this local scale, it follows that there would be a greatly reduced potential for larger-scale effects" (MacDonald, 2000). For other species, particularly those which are disturbance tolerators or fire-followers, minimizing on-site changes could be detrimental. These species tolerate or benefit from on-site changes which result in opening the stand, reducing the potential for catastrophic fire, and increasing light reception in the understory. Thus, the response of sensitive plant species to the management activities is species-dependent.

Past and present forest management activities have caused changes in plant community structure and composition across the forests. Management activities that have cumulatively impacted sensitive plant occurrences on the forests include: historic grazing, timber harvest, fire suppression, prescribed fire, mining, recreational use, road construction, urban development, and noxious weed infestation. These cumulative impacts have altered the present landscape to various degrees. However, cumulative, direct and indirect effects can be minimized by following Forest Service standards and guidelines and by implementing mitigation measures to monitor or offset impacts to sensitive plants species. With these protective measures in place, cumulative effects are less likely to be adverse.

SOPs common to all action alternatives will minimize potential adverse direct effects to sensitive plant species. Minimizing direct effects is the largest individual factor in diminishing cumulative effects to sensitive plant species. The Proposed Action may improve the quality and amount of suitable habitat for sensitive plants species that tolerate or prefer moderate disturbance conditions.

Astragalus lentiformis is a locally abundant species found in open pine forests with sparse duff; it responds favorably to disturbance. Its range is restricted to the southeast portion of the Beckwourth Ranger District of the Plumas NF. Suitable habitat for this species may have been lost in the past due to fire suppression and vegetation management practices. A lack of thinning in early seral forest and a resulting dense canopy cover would leave less area available for *A. lentiformis*. This species would benefit from opening the stand, reducing the potential for catastrophic fire, and increasing light reception in the under story. Annual grazing in the Grizzly Valley Allotment will continue to impact this species. PNF botanists have observed that *A. lentiformis* tolerates moderate grazing. Cumulatively, if moderate disturbance is applied on a landscape level this should benefit this species in a wider area. It is unlikely that the Freeman project will have any adverse cumulative effects on this species because adequate surveys have been done, and known populations will not be disturbed.

Botrychium minganense is a perennial fern that occurs in seeps, springs, fens, and riparian habitats in coniferous forests. It is rare in California and known from Butte, Fresno, Plumas, and Tehama Counties. All occurrences have few individuals. Actual trends in these occurrences are hard to determine since the sporophytes do not appear above ground every year, and many occurrences were only recently located. Soil disturbance can be very detrimental, especially if it is occurring on a regular basis. Soil disturbance includes grazing and trampling by livestock and OHV, where a little disturbance and compaction is tolerated but heavy disturbance will kill individuals. Changes in the hydrologic regime (from erosion, roads, grazing, etc.) may also potentially threaten occurrences. Hot fires have been shown to be detrimental, especially if the conditions are very dry during the burn. Habitat for this species may have been lost as a result of previous management activities. A shelterwood treatment removed canopy cover around a site of *Botrychium minganense* (BOMI 11-003B) in 1990. The site was prepared for planting in 1991 and planted in 1996. The effects of these activities on BOMI 11-003B cannot be accurately described because this occurrence was not known until 2004.

Grazing in the Grizzly Valley Allotment will continue to impact *Botrychium* plants. A project planned to be implemented in 2006 will erect fences around four known *Botrychium* occurrences to prevent impacts from grazing and trampling. One *Botrychium* site (BOMI 11-004) is within the DFPZ. Future maintenance of DFPZs can potentially impact this occurrence. The site will be flagged and avoided at the time of any future maintenance. Therefore DFPZ maintenance will not cause cumulative effects to this species.

It is unlikely that the Freeman project will have any adverse cumulative effects on this species because adequate surveys have been done, and known populations will not be disturbed. The project area has also been surveyed for seeps, springs, and fens which are considered special habitats and are suitable habitats for *Botrychium* species. These known special habitats will be protected.

Ivesia sericoleuca is found in gently sloped vernally saturated meadows. Based on lack of reproduction and evidence of disturbance to all known occurrences this plant appears to be declining across its range. On the Plumas, livestock grazing and trampling appears to cause a decrease in reproductive potential and recruitment at some locations. Cattle trails can create channels through wet meadows causing the meadow to be drained of the seasonal moisture needed by *I. sericoleuca*. Changes to the hydrological regime as a result of road construction and maintenance, watershed restoration, and grazing may have adversely affected habitat. Throughout the range of the species, hydrologic changes to meadow habitats continue to threaten habitat availability. Habitat for this species may have been lost as a result of previous management activities. It is unlikely that the Freeman project will have any adverse cumulative effects on this species because adequate surveys have been done, known populations will not be disturbed, and vernally moist meadows will not be degraded.

Meesia uliginosa is found in very wet meadows and boggy areas in openings of mixed conifer forests. No trend data are available for this species. Cattle often impact the habitat for the species and there are hydrological concerns with the habitat. There is only one known population of *Meesia uliginosa* in the Plumas National Forest. This population was found in 2004 during pre-project surveys for the Freeman project. The plants are growing on stumps of lodgepole pines surrounded by a perennially saturated meadow. The removal of lodgepole pine trees probably improved conditions for *M. uliginosa*. It is likely that other populations of this very small moss exist in the Plumas NF but have been overlooked. Any activities that have caused changes to the hydrology of wet meadows could have reduced the area of potential habitat. Cattle trampling can harm individual plants and habitat. Conifer encroachment into meadows as a result of fire suppression may have reduced the area of suitable habitat. It is unlikely that the Freeman project will have any adverse cumulative effects on this species because adequate surveys have been done, known populations will not be disturbed, and its habitat will not be degraded.

Pyrrocoma lucida is found in vernally moist meadows and alkali flats. This species is locally abundant. It has been disturbed by grazing, and individuals may have been destroyed. *Pyrrocoma lucida* plants are green and palatable in mid-summer when most other herbs have become desiccated and it is likely that reproduction has been decreased due to grazing. Changes to the hydrological regime as a result of road construction and maintenance, watershed restoration, and grazing may have adversely affected habitat. If a wet meadow were drained early in spring or remained flooded throughout the summer *Pyrrocoma lucida* could be harmed. If the hydrologic change were permanent the area would no longer be suitable habitat. For these reasons habitat for this species may have been lost as a result of previous management activities. It is unlikely that the Freeman project will have any adverse cumulative effects on this species because adequate surveys have been done, known populations will not be disturbed, and vernally moist meadows will not be degraded.

Noxious weeds will continue to pose a threat to native plant habitat and sensitive plant species. With timber and fuel activities of the Proposed Action that will open the stand, noxious weeds can more easily invade the area. Forest management activities in the past have probably spread noxious weeds and created habitat for them. Weed seeds can be spread by vehicles, and disturbed areas are prone to noxious weed infestation. Many other factors contribute to weed spread; all types of forest recreation, wood cutting, state highways and county roads through the National Forest, grazing, and activity on adjacent privately owned land all contribute to weed spread. Following standards and guidelines would greatly reduce the cumulative effects of noxious weeds. A foreseeable future action is a chemical noxious weed treatment along roadsides within the Plumas-Sierra Weed Management Area. One known weed site in the Freeman project area is expected to be analyzed for chemical treatment. Following standards and guidelines found in the HFQLG SEIS ROD (2003) for chemical weed treatments would greatly reduce the cumulative effects of spraying noxious weeds. See Appendix B Noxious Weed Risk Assessment.

Cattle grazing in the project area will continue to have effects on sensitive plant habitats and noxious weeds. Grazing has occurred in the Beckwourth Ranger District for at least the previous 150 years. Cattle can damage sensitive plants, degrade their habitats, and spread noxious weeds. Freeman project activities are unlikely to add to the effects of grazing on sensitive plants because of the extensive surveys done and the mitigations to known sensitive plant populations. The Freeman project is unlikely to cause any changes to grazing practices that would impact sensitive plants because meadows are not being treated. Meadows are the primary use areas for grazing.

The Lake Davis Pike Eradication project may affect sensitive plant habitats by altering the hydrology of nearby wet meadows. Several sensitive plants have habitat in vernally moist areas. It is possible that the proposed draw down of Lake Davis would cause these areas to be drained at an unnatural time of year. Those plants whose habitat is in vernally moist meadows may be adversely affected. These potential effects will be analyzed in the environmental document for that project and will be mitigated appropriately.

The Lake Davis Pike Eradication project may affect the spread of noxious weeds. There are known populations of Canada thistle (*Cirsium arvense*) and tall whitetop (*Lepidium latifolium*) on the shore of the lake. As the water level is drawn down more habitat becomes available for these and other weed species. Although any new individuals would likely die when the lake level is returned to normal, it is possible that the seed bank of these weeds would be greatly increased. Vehicle access to the Freeman project is by way of Lake Davis. There is a potential for weed seeds to be spread by vehicles passing these weed sites. Standard weed precautions will be followed during implementation of both the Freeman and Lake Davis Pike Eradication projects and will minimize the risk of noxious weed infestation. These known weed sites will not be disturbed by project activities. Details of noxious weed sites, risks, and treatments can be found in Appendix B, the Noxious Weed Risk Assessment.

Watershed restoration projects have occurred in the Freeman project area over the past several years. Changes in hydrology can affect sensitive plant habitats. These projects were evaluated prior to implementation and any effects to sensitive plants were mitigated. These projects were designed to restore the natural hydrological regime. Overall, sensitive plant habitat should increase as a result of the restoration. Standard weed precautions were followed during implementation.

It is also likely that future management actions would include recreation, some prescribed fire, and timber management activities. Standards and guidelines apply to all foreseeable future actions and would reduce cumulative effects on sensitive plant species. Standards and guidelines can be found in the HFQLG SEIS ROD (2003).

The extent of cumulative effects depends on the management of potential direct and indirect effects, as well as the attributes of the sensitive plant species located within the analysis area, their distribution within the analysis area, and the ability to design future projects with sensitive plant attributes in mind. Overall, management of the direct and indirect effects through project design and mitigation measures is assured to minimize the potential for cumulative effects. Adverse cumulative effects are not expected as a result of implementation of the Freeman project for the following reasons:

The project area has been adequately surveyed for sensitive species.

Known occurrences of sensitive species will be protected by flagging and avoiding.

Proposed treatments would lead to a mosaic of habitat types in the project area, providing additional potential habitat for the species which inhabit forest openings.

By reducing potential direct and indirect effects through botanical surveys, project design, and protection of existing sensitive plant populations, cumulative effects are expected to be minimal.

3.9.6.3 Differences in Effects of the Action Alternatives

Alternative 1 (Proposed Action)

The following sensitive species have potential habitat in the project area but were not found during botanical surveys: *Astragalus pulsiferae* var. *coronensis, Astragalus pulsiferae* var. *pulsiferae, Astragalus pulsiferae* var. *suksdorfii, Astragaulus webberi, Botrychium ascendens, B. crenulatum, B. lineare, B.lunaria, B. montanum, B. pinnatum,, Bruchia bolanderi, Cyrpipedium fasciculatum, Cypripedium montanum, Hydrothyria venosa, Ivesia aperta* var. *aperta ,Ivesia webberi, Lewisia cantelovii, Lupinus dalesiae, Meesia uliginosa, Oreostemma elatum, Penstemon personatus, Rupertia hallii, Silene occidentalis* ssp. *longistipitata,* and *Vaccinium coccineum.* The potential habitat of the above species may be treated under the Proposed Action since no occurrences were found. Although adequate botanical surveys have been performed in the project area, it is possible that isolated individuals may be present. Therefore, undiscovered individuals may be impacted inadvertently. For this reason (potential impact to undiscovered individuals) a determination of "may impact individuals but not likely to cause a trend toward federal listing or loss of viability" has been made for these species. However, if any of these species with potential habitat but no known occurrences in the project area are found during project implementation they will be protected by applying the standard operating procedures (SOP's), such as flagging and avoidance or a limited operating period (LOP).

The Proposed Action may improve the quality and amount of suitable habitat for sensitive plants species that tolerate or prefer moderate disturbance conditions.

Of the total 645 acres of aspen treatment units, 350 acres are within RHCA's. Under the Proposed Action, within RHCA's only hand treatment will occur on slopes greater than 15%. Under Alternatives 3 and 4 there will be 233 acres of aspen treatment units. All 233 of these acres are within RHCA's. Under Alternatives 3 and 4, the slope restriction will change from the 15% in the Proposed Action to 35%. Only hand treatment will occur on slopes greater than 35% within RHCA's.

Alternative 1 will cause greater disturbance because it treats a greater number of acres. This corresponds to a greater risk of weed infestation in the short term. Over the long term, the resulting increase in health of the treated aspen stands is likely to have a favorable affect on native plant communities.

Alternative 3

Direct Effects:

This alternative decreases the size of the units planned for aspen treatments resulting in a decrease in the number of acres of aspen treatments, from 645 to 233. Under this alternative the extended treatment zone of up to 150 feet around the aspen stands would not be treated. The aspen treatments areas would be defined by the extent of riparian vegetation and only aspen stands within that vegetation would be treated. Aspen treatment units would range from 1 to 31 acres in area. Additionally, Alternative 3 would evaluate the upper diameter limit of conifer retention, based on whether the conifers were there previous to the aspen. These changes would result in a greater number of conifers left within some aspen stands, and greater canopy cover around some aspen stands.

This alternative also changes the delineation of RHCAs, and treatments for fuels reduction, bald eagle habitat improvement, and forest health improvement. Alternative 3 does not add any direct effects to sensitive plants because all of the changes result in reductions in treatment area.

The reduced amount of disturbance may pose less risk of noxious weed infestation because less suitable habitat would be available.

Indirect Effects:

The reduction in acres of aspen stands released from conifer competition may affect potential habitat for sensitive plants that inhabit riparian or wetland areas. Riparian areas in the Beckwourth Ranger District are potential habitat for several sensitive species of moonworts (*Botyrchium* species). Species of moonworts are usually found in moist riparian areas with filtered sunlight but may grow in moist forest openings. Under this alternative thinning will occur within the aspen stands as described in the Proposed Action with the exception of the 150-foot extended treatment area around the stands. The extended treatment zone will not be part of the Aspen treatment under this alternative. The extended treatment zone will not receive the aspen release treatment. Other types of treatment may occur in parts of the extended treatment zone where they are overlapped by some other type of treatment unit designated by Alternative 1 (the Proposed Action). Alternative 3 will result in a greater canopy cover in aspen stands after project implementation. It is unlikely that potential habitat for moonworts will be adversely affected by the lack of thinning in these buffer areas. But they may be affected if the lack of thinning in aspen stands leads to greater risk of stand replacing fire. A stand replacing fire may have adverse effects on potential habitat of moonworts. If moonworts were destroyed in a fire that also removed 100% of the canopy cover, it would be unlikely that they would reestablish in the site.

Other indirect effects would be the same as those of the Proposed Action.

The area has been adequately surveyed by qualified botanists. Any known sensitive plant populations in riparian areas will be protected. They will not be disturbed. Details of protections can be found in Appendix C, the Botany Protection Plan.

Alternative 3 may pose a slightly lower risk of noxious weed infestation because less area will be disturbed.

Cumulative Effects

The cumulative effects of this alternative on sensitive plants will be the same as those of Alternative 1, the Proposed Action.

Alternative 4 (Preferred Alternative)

Direct Effect

The direct effects to sensitive plants would be the same as those of the Alternative 1.

Indirect Effect

The indirect effects to sensitive plants would be the same as those of Alternative 3.

Cumulative Effect

The cumulative effects to sensitive plants would be the same as those of Alternative 1.

3.9.7 Determinations

3.9.7.1 Action Alternatives

All action alternatives may impact individuals but are not likely to cause a trend toward federal listing or loss of viability to: *Astragalus lentiformis, Ivesia sericoleuca, Meesia uliginosa, Astragalus pulsiferae var. pulsiferae, Astragalus pulsiferae var. suksdorfii, Astragaulus webberi, Botrychium ascendens, Botrychium crenulatum, Botrychium lineare, Botrychium lunaria, Botrychium montanum, Botrychium pinnatum, Bruchia bolanderi, Cyrpipedium fasciculatum, Cypripedium montanum, Hydrothyria venosa, Ivesia* aperta var. *aperta, Ivesia sericoleuca, Ivesia webberi, Lewisia cantelovii, Lupinus dalesiae, Meesia triquetra, Oreostemma elatum, Penstemon personatus, Pyrrocoma lucida, Rupertia hallii, Silene occidentalis* ssp. *longistipitata, Vaccinium coccinium*. Although known occurrences will be protected, undiscovered occurrences of sensitive plants may exist in the project area. For this reason the aforementioned plant species may be impacted. The project area has been adequately surveyed for sensitive species, and such impacts are expected to be minimal.

3.9.7.2 No-action Alternatives

The No-action Alternative will not affect: *Astragalus lentiformis, , Astragalus pulsiferae* var. *pulsiferae, Astragalus pulsiferae* var. *suksdorfii, Astragaulus webberi, Botrychium ascendens, Botrychium crenulatum, Botrychium lineare, Botrychium lunaria, Botrychium minganenese, Botrychium montanum, Botrychium pinnatum, Bruchia bolanderi, Cyrpipedium fasciculatum, Cypripedium montanum, Hydrothyria venosa, Ivesia aperta* var. *aperta, Ivesia sericoleuca, Ivesia webberi, Lewisia cantelovii, Lupinus dalesiae, Meesia triquetra, Meesia uliginosa, Oreostemma elatum, Penstemon personatus, Pyrrocoma lucida, Rupertia hallii, Silene occidentalis* ssp. *longistipitata, Vaccinium coccinium*.

3.10 Special Interest Plant Species

3.10.1 Introduction

Special interest species make an important contribution to the forest biodiversity and should be maintained under the provisions of the National Forest Management Act (NFMA). Therefore, they must be addressed appropriately through the National Environmental Policy Act (NEPA) process. Appendix A, the Botany Report, of the Biological Evaluation for Threatened, Endangered, and Sensitive Plants is located in the project record and is the source of the information found here in section 3.9 of this document.

There is one occurrence each of the special interest plants, *Carex sheldonii* and *Trifolium lemmonii* in the project area.

3.10.2 Summary of Effects

3.10.2.1 Action Alternatives

The occurrences of Sheldon's sedge (CASH 11-013), and Lemmon's clover (TRLE 11-036) are outside of any treatment units and will not be disturbed by project activities. The action alternatives are unlikely to cause any adverse affects on these species.

3.10.2.2 Alternative 2 (No-action Alternative)

This alternative is unlikely to cause any adverse affects on *Carex sheldonii* and *Trifolium lemmonii*.

3.10.3 Scope of the Analysis

Geographic Analysis Area: The geographic boundary for analyzing cumulative effects to special interest plants is the project boundary. Special interest plants are managed according to the PNF Interim Management Prescriptions (Hanson 2005). All known ecology, habitat, range, and distribution information is considered in creating these prescriptions, and they are periodically reviewed and updated by forest service botanists. Therefore, an analysis area equal to the project area insures adequate conservation.

Timeframe of Analysis: The timeframe for determining cumulative effects depends on the length of time that lingering effects of the past action will continue to negatively impact the species in question. This will vary widely between species because some rare plants require and tolerate disturbances that would harm others. Past actions that occurred in the area of each special interest plant occurrence are included in this evaluation if information is available. Where site-specific information is lacking, the general discussion of cumulative effects addresses the effects of disturbances likely to have occurred.

3.10.4 Analysis Methodology

The Freeman Project area was reviewed using aerial photographs, soils maps, and known occurrences to help determine potential habitat for special interest plant species. In the field, areas identified as potential habitat were surveyed at a high level of intensity (complete survey). Areas identified as potential habitat include openings in the forest, serpentine soils, meadows, riparian areas, seeps, and springs. Other areas with little to no potential habitat were surveyed at a less intense level (cursory survey). Plant location data were recorded using Global Positioning Systems, and the data were then entered into a Geographic Information System (GIS). Treatment units were added to the GIS to analyze proximity to rare species and identify potential detrimental treatments and designate "Controlled Areas." Areas of concern were brought forward at planning meetings, and appropriate mitigations will be enacted.

3.10.5 Affected Environment

The following briefly summarizes the survey, habitat, and distribution information about the species listed in the introduction in relation to the project area. The R-E-D code is defined by the California Native Plant Society (CNPS) and gives indications of rarity, which addresses numbers of individuals and distribution within California; endangerment, which addresses the plant's vulnerability to extinction for any reason; and distribution, which describes the overall range of the plant. A value of 1, 2, or 3 is assigned to each category; higher numbers indicate greater concern (California Native Plant Society 2001).

Carex sheldonii is a sedge that occurs in marshes, swamps, and riparian areas in lower montane coniferous forests. It is found in northeast California and parts of the Great Basin. The CNPS includes it on List 2 (plants rare, threatened, or endangered in California but more common elsewhere) and gives it an R-E-D code of 2-2-1, indicating a plant of limited distribution, that is endangered in some parts of its range, and is widespread outside of California.

Trifolium lemmonii is a perennial herb that occurs on volcanic soils, low sage flats, and open terraces in open yellow pine forest. It is found in Nevada, Plumas, and Sierra Counties and in the state of Nevada. The CNPS includes it on List 4 (plants of limited distribution, a watch list) and gives it an R-E-D code of 2-2-2, indicating that it is of limited distribution, endangered in some parts of its range, and rare outside of California,

3.10.6 Environmental Consequences

3.10.6.1 Action Alternatives

Direct and Indirect

Botanical surveys have been done and known populations of special interest plants will be undisturbed by the project. Both of the special interest plant species found in the project area are not within treatment units. The activities proposed by this alternative are unlikely to have direct effects on special interest plant species because they will not be disturbed.

Carex sheldonii (Sheldon's sedge) There is one occurrence of Sheldon's sedge in the project area. It is approximately 200 feet west of County Road 126 and ¾ miles east the nearest project activity. It will not be disturbed by the Freeman project. Suitable habitat for this species in the project area has been surveyed.

Trifolium lemmonii (Lemmon's clover) There is one occurrence of Lemmon's clover in the project area. It is farther than 500 feet from any treatment unit or project activity. It will not be disturbed by the Freeman project. Suitable habitat for this species in the project area has been surveyed.

Cumulative Effects

Overall, the direct and indirect effects on *Carex sheldonii* and *Trifolium lemmonii* from this alternative would be negligible to minor; therefore, there is a low risk of cumulative effects. Past projects have affected existing occurrences of these plants. If existing management guidelines, such as rare plant surveys and protection of known rare species locations remain in place, the cumulative effects of proposed and future projects are likely to be negligible.

3.10.6.2 Alternative 2 (No-action)

The direct, indirect, and cumulative effects of this alternative would be negligible for *Carex sheldonii* and *Trifolium lemmonii* because the known populations of these plants are not located in treatment units. Adequate surveys have been done.

3.10.7 Determinations

3.10.7.1 Action Alternatives

The Action Alternatives may impact special interest plant species but are not likely to lead to a trend to federal listing.

3.10.7.2 No-action Alternative

The No-action Alternative will not impact special interest plants.

3.11 Economic Effects

3.11.1 Introduction

The following assessment is summarized from the economics report for the Freeman Project, which is incorporated here by reference (USFS PNF BRD 2006j)

The HFQLG FEIS, Appendix S, and Appendix T describe the direct, indirect, and cumulative socioeconomic impacts of implementing the HFQLG Pilot Project. Therefore, this economic analysis will not revisit the information presented in the HFQLG FEIS, but will focus only on those revenues and treatment costs associated with implementing thinning and fuels reduction treatments within the Freeman Project area. The purpose of this economic analysis is to display the revenues and costs associated with each of the alternatives for comparison purposes.

In addition, this analysis does not include monetary values assigned to resource outputs such as wildlife, watershed, soils, recreation, visual, and fisheries. It is intended only as a relative measure of differences between alternatives based on those direct costs and values used. Other values are discussed in the appropriate sections of the Freeman Project Environmental Impact Analysis.

3.11.2 Summary of the Effects

This economic analysis for the Freeman Project is focused on those revenues and treatment costs associated with implementing fuel reduction treatments, group selection, and individual tree selection.

3.11.2.1 Action Alternatives

All action alternatives would provide employment opportunities and generate harvest revenues and timber yield taxes. However, alternative 1 would generate more harvest revenue, timber yield taxes, employment opportunities, and employee-related income than alternatives 3 or 4 (Table 3.84). In addition, alternative 4 would contribute more DFPZ and biomass volume harvested to the Pilot Project area than alternatives 1 and 3 (Table 3.86). Alternative 1 would contribute more sawtimber volume harvested to the Pilot Project area than alternative 3 and 4 due to greater treatment of Aspen stands.

3.11.2.2 Alternative 2 (No-action)

Implementation of the no-action alternative would have a negative impact on the local industries that depend on service contracts or a steady supply of timber, as well as counties that use timber yield taxes to fund county programs. If the no-action alternative were implemented, additional funds would be needed to conduct fuel reduction treatments or wildlife habitat, meadow, and streambank restoration.

3.11.3 Scope of the Analysis

Geographic Analysis Area: The social and economic environment of the Plumas National Forest is described in the Forest's 1988 Land and Resource Management Plan (LRMP), as amended by the Herger-Feinstein Quincy Library Group Final Environmental Impact Statement (FEIS) and Record of Decision (ROD) of 1999; a final supplemental FEIS and ROD addressing DFPZ maintenance adopted in 2003; and the Sierra Nevada Forest Plan Amendment (SNFPA) final supplemental EIS and Record of Decision (ROD) of 2004, amending the LRMPs of all national forests in the Sierra Nevada.

The geographic boundary for the social and economic analysis for the HFQLG pilot project encompasses the counties located within the core and peripheral areas (HFQLG FEIS, Appendix S, page S-7). The core area of the QLG region contains the three counties of Lassen, Plumas, and Sierra. The peripheral area of the QLG region contains five counties that surround the core area. These counties are Butte, Nevada, Shasta, Tehama, and Yuba. The focus of the socioeconomic analysis is on 41 communities within the HFQLG region (HFQLF FEIS, Appendix T, Table T-1). The Freeman Project is part of the HFQLG pilot project and this economic analysis will be based on the incremental effect of the Freeman Project within the HFQLG Pilot Project region.

Time Frame Boundary: As stated above, this economic analysis will not revisit the information presented in the HFQLG FEIS, but will focus only on the time frame associated with implementing thinning and fuels reduction treatments for the Freeman Project. The time frame for completing the timber harvest removal would take approximately 2 to 3 years. The time frame for DFPZ construction activities would take an additional 3 to 6 years after timber harvest removal is completed.

3.11.4 Analysis Methodology

This economic analysis focuses on those revenues and treatment costs associated with implementing group selection and fuel reduction treatments in the Freeman Project area. The purpose of this economic analysis is to present the potential revenues and costs associated with each of the alternatives for comparison purposes.

This analysis does not include monetary values assigned to resource outputs such as wildlife, watersheds, soils, recreation, visual quality, and fisheries. It is intended only as a relative measure of differences between alternatives based on direct costs and values used. Other values are discussed in the appropriate sections of this document.

Timber harvest values used in this economic analysis were based on the California State Board of Equalization Timber Harvest Values (January 1, 2005 – June 30, 2005). Harvest costs and road improvement costs were developed from the latest timber sale appraisal values. Mechanical (mastication, grapple pulling), manual (hand cutting, hand piling), and prescribed fire (underburning, pile burning) treatments are based on the latest service contract prices, Knutson-Vandenberg, and brush disposal sale area improvement plans.

3.11.5 Affected Environment

The Plumas National Forest (the Forest) contributes to the regional economy in two primary ways: (1) through the generation of income and employment opportunities for residents of the immediate area, and (2) through direct and indirect contributions to local county revenues. The Forest also contributes in secondary ways, such as through production of goods and services in local and regional markets. Although some economic effects are dispersed over a broad area, the most substantial impacts are felt locally in Butte, Plumas, Lassen, Sierra, and Yuba Counties. The percentage of Plumas National Forest land in local counties is shown in Table 3.82.

Table 3.82 Percentage of Plumas National Forest lands by county (based on GIS data).

County	County Acres	Beckwourth Ranger District (acres)	Feather River Ranger District (acres)	Mount Hough Ranger District (acres)	Total Plumas National Forest Lands in Each County (acres)	Plumas National Forest Lands within Each County (percent)
Butte	1,072,708	0	143,517	0	143,517	13.4
Lassen	3,022,136	39,686	0	1,635	41,320	1.4
Plumas	1,672,778	448,365	183,210	579,196	1,210,771	72.4
Sierra	615,514	14,794	33,522	0	48,316	7.8
Yuba	411,695	0	33,734	0	33,734	8.2
Totals	**6,794,830**	**502,844**	**393,984**	**580,831**	**1,477,659**	**21.7**

The two employment sectors most related to forest planning processes are the timber industry and tourism. They are very difficult to quantify, in terms of both total employment and their relative importance to local economies, because state and federal employers generally do not break down employment data into these categories.

Forest contributions to local county revenues come from three sources: (1) Payments in Lieu of Taxes, (2) timber yield taxes, and (3) Receipt Act payments or payments from the Secure Rural Schools and Community Self-Determination Act of 2000. Of these, the Receipt Act or Secure Rural Schools and Community Self-Determination Act payments are by far the most significant in terms of total contributions to each county and are therefore most likely to be affected by Forest land management decisions.

Payments in Lieu of Taxes. Payments in Lieu of Taxes are administered by the Bureau of Land Management and apply to many different types of federally owned land, including National Forest System lands. Payments in Lieu of Taxes compensate counties for the loss of property tax revenues due to nontaxable federal land in the county. Payments are made annually and are based on local population, federal acreage in the county, and other federal payments during the preceding fiscal year. The minimum payment is 75 cents per entitlement acre. The county may use these funds for any purpose. The Forest has no control over the disbursement of these funds, and the amount disbursed every year is unaffected by Forest land management decisions.

Timber Yield Taxes. The second source of revenues to local government is the timber yield tax, administered by the State Board of Equalization. The Forest does not pay this tax; instead, it is paid by private timber operators, based on the amount of timber harvested in a given year on both private and public lands. The tax is 2.9 percent of the value of the harvested timber. The taxes are collected by the state, and approximately 80 percent is returned to the counties from which the timber was harvested. Decisions about the amount of timber to be offered for sale each year on the Forest can affect the amount of revenues disbursed to the counties.

Receipt Act. Receipt Act payments are distributed pursuant to the National Forest Management Act (Public Law 94-588). Under this law, 25 percent of National Forest revenues are allocated to the state in which the Forest is situated. The amount returned is based on the National Forest acreage within each county. According to state law, Receipt Act funds must be divided evenly between public schools and public roads of the county or counties in which the National Forest is located and may not be spent on anything else.

Receipt Act payments are based on 25 percent of the total revenues collected from timber, grazing, land use, recreation, power, minerals, and user fees. Within the 11 western states, however, payments are based on 50 percent of revenue from grazing. Historically, at least 90 percent of total revenues have come from timber sale receipts. As a result, the amount of money available for distribution each year fluctuates widely, depending on the amount of timber harvested on National Forests.

Secure Rural Schools and Community Self-Determination Act. Congress passed the Secure Rural Schools and Community Self-Determination Act in 2000, offering counties an alternative to the Receipt Act. Under the Self-Determination Act, a state's three highest payment amounts between 1986 and 1999 are averaged to arrive at a "compensation allotment" or "full payment amount." A county may choose to continue to receive payments under the Receipt Act or to receive its share of the state's full payment amount under the Secure Rural Schools and Community Self-Determination Act. National Forests and other federal agencies that contribute to the 25 percent fund would have to generate approximately $56.4 million in total revenues in order to offset the $14 million that the counties receive under the Secure Rural Schools and Community Self-Determination Act.

Counties can receive variable, revenue-dependent payments under the Receipt Act or receive stable funding for local schools and roads under the Secure Rural Schools and Community Self-Determination Act. The legislation promotes local involvement, decisions, and choice by creating well-balanced resource advisory committees that recommend forest projects to the Secretary of Agriculture or advise counties on county project proposals. Counties that elect to receive the full payment amount under the Secure Rural Schools and Community Self-Determination Act, and receive more than $100,000, are required to allocate 15 to 20 percent of their funding to projects under Title II or Title III (see Table 3.83). Like traditional 25 percent funds, Title I funds are expended for public schools and roads. Title II funds are allocated for projects on federal lands or projects that benefit federal lands. Resource Advisory Committees are established to determine

Title II fund distribution. Title III funds are allocated for county projects that include search and rescue, community service work camps, easement purchases, forest-related education opportunities, fire prevention and county planning, or cost-share for urban community forestry projects. The Secure Rural Schools and Community Self-Determination Act full payment amounts (fiscal year 2005) for the five counties containing Plumas National Forest lands are shown in Table 3.83.

Table 3.83 Secure Rural Schools and Community Self-Determination Act full payment amounts to counties for fiscal year 2005.

County	Full Payment Amount	Title I Funds	Title I Percent of Full Payment	Title II Funds	Title II Percent of Full Payment	Title III Funds	Title III Percent of Full Payment
Butte	$895,320	$716,256	80%	$0	0%	$179,064	20%
Lassen	$3,876,372	$3,294,916	85%	$581,456	15%	$0	0%
Plumas	$7,258,972	$6,170,126	85%	$816,634	11%	$272,211	4%
Sierra	$1,848,005	$1,570,804	85%	$92,400	5%	$184,801	10%
Yuba	$238,982	$191,186	80%	$0	0%	$47,796	20%
Total	**$14,117,651**	**$11,943,288**		**$1,490,490**		**$683,872**	

Relative to the local economy, there is a potential to harvest 9–14 million board feet of timber over several years as part of the Freeman Project. The five Counties can expect to receive 25 percent of the revenues generated from this timber sale through the Receipt Act or receive full payment from the Secure Rural Schools and Community Self-Determination Act. 100 percent of the Freeman Project area is located in Plumas County. Employment opportunities would be created from proposed thinning and biomass removal, fuels reduction, site preparation, and planting activities. Furthermore, indirect and induced economic employment and monies would be generated when income received by contractors and the timber industry is re-spent within the local economy.

3.11.6 Economic Consequences

Economic consequences are a measure of the overall value of the four alternatives considered in this analysis. The level and mix of goods and services available to the public varies by alternative, resulting in a range of impacts on the social and economic environment. The impacts discussed in this section include estimated government expenditures and revenues, as well as monetary impacts on local communities.

Direct monetary impacts are discussed in terms of net cash value to the U.S. Treasury, including the costs associated with implementing the treatments and direct, indirect, and induced job opportunities.

In general, the monetary value of each alternative depends on the amount and method of timber harvest and the acreage planned for fuels reduction treatments. Areas with positive timber harvest values would pay for associated fuels reduction activities on those acres. Fuels reduction treatment costs that exceed harvest revenues would become service contracts to be financed through appropriated funds when available.

The HFQLG Act final EIS and Record of Decision described the economic impacts of implementing the Pilot Project. This economic analysis does not revisit the information presented in the final EIS and Record of Decision, but for comparison purposes, it focuses only on those revenues and treatment costs associated with each of the alternatives.

3.11.6.1 Action Alternatives

Direct and Indirect Effects

Employment

Employment opportunities can have direct, indirect, or induced effects on the local economy. Direct effects are associated with the primary producer. For example, the manufacturing of lumber from the Freeman Project would have a direct effect on employment opportunities. Indirect effects account for employment in service industries that serve the lumber manufacturer. These industries may include logging, trucking, and fuel supplies. Induced effects are driven by wages. Wages paid to workers by the primary and service industries are circulated through the local economy for food, housing, transportation, and other living expenses. The sum of direct, indirect, and induced effects is the total economic impact in terms of jobs, which typically range from 10 to 15 jobs per million board feet of timber harvested.

Revenue to the Government

Net revenue is the difference between the revenues generated by an alternative and the costs required to implement the alternative. In this analysis, revenues come from harvest of timber.

Payments to Counties

Local counties receiving payments through the Receipt Act rather than the Secure Rural Schools and Community Self-Determination Act would share part of the revenues generated from the timber harvest. The actual payment amount depends on estimated stumpage value and the price bid by the purchaser awarded the timber sale contract.

Treatment Costs

Treatment or management costs include those costs associated with timber harvesting, biomass removal, road improvements, fuels treatments, and mitigation measure requirements, as well as costs of resource enhancement measures not associated with the sale of timber. Costs vary widely depending on the amount of mechanical, manual, or thermal treatments prescribed; the board feet of sawlogs or tons of biomass removed per acre; and the accessibility of the treatment units.

Net harvest revenues for group selection, thinning and biomass removal would generate $798,000 for alternatives 1, $78,000 for alternatives 3 and $47,000 for alternatives 4. Total project cost would be -$1,050,000 for alternatives 1, -$1,815,000 for alternatives 3 and -

$1,517,000 for alternatives 4. The economic analysis does not take into account nonpriced benefits such as reduced fire hazard.

Thinning, biomass removal, and fuel treatments would directly generate 247 full-time employment opportunities for alternative 1, 176 full-time employment opportunities for alternative 3 and 203 full-time employment opportunities for Alternative 4. All action alternatives would create additional employment opportunities in service industries (such as logging supply companies, trucking companies, and fuel suppliers) that serve the timber industry. There is also an induced effect that is driven by wages. Wages paid to workers by the primary and service industries would be circulated through the local economy for food, housing, transportation, and other living expenses.

The sum of direct, indirect and induced effects is the total economic impact in terms of jobs. In addition to the direct employment that would result from the harvesting and fuel reduction treatments in Alternatives 1, 3 and 4, and the indirect benefits of jobs in sawmills and energy generation plants, there would be some additional benefits to the local economy as wages earned by those employees are spent on living expenses. Alternative 1 would generate an estimated 310 direct, indirect, and induced jobs, Alternative 3 would generate an estimated 240 direct, indirect, and induced jobs, Alternative 4 would generate an estimated 248 direct, indirect, and induced jobs.

Nonpriced Costs and Benefits

It should be noted that all costs and values are not represented in the economic analysis. Calculations do not include costs and values for those items that cannot be estimated in dollar terms. The economic analysis does not take into account nonpriced benefits such as improved long-term wildlife habitat, improved watershed conditions, improved fish passage, and reduced fire hazard. The various habitat improvement opportunities, which are not funded from the project’s timber receipts, may be funded through other sources such as watershed improvement needs, Resource Advisory Committees, wildlife habitat improvements, Knutson-Vandenberg, or other appropriated funds. Examples of costs not estimated in dollar terms are the reduction in scenic value in the early years of fuels treatments, air pollution from wildfires, or reestablishing a forest following a stand-replacing wildfire.

For a detailed discussion of these nonpriced benefits and costs, refer to the appropriate resource section in this document. These nonpriced benefits and costs will be considered along with the net economic value of each alternative in order to make a judgment as to which alternative offers the best overall mix of costs and benefits to society.

Table 3.84 summarizes the economic impacts of alternatives 1-4 on the local economy.

Cumulative Effects

Each of the action alternatives would result in the same cumulative effect—an increase in the overall economic activity in the HFQLG Pilot Project area. Though not a requirement, it is assumed in this analysis that most products from HFQLG Pilot Projects would be processed locally due to high hauling costs of products and equipment. Likewise, it is also assumed that most employment would largely be derived from Lassen, Plumas, and Sierra Counties. The Freeman Project timber sale revenues and service contract employment would complement all other HFQLG-funded projects across the forest. The economic goals for the project, as a whole, across the Pilot Project area are discussed in the HFQLG Act final EIS.

Table 3.84 Comparison of economic impacts by alternative for the Freeman Project area.

Revenue/Cost/ Employment	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Total Sawlog Volume (mmbf)	13.9	0	8.9	9.9
Total Biomass Volume (mtons)	57.3	0	51.7	63.2
Total Cost	$2,251,000	$0	$1,881,000	$2,041,000
Net harvest revenues	$798,000	$0	$78,000	$47,000
% Above Value	26%	0	4%	2%
DFPZ Service Contract	($841,000)	$0	($864,000)	($779,000)
Area Thin Service Contract	($1,007,000)	$0	($1,030,000)	($785,000)
Total Project Value	($1,050,000)	$0	($1,815,000)	($1,517,000)
Direct jobs	247	0	176	203
Indirect jobs	63	0	64	45
Total direct and indirect jobs	310	0	240	248
Total employee-related income	$13,341,000	$0	$10,340,000	$10,667,000

The cumulative effects of these alternatives would include increased overall economic activity in the HFQLG Pilot Project Area. Though it is not a requirement, it is assumed in this analysis that most products from HFQLG projects will be processed locally due to high hauling costs of products and equipment. Likewise, it is also assumed most employment will largely be derived from Butte, Lassen, Plumas, Sierra and Yuba counties. The Freeman timber sale revenues and service contract employment would complement all other HFQLG funded projects across the forest. Economic goals for the project as a whole across the Pilot Project Area are discussed in the HFQLG Final Environmental Impact Statement. Table 3.85 displays the Pilot Project accomplishments of DFPZ and group selection acres treated and sawlog and biomass volumes harvested over the past three years (Reference HFQLG oracle Database).

The Freeman Project contribution to the Pilot Project region by alternative is displayed in Table 3.86. For DFPZ acres treated, the contribution to the Pilot Project region would be the same for all alternatives. For group selection acres and the amount of sawlog and biomass volume harvested, alternative B would provide the most contribution to the Pilot Project region, followed by alternative C and the least contribution coming from alternative D. There are no past projects that are still in operation and contributing toward economic stability from the Freeman Project area. See Appendix F of this EIS for the complete economic analysis, by alternative.

Table 3.85 Pilot Project region averages of acres treated and volume harvested.

	FY 2003	FY 2004	FY 2005	Pilot Project Average
DFPZ Acres Accomplished	24,442	36,635	21,073	27,383
Group Selection Acres Accomplished	-0-	1,738	1,792	1,177
Sawlog Volume Offered CCF	41,418	203,012	143,373	129,268
Biomass Volume Offered CCF	44,402	198,204	129,814	124,140

Summary of Cumulative Effects

This economic analysis for the Freeman Project is focused on those revenues and treatment costs associated with implementing fuel reduction treatments, group selection, and individual tree selection. Implementation of the no-action alternative would have a negative impact on the local industries that depend on service contracts or a steady supply of timber, as well as counties that use timber yield taxes to fund county programs. If the no-action alternative were implemented, additional funds would be needed to conduct fuel reduction treatments or wildlife habitat, meadow, and streambank restoration.

All action alternatives would provide employment opportunities and generate harvest revenues and timber yield taxes. However, alternative 1 would generate more harvest revenue, timber yield taxes, employment opportunities, and employee-related income than alternatives 3 or 4 (Table 3.84). In addition, Alternative 4 would contribute more DFPZ and biomass volume harvested to the Pilot Project area than alternatives 1 and 3 (Table 3.86). Alternative 1 would contribute more sawtimber volume harvested to the Pilot Project area than Alternative 3 and 4 due to greater treatment of Aspen stands.

Table 3.86 Freeman Project contribution to the Pilot Project area

	Alt 1.	Alt 2.	Alt 3.	Alt 4.
Proposed DFPZ Acres Percent contribution	1,357 5.0%	0	1,485 5.4%	1,885 6.9%
Proposed Group Selection acres Percent contribution	175 14.8%	0	175 14.8%	174 14.7%
Proposed Sawlog Volume MMBF	13.9	0	8.9	9.9
Proposed Sawlog Volume CCF Percent contribution	27,600 21.3%	0	17,800 13.8%	19,800 15.3%
Proposed Biomass Volume Tons	60,000	0	55,000	66,000
Proposed Biomass Volume CCF Percent contribution	24,000 19.2%	0	22,000 17.6%	26,400 21.2%

Conversions: MBF = 2 CCF; Tons = 0.4 CCF

3.11.6.2 Alternative 2 (No-action)

Direct and Indirect Effects

This alternative would not reduce critical fuel loadings or harvest any timber. No funds would be generated for the U.S. Treasury or returned to local counties. No additional employment opportunities or wages paid to primary and service industry employees would be circulated through the local economy.

The cumulative impact of no-action alternative would negatively affect local industries dependent on Forest Service contract work or a steady supply of timber, as well as counties that use the timber yield taxes to fund county programs. These local industries would lack opportunities or business that would be provided from fuels reduction, site preparation or timber harvest activities. The local economy also would fail to receive benefit from associated employment, such as in food, lodging, and transportation businesses. Throughout northern California, cumulative years of reduced timber harvesting activities (including those on federal lands) have resulted in the loss of infrastructure (i.e, mills) to complete such activities. Loss of such infrastructure, including local mill closures could significantly reduce or eliminate future economic and environmental opportunities from national forest lands. Fuel reduction activities in the creation and maintenance of DFPZs would not occur thereby further negating opportunities for long-term employment and rural community stability. Table 3.84 summaries the economic impacts of alternatives 1, 2, 3 and 4 on the local economy.

Under the no-action alternative, wildlife habitat, meadow, and streambank restoration and enhancement could not take place without appropriated money from Congress. In addition, dense standing trees and down woody material in the Freeman Project area would continue to pose a very high fire hazard to the surrounding areas. If the no-action alternative were implemented, additional money would be needed to conduct any fuel reduction treatment, as well as possible elevated fire suppression costs should fire reoccur in the Freeman vicinity.

Cumulative Effects

The no-action alternative would result in a negative effect on local industries that depend on service contracts or a steady supply of timber, as well as counties that use timber yield taxes to fund county programs. These local industries currently lack opportunities related to fuels reduction, site preparation, and timber harvest activities; the action alternatives would provide those opportunities. The local economy would also not receive benefits from associated employment, such as in food, lodging, and transportation businesses. Throughout northern California, cumulative years of reduced timber harvesting activities (including those on federal lands) have resulted in the loss of infrastructure to complete such activities. The loss of such infrastructure, including local mill closures, could significantly reduce or eliminate future economic and environmental opportunities from National Forest lands. The continuation of current conditions under Alternative 2 would preclude opportunities for long-term employment and rural community stability because the fuel reduction activities related to the creation and maintenance of DFPZs would not occur.

Under the no-action alternative, wildlife habitat, meadow, and streambank restoration and enhancement could not take place without appropriated money from Congress. In addition, dense standing trees and down woody material in the Freeman Project area would continue to pose a very high fire hazard to the surrounding areas. If the no-action alternative were implemented, additional money would be needed to conduct any fuel reduction treatment, as well as possible elevated fire suppression costs should fire reoccur in the Freeman Project vicinity. Table 3.84 above summarizes the economic impacts of all alternatives on the local economy.

3.12 Transportation System Effects

3.12.1 Introduction

The following assessment is summarized from the economics report for the Freeman Project, which is incorporated here by reference (USFS PNF BRD 2006j). The purpose of the National Forest road system is to provide suitable conditions for passage of all Forest Service and cooperator emergency vehicles and to meet resource management and public access needs. The road system and improvements should minimize adverse effects on watershed and wildlife values. Roads near streams or in riparian zones have the greatest probability of intercepting, concentrating, and diverting flows from natural flow paths and should therefore be minimized where feasible. Road-stream crossings have the potential for failing and diverting water and should therefore be minimized where feasible. Roads can reduce and fragment wildlife habitat, but they can also provide access for habitat protection from wildfire and treatments designed to improve habitat quality. Roads should be minimized where adverse effects outweigh benefits to wildlife.

To protect watershed resources, the desired conditions for roads that would be retained and improved (through for road construction, reconstruction, or relocation) include the following:

- Accommodation of the 100-year flood at stream crossings, including streamflow, bedload, and debris;
- No diversion of streamflow along roads in the event of crossing failure;
- No diversion of natural hydrologic flow paths at stream crossings, including paths of streamflow, surface runoff, and groundwater; and
- No roads located in wetlands and meadows and minimization of road effects on natural flow patterns in wetlands and meadows.

3.12.2 Analysis Methods

The transportation system for the Freeman Project area was evaluated through a roads analysis. The following needs were identified based on that analysis and known access needs for proposed DFPZ and group selection treatments:

- Road reconstruction and maintenance are needed to bring existing classified roads into compliance with current maintenance standards and to provide access to the DFPZ and group selection treatment areas. Reconstruction and road maintenance are also necessary to reduce erosion and sedimentation and to provide for public safety.
- Road decommissioning is needed to reduce erosion, sedimentation, and soil compaction and to reduce road density and wildlife impacts.
- Closure of spur roads is needed to reduce erosion, sedimentation, soil compaction, and impacts to wildlife.

- Culvert replacement, removal, or upgrade is needed to improve watershed connectivity.
- Temporary road construction is needed to access group selection and DFPZ units where existing road access is absent.
- Two classified road relocations are needed to provide access to treatment areas where existing road access is impacting watershed and heritage resources.
- Harvest landing construction and reconstruction are needed to facilitate removal of wood products.

3.12.3 Affected Environment

One major arterial route accesses the project area: the Lake Davis Road (Plumas County Road 112) on the northeast side on Lake Davis. The Freeman Project area is considered to have a fully developed arterial and collector road system.

There are a total of approximately 82.4 miles of existing classified roads in the project area. In addition to the existing classified roads, there are numerous unclassified roads, abandoned roads, and skid trails in the project area. There are 0.9 miles of Level 1 roads assigned to intermittent service. There are 49.5 miles of Level 2 roads assigned where management direction requires the road to be open for limited passage of traffic. There are 31.5 miles of Level 3 roads where management direction requires the road to be open and maintained for safe travel by a prudent driver in a passenger car. There are 0.5 miles of Level 5 roads where management direction requires the road to provide a high degree of user comfort and convenience at moderate travel speeds.

3.12.4 Environmental Consequences

3.12.4.1 Action Alternatives

Direct Effects

Approximately 0.7 miles of existing classified road could potentially be closed with barriers upon project completion (see Table 3.87). In addition to the information contained in the tables in this section, Figures G.2, G.3, and G.4 in Appendix G depict the proposed transportation system changes.

The Freeman Project proposes road decommissioning (see Table 3.88) approximately 6.0-miles of existing system roads, 1.9-miles of non-system roads. An additional 0.7-mile of system road would be reduced to single-track, in order to provide for recreational opportunities near Lake Davis. Decommissioning would include recontouring, removing drainage structures, subsoiling, restoring vegetative cover and/or blocking access. Decommissioning of roads would reduce equivalent roaded acres (ERA) values, thereby lowering cumulative watershed impacts and soil compaction. None of the roads proposed for decommissioning are needed for the long-term transportation system. Portions of roads are in poor locations within RHCAs and are causing direct stream impacts. Roads slated for decommissioning are not needed for fire access or resource management and are causing watershed and wildlife impacts. Proposed road decommissioning, closure, or reconstruction would contribute to watershed restoration, including meadow enhancement, fish passage, and stream stabilization. There are many unsurfaced roads in the Freeman Project area that are contributing to degradation of water quality and aquatic habitat.

Table 3.87 Potential road closures under the Freeman Project.

Freeman Road Closure Opportunities					
Road No.	**Classified**	**Location Township/Range Section**	**Classified Miles**	**Dead End**	**Loop**
1	23N16Y	23/13 S 9	0.23	Yes	
2	24N42XA	24/12 S26	0.30	Yes	
3	24N70Y	24/13 S33	0.20	Yes	
Classified Road Mileage			**0.73**		
Miles – Number of Dead-end Roads			**0.73**	**3**	
Total			**0.73**		

Through project planning, the public was given the opportunity to participate and comment on proposed road closures and decommissioning. The Plumas National Forest is currently undergoing an off-highway vehicle (OHV) route inventory and designation process. Roads proposed for decommissioning or closure in this project are creating unacceptable resource damage, to the extent that a delay in their closure would result in unacceptable and irretrievable impacts on the resource.

Table 3.88 Freeman Project classified and unclassified road decommissioning opportunities.

Road Number	Location Township/Range Section	Classified Miles	Unclassified Miles	Dead-end Spur	Loop Road
24N07B	23/13 S4	0.30		Yes	
24N07C	23/13 S4 & S3	0.26		Yes	
24N10D	24/13 S33	0.62		Yes	
24N12B	24/13 S31	0.49		Yes	
24N43X	24/12 S26 & S35	1.35			Yes
24N55	23/13 S7	0.19			Yes
24N57C	24/12 S27	0.25		Yes	
24N57D	24/12 S27	0.19		Yes	
24N57E	24/12 S26	0.04		Yes	
24N57F	24/12 S26	0.13		Yes	
24N61A	24/12 S27 & S28	0.17		Yes	
24N71Y	24/13 S33	0.76		Yes	
24N74Y	23/13 S8	0.19			Yes
24N89YA	23/12 S1	0.25		Yes	
24N89YB1	23/12 S1	0..25		Yes	
24N89YB2	23/12 S1	0.61		Yes	
U-----	Numerous		1.91	Yes	
Classified Road Mileage		**6.05**			
Unclassified Road Mileage			**1.91**		
Total Classified and Unclassified		**7.96**			

Approximately 14 miles of existing classified roads would be reconstructed prior to project use (Table 3.89). Reconstruction would consist of brushing, blading the road surface, improving drainage and replacing/upgrading culverts where needed. 0.45-mile of system road would be relocated. Hazard trees would be removed. Identification of hazard trees would follow guidelines in the Plumas National Forest Roadside/Facility Hazard Tree Abatement Action Plan (2003).

Approximately 17 temporary roads would be built, totaling 2-miles, are needed to implement planned activities. Most are less than 100’ in length and are needed to place landings beyond visually sensitive locations. These roads would be decommissioned upon completion of the project.

Existing harvest landings in group selection units and DFPZs would be reconstructed, and new ones would be constructed.

Table 3.89 Freeman Project proposed road reconstruction.

Road Number	Miles	Maintenance Level	Road Number	Miles	Maintenance Level
23N22Y	2.4	2	24N11X	1.2	2
23N88	1.6	2	24N55	1.4	2
24N07	2.5	2	24N57	0.5	2
24N07A	0.6	2	24N61	1.2	2
24N10B1	0.4	2	24N70Y	0.8	2
24N10C	1.8	2			
Total miles 14.4					

The road improvements proposed in the action alternatives would provide access needed for the DFPZ and group selection units. The proposed improvements would also provide access needed for fire suppression and fuels management to reduce the chance of catastrophic fire through intensive vegetation manipulation at a lower cost because of the improved access. The action alternatives would generate traffic from log trucks, chip vans, and support vehicles. Traffic-related safety problems would be mitigated with standard contract requirements.

Indirect Effects

No right-of-ways are need for this project.

Cumulative Effects

A net reduction of approximately 8.0 miles of classified and unclassified roads in the action alternatives would occur after proposed road decommissioning is completed. Once decommissioned, roads would be available for reforestation and conversion back to a natural landscape.

Past, Present, and Reasonably Foreseeable Future Actions

Other than ongoing routine road maintenance, past, present, and future projects in the vicinity of the Freeman Project have not impacted nor are they expected to impact the transportation system in the project area.

3.12.4.2 Alternative 2 (No-action)

Direct Effects

Reconstruction of classified roads would not occur, and impacts on watershed and user safety would continue on roads needing reconstruction. There would be no new direct impact on road surfaces from log haul activity. There would be no increase in hazards to driver safety from logging traffic. Classified roads, unclassified roads, and abandoned skid trails would not be decommissioned and would continue to cause resource damage. Normal routine maintenance would occur based on current maintenance levels.

Roads would continue to negatively impact watersheds and public safety because no roads would be reconstructed, decommissioned, or closed. Fire access would be restricted because some roads would remain, or become, impassable.

Indirect Effects

No rights-of-way would be needed for the normal road maintenance completed in this area.

Cumulative Effects

No reduction in classified or unclassified roads would occur during normal road maintenance completed in this area.

3.13 Noxious Weed Effects

3.13.1 Introduction

The following assessment is summarized from the botany noxious weed risk assessment for the Freeman Project, incorporated here by reference (USFS PNF BRD 2006b). This Noxious Weed Risk Assessment has been prepared to evaluate the effect of the Freeman Project on California Department of Food and Agriculture (CDFA) listed noxious weeds and other invasive non-native plant species. This assessment is in compliance with the Plumas National Forest Land and Resource Management Plan (USDA Forest Service 1988), the Herger-Feinstein Quincy Library Group Forest Recovery Act Final Environmental Impact Statement (USDA Forest Service 1999), the Sierra Nevada Forest Plan Amendment Final Environmental Impact Statement Record of Decision (USDA Forest Service 2001), Executive Order on Invasive Species (Executive Order 13112),and the direction in the Forest Service Manual section 2080, Noxious Weed Management (amendment effective since 11/29/95) (USDA Forest Service 1991), which includes a policy statement calling for a risk assessment for noxious weeds to be completed for every project. The overriding principle stated in these documents is that "…it is much cheaper to prevent an infestation from becoming established than to try to eliminate it once it has begun to spread, or deal with the effects of a degraded plant community." Specifically, the manual states: 2081.03 - Policy. When any ground disturbing action or activity is proposed, determine the risk of introducing or spreading noxious weeds associated with the Proposed Action.

1. For projects having moderate to high risk of introducing or spreading noxious weeds, the project decision document must identify noxious weed control measures that must be undertaken during project implementation.
2. Use contract and permit clauses to prevent the introduction or spread of noxious weeds by contractors and permittees. For example, where determined to be appropriate, use clauses requiring contractors or permittees to clean their equipment prior to entering National Forest System lands.

2081.2. Prevention and Control Measures. Determine the factors that favor the establishment and spread of noxious weeds and design management practices or prescriptions to reduce the risk of infestation or spread of noxious weeds.

Where funds and other resources do not permit undertaking all desired measures, address and schedule noxious weed prevention and control in the following order:

1. First Priority: Prevent the introduction of new invaders,
2. Second Priority: Conduct early treatment of new infestations, and
3. Third Priority: Contain and control established infestations.

The California Department of Food and Agriculture's noxious weed list (http://www.cdfa.ca.gov) divides noxious weeds into categories A, B, and C. A-listed weeds are those for which eradication or containment is required at the state or county level. With B-listed weeds, eradication or containment is at the discretion of the County Agricultural Commissioner. C-listed weeds require eradication or containment only when found in a nursery or at the discretion of the County Agricultural Commissioner.

3.13.2 Summary of Effects

3.13.2.1 Action Alternatives

The overall risk of noxious weed establishment as a result of Freeman project implementation is moderate. This determination is based on the following:

1. Mapping of noxious weed species,
2. Small size of existing known populations,
3. Continued treatment of known populations,
4. Standard Management Requirements,
5. Low intensity underburns.

The overall net benefits of the Freeman project are likely lead to reduced future risk of noxious weed establishment in much of the project area. These benefits include promoting native plant communities (i.e. aspen communities) and reducing risk of catastrophic fire.

3.13.2.2 Alternative 2 (No-action)

If no action is taken the risk of noxious weed infestation will be low. Non-proposed action dependent factors will not change. These include: inventory, known noxious weeds, non-project dependent vectors (e.g. recreationalists, woodcutters, vehicle traffic), and existing habitat vulnerability. Inventory and control activities would continue as part of the part of the PNF noxious weed program.

However, the absence of treatment could lead to an increased risk of catastrophic wildfire and degraded aspen communities. These results can indirectly increase risk of noxious weed infestation.

3.13.3 Scope of the Analysis

Geographic Analysis Area: The Freeman Project area is approximately 14,967 acres. The area of analysis for noxious weed risk assessment includes the surrounding land up to 1 mile from the project boundary. Access routes to the project area were also considered in analyzing the risk of noxious weed infestation.

Timeframe: The earliest noxious weed records for this analysis area are from 2000. These records and any subsequent records of noxious weeds in the area were considered in this analysis.

Analysis Methods

Surveys

Noxious weed surveys targeting roadsides, landings and campgrounds within DFPZ and Group Select boundaries were conducted in 2004 beginning May 17, 2004 and continuing to August 13, 2004. The noxious weed surveys were conducted in conjunction with rare plant surveys. Although surveys focused on areas within the project boundaries, adjacent roads and landings were surveyed as well. Access routes into the project area were also considered in this noxious weed risk analysis. Greg Jennings Botanical Consulting of Eureka, CA, and PNF botanists conducted noxious weed surveys in the project analysis area. Adequate noxious weed surveys have been completed within and adjacent to the project area.

The risk of noxious weed establishment takes into account a variety of factors:

1. Mapping of noxious weed species,
2. Size of existing known populations,
3. Treatment of known populations,
4. Standard Operating Procedures or Standard Management Requirements,
5. Intensity of underburns.

3.13.4 Affected Environment

There are two known occurrences of the A-listed weed species spotted knapweed (*Centaurea maculosa*) in the analysis area. There are two known occurrences of B-listed weed species in the analysis area, tall whitetop (*Lepidium latifolium*), and Canada thistle (*Cirsium arvense*). Tall whitetop occurs in three sites and Canada thistle in six sites. There are two known occurrences of C-listed weed species field bindweed (*Convolvulus arvense*) in the analysis area. These occurrences are summarized in Table 2.9 in Chapter 2.

A-listed weeds: eradication or containment is required at the state or county level. The two spotted knapweed sites are located outside of the analysis area but both are along roads that may be used to access to the project. One site, CEMA4_003, is along county road 112 (forest road 175). It was visited by forest service botanists in September 2005. Only two plants were found and both were pulled. The second spotted knapweed site is along county road 126. It was visited by forest service botanists in July 2005 and no knapweed plants were found. Plumas county employees treated the site by hand pulling the weeds in 2004 (Tim Gibson personal communication). There is likely to be a seed bank in the soil, and the area will continue to be considered a noxious weed site. Both of these spotted knapweed sites will be revisited in summer of 2006, and mechanically treated as necessary. These sites will be flagged and avoided, and will not be disturbed by the Freeman project.

B-listed weeds: eradication or containment is at the discretion of the County Agricultural Commissioner. Three tall whitetop sites are located along county road 112 (forest road 175) at the north end of Lake Davis. They are not in treatment units but are along an access route. All three of these will be flagged and avoided and will not be disturbed by the Freeman project. They have been treated by hand pulling in 2004 and will be monitored and treated as necessary again in 2006.

Six sites of Canada thistle are known within the analysis area. None of these are located in a treatment unit or along access routes. One Canada thistle site (CIAR_054_001) is on forest road 24N13Y, and is less than one tenth of a mile from unit 62. This site will be flagged and avoided.

C-listed weeds: require eradication or containment only when found in a nursery or at the discretion of the County Agricultural Commissioner. Two sites of field bindweed are located in the project area along forest road 24N10. This weed is common throughout California. It does not pose a serious threat to wildland habitats (CDFA 2006). The County Agricultural Commissioner does not require treatment of this weed species.

Klamathweed can be found along most Forest Service roads on the Plumas National Forest that are not shaded by over-story canopy. Plants are usually scattered within the road prism, rarely forming dense stands or invading the adjacent forest. Plant distribution appears to be most heavily concentrated at the lower elevations (1000-4000 ft) with plants becoming less common at the higher elevations. The Freeman project area is generally above five thousand feet; therefore Klamathweed is far less common in the project area. The biological control agents *Chrysolina quadrigemina* and *C. hyperici*, leaf-feeding flea beetles and *Agrilus hyperici* a root-boring beetle largely control Klamathweed. These biological control agents have reduced infestations by 97% to 99% since 1940 (California Department of Food and Agriculture 2004). No other action is prescribed for controlling Klamathweed.

Bull thistle is common along most Forest Service roads on the Plumas National Forest. Like Klamath weed, bull thistle is found along roads that are not shaded. Bull thistle is most common in disturbed areas with little to no canopy cover. It was probably introduced in North America during colonial times. It is naturalized and widespread throughout North America and is on every other continent except Antarctica (Bossard 2000). Although not native, bull thistle plants provide forage for many native insect species. Butterflies and bees are frequently observed on these plants. Furthermore, it does not spread by rhizomes or other creeping roots and does not produce allelopathic chemicals like some other A and B rated noxious weeds (Bossard 2000). Two biocontrol insects (*Urophora stylata* and *Rhinocyllus conicus*) have been released and help reduce population levels. Bull thistle is widely distributed along PNF roads and other disturbed areas.

Overall, risk of noxious weed infestation resulting from the project is moderate. Although several occurrences of high priority species exist in the area, they all have very few individuals and have been previously treated. None are within treatment units. They will not be disturbed by project activities.

Vulnerability to noxious weed invasion and establishment is greatly influenced by plant cover, soil cover, and over-story shade. These factors vary widely across the project area. Wildland fire and logging are sources of disturbance that can greatly alter vulnerability to noxious weed invasion. Analysis of wildland fire, timber harvest, and thinning related disturbances occurring from 1995-2005 in the project area was done. No high intensity, stand replacing fires have occurred within this time frame. Several timber harvests have occurred in the area. There are ongoing recreational activities in the project area, including hunting and off-road vehicle riding. The area provides access to Lake Davis. The combination of current condition, ongoing activity, and moderate risk of wildfire result in a moderate vulnerability to noxious weed invasion in the project area.

Non-project dependent weed vectors include: roads, personal woodcutting, grazing allotments, commercial timber harvest in adjacent lands, and recreational activities including camping, hiking, horseback riding, and hunting. The areas at greatest risk in this proposed project area are those located next to roads. Roads provide dispersal of exotic species via three mechanisms: providing habitat by altering conditions, making invasion more likely by stressing or removing native species, and allowing easier movement by wild or human vectors. These factors contribute to a moderate risk of noxious weed invasion.

3.13.4.1 Environmental Consequences

Action Alternatives

Direct and Indirect Effects

Treatments are broken down into three types of treatments for the noxious weed assessment: high, medium and low. The “high disturbance” treatments are Mechanical thin/Groups (3,076 acres) and Aspen thin (233 acres). “Medium disturbance” treatments are: Mechanical /Hand Fuel Treatment (3,066 acres). “Low disturbance” Treatments are: Hand thin/Helicopter Thin (244 acres) and Underburn (2,807 maximum possible acres)

Mechanical thinning, group selection, and aspen thinning are considered as high disturbance treatments because the removal of canopy and amount of ground disturbance is greater than other treatment methods planned to be used in this project. These treatments create potential habitat for noxious weeds by removing canopy cover and disturbing soil. Soil disturbance associated with mechanized thinning may create conditions that favor the establishment of early seral (i.e. pioneer) species. Many noxious weeds are adapted to such environments. Mechanical thinning involves use of vehicles and equipment which can carry noxious weeds into the disturbed areas. Some native plant species will also colonize areas that have been highly disturbed. SOPs, including vehicle washing, are in place to prevent the introduction and spread of weeds (Appendix D).

Hand thinning operations result in much less disturbed soil. As a result this treatment is considered to have a decreased probability of establishing noxious weeds as compared to mechanical treatments.

Underburning in the mixed coniferous forest associated with the Freeman DFPZ/GS should not create environmental conditions favorable to noxious weed invasion. The prescribed underburns will occur in the spring or fall when fuel moisture levels, temperature, and humidity are favorable for a low intensity burn that will not completely remove the duff layer nor remove the canopy. Data suggest the degree of fire-induced disturbance is an important factor in post-fire noxious weed invasion. According to Crawford (cited in Keeley 2001), studies of high and low intensity burns showed that noxious weed invasion is favored when fire intensity is sufficient to open the canopy and destroy the litter layer. Also, Brooks et al (citing Keeley et al in preparation) explains how recent studies throughout the southern Sierra Nevada have shown cheatgrass (*Bromus tectorum*) invasions to be the most preditable in forest patches that were burned with high intensity. He explains that such impacts could be potentially more profound now due to unnaturally high fuel loads. A goal of the Freeman Project underburns is to reduce the unnaturally high fuel loads that would support a high intensity wildfire and result in favorable conditions to noxious weed invasion.

Soil disturbance associated with mechanized thinning, fireline construction, and road construction may create conditions that favor the establishment of early seral (i.e. pioneer) species. Many noxious weeds are adapted to such environments. Also, many native species such as *Lupinus* spp., *Ceanothus* spp., *Clarkia* spp., and many grasses readily establish in disturbed areas. Consequently, the creation of a disturbed area does not necessarily translate into the creation of habitat populated only by noxious weeds.

A second important element in noxious species establishment is sunlight. Keeley (2001) explains that most alien species are highly intolerant of shading. Fuels reduction treatments will maintain 40% canopy cover. This should help prevent the establishment of many invasive species that require high levels of sunlight.

There are high-priority weeds located in the analysis area. Each of these occurrences is very small, and they are few in number. They are not in treatment units and will not be disturbed by project activities. Control activities in 2004 have treated all tall whitetop infestations in the Freeman DFPZ/GS project area. Sites not treated were those that were not relocated in the 2004 field season. The spotted knapweed along the access route to the project area has been treated by hand pulling in 2004 and 2005. Continued hand-pulling and monitoring of weed populations is planned for 2006 field season.

The cost to control these small infestations is relatively small. A catastrophic wildfire could create conditions that would favor a broad scale infestation that would be difficult and expensive to control. The Freeman DFPZ/GS project would reduce the threat of catastrophic wildfires, and may promote the establishment of native species that have coevolved with frequent low-intensity fires in this region of the Sierra Nevada Mountains.

The implementation of the Freeman project is predicted to result in a low potential for weed introduction and spread if all SOPs are adopted, and all road decommissioning and closure is implemented. If no noxious weed SOPs are incorporated into the project it is likely that new weeds will be introduced and become established in project created suitable habitat. SOPs and the design of the Proposed Action would decrease the risk associated with habitat alteration expected as a result of the project and increased vectors as a result of project implementation. Habitat vulnerability and non-project dependent vectors would not be changed by the SOPs. However, monitoring during project implementation and post project, avoidance of known sites, and treatment of any weed populations discovered during implementation will greatly reduce the chances of an uncontrollable spread of weeds in the project area.

Application of borax is highly unlikely to create habitat for noxious weeds. An accidental spill may create potential habitat for noxious weeds by killing vegetation. Known infestations of noxious weeds are mitigated by avoidance during or removal before project activity. An accidental spill would most likely be very small and would affect a very small area.

The overall risk of noxious weed establishment as a result of Freeman project implementation is moderate. Based on the following:

1. Mapping of noxious weed species,
2. Small size of existing known populations,
3. Continued treatment of known populations,
4. Standard Operating Procedures (or Standard Management Requirements) and
5. Low intensity underburns.

The Freeman project will result in ecological and economic benefits. While the project poses a risk of noxious weed spread and establishment, these risks are minimized by the SOPs discussed above. The overall net benefits of the Freeman project are likely lead to reduced future risk of noxious weed establishment in much of the project area. These benefits include promoting native plant communities (i.e. aspen communities) and reducing risk of catastrophic fire.

Cumulative Effects

The effect of past activities on noxious weed species in the analysis area is largely unknown. The earliest record of noxious weeds in the project area is from 2000. In general, the lack of information makes it very difficult to draw definitive conclusions regarding the effects of past project activities on noxious weed introduction and spread.

While it is often difficult to make conclusions regarding the effects of past activities on noxious weed introduction and spread, the presence of noxious weeds suggests that past activities have had an effect. Previous timber harvests have created habitat for noxious weeds. The group select treatment method will add to this potential habitat. If noxious weeds were to be brought into the project area it is possible that these potential habitats will be infested.

No-action Alternative

Direct,Indirect and Cumulative Effects

If No-action is taken the risk of noxious weed infestation will be low. Non-proposed action dependent factors will not change. These include: inventory, known noxious weeds, non-project dependent vectors (e.g. recreationalists, woodcutters, vehicle traffic), and existing habitat vulnerability. Inventory and control activities would continue as part of the part of the PNF noxious weed program.

However, the absence of treatment could lead to an increased risk of catastrophic wildfire and degraded aspen communities. These results can indirectly increase risk of noxious weed infestation.

3.14 Recreation and Visual Quality Effects

3.14.1 Introduction

The following aaessment is summarized from the recreation report for the Freeman Project, which is incorporated here by reference (USFS PNF BRD 2006i). The Freeman project has areas within the Lake Davis Recreation Area. The recreation analysis includes the effects of this project on recreationalists, the facilities and the roads within the Recreation Area. The Lake Davis east side recreation sites are within the project area. The short term and long term effects as well as benefits are included in the analysis.

A portion of the project is under the LRMP prescriptions of visual retention. Visual retention requires the maintenance of a natural-appearing landscape where management and other activities are generally not evident to the casual forest visitor. Areas just beyond the visual retention zone are classified as visual partial retention where activities must remain visually subordinate to the characteristic landscape.

3.14.2 Summary of the Effects

3.14.2.1 Action Alternatives (Proposed Action)

The general effects for all the Action Alternatives are similar in their effects on recreation. With all Action Alternatives the locations of the proposed area thin treatments are adjacent to the fishing access and boat launch roads.

Thinning activities would have a beneficial effect of reducing the risk of wildfire and aesthetically cleaning up the stands of trees. These values promote and benefit recreation. However, for all action alternatives the logging activity may have short term impacts including traffic and noise. This could discourage people from coming to recreate at Lake Davis or cause them to leave the area early. Reduced tourism could have a negative effect on community economic stability. Part of this project is to burn residue slash. The smoke from burning would affect the air quality in the Recreation Area. Some people may leave the area because of smoke.

Proposed road work will reconstruct current roads to provide better access while closures of resource damaging roads may reduce access for Off Highway Vehicle (OHV) users. Decisions regarding the transportation system are being coordinated with ongoing planning for the Travel Management Rule. The 24N10 road will be chip sealed to the Camp 5 road in the summer of 2006. This road and other fishing access roads may be damaged by the heavy equipment. The chipseal surface would be damaged if logging occurs during wet winter conditions.

For all Action Alternatives, the treatment of aspen will enhance recreation. Alternative 1 may have a short term detrimental effect due to the variable width extended treatment zone. Aspen treatment in alternatives 3 and 4 will have very similar effects on recreation.

If winter logging occurs and roads are plowed for access this would impact recreation opportunities, such as snowmobiling and skiing. There are currently two winter recreation events at Lake Davis, a snowmobile poker run and dog sled races.

3.14.2.2 Alternative 2 (No-action Alternative)

The No-action Alternative 2 would not reduce the risk of fire or improve stand health. A fire or tree mortality from over stocking would destroy the forest around the lake. This would greatly reduce the visual quality of the Recreation Area. However, the lack of thinning and its associated activities such as logging traffic or slash burning would not have a negative impact on recreation.

Alternative 2 would not treat any aspen. This would have a short-term positive effect because there would not be any gaps in aspen stands from conifer removal. However, the long-term effect would be negative as aspen stands decline over time.

There would be no changes to the transportation in the No-action Alternative.

3.14.3 Scope of the Analysis

Geographic Analysis Area: The geographic boundary for the cumulative effects analysis is the Freeman Project Area and the boundary of the Lake Davis Recreation Area. The rationale for this boundary is that the effects of noise, traffic, smoke and scenic values would easily occur across the lake impacting the Recreation Area.

Timeframe of Analysis: In the analysis of the Proposed Action, current ongoing actions and reasonably foreseeable actions were considered. The existing condition encompasses the past history of man including the lake, all the facilities and the use levels. These were incorporated in the analysis for the existing environment. The timeframe that these cumulative effects would impact recreation is during the project and for a few years beyond its completion. During the actual project implementation there will be disturbance from logging and follow up burning. Visual effects from treatment may linger for several years and may include such things as skid trails, burn piles and charring from underburning remain visible.

3.14.4 Analysis Methodology

Camping use numbers were from the campground concessionaire’s use and revenue reports. These numbers are relatively accurate because they are tracked regularly. The numbers used for the day use facilities are from the Forest Service Meaningful Measures information. These numbers are estimates from visual observations when site visits are made. The Plumas National Forest Land and Resource Management Plan give general direction on managing the Recreation Areas. Recreation Area maps were used for boundaries. Other information comes from the professional judgment of the District recreation staff.

3.14.5 Affected Environment

The Lake Davis Recreation Area is a major recreation destination on the Plumas National Forest. The lake and its facilities are very popular with recreation visitors and local residents. The lake is well known throughout California for its excellent fishing opportunities. The Recreation Area includes: Three family campgrounds with a total of 186 family sites; an undeveloped overflow camping area; four boat launches with parking lots and accessible toilets; nine fishing access sites; one dump station; and an information kiosk. Lake Davis Recreation Area is operated by concessionaire under a special use permit. Approximately 260,000 visitors come to Lake Davis each year. Recreational opportunities include camping, hiking, boating, fishing, swimming, biking, wildlife watching and picnicking. Winter recreation includes ice fishing, cross country skiing, ice skating, snowmobiling, sled dog racing and snow play.

Developed sites within the project area include: Eagle Point, Jenkins Point, Cow Creek, Big Grizzly and Freeman Creek Fishing Accesses, as well as Old Camp five boat launch facility. These are all day use sites and they are only closed by weather.

Eagle Point Fishing Access, road 23N10Y, has a graveled surface. Other improvements include a vault toilet and barriers to keep the public from driving off road. Use capacity at this site is 42 Persons At One Time (PAOT). It is estimated that: 82 days is high use with 40% occupancy; 9 days holidays with 70% occupancy; 120 days moderate shoulder with 30% occupancy; and 154 days low with 5% occupancy.

Jenkins Point Fishing Access, road 24N70Y is a native surface road. The road is in poor condition but use at this site is high with 5 to 15 vehicles most weekends and 1 to 5 vehicles during the week. This area is closed during the winter by snow.

Cow Creek Fishing Accesses, road 24N10B, has graveled surface to where the road splits and then is native surface on both spurs beyond this. On road 24N10B a vault toilet is at the end of the access. The road 24N10B1 is scheduled for reconstruction with this project. Use capacity at this site is 100 PAOT’s. It is estimated that: 42 days is high season with 60% occupancy; 9 days holidays with 80% occupancy; 164 days moderate with 20% occupancy and 150 days low/closed with 0% occupancy.

Freeman Fishing Access, road 24N79Y has a graveled surface. This site ends at Freeman Creek with a short hike to the lake. This site is not used very much because of the distance from the lake.

Big Grizzly Fishing Access, road 24N84X is native surface and provides parking and access to the Grizzly Creek for fishing. This site has only moderate use.

Old Camp five boat launch has a paved access road 23N13Y, paved parking with an accessible fishing levy, boat ramp, dock, bulletin board and toilet building. This site is very popular with the public, with fishing and boating being the main activities. Use capacity for this site is 88 PAOT’s. It is estimated that: 92 days are high use with 45% occupancy; 9 days holiday with 75% occupancy 120 days moderate with 30% occupancy and 144 days low/closed with 0%

occupancy. This boat ramp is one of two that can operate when the lake has low water. Use here is expected to increase when the 24N10 road is chip sealed in the summer of 2006.

In June the Rotary Club sponsors a fishing derby at Lake Davis. This annual recreation event was designed to highlight fishing at the lake after the first treatment for Northern Pike. This event has occurred since 1999 and it is expected to continue into the future.

Most of the recreational use outside the recreation area is dispersed activities that include hiking, horseback riding, mountain biking, Christmas Tree cutting, dirt biking, pleasure driving, ATV riding, wildlife watching, hunting, fishing, camping, firewood gathering.

During the winter Lake Davis is also used by recreationalists. It is identified as a winter snowmobile area, with marked trails. These trails are not groomed, but they include the road around the lake, 24N07 to 24N12 loop and the Jackson Creek Trail. In February the Rotary Club holds a snowmobile poker run, using some of the roads within the project area. This annual recreation event has been occurring for at least ten years. Another recreation event that occurs at Lake Davis is the Dog Sled Races. In the past this occurred on the 24N10 road, but last year the event was moved to Honker Cove and the County Road 112.

3.14.6 Environmental Consequences

3.14.6.1 Action Alternatives

Direct and Indirect Effects

Reduce Hazardous Fuels and Improve Forest Health

With all Action Alternatives the locations of the proposed area thin treatments are adjacent to the fishing access and boat launch roads. This would have a beneficial effect of reducing the risk of wildfire and aesthetically cleaning up the stands of trees. Improving Forest Health would insure that this area remains well stocked and pristine. These values promote and benefit recreation.

Part of this project is to burn residue slash. The smoke from burning would effect the air quality in the Recreation Area. The timing that the burning occurred would determine how much of an impact this had. The recreation season starts Memorial Day weekend and continues through Labor Day weekend. June and July are the most popular months at the lake. Although there is a substantial amount of day use mid April through May there is not as much overnight activity. Some people may leave the area because of smoke. To minimize these effects burning should occur before Memorial Day and not on weekends.

The treatments proposed in all of the action alternatives will be minimized because the effects on visual quality with landing and skid trail layout are designed to move material away from the visually sensitive road. Stumps will also be cut low.

Improve Bald Eagle Habitat

For all Action Alternatives improving Bald Eagle Habitat may increase numbers of eagles at Lake Davis. This would have minimal direct effect on Recreation.

Contribute to the Economic Stability of the Local Community

For all action alternatives if the logging activity discourages people from coming to recreate at Lake Davis this could have a negative effect on community economic stability. Tourism is an important part of the economy of Plumas County. Many people would choose to stay and shop in these communities while visiting Lake Davis. Any actions that may turn visitors away, causing them to leave early or not even come to the area could effect tourism dollars, therefore economic stability.

Improve Aspen Stands

Improving Aspen stands would benefit recreation because of the opportunity to view fall colors. The Proposed Action Alternative 1 would benefit the Aspen stands the greatest but would not be as aesthetically appealing because of the large clearings around the stand. Both Alternative 3 and 4 improve Aspen stands but are more aesthetically appealing because they do not cut the buffer zone around the Aspen stand.

Provide Access Needed to Meet Other Project Objectives and Reduce Transportation System Impacts

With all Action Alternatives, the increased high use of logging trucks would change the recreational values for persons seeking recreation opportunities during this time period. Logging trucks, heavy equipment, and water trucks would increase the potential hazards encountered by users of the road system. The 24N10 road is wide enough for two way traffic. Other fishing access roads are not wide enough for two way traffic and require pulling over for passage. Mitigation for this would be to sign roads for logging truck traffic. Any road closures on the 24N10 road or fishing accesses would impact users. Closures should be minimized as much as possible to reduce impacts. Weekend closures should be avoided. Fishing access roads are used most heavily in the spring and fall. Heavy equipment on both the 24N10 road and fishing accesses may damage road surfaces. The 24N10 road from the intersection with West St. to Old Camp 5 Boat Launch is scheduled to have a chipseal surface installed in the summer of 2006. This was a Capital Investment Program grant to enhance recreation, specifically boating at Old Camp 5. To mitigate the impacts of heavy equipment on these roads, the contract should require any damage to the roads be fixed, with a surface replacement clause in the contract. If winter logging occurs this would have a more serious impact on the chipseal surface. Chip seal is not designed to be plowed and have heavy equipment traffic during the wet winter months.

Noise levels from the equipment would be elevated which may have an effect on individuals that are recreating in the area. This would probably be loud enough to carry outside the project area across the lake to the campgrounds. The noise could cause visitors to leave the Recreation

Area early because their experience is being impacted. Some wildlife limited operating periods (LOP) may help recreation by prohibiting activity until later in August and September, when use is lower. However the area between Old Camp 5 Boat Launch and beyond the 24N71Y road has no LOP. Therefore activity could occur during the peak summer months. To minimize some of the impacts of the noise on the recreation area, early morning starts and weekend operations should be avoided.

Decisions regarding the transportation system are being coordinated with ongoing planning for designation of Off-highway vehicle routes. Justification for closing or decommissioning certain roads before the completion of the forest wide OHV analysis process has been documented in the Proposed Action. Road decommissioning or closures within the Recreation Area include: 24N71Y, 24N84X and a non-system spur off the Cow Creek Fishing Access 24N10B. Road 24N71Y has been closed for at least eight years with no public access. Road 24N84X is the Grizzly Creek Fishing Access road; this road is approximately ¼-mile and ends in a parking area. The parking area has barrier posts around it closing the remainder of the road. The beginning ¼-mile portion of the road would be reconstructed. The remainder of the road would remain closed leaving a trail for foot travel along the creek. The non system road off the cow creek road is a short spur that dead ends. This site is not used very often by the public because it is a long hike to the lake. Decommissioning this road would have minimal impact on public access.

Other transportation projects within the Recreation Area include the rerouting and reconstruction of 24N70Y. This road goes thru an archaeological site and is in poor condition. The public has complained about the condition of this road for years. However because of the archaeological site and lack of funds few improvements have occurred. Rerouting and reconstructing it would benefit recreation opportunities. The 24N10B1 spur road may be reconstructed with this project. This is a popular fishing access that gets very muddy during the spring and fall. Spring and fall are optimum times for fishing. Therefore reconstruction would benefit recreation opportunities.

Outside the Recreation Area 23N16Y will be closed to motorized vehicles but will remain open to non motorized use, including leaving the existing roadbed for a single track non-motorized trail. This would benefit recreation opportunities providing much needed trails in this area. All other roads that will be decommissioned are small spurs that did not go anywhere or roads that were causing egregious resource damage. Decommissioning these roads would have minimal impacts on public access.

Indirect Effects

Reduce Hazardous Fuels and Improve Forest Health

The thinning of trees along the Fishing Access roads will open up the stand and allow enough space for vehicles to drive off road. It is against regulations to drive off road in a developed recreation area. In order to prevent this from occurring during this treatment a buffer of trees would be left along the roads keeping the spacing too tight for vehicle traffic.

Improve Bald Eagle Habitat

For all action alternatives improving Bald Eagle Habitat may increase numbers of eagles at Lake Davis. If more eagles were at the lake this would offer the public more opportunities to see them when bird watching or participating in other activities. However more nesting eagles may lead to more restrictions on recreation development and activities. This could limit future expansion and would have an indirect effect on Recreation.

Contribute to the Economic Stability of the Local Community

For all action alternatives having viable communities would benefit recreation. Many people would choose to stay and shop in these communities while visiting Lake Davis. Without these services individuals may choose not to come to this area.

Improve Aspen Stands

Encouraging tourism in the fall to see the trees turn colors is one of the goals of the Plumas County Visitors Bureau. As these Aspen stands grow and offer more opportunities for viewing fall colors, which benefits recreation.

Provide Access Needed to Meet Other Project Objectives and Reduce Transportation System Impacts

Some members of the public may be upset with the closing of roads before the completion of the forest wide OHV analysis process. At initial meetings with the public they were told that roads would be closed after they had been through the process not before.

Cumulative Effects

Present projects around the lake which will occur in the summer of 2006 include the Chip sealing of the 24N10 road, the water and toilet improvements at Lightning Tree Campground and the rerouting and graveling of the Bluff Cove Fishing Access road. All these projects benefit recreation. The 24N10 widening and chip sealing will occur from the intersection with West St. to the Old Camp 5 turnoff. An Environmental Assessment and Decision Notice were completed for this project. The improvements at Lightning Tree Campground will include developing a water system and installing toilets. An Environmental Assessment and Decision Notice were completed for this project. The Bluff Cove Fishing Access improvements will reroute and gravel the existing access and close all unnecessary portions of the road. An Environmental Assessment and Decision Notice were completed for this project.

A future projects is the Lake Davis Pike Eradication Project by the California Department of Fish and Game (CDFG) which will have cumulative impacts on recreation. Pike are a nonnative invasive fish species illegally introduced to California. In 1994 Pike were discovered in Lake Davis. In 1997 a chemical treatment was conducted to remove pike from Lake Davis and its tributary streams. Pike were rediscovered in Lake Davis in May 1999. In 2000 the CDFG and the Lake Davis Steering Committee developed a management plan to suppress the pike population, contain it within Lake Davis and to remove as many pike as possible from the reservoir. In September 2003 CDFG evaluated the previous 31/2 years of pike removal and data indicated pike numbers continued to increase in spite of the concerted control efforts. The Forest Service in cooperation with CDFG is preparing a joint Environmental Impact Statement and Environmental Impact Report to eradicate northern pike from Lake Davis and its tributaries, with a proposed date of fall 2007. The treatment that occurred in 1997 had a significant impact on recreation, reducing the number of campers from 26,145 in 1997 to 19,702 in 1998 (accurate numbers are only available for camping). Camper use remained low in 1999 (20,524) and then started to increase. Use for 2000 and 2001 showed higher levels than 1997 with 38,854 and 30,746 respectfully. Use has decreased since 200l: in 2002 there were 24,668 campers; 2003 had 14,853; 2004 had 21,925; and 2005 had 21,569. The fluctuation in use numbers is caused in some part by the negative publicity surrounding the lake. Also lake levels have been lower due to weather and the need to keep it from spilling over the dam. It is anticipated that if draining and treating the lake does occur, use will drop significantly.

An Environmental Assessment and Decision Notice have been completed to install toilets at the end of the Freeman Fishing Access, road 24N74Y, and Fairview Point Fishing Access, road 24N55Y, but funding to complete this project is still being pursued.

The Off Highway Vehicle (OHV) Route Designation process is also occurring. This process has identified and mapped OHV routes. This includes system roads as well as non system roads and user created routes. This information will be analyzed to determine which routes will be included in the OHV route system. An EIS is going to be prepared for this process and it is scheduled to be completed by December 2008. The Freeman project area has routes identified within it.

There are also future plans to upgrade the parking area at Old Camp 5 boat ramp. The actual proposal for this plan has not been developed to analyze the effects. Prior to implementation the planned parking area upgrade will be analyzed, including cumulative effects.

3.14.6.2 Alternative 2 (No-action)

Direct and Indirect Effects

Reduce Hazardous Fuels and Improve Forest Health

The No-action Alternative 2 would not reduce the risk of fire or improve stand health. A fire or tree mortality from over stocking would destroy the forest around the lake. This would greatly reduce the visual quality of the Recreation Area.

Improve Bald Eagle Habitat

The No-action Alternative 2 would not improve Bald Eagle habitat. This would have little effect on recreation. Two pair of eagles already nest at the lake and are often observed by the public

Contribute to the Economic Stability of the Local Community

The No-action Alternative would not have a direct effect on recreation. However, since Alternative 2 would not contribute to economic stability, tourism would be indirectly affected by a potential lack of available service.

Improve Aspen Stands

The No-action Alternative would not remove any aspen. There would not be any direct aesthetic impacts to visitors viewing the aspen foliage change in the fall. However, over time, these aspen stands would ultimately be overtopped by conifer competition. Future visitors would have decreased opportunities to view aspen foliage changes in the fall.

Provide Access Needed to Meet Other Project Objectives and Reduce Transportation System Impacts

The No-action Alternative would not have any direct or indirect effects on recreation.

3.15 Range Effects

3.15.1 Introduction

The following assessment is summarized from the range effects report for the Freeman Project, which is incorporated here by reference (USFS PNF BRD 2006h). Livestock grazing is authorized in the Freeman project area. Livestock grazing permits are issued for a ten-year period on specific portions of the project area. An analysis conducted according to the National Environmental Policy Act (NEPA) is required in order to ensure that the Freeman Project Purpose and Needs do not conflict with Range as a Resource.

3.15.2 Summary of Effects

3.15.2.1 Action Alternatives

The general effects for all the Action Alternatives are similar in their effects on range. Livestock may experience stress from being moved to avoid conflicts with project activities. Range improvements such as fencing and water trough maintenance may be impacted by project implementation. Permittees may also experience some short term inconvenience as they attempt to coordinate with project implementation activities.

3.15.2.2 Alternative 2 (No-action)

The range resource would be unaffected by the No-action Alternative. Livestock grazing activities by the permittees would remain the same.

3.15.3 Scope of Analysis

Geographic Analysis Area: The cumulative effects analysis for range includes the land area encompassing all the allotments in or partially within the project area. The area of cumulative effects analysis was bounded in this manner because: 1) all range permits are organized by the ‘allotment’. The allotments are referred to by name in the Forest Plan and are mapped in GIS layers. 2) Project activities; Rx burn, logging, on one part of the allotment effect livestock management on the rest of the allotment in the Annual Operating instructions.

Timeframe of Analysis: In assessing cumulative effects for Range, impacts of past actions were included for actions implemented since 2001. Actions preceding that date were not included because the 2001 Sierra Nevada Forest Plan Amendment (SNFPA) required consistent year end use monitoring at Key Areas. Prior to 2001, use monitoring is sporadic in the 2,210 allotment folders at the Beckwourth Ranger District. Similarly, impacts of reasonably foreseeable actions were not included beyond the length of the 10 year term grazing permit and the reason for not analyzing cumulative effects beyond that year is the Term grazing Permit is the document which authorizes grazing on the allotment.

3.15.4 Analysis Methodology

Several types of Range monitoring have been conducted over the years. The data is stored in the 2230 Allotment folders at the Beckwourth Ranger District. Annual monitoring may include range readiness, permit compliance checks and year end use checks. Year end use for the past five years is summarized in Appendix 2 of the Range Report. A GIS layer of the Key Areas is located on the Plumas National Forest (PND) GIS database. Long term monitoring includes 1960's Parker Three Step condition and trend monitoring, Wiexleman's Long term Meadow Monitoring and Froli's Rapid Assessment of Meadow Condition and Trend. Vegetation type mapping was done for each allotment in the 1960s. A GIS layer was created from the 2230 allotment folders and show primary range and vegetation types. Those GIS layers are stored are also stored in the PNF GIS database.

3.15.5 Affected Environment

The Range resource consists of the permittee, their permitted livestock and the allotment. The allotment includes range improvements such as fences, gates and cattle guards, forage and livestock water sources. The Plumas National Forest sells forage and water to the permittee for his permitted livestock, per the standards and guides in the 1988 Plumas National Forest Land and Resource Management Plan as amended by the 2004 Sierra Nevada Forest plan Amendment. This Range analysis reports on the impact of the proposed action and alternatives to the permittee; his permitted livestock; and the allotment. This range analysis report does not analyze the impacts of the cows to the vegetation, hydrology, wildlife, heritage, or recreation resources, although livestock use is considered in some of the cumulative effects analyses done for the Freeman project. Livestock impacts to the other resource areas will be discussed in detail in upcoming Forest-wide Range NEPA analyses. Allotments in the Freeman area are scheduled for analysis later in 2006, with a decision expected by the summer of 2007.

There are portions of four allotments within the Freeman project area. Those allotments are:

- Grizzly Valley
- Grizzly Valley Community
- Long Valley
- Humbug.

Grizzly Valley Allotment has one permittee. The allotment is managed with a three pasture rotation system. There are 505 pair permitted cattle cow-calf pair from June 16 to September 15th. Grizzly Valley Allotment borders Lake Davis on three side, the north, south and west. Pastures were designed with fences running northeast so all three pastures have access to Lake Davis. Livestock are moved with cowboys on horseback through all three pastures in a rotation system. A rotation system means all cattle are in one pasture for about a month then all cattle are moved to the next pasture when use standards are met. Livestock moves and use standards are pre-planned each spring between the Forest Service Range Manager (Range Conservationist) and the rancher (permittee). The plan is called an 'Annual Operating Instruction' and is approved by the District Ranger each year prior to livestock being turned out onto the forest. Grizzly Valley Allotment is unique on the forest with the number of meadows, with creeks running through them, pockets of aspen, and views of Lake Davis. All pastures are timbered with most of the grazing occurring in the meadows.

Grizzly Valley Community Allotment has two separate permittees with a three pasture rotation system with 277 cattle cow/calf pair permitted from June 16th to September 15th running together on a community allotment. Grizzly Valley Community Allotment has one large meadow divided into two pastures. All pastures are timbered.

Long Valley Allotment is currently vacant. It is a sheep allotment that was last grazed in 1993 with 600 dry ewes from June 18th to July 24th. It is timbered with a few riparian stringers.

Humbug Allotment has one permittee with season long grazing with 95 cattle cow/calf pair permitted from June 1st to August 1st. Dan Blough is a nice meadow in the northwest corner of the allotment. The majority of the allotment is timbered. Cattle are fenced off from access to Lake Davis by the Holding Field Pasture of the Grizzly Valley Allotment.

3.15.5.1 Historic

Grazing has occurred on these allotments since the 1870's prior to the establishment of the Plumas National Forest in 1905. Actual use records are maintained in the 2210 allotment folders in the Beckwourth Ranger District. Current grazing is at its lowest compared to historic use.

Three of the permittees on the active allotments are small family ranches whose grandparents homesteaded the area. One permittee is a larger operator who runs on adjoining BLM and Forest permits. All four permittees run ranches where cattle and livestock are the main business.

3.15.6 Environmental Consequences

3.15.6.1 Action Alternatives

All Action alternatives are expected to have similar impacts to the range resource.

Direct Effects

The permittee may have to actively schedule moves between allotment pastures in order to keep livestock away from active timber falling operations, haul routes and prescribed burns.

Livestock may have increased stress with changed rotations. Although livestock generally tend to avoid areas where trees are being felled, they could be hit by logging traffic. Coordination with the permittees in advance and requiring timber operators to drive at reduced speeds within primary range in active allotments should reduce potential cow/vehicle collisions.

Although range improvements are required to be protected from the proposed activities, there is possibility of accidental damage. Any damage incurred would be repaired (Appendix D).

Indirect Effects

The permittee may need to defer grazing within some prescribed fire units until after seed set the year following the burn. The Forest Service Prescribed Burn should coordinate with the Forest Service Range Conservationist each spring to know which prescribe burn units are proposed to be prescribed burned that year. The Forest Service Range Conservationist would schedule those prescribe burn unit into the Annual Operating Instructions. The permittee may have to adjust cattle pasture rotations from previous years to accommodate the prescribed burns.

The allotment may need additional fencing if the vegetation treated under Freeman creates new unexpected travel routes for the cows. If additional fences are built, additional expenses will be incurred by the permittee.

Understory grass species may increase in species abundance and pounds per acre as a result of reduced conifer competition through thinning. The silvicultural practice of thinning trees and allowing a temporary successional increase in grass in the Range program is called creating ‘transitory range’. No increases in permitted animal unit months (AUM) are proposed with this project. The indirect effect would be existing livestock use would be diffused over a larger area.

Cumulative Effects

Past Actions

In order to understand the contribution of past actions to the cumulative effects of the proposed action and alternatives, this analysis relies on current environmental conditions as a proxy for the impacts of past actions. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects. For a list of past actions, see Appendix E of the Freeman DEIS.

Present Actions

Present actions include the Annual Operating Instructions from last year, 2005 and the upcoming Annual Operating Instructions for the coming grazing season in 2006.

Future Actions

Although forage may increase after Freeman removes competing conifer vegetation, there are currently no intentions to increase the AUMs. Any increase in forage is expected to distribute existing use throughout the allotments.

Cumulative Effects

Cumulative effects to the permitted livestock with disturbance, whether from Freeman , Grizz DFPZ/GS/ITS, Cut Off DFPZ Mt Ingalls DFPZ and the future maintenance of DFPZ and WUI in the area, increase in recreation and fuelwood gathering include stress that tend to make the cows more nervous, high strung and harder to gather in the fall.

The rotenone treatment may impact water sources for livestock. Alternative watering sites or sources may need to be provided in the Pike Project depending upon the label restrictions for livestock watering.

Herbicide treatments of noxious weeds should have no adverse effect on cattle by following the label. Herbicides are designed to act on plants, not animals. Noxious weed sites are few and low in acres infested. Herbicide treatment should be minimal.

Fisheries culvert replacement and Recreation boating area tree removal 23N10Y should have no adverse impact on the allotment.

The creation of 7 Great Grey Owl nest sites should have no adverse impact on the allotments because PACs have already been identified with their residual cover standard from the 2004 Sierra Nevada Forest Plan Amendment. No additional PACs are planned with the creation of nest sites.

3.15.6.2 Alternative 2 (No-action)

Direct Effects

Permitees would experience no short-term inconvenience from vegetation management activities. Livestock would not be stressed by project activities.

Indirect Effects

None anticipated.

3.16 Heritage Resource Effects

3.16.1 Introduction

The following assessment is summarized from the heritage resource compliance for the environmental analysis of the Freeman Project, incorporated here by reference (USFS PNF BRD 2006e). Cultural objects, historic structures and buildings, and archaeological sites are the material remains of our national heritage. Together they are known as heritage or cultural resources. The Plumas National Forest is responsible for, and committed to, protecting and managing these nonrenewable resources for current and future generations to understand and enjoy.

3.16.2 Summary of Effects

3.16.2.1 Action Alternatives

The SOPs would be followed during implementation of any of the action alternatives. Archaeological site boundaries are flagged and sites would be avoided during project implementation, therefore there would be no effect on heritage resources.

3.16.2.2 Alternative 2 (No-action)

With no proposed activity, there would be no effect to heritage resources.

3.16.3 Scope of the Analysis

Geographic Analysis Area: The heritage resources geographic analysis area is the same as the Freeman project area. This boundary was chosen because sites within the project area would be protected during the implementation of any of the action activities.

Timeframe of Analysis: The temporal boundary is determined by the life of the project. This boundary was chosen because sites within the project area would be protected during the implementation of any of the action activities.

3.16.4 Analysis Methodology

Three levels of analysis were completed to understand the significant themes and extent of heritage resources within the Freeman project area. First, research into the larger geographic history relevant to the project area was conducted to understand historic themes or events that have transpired in time and space. This information is presented in the following section, Affected Environment. Next, heritage resource field surveys were conducted to identify cultural properties. Information on these surveys will be presented. Then, finally the amount and types of archaeological sites within the project area are discussed.

The great majority of the project area had already been previously surveyed and the remaining area was surveyed for this project. A total of 13,990 acres were surveyed for thirty-one earlier projects. The remaining 977 acres of the Freeman project area were surveyed during the field seasons of 2004 and 2005. The entire project area has been surveyed and all identified cultural resources have been recorded.

There are a total of one hundred known archaeological sites within the Freeman project area, which includes nine new sites that were discovered during field surveys. Sixty of the sites are classified as prehistoric. These consist of campsites, food processing stations, and tool production stations, primarily exhibiting flaked stone artifacts. Twenty-six of the sites are historic. These sites include historic habitation areas, a saw mill site, sheep camps, arborglyphs (carvings on aspen tress), ditches, Feather River Lumber Company railroad grades, and the Beckwourth Emigrant Trail. There are also fourteen multicomponent sites. Multicomponent sites contain cultural material from both the prehistoric and historic time periods.

All known archaeological sites within the Freeman project area of potential affect, were field visited and site boundaries were flagged. One observation made during fieldwork was the mortality of aspen trees. Historically Basque sheepherders carved names, dates, and the region of their origin on aspen trees (Mallea-Olaetxe 2001). Historic carving dates range from the early 1900s to the mid 1950s. However, even later carvings have been observed. It is common for the carvings from the early 1900s to be illegible or simply gone from the archaeological record due to the average 100-year life span of aspen trees. It is also common to see trees that have carved dates from the 1940s where trees are dead or dying. Monitoring of these sites indicated that there was almost always at least one, often more, aspen trees with carvings that had died. The carvings were either no longer legible, the bark had fallen off, or part or the entire tree had fallen down. The loss of these precious heritage resources highlights the decline of health of aspen stands within the project area.

3.16.5 Affected Environment

Three levels of analysis were completed to understand the significant themes and extent of heritage resources within the Freeman project area. First, research into the larger geographic history relevant to the project area was conducted to understand historic themes or events that have transpired in time and space. Next, heritage resource field surveys were conducted to identify cultural properties. Information on these surveys will be presented. Then, finally the amount and types of archaeological sites within the project area are discussed.

History of the Freeman Project Area

The cultural history of the Freeman project area has implications to both the cultural and environmental existing condition of the Freeman Project Area. The following discussion is presented in three brief sections. First general information about the prehistoric period will be reviewed, then the ethnographic period is presented, and finally the historical period is discussed.

Prehistoric Period

Very few intensive archaeological research projects have been completed on the Plumas National Forest. Due to this lack of data, archaeological information from nearby regions is relied upon therefore information on prehistory presented below considers a larger geographic area than the Freeman project boundaries.

Based on evidence from the eastern Sierra Nevada, Elston (1986) proposed that human occupation of the region spanned from the Early Holocene (ca. 8,000 BC) to the present time. Prehistoric cultural complexes which have been documented for the northern Sierra Nevada mountains are the Tahoe Reach (8,000-6,000 BC), Spooner (5,000-2,000 BC), Martis (2,000 BC-AD 500), Kings Beach (AD 500- 1850), and Historic (after 1850) (Kowta 1988, Moratto 1984).

The Tahoe Reach Complex dates to the early Holocene when the environment was in a warming trend after the last ice age (Wallace 1978). The most notable artifacts of this time in this region are large Parman projectile points (Moratto 1984). Other diagnostic artifacts of this cultural complex include basalt bifaces, crescents, and scrapers. Cultural material from this time period remains sparse, which may demonstrate a small human population (PAR Environmental Services 1996).

The Spooner cultural Complex is thought to mark the initial occupation of the high Sierras (PAR 1996, Moratto 1984). There was still a general warming and drying of the environment evident during periods when Lake Tahoe did not overflow. Characteristic artifacts of this cultural complex are large basalt projectile points, milling stones, manos, and unshaped pestles. There are not many significant differences between the Spooner and Martis Complexes.

The Martis Complex is further broken down into the Early (2,000-1,500BC), Middle (1,500 -500BC), and Late (500 BC-AD 500) Complexes. It is believed that the Martis Complex is "represented on both sides of the Sierran crest from south of Lake Tahoe northward to the south end of Honey Lake" (Kowta 1988). Projectile points, scraping, and cutting tools, most commonly made of basalt, demonstrate the importance of hunting large and small game. Diagnostic projectile points include contracting stemmed, corner-notched, eared, and large side notched points. Seed grinding tools, the milling stone and mano, are also present. Mortars and pestles, associated with acorn and larger seed grinding, show up later in the Martis complex. Areas revisited or occupied over a long period of time had a wide variety and quantity of artifacts, which included bedrock milling features and midden (dark colored culturally affected soil). Population size increases are evident in the size of permanent base camps and winter settlements (PAR 1996). Evidence of circular houses with sunken floors also appear in the archaeological record during this time.

The Kings Beach Complex is also further broken down into Early (AD 500- 1,200) and Late (AD 1,200 – historic) Complexes (Kowta 1988). Smaller and lighter projectile points are more commonly made of chert, jasper, and obsidian and demonstrate the introduction of the bow and arrow (Moratto 1984). Diagnostic projectile point types include small Desert side notched, Cottonwood triangular, and Rosegate Series. Local faunal food sources include deer, mountain sheep, rabbits, and ground squirrels. Hopper and bedrock mortars as well as the continued use of milling stones and manos demonstrate that seeds and other plant resources like piñon nuts and grass seeds are still utilized (PAR 1986). Other artifacts include pine nut beads, olivella shell beads, steatite pipes, bone tubes, cordage, and basketry.

Prehistoric sites within the Freeman project area primarily include diagnostic artifacts from the Middle to Late Archaic periods, or the Martis and Kings Beach cultural complexes. The majority of stone tools and flakes are basalt. Diagnostic projectile points from the Martis Complex include contracting stem and large side notched points. Plant processing is also evident by the milling stones and manos identified. Artifacts indicative of the Late Archaic period include smaller projectile points made of chert and obsidian as well as bedrock mortars. Desert side notched and Rosegate points were two types of projectile points identified. One archaeological site in particular has a large amount of bedrock mortars. However, overall bedrock mortars were not as common as milling stones and manos within the Freeman Project area. Based on field survey data available at the BRD, it appears that the majority of prehistoric archaeological sites present within the Freeman Project Area date to the Middle and Late Archaic.

Ethnographic Period

The Freeman project area is located in a region described as a ‘contact zone’ between two geomorphic provinces and ethnographic areas, which are known as the Sierra and Western Great Basin (PAR 1996, Kroeber 1925). Because of similar traits, the sharing of ideas, and the use of the same natural materials, the identification of historic cultural boundaries between Native American groups in this area is difficult. There are three tribes that may have historically utilized resources within the project area: the Mountain Maidu, Washoe, and Northern Paiute (D’Azevdo 1986, Fowler & Liljeblad 1986, Riddell 1978). At the time of European contact, the land within the Freeman project area was inhabited by the Mountain Maidu (Dixon 1905).

The Maidu have three distinctive linguistic and cultural groups that also coincide with geographical locations (Dixon 1905). These groups are the Mountain Maidu or Northeastern, the Konkow or Northwestern, and the Nisenan or Southern (Riddell 1978). The Mountain Maidu lived in and around the Freeman project area. This project location lies within the Northeastern cultural area which is characterized by an arid climate, with cold winters and hot summers, and a chain of high elevation mountain valleys.

During the early 1900s the Mountain Maidu occupied Red Clover Valley and portions of northwestern Sierra Valley, and also “held Mohawk Valley as a hunting-ground, the snowfall being too heavy there for a permanent residence” (Dixon 1905). Grizzly Valley was probably also occupied by the Maidu at this time due to it’s proximity to the above mentioned valleys.

The Maidu utilized various stone tools including knives, small and large projectile points, scrapers, pestles, mortars, and milling stones (Dixon 1905). Other objects include stone pipes and charms. Obsidian, largely obtained through trade, basalt, chert, and jasper were utilized. Nets were made primarily of milkweed and baskets were made from hazel, yellow pine roots, grasses, maiden hair fern, and other local vegetation.

The Northeastern Maidu carried out a seasonal migration where they moved around to gather various resources (PAR 1986). However, there are also permanent villages which were “situated on the edges of various valley floors at slightly lower elevations during winter months where water, vegetation, and game were abundant” (PAR 1986). Hunting was pursued during the spring, summer, and fall. Game animals included deer, bear, elk, antelope, mountain sheep, rabbits, and squirrels (Dixon 1905). Nets and traps were utilized to catch fish.

Many different varieties of berries and plants were gathered during the spring and summer (Dixon 1905). Manzanita berries were collected in abundance to make a cider. Other examples of preferred berries include wild currants, chokecherries, blackberries, and gooseberries (PAR 1986). Other plant resources utilized are roots, bulbs, grass seed, clover, wild mint, and mushrooms.

We know that historically both the Mountain Maidu and Washoe considered eagles to be sacred animals (D’Azevedo 1986, Riddell 1978). The Maidu never shot eagles because “it brought bad luck” (Riddell 1978). Also the Washoe never killed or ate eagles because they were believed “to have extraordinary supernatural attributes” (D’Azvedo 1986). In the past, Native American hunting affected the abundance of some wildlife species (Williams 2003). Due to cultural and spiritual motivations both of these Native American groups were, in a sense, protecting eagles. Today eagles and their habitat, with golden eagles as management indicator species and bald eagles on the threatened species list, continue to be protected. One purpose of the Freeman project is to improve bald eagle habitat.

In the American West, natural and anthropogenic fire was a normal occurrence before the arrival of Euroamericans (Williams 2003). There were numerous reasons that Native Americans utilized fire. Fire was used as a tool to remove small trees, underbrush, and diseased vegetation, which left open, healthy forests with large trees. The Freeman project proposes to improve forest health by treating disease and insect infestations. One way of accomplishing this is by thinning California Wildlife Habitat Relationships (CWHR) Size Class 4 to accelerate the stands growth to CWHR Size Class 5. Removing disease and encouraging growth of large diameter trees would help to bring the natural environment of the project area closer to its historical setting.

Historical Period

The California Gold Rush was the initial catalyst for early Euro-American settlement in what would become central Plumas County. Many early gold seekers undoubtedly passed westward through the area in 1849 but, so far as is recorded, none settled that year (Farriss and Smith 1882). However, strikes along the middle and north forks of the Feather River in early 1850 resulted in the first settlements both along the river terraces and within the attractive and temperate locations of American and Indian Valleys. Many land claims and permanent settlement were well established the following year.

There is no specific record of any Euroamerican entry into Grizzly Valley until after Jim Beckwourth (of African-American heritage) first surveyed an overland trail through the northern Sierra Nevada in the summer of 1850 (Young 2004). From modern day Sparks, NV, his trail first extended northwest then east across Beckwourth Pass skirting the northern edge of Sierra Valley then followed Grizzly Creek northwest into Grizzly Valley. The trail continued northwest diagonally through the valley to Emigrant Creek where it made one of the most difficult crossings along its length over Grizzly Ridge. From here the trail continued down into American Valley and then westward to end at Bidwell's Bar. The route saw extensive one-way traffic though Grizzly Valley throughout the 1850s including the movement of great numbers of cattle to the markets of California's northern gold camps (Lawson 2005).

It was probably during this time that early settlers of central Plumas County became aware of the excellent forage surrounding Grizzly Valley. There was never any substantial mineral wealth in the immediate vicinity of Grizzly Valley sufficient to attract early prospectors. One reference indicates that an unsuccessful attempt at prospecting along Grizzly Creek (probably north of the valley) took place as early as July of 1851 (Farriss and Smith 1882). In later years the area northwest of Grizzly Valley saw considerable mining development culminating in the development of a major copper producer, Walker Mine, between ca. 1915 - 1940.

The Plumas County Map of 1874 shows no improvements within Grizzly Valley other than the road extending up Grizzly Creek into the valley. The arduous route over Grizzly Ridge had been abandoned by the end of the 1850s. Exactly when the first settlement around the valley took place is uncertain but the Government Land Office (GLO) Maps surveyed between ca. 1872 and 1880 show several locations at the northern end of valley. These include Lovejoy's House, Cate and Heriot's Barn, the Chase House, and several others. This indicates they were likely in place by at least the mid to late 1870s. Interestingly, an "Old Log House" is depicted along what is now known as Old House Creek at the north end of the valley. If it was old when the GLO surveys were conducted, this gives a good clue that this house, at least, probably dates back to the 1860s. In addition, the Plumas County Tax Assessment Records (PCTAR) include an entry for George Freeman in 1875 for "Possessory Claim" for 320 acres and a ranch in the area of Freeman Creek (PCTAR 1875). All of these early locations, with the possible exception of the old log house, are associated with ranching, dairying, and hay production.

Agricultural products were in high demand at this time due to the rise of the Comstock in Nevada beginning in the late 1860s. During the following decade many small dairies were established in the valleys of the northern Sierra Nevada to tap this lucrative market. Despite significant transportation challenges, many of these small operations found considerable profit until the mining boom ended in the mid-1880s. Facing a shrinking market and a downturn in the national economy beginning in the early 1890s, most of these small dairies did not survive into the new century. George Freeman sold out to George Mapes, a well-known cattleman in Sierra Valley as early as 1879 (Plumas County Deeds 1879). By the mid 1880s, the emphasis within Grizzly Valley appears to have been focused primarily on ranging beef cattle. The Plumas County

Map of 1892 shows substantial private land holdings (claims) within and surrounding Grizzly Valley including Mapes, as well as Putnam Cate and Robert Herriot (both residents of Beckwith; today's Beckwourth), and Moses Lovejoy.

By this time, considerable placer mining was occurring along Grizzly Creek northwest of Grizzly Valley and traffic through the valley likely increased as a result. The discovery of copper at Walker Mine also brought increased traffic through the valley. By the mid 1920s Walker Mine had grown to include a full size town. Until 1920, when a nine-mile aerial tram was constructed extending west over Grizzly Ridge, ore was transported by wagon or truck through the valley to the railroad connection at Kerby's (later Gulling) near the confluence of Grizzly Creek and the Middle Fork of the Feather River. Even following the establishment of the tram, the route through Grizzly Valley was the primary auto road between the mine and Portola and traffic was substantial in the non-winter months.

In March of 1905, the Plumas Forest Reserve was established. Most, if not all, the land not yet claimed within and surrounding Grizzly Valley became part of what would, by 1908, be known as the Plumas National Forest. A guard cabin was erected in Three Mile Valley during the early years of forest administration. The forest also apparently briefly used Lovejoy's as a station as shown on the 1918 edition of the PNF map. In 1923, the PNF completed the connecting road between Crocker Guard Station and lower Grizzly Valley that may have made regular use of the Three Mile Station less important (Plumas National Bulletin 1923). The Three Mile Station was no longer shown on the forest maps by 1950.

When the Western Pacific Railroad was completed through Plumas County in 1909 many sawmills were developed along the new route. Among these was the Feather River Lumber Company (FRLC), formed in 1905 (Vaughan 1989). By 1910 the main sawmill and box factory had been established at Delleker, west of Portola. The FRLC engaged in extensive logging operations in the forested hills south of Grizzly Valley in the late 1910s and early 1920s on both private and PNF land. After about 1915 the company began using a narrow gauge railroad to bring logs to its mill.

Up until the late 1910s, no substantial logging operations had taken place in the Grizzly Valley. There was a sizable sawmill at Walker Mine by ca. 1916 but there is no record of logging operations in the direct vicinity of Grizzly Valley as there were sufficient timber stands closer to the mine. In 1920, investors from Klamath Falls, OR, established the McCollum and Christy sawmill on Cow Creek. This short-lived operation was plagued with legal and financial problems. Lumber was hauled down the Grizzly Creek Road on trucks to the rail connection at the Western Pacific. The sawmill was sold and by the end of 1924, it had been moved out of Grizzly valley altogether (The Timberman 1924).

In May of 1924, the FRLC was awarded a large government timber sale along Humbug Creek and the company pushed its railroad logging operation in the direction of Grizzly Valley (Vaughan 1989). A Timber Sale Cut Atlas on file at the Beckwourth Ranger District indicates that additional sales by the PNF were made within the current Freeman Project area shortly after the

Humbug sale and operations had begun within the current project area by the late 1920s. By the end of the decade, the company had penetrated the southwest end of Grizzly Valley and had constructed miles of temporary railroad spurs throughout the area. Several large logging camps operated at various periods. The company used caterpillar tractors and big wheels rather than steam donkeys due, in large part, to the comparatively gentle topography of much of the sale area. By the mid 1930s, tracked flatbeds were being pulled by the cats. There were slow downs in production as a result of the Great Depression in the early 1930s but logging continued into the northern part of Grizzly Valley during the mid- to late 1930s. The final Grizzly Valley logging camp was located in the Old House Creek area in the late-1930s. Railroad logging operations ended in 1940 and logging in the area was essentially completed by the FRLC by 1941 or 1942. By the early 1950s, the old mainline grade along the western end of the valley was converted into the main road, today's 24N10 Road. Timber harvest re-entry into the logged over areas of the FRLC was common between the 1950s and 1980s.

During the first half of the twentieth century, range activities continued. By 1920, however, R.T. Jenkins had acquired at least some of the lands formerly held by George Mapes. Jenkins established a camp and ran thousands of head from this time until at least the early 1960s. Sheepherders were often of Basque descent. These people had a tendency to carve various designs and messages on the many aspen trees located through the area. The oldest one recorded in the Grizzly Valley area dates to 1909 indicating that sheep had probably been introduced by that time. Cattle allotments also continued into the twentieth century but allotments were now managed by the PNF. Many of these allotments remain active to the present day, although the numbers of animals have been substantially reduced over the years. Currently, no sheep graze in Grizzly Valley but the overall pattern of seasonal range use in the area is one that has been continuously present for at least 130 years.

Recreation in the form of hunting and fishing was a common activity within Grizzly Valley throughout the late nineteenth and early twentieth century. When the Old House Creek logging camp of the FRLC was abandoned, many people from the Portola area simply moved into the old skid shacks and used them as summer recreation sites during the 1940s and 1950s (Donnenwirth 2005). In the late 1960s, recreation took on a new and expanded form with the construction of the Grizzly Dam and the formation of Lake Davis. Even as early as 1920, speculation was present regarding the use of lower Grizzly Valley as a reservoir (PNB 1920). In 1966 the project was begun and by 1968 the lower valley was flooded covering the old Beckwourth Emigrant Trail and numerous other cultural resource sites. The PNF proceeded immediately to establish camping areas and fishing access points. To this day, Lake Davis is one of the most popular recreation sites on the forest.

3.16.6 Environmental Consequences

3.16.6.1 Action Alternatives

Direct and Indirect Effects

Heritage resource site boundaries are flagged and SOPs would be followed during implementation of any of the action alternatives. All heritage resource sites would be avoided during project implementation therefore there would be no effect on heritage resources.

Cumulative Effects

There would be no direct or indirect effects to cultural resources from any of the alternatives therefore there would be no cumulative effects.

3.16.6.2 Alternative 2 (No-action)

With no proposed activity, there would be no effect to heritage resources.

3.17 Legal Regulatory Compliance and Consultation

The Beckwourth Ranger District operates under a diverse array of local, stated and federal management guidance and policy as well as various executive orders.

Currently, the Beckwourth Ranger District is guided by the Plumas National Forest 1988 Land and Resource Management Plan (LRMP)as amended by the Herger-Feinstein Quincy Library Group (HFQLG) 1999 Final EIS and Record of Decision (ROD), the 2003 HFQLG Supplemental EIS and ROD and the 2004 Sierra Nevada Forest Plan Amendment (SNFPA) supplemental EIS and ROD.

3.17.1 Principle Environmental Laws

3.17.1.1 National Environmental Policy Act

The Council on Environmental Quality (CEQ) regulations for implementing the National Environmental Policy Act (NEPA) requires that federal agencies rigorously explore and objectively evaluate all reasonable alternatives and briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 Code of Federal Regulations [CFR] 1502.14).

The Freeman Project EIS meets the CEQ regulations requiring public scoping and a thorough analysis of issues, alternative and effects. Refer to Section 2 of the EIS for further details.

3.17.1.2 National Forest Management Act

The National Forest Management Act (NFMA) reorganized, expanded and otherwise amended the Forest and Rangeland Renewable Resources Planning Act of 1974, which called for the management of renewable resources on national forest lands. The National Forest Management Act requires the Secretary of Agriculture to assess forest lands, develop a management program based on multiple-use, sustained-yield principles, and implement a resource management plan for each unit of the National Forest System (NFS). It is the primary statute governing the administration of National Forests.

Section 6 of the Forest and Rangeland Renewable Resources Planning Act of 1974, as re-designated by this Act, is amended by adding at the end thereof new subsections (c) through (m) as follows: "(c) The Secretary shall begin to incorporate the standards and guidelines required by this section in plans for units of the National Forest System as soon as practicable after enactment of this subsection and shall attempt to complete such incorporation for all such units by no later than September 30, 1985. The Secretary shall report to the Congress on the progress of such incorporation in the annual report required by section 8(c) of this Act. Until such time as a unit of the National Forest System is managed under plans developed in accordance with this Act, the management of such unit may continue under existing land and resource management plans.

The Plumas LRMP, HFQLG Forest Recovery Act and SNFPA all follow the guidelines regarding natural resource management and planning set forth in NFMA. By following the

Standards and Guidelines in these management documents that govern activities on the Beckwourth Ranger District, compliance with NFMA is met.

3.17.1.3 Endangered Species Act

Congress passed the Endangered Species Preservation Act in 1966. This law allowed listing of only native animal species as endangered and provided limited means for the protection of species so listed. The Departments of Interior, Agriculture, and Defense were to seek to protect listed species, and insofar as consistent with their primary purposes, preserve the habitats of such species. Section 7 of the Endangered Species Act (Act) [16 U.S.C. 1531 et seq.] outlines the procedures for Federal interagency cooperation to conserve Federally listed species and designated critical habitats.

Section 7(a)(1) directs the Secretary (Secretary of the Interior/Secretary of Commerce) to review other programs administered by them and utilize such programs to further the purposes of the Act. It also directs all other Federal agencies to utilize their authorities in furtherance of the purposes of the Act by carrying out programs for the conservation of species listed pursuant to the Act.

This section of the Act makes it clear that all Federal agencies should participate in the conservation and recovery of listed threatened and endangered species. Under this provision, Federal agencies often enter into partnerships and Memoranda of Understanding with the United States Fish and Wildlife Service (USFWS) or the National Marine Fisheries Service (NMFS) for implementing and funding conservation agreements, management plans, and recovery plans developed for listed species. Biologists for the Services should encourage the development of these types of partnerships and planning efforts to develop pro-active approaches to listed species management.

Wildlife and Fisheries

Several Threatened and Endangered (T&E) species identified in the list of T&E species provided by the USFWS (http://www.fws.gov/sacramento/es/spp_lists/NFActionPage.cfm)", updated February 14, 2006, have been eliminated. Due to the lack of species distribution and/or lack of designated critical habitat, only the bald eagle (Threatened status) is being actively managed for.

The Lake Davis Bald Eagle Habitat Management Plan (BEHMP) was finalized in mid-June 2004 with consultation from USFWS and the California Department of Fish and Game. It is the guiding document for managing bald eagle habitat. Consultation with USWFS regarding the Freeman project area initiated in mid-April 2004 with discussion regarding cumulative effects of the Freeman Project on the bald eagle.

Botany

The latest USFWS species list for Plumas County, in which the project occurs, was accessed from the USFWS website on March 13, 2006 and incorporates the database update of March 1, 2006

(USDI, Fish and Wildlife Service, 2006). This list fulfills the requirements to provide a current species list pursuant to Section 7(c) of the Endangered Species Act, as amended.

Controlling special interest plants and populations greatly reduces the impact to botanical resources. Occurrences protected by flagging and avoiding as a control area will be flagged prior to implementation.

3.17.1.4 Clean Water Act

Section 208 of the Clean Water Act required the States to prepare non-point source pollution plans, which were to be certified by the State and approved by the Environmental Protection Agency (EPA). In response to this law, and in coordination with the State of California Water Resources Control Board (SWRCB) and EPA, Region Five began developing Best Management Practices (BMPs) for water quality management planning on National Forest System lands within the State of California in 1975.

The Freeman Project meets the Clean Water Act by implementing the Best Management Practices (BMP) of the Soil and Water Conservation Handbook. By using BMPs, the Freeman Project meets this Act according to the ROD of the SNFPA (Section VII, ROD of the SNFPA).

3.17.1.5 Clean Air Act

The Clean Air Act provides the principal framework for national, state, and local efforts to protect air quality. Under the Clean Air Act, the Office of Air Quality Planning and Standards is responsible for setting standards for pollutants which are considered harmful to people and the environment. The 1990 Clean Air Act is the most recent version of a law first passed in 1970.

All burning is done in accordance with an approved smoke management plan approved by the Northern Sierra Air Quality Management District (NSAQMD). The smoke plan requires burning with wind directions that transport smoke away from communities, and the amount of acres burned daily are limited. Burns are conducted during approved burn days, when atmospheric conditions favor smoke dispersion. Prescribed burning takes place in spring or fall after the first rains when fuels are relatively moist to reduce the potential for escape.

3.17.1.6 National Historic Preservation Act

Section 101 of the National Environmental Policy Act (NEPA) requires the federal government to preserve important historic, cultural, and natural aspects of our national heritage. To accomplish this, federal agencies utilize the Section 106 process of the National Historic Preservation Act (NHPA). This process has been codified in 36 CFR 800 Subpart B. The coordination or linkage between the Section 106 process of the NHPA and the mandate to preserve our national heritage under NEPA is well understood, and is formally established in 36 CFR 800.3b and 800.8. NEPA includes reference to "…important historic, cultural, and natural aspects of our national heritage". Locally, the Plumas National Forest uses a programmatic agreement (PA) between Region 5 of the US Forest Service, the California State Historic

Preservation Officer, and the Advisory Council on Historic Preservation to implement the Section 106 process.

The Freeman Project EIS meets NHPA by protecting heritage and cultural resources through surveying, tribal and historical preservation society consultation and protecting sites in the Freeman project area. All known archaeological sites within the Freeman project area of potential affect, were field visited and site boundaries were flagged. As outlined in the Programmatic Agreement, protection measures will be implemented, as appropriate, for all heritage resources located within the project area. The application of the protection measures would result in the Freeman project having “no effect” on heritage resources and the Forest would have taken into account the effect of the project on heritage resource sites in compliance with the PA and Section 106 of the NHPA.

3.17.2 Executive Orders

3.17.2.1 Consultation and coordination with Indian Tribal governments, Executive Order 13175 of November 6, 2000

The following tribes were consulted during the NEPA scoping phase of the Freeman Project on August 29, 2005:

- Washoe Tribe of California and Nevada
- Susanville Indian Rancheria
- Greenville Indian Rancheria

Only the Susanville Indian Rancheria responded to the scoping letter. The Susanville Indian Rancheria scoping response letter was received on September 18, 2005.

3.17.2.2 Indian Sacred Sites, Executive Order 13007 of May 24, 1996

Through scoping and consulting with local Native American tribes, it was determined by District Heritage Specialists that there were no Indian sacred sites in the Freeman Project area.

3.17.2.3 Invasive species, Executive 13112 of February 3, 1999

Executive Order 13112 created the Invasive Species Council (ISC) in order to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological and human health impacts that invasive species cause. Federal agencies are required to:

- identify actions that may affect the status of invasive species
- use relevant programs and authorities to prevent the introduction, control and monitoring of invasive species
- provide for native species restoration as well as their habitats
- promote public information
- not condone or carry out actions that may spread invasive species

- consult with the ISC and other stakeholders as appropriate

The Freeman Project meets the Executive Order by following the noxious weedsmanagement Standards and Guidelines in Appendix A of the ROD for SNFPA. The SNFPA guidelines direct proactive management of noxious weeds that meet with the Executive Order. District botanists carried out the intent of the Executive Order and the noxious weeds Standards and Guides by:

- consulting with a ISC representative
- identifying and controlling weed infestation areas
- preventing the spread of noxious weeds through SOPs and site specific mitigation
- educating the public regarding the presence and spread of noxious weeds

3.17.2.4 Floodplain management, Executive Order 11988 of May 24, 1977 and Protection of Wetlands, Executive Order 11990 of May 24, 1977

Executive Orders 11988 and 11990 require Federal agencies to avoid, to the extent possible, short- and long-term effects resulting from the occupancy and modification of flood plains, and the modification or destruction of wetlands. These executive orders are intended to preserve the natural and beneficial values served by floodplains and wetlands.

The Freeman Project meets these executive orders by implementing the Best Management Practices (BMP) of the Soil and Water Conservation Handbook. By using BMPs, the Freeman Project meets these executive orders according to the ROD of the SNFPA (Section VII, ROD of the SNFPA).

3.17.2.5 Environmental Justice, Executive Order 12898 of February 11, 1994

Executive Order 12898 requires that Federal agencies make achieving environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health and environmental effects of their programs, policies and activities on minority and low-income populations.

Although low-income and minority populations are within the vicinity of the Freeman Project, activities associated with the Project would not discriminate against them. Proposed activities would not adversely affect community, social, economic and human health and safety factors. Public scoping was conducted in accordance with NEPA regulations to identify any potential issues or hazards associated with the Freeman Project.

3.17.2.6 Use of off-road vehicles, Executive Order 11644 and 11989, amended May 25, 1977

It is the purpose of these orders to establish policies and provide for procedures that will ensure that the use of off-highway vehicles (OHV) on public lands will be controlled and directed so as to protect the resources of those lands, to promote the safety of all users of those lands, and to minimize conflicts among the various uses of those lands.

On July 15, 2004, the Forest Service published proposed travel management regulations in the Federal Register. The final rule provides a national framework for local units to use in designating a sustainable system of roads, trails, and areas for motor vehicle use. The rule's goal is to secure a wide range of recreation opportunities while ensuring the best possible care of the land.

Currently, all roads proposed to be closed in the Freeman Project are coordinated with ongoing planning for designation of off-road highway vehicle routes (Appendix B, Table B.4). Roads being proposed for closure and decommission are guided by the forestwide OHV analysis process and the Riparian Management Objectives, which set forth goals for water quality and soil compaction.

3.17.3 Special Area Designation

3.17.3.1 Lake Davis Recreation Area

The area surrounding Lake Davis is a Recreation Area. The Recreation Area offers a wide variety of summer outdoor experiences to the public. Vehicle activity is restricted to established roads to minimize impacts on recreation activities.

3.17.3.2 California State Game Refuge

The California Department of Fish and Game (CDFG) currently manages a State Game Refuge of which portions are within the Freeman Project area. CDFG restricts any type of hunting or discharge of a firearm within a Game Refuge.

3.17.3.3 Non-applicable Areas

The following special interest areas are not found within the Freeman Project area:

- Research Natural Areas
- Inventoried roadless areas
- Wilderness areas
- Wild/scenic rivers