Appendix JJ - Snags and Coarse Woody Debris Standards and Guidelines

Snags and Coarse Woody Debris

Snags

Target densities (snags per acre) for each size class were developed for each of the four ecoregions. See tables AJJ-1 through AJJ-3 for snag density, size and species targets for each ecoregion. Target densities were calculated by adding one standard deviation to the mean observed number of snags in the size class in the ecoregeion. This was done in order to avoid establishing the mean number as the target. Establishment of the mean as the target would be to ignore the natural variability in snag numbers observed in the stands, particularly at the high end of the snag density spectrum. The intent is to ensure that at least some stands retain and or develop relatively very high snag densities.

Table AJJ-1. Siskiyou Foothills Ecoregion observed Snag Density Targets. (5 sample sites)

Size Class (dbh)	Observed Mean Snags (per acre)	Target level (Snags per acre)
8-15.9	4.58	4.5
16-23.9	1.08	2.5
24-31.9	0.32	1
32+	0.48	1
All	6.46	
16+	1.88	**4.5**

Mean snags per acre 6.6 (n = 5 sites)
Sample standard deviation of snag density 3.80 (n = 5 sites)
Snag density at most snag-rich site 10.6 per acre
Snag density at snag-poorest site 1.8 per acre

Table AJJ-2. South Cascades Ecoregion observed Snags and Snag Density Targets
(5 sample sites)

Size Class (dbh)	Observed Mean Snags (per acre)	Target levels (Snags per acre)
8-15.9	7.96	8
16-23.9	2.72	5
24-31.9	1.94	4
32+	2.52	4.5
All	15.14	
16+	**7.18**	**14**

Mean snags per acre 15.20 (n = 5 sites)
Sample standard deviation of snag density 5.73 (n = 5 sites)
Snag density at most snag-rich site 24.5 per acre
Snag density at snag-poorest site 10.1 per acre

Table AJJ-3. Klamath River Ridges Ecoregion* observed Snags and Snag Density Targets
(5 sample sites)

Size Class (dbh)	Observed Mean Snags (per acre)	Target levels (Snags per acre)
8-15.9	7.02	7.02
16-23.9	3.74	6.06
24-31.9	2.4	4.47
32+	0.76	1.96
All	13.92	
16+	**6.9**	**12.5**

* Snag density targets in this table also apply to the South Cascade Slopes Ecoregion.
Mean snags per acre 14.10 (n = 5 sites)
Sample standard deviation of snag density 2.94 (n = 5 sites)
Snag density at most snag-rich site 17.2 per acre
Snag density at snag-poorest site 9.7 per acre

Applying the Target Density Figures for Snags

Target snag densities would be applied on a unit by unit basis whenever management activities which may affect current snag densities, and/or future snag recruitment potential are proposed. Density management activities in the form of understory thinnings, plantation thinnings, large tree culturing, small group selections, and underburning are the activities that are most likely to affect current and future snag numbers. As part of these activities, some excess trees would be considered for removal from stands in order to meet stand protection, fuels management, or other objectives. Before these trees are actually selected for removal, an analysis would be performed to

determine if, and how many of, these excess trees would be necessary to retain in order to meet current and future snag and CWD targets. Only material in excess of current and future snag, CWD, and canopy closure needs would be removed from the site. Projected rates of snag decay and recruitment would be used in determining if ,and how many, green trees would need to be left for future snag and CWD needs.

Stands proposed for treatments would be subject to a 2.5 percent sample of snags. For example, a 44 acre unit would be sampled with 1.1 acres of snag transect. The pre-treatment densities observed would be compared to target snag densities for the ecoregion. Hazard trees along open roads would be exempt from the snag density targets. They could be felled as necessary for safety purposes.

Prescriptions for selecting treatments under three situations as follows:

Situation #1 Early and mid-successional stands that are below snag target levels

— No activities would be undertaken which would preclude or retard the development of sufficient numbers of snags to meet and maintain the target levels and simultaneously maintain canopy closure target levels through time. Trees identified for possible removal would be designated for snag creation until snag size class targets are met. Material (trees) excess to current and future snag, CWD and canopy closure needs could be removed from the site.

Situation #2 LSOG stands which are currently below snag target levels

— Any activity that would remove trees from the site would be designed to provide for the creation of sufficient numbers of snags to meet the target levels as an integral component of the treatment. No activities would be undertaken which would preclude the recruitment of sufficient numbers of snags to maintain the target levels and simultaneously maintain sufficient canopy closure through time. Only material excess to current and future snag, CWD and canopy closure needs could be removed from the site.

Situation #3 LSOG stands which are currently at or above the snag target levels

— No activities would be undertaken which would reduce the existing snag levels below the target levels. No activities would be undertaken which would preclude the recruitment of sufficient numbers of snags to maintain the target levels and simultaneously maintain sufficient canopy closure through time.

Snag Attribute Criteria

Short snags with a height (in feet) that is less than 2-1/2 the dbh (in inches) would not be counted towards attainment of snag target densities. For example:

- Short snag A is 20 inches in diameter and 35 feet tall and counts.
- Short snag B is 20 inches in diameter and 8 feet tall and does not count.

Hollow or green cull trees could be counted as snags as long as they don't make up more than 1/4 of snags on the site. Existing large snags could be substituted for smaller snags when trying to meet size class based density targets. However, this substitution does not work in reverse. Two "extra" 15" size class snags could not substitute for a 30" class snag. If a stand is deficient in a size class, no snags in that size class would be removed from the stand unless a suitable number of green trees of appropriate size are going to be made into snags as part of the project. These green trees could only be made into snags if doing so does not bring the canopy closure down below the target level for the stand.

Worker safety must be considered when planning and implementing projects on the ground. Accordingly, in thinning operations, no trees should be marked to cut adjacent to snags that would require the snag to be felled as a hazard tree. Also during understory thinning, "leave islands" would be left around all hazardous snags.

Salvage activities would occur only when consistent with the 10+ acre salvage guidelines for LSR's (found in NFP/ROD,pg. C-13), and as amended by existing and future Regional Ecosystem Office directives pertinent to LSR snag management.

Coarse Woody Debris (Down Wood)

In stands being treated, retain all existing CWD on site consistent with targets listed below, and hazard reduction criteria. Based on the current/observed information, target levels for decay class 1 and 2 coarse wood in the respective ecoregions were prepared and summarized in Table AJJ-4. Observed snag numbers are also shown in that table to indicate potential future contribution to coarse woody debris amounts.

Density management treatments would use the amounts observed in the 1989 inventory as a minimum or threshold level. If this minimum amount of wood is not present in a stand pre-treatment, the two largest trees marked for removal would be made into snags and left in addition to the target snag level as future CWD. This will ensure that wood contributed to the forest floor ecosystem is adequate to meet habitat needs and other ecosystem functions. Material under 3" is not considered CWD. Activity created slash (limbs and tops) less than 3" diameter could be removed for fuel hazard reduction. In order to retain existing CWD, slash piled immediately adjacent to or on logs should not be burned.

The target CWD density on lands where management occurs will be relatively higher than the observed level. This target level, given in the table below, is the desired level for mature stands. Stands should be monitored following treatment to determine if the target levels and the desired species mix are developing. In most cases the higher numbers of snag or blowdown will provide the desired down woody debris over time. If, after five years following stand manipulation, the CWD levels, averaged over a 40 acre area basis, are not reaching the target levels, additional trees within the larger average diameter range will be "snagged" in order to attain the target CWD level.

During any salvage operations retain a high level of snags and down woody debris to carry the new stand from the stand re-initiation stage through to the stand maturity stage when CWD will again develop as a result of natural mortality. The snag numbers and down woody debris amounts would be managed to meet or exceed the target levels per acre from the largest diameters available on site.

The standard of 16 inch diameter by 16 foot length as a measure of CWD is a baseline (USDI 1995b). Large diameter pieces shorter than 16 feet do not meet the 16' X 16" standard and as such could theoretically be removed from stands because they don't "count." Biologists recommend the retention of these larger diameter, but shorter length logs in most cases. If these large diameter segments provide the desired CWD form and function despite the fact that their length is shorter than the specified minimum, they

may be counted toward the target piece requirement when:

• Large end diameters are greater than 30 inches and log length is greater than 10 feet;

OR

• Log diameters are in excess of 20 inches and volume is in excess of 32 cubic feet; (see Appendix H BLM Information Bulletin No. OR-97-064 Question 3 and attached table)

OR

• They are the largest (by volume) material available for the site in question.

Table AJJ-4. Coarse Woody Debris and Snag Observations and Target levels

Ecoregion	Observed Ave (Minimum) Coarse Wood on ground 16"dia.*/16'+ in decay class 1 or 2 (Ave. # pieces/acre)	Target Range Density for Coarse Wood 16"dia.*/16'+ in decay class 1 or 2 (Ave. # pieces/acre)	Observed Ave (Minimum) Snags 16"dia.*/16'+ (mean snags per acre)	Target snag level 16"dia.*/16'+ (Ave. per acre)
Siskiyou Foothills	1.4	**2-4**	1.9	**4.5**
Klamath River Ridges	5.2	**6-8**	6.9	**12.5**
South Cascades	4.2	**5-7**	7.2	**14**
South Cascade Slopes**	n/a	**6-8**	n/a	**12.5**

* Diameter is measured at the large end

** As a result of not having an adequate number of transects in the Southern Cascade Ecoregion, the target density for that ecoregion will be the same as the adjacent Klamath River Ridges Ecoregion which is similar in elevation and plant associations.

Appendix KK - Land Acquisition Criteria

The following land acquisition criteria is listed in priority:

1. Habitat currently occupied by a threatened, endangered, or proposed wildlife or plant species, and expected future management under current or expected ownership would be detrimental to the site. Parcel borders Monument lands and is within CSNM Proclamation boundary.

2. Habitat currently occupied by a threatened, endangered, or proposed wildlife or plant species, and expected future management under current or expected ownership would be detrimental to the site. Parcel does not border Monument lands but is within CSNM Proclamation boundary.

3. Habitat currently occupied by a locally endemic or Survey and Manage or Bureau Sensitive wildlife or plant species, and expected future management under current or expected ownership would be detrimental to the site. Parcel borders Monument lands and is within CSNM Proclamation boundary.

4. Habitat currently occupied by a locally endemic or Survey and Manage or Bureau sensitive wildlife or plant species, and expected future management under current or expected ownership would be detrimental to the site. Parcel does not border Monument lands but is within CSNM Proclamation boundary.

5. Habitat currently occupied by a threatened, endangered, or proposed wildlife or plant species, and expected future management under current or expected ownership would be detrimental to the site. Parcel is within CSNM Proclamation boundary.

6. Currently late-successional habitat (Habitat Type 1 or 2) within 0.5 miles of a Northern Spotted Owl site. Parcel is within CSNM Proclamation boundary.

7. Currently Northern Spotted Owl dispersal habitat (Habitat Type 5 or 6) within 0.5 miles of a Norhtern Spotted Owl site. Parcel borders CSNM OGEA lands and is within CSNM Proclamation boundary.

8. Currently late-successional habitat (Habitat Type 1 or 2) within 1.2 miles of a Northern Spotted Owl site. Parcel borders OGEA lands and is within CSNM Proclamation boundary.

9. Currently Northern Spotted Owl dispersal habitat (Habitat Type 5 or 6) within 1.2 miles of a Northern Spotted Owl site. Parcel borders OGEA lands and is within CSNM Proclamation boundary.

10. Jenny Creek riparian habitat (i.e., the stream runs through parcel). Parcel is within CSNM Proclamation boundary and borders Monument land.

11. Currently late-successional habitat (Habitat Type 1 or 2). Parcel borders OGEA lands and is within CSNM Proclamation boundary.

12. Currently spotted owl dispersal habitat (Habitat Type 5 or 6). Parcel borders OGEA lands and is within CSNM Proclamation boundary.

13. Currently late-successional habitat (Habitat Type 1 or 2) within 0.5 miles of a Northern Spotted Owl site. Parcel does not border OGEA lands but is within CSNM Proclamation boundary.

14. Currently Northern Spotted Owl dispersal habitat (Habitat Type 5 or 6) within 0.5 miles of a Northern Spotted Owl site. Parcel does not border OGEA lands but is within CSNM Proclamation boundary.

15. Currently late-successional habitat (Habitat Type 1 or 2) within 1.2 miles of a Northern Spotted Owl site. Parcel does not border OGEA lands but is within CSNM Proclamation boundary.

16. Currently Northern Spotted Owl dispersal habitat (Habitat Type 5 or 6) within 1.2 miles of a Northern Spotted Owl site. Parcel does not border OGEA lands but is within CSNM Proclamation boundary.

17. Jenny Creek riparian habitat (i.e., the stream runs through parcel). Parcel is within CSNM Proclamation boundary but not adjacent to Monument land..

18. Currently late-successional habitat (Habitat Type 1 or 2). Parcel does not border OGEA lands but is within CSNM Proclamation boundary.

19. Currently Northern Spotted Owl dispersal habitat (Habitat Type 5 or 6). Parcel does not border OGEA lands but is within CSNM Proclamation boundary.

20. Parcel contains perennial or long duration intermittent stream (and associated riparian area) and is within CSNM Proclamation boundary.

21. Lands with potential to develop late-successional habitat at some point in the future. Parcel does not border OGEA lands but is within CSNM Proclamation boundary.

22. Lands with potential to develop late-successional habitat at some point in the future. Parcel is within CSNM Proclamation boundary.

23. Other lands bordering the Monument lands and is within CSNM Proclamation boundary.

24. Parcel is within CSNM Proclamation boundary.

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I. INTRODUCTION

The Presidential Proclamation for the Cascade-Siskiyou National Monument (CSNM) calls for protecting the objects considered special to the Monument. These include Greene's Mariposa lily, Gentner's fritillary, Bellingers meadowfoam, populations of long isolated fish species, special plant communities (rosaceous chapparral and Oregon white oak-juniper woodlands), Mixed conifer, winter deer habitat, "old growth conifer habitat crucial for spotted owl," as well as the diversity of butterfly and snail species associated with the assemblage of plant communities dispersed across the landscape.

The call to consider ecosystem dynamics (change over time) and ecosystem integrity (whether all the components of the ecosystem are present and functioning) requires the BLM to consider biological objects and ecosystem variables relative to the range of processes occurring within the CSNM landscape. The monitoring of key species (for example, old-growth sugar pine) and variables indicative of ecosystem functioning (nutrient and water cycling, water temperature) is critical to understanding the health of the ecosystems within the Monument. While most monitoring projects identified in Table ALL-1 contribute to an understanding of ecological integrity and ecosystem functioning, other important processes that need to be monitored include forest succession, weed invasion, hydrology, and monitoring of individual species considered indicative of habitat conditions required by a broader suite of species.

Of particular concern within the Monument is the impact of livestock on the biological elements considered characteristic of the CSNM and mentioned within the Presidential Proclamation. The subset of projects examining potential livestock impacts are listed in table ALL-1 and presented in greater detail in Draft Study of Livestock Impacts on the Objects of Biological Interest in the Cascade-Siskiyou National Monument. The remainder of this document describes some of the themes of information that the range of monitoring projects will supply, as well as more detailed descriptions of the critical projects defined.

There are four primary categories of monitoring need to assess the array of values and potential impacts of management actions throughout the CSNM. Monitoring within each category is necessary to provide a comprehensive ecological perspectives at the landscape scale. Each of the described monitoring efforts contribute to one or more of the following:

Baseline Data

Forest systems in the Monument will be monitored to determine trends related to disturbance agents such as insects, disease, and fire. Non-forest plant communities are effected by grazing and fire exclusion in the Monument. A study that determines impacts of livestock grazing in the Monument with specific attention to sustaining the natural ecosystem dynamics is required and under way. Landscape level plant community surveys will be conducted on the ground and supported by satellite imagery in order to determine long term trends. Baseline data gathering methodologies will be initiated as soon as possible.

In addition to ongoing surveys and old aerial photographs, the semi-annual collection and archival of satellite imagery will provide the baseline data for examining plant compositional changes consequent to wildfire and management activities across the Monument landscape in the longer term.

Historical Plant Community Change

Several monitoring projects/surveys are planned to provide a better understanding of historical and more recent impacts of livestock, human, and natural disturbance on ecosystem dynamics across the CSNM landscape. Monitoring/surveying will be conducted to examine present landscape-level condition, past plant community changes, the distribution of special plant community/wildlife habitat, and noxious weed invasion. Imagery (aerial and satellite) may provide additional baseline data to examine the above dynamics in more detail in the future.

Landscape-level surveys of plant community, wildlife habitat, weed abundance, surface hydrology, riparian condition, and livestock utilization will provide the context for more intense monitoring at specific sites on the landscape. Full use is being made of existing data to provide seamless maps of plant communities across the CSNM landscape.

Fence-line contrasts and existing livestock exclosures coupled with ground-nesting bird surveys will allow limited assessment of past plant community change and wildlife nesting habitat associated with livestock impact. A re-examination of vegetation plots associated with old soil and vegetation surveys will allow further assessment of long-term change for the range of plant communities within the Monument. 1939 Aerial photos have been purchased to provide visual evidence of change at specific locations within the CSNM.

Ecosystem Dynamics

Several projects will provide insight to "ecosystem dynamics" as defined by the Proclamation. Studies of insect and arthropod populations, changes in plant community composition, weed invasion, coarse woody debris, tree vigor and disease & insects within Northern Spotted Owl cores and adjacent areas within the context of past disturbance/ecological process (timber harvest, grazing, wildfire, weed invasion, etc) will provide inference about ecosystem dynamics.

Monitoring of Management Activities

The Monument supports a variety of forest and non-forest plant communities with changing compositional and structural characteristics. Any activities initiated within the Monument that change or effect plant communities require monitoring and research that support or validate management objectives. Issues related to this are Grass/Shrubs/Woodland Plant Community Health, Forest Health and Livestock Grazing. Plant community trends need to be measured with the best technology available in a manner that will identify environmental processes over time creating a long term archive in the process.

Future management activities (prescribed fire, weed eradication, small tree thinning, and others) will be monitored using permanently marked monitoring sites following standard protocols established for the CSNM. Where feasible, care will be taken to establish monitoring protocols that maintain compatibility with existing data.

Past, Current, and Proposed Monitoring

A detailed list of all past, ongoing, and proposed monitoring within the Monument is presented in Table ALL-1. Several past monitoring projects listed in Table ALL-1 are a source of baseline information also providing a historical context for the Monument. Compilation of historical and current monitoring projects (Map 46) will help identify knowledge gaps and provide guidance for the selection of new monitoring projects and sites. A full compilation of past and current monitoring efforts will also aide the integration of new monitoring projects with historical information.

Table ALL-1. Existing and Proposed Monitoring Projects in the CSNM.

Monitoring Project	Objectives	Data Type	Replication	Scale	Monitoring type
LIVESTOCK ENCLOSURE/EXCLOSURE STUDY					
Existing enclosures	Examine past influence of livestock on plant communities	Point cover data and photo-monitoring	3	Project	Baseline
New enclosure and paired grazed site to examine the effects of livestock on butterfly community	Examine the effect of livestock on butterfly abundance and richness	Butterfly abundance and richness during timed intervals before and after grazing	2	Landscape	Validation
New enclosure to test native plant seeding strategies	Examine feasibility of restoring weed infested/native plant depauperate plant communities	Canopy cover, permanent photo-point	Determined at the time of project implementation	Project	Validation
New enclosures and paired grazed site to examine the effects of livestock on the proliferation of weeds	Determine if livestock enhance the proliferation of annual grasses and yell0ow starthistle on poor/fair condition range sites	Point cover and photo- monitoring	5	Landscape	Validation

Table ALL-1. Existing and Proposed Monitoring Projects in the CSNM.

Monitoring Project	Objectives	Data Type	Replication	Scale	Monitoring type
New enclosures and paired grazed site to protect and/or study the effect of livestock on special status species	Examine the effect of livestock on Calochortus greenei, *Limnanthes floccosa*, and the Fredenberg pebble snail	Plant and seedhead counts, photo-monitoring, snail counts and habitat data where applicable	5	Landscape	Validation
New enclosures to examine the effect of livestock on a range of plant communities	Examine the effect of livestock on conifer understory, riparian, wet meadows, dry meadows, shrub and oak woodland plant communities	Point cover and photo- monitoring	Approximately 30	Landscape	Effective-ness validation
STUDIES SUPPORTING THE LIVESTOCK ENCLOSURE/EXCLOSURE STUDY					
Landscape plant community surveys	Provide general landscape condition, fuels, context for other studies	Tree & shrub canopy cover and herbaceous foliar cover estimates	Synoptic for Klamath River Ridges	Landscape	Baseline
Re-examination of historic plot/stand plant species compositional data	Provide objective data for examining plant community change across time by repeating old SCS (NRCS) and SVIM vegetation plots/transects	Phytomass and/or cover by species	90 existing plot locations	Landscape	Validation
Existing rangeland condition/trend data	Determine if rangeland trend is moving towards a desired future condition	Nested frequency data and utilization data	6	Landscape	Effective-ness
Utilization by livestock based on stubble height	Determine riparian/upland utilization by livestock based on stubble height	Percentage utilization by species	Throughout the monument.	Landscape	Baseline
Existing utilization plots	Determine percent forage utilization by livestock	Percent utilization by species	16	Landscape	Effective-ness

Table ALL-1. Existing and Proposed Monitoring Projects in the CSNM.

Monitoring Project	Objectives	Data Type	Replication	Scale	Monitoring type
Recreate historic Riparian/ wetland/ spring utilization surveys	Repeat historic surveys from 1983	Numerous variables	50+ sites	Landscape	Baseline
Existing fenceline contrast	Examine past influence of livestock on plant communities and bird nesting habitat	Point cover data and photo-monitoring, nesting bird surveys	To be determined	Project	Validation
Aerial photo-derived plant community change	Determine plant community change and site specific disturbance history using aerial photos: focus on all past and present monitoring plots/enclosures, special plant communities, key functional areas	Digitally ortho-corrected GIS layer photo mosaics of Jenny Creek and tributaries in 40s 4e sections 22,27, and 28 using photos from 1939, 1953, 1962, 1966, 1975, 1980, 1985, 1991, 1996, ~2001, and ~5 year intervals after that.	~5-year intervals	Project	Baseline effective-ness validation
Rare plant monitoring and surveys	Generalize monitoring for rare plant species	Perform walk through of known sites	Annually	Landscape	Baseline
Weed monitoring	Several sources of information will provide understanding of weed dynamics	Fixed transects, re-examination of vegetation plots, other existing surveys	1-3 years	Landscape	Baseline
Dietary overlap between livestock and native ungulates	Examine diets of large herbivores collecting information about potential interaction/competition for food	Re-analysis of fecal composition data collected in the late 1970s and early 1980s	one time	Landscape	Baseline

Table ALL-1. Existing and Proposed Monitoring Projects in the CSNM.

Monitoring Project	Objectives	Data Type	Replication	Scale	Monitoring type
Winter deer habitat - shrub demographics studies	Determine correlation between range of shrub age classes and condition and suitability of deer winter range	Re-examination of shrub demographic data collected in the late 1970s	one time	Landscape	Baseline
Fish habitat and riparian condition monitoring within grazed and ungrazed streams	Project dovetails with other riparian projects & water quality monitoring	channel width/depth ratio residual pool depth pool frequency plant community structure shading	one time	Landscape	Baseline
Photo plot monitoring	Database of photo plots	Changes in life-form abundance	every 1-5 years	Landscape	Baseline

Table ALL-1. Existing and Proposed Monitoring Projects in the CSNM.

Monitoring Project	Objectives	Data Type	Replication	Scale	Monitoring type
INDIVIDUAL MONITORING PROJECTS CONTRIBUTING TO UNDERSTANDING THE CSNM LANDSCAPE: TERRESTRIAL					
Oregon Gulch RNA: protecting, maintaining, and restoring natural values	Sugar pine tree vigor, density, prescribed fire effects	Stand exam, fuels inventory, canopy, tree vigor and age	Permanent plots replicated throughout stand	Project	Effective-ness, validation
Influence of commercial thinning on white fir stands on...arthropod communities in SW Oregon.	Arthropod communities	Transects, soil samples, pitfall traps, CWD sampling	6-12 replications	Project	Validation
Historic fire frequence in old-growth forests	Quantify fire occurrence in old-growth forest stands, the frequency of fire occurrence among stands and among forest types, and the length of fire free periods. Compare the frequency of fire with tree recruitment. Determine developmental tree and stand characteristics in relation to their fire environment.	Growth ring analysis	one site	Landscape	Validation
The effect of thinning on the decomposition food web	Understand how thinning affects the decomposition food web.	Transects, soil samples, catch traps, pieces of CWD	8 paired sites in spotted owl cores and adjacent Habitat type 5.	Project	Validation
Habitat Type “1” & “2” vs. “5” effectiveness monitoring	Determine effects of treatments in habitat types in the same areas as the arthropod studies	Measure structure, stand density, canopy, fuels, CWD and snags over time using slivicultural and fuels databases. CO ov Var. pre and post treatment	8 paired site in spotted owl cores and adjacent forest stands	Project	Effective-ness

Table ALL-1. Existing and Proposed Monitoring Projects in the CSNM.

Monitoring Project	Objectives	Data Type	Replication	Scale	Monitoring type
Root rot incidence and insect activity	Monitor disturbance agents annually and note trends. Review CVS plots for structural and disturbance characteristics	Tree vigor, mortality and forest changes.	15 CVS plots, throughout the monument, RNAs	Project	Baseline
Aerial and satellite imagery	Imagery of plant cover and long term plant community changes; Several potential applications.	Canopy cover by plant community, shrub-interspace mosaic dynamics	Focus on enclosures & key areas, synoptic for monument, annual flights	Landscape	Baseline

Table ALL-1. Existing and Proposed Monitoring Projects in the CSNM.

Monitoring Project	Objectives	Data Type	Replication	Scale	Monitoring type
INDIVIDUAL MONITORING PROJECTS CONTRIBUTING TO UNDERSTANDING THE CSNM LANDSCAPE: AQUATIC (PHYSICAL AND BIOLOGICAL)					
Landscape hydrologic/ riparian surveys	Provide general hydrologic/riparian spatial information, morphologic description, flow regime, and condition as context for other studies, input to the Monument transportation plan, and protection of aquatic/riparian objects identified. Baseline for long- term monitoring.	Location, flow duration, channel classification/ morphology data for streams, wetlands, and other hydrologic features; instream large wood; impact descriptions and restoration opportunities, especially related to livestock, transportation, and vegetation	Keene Creek, portion of Middle Jenny Creek subwatersheds completed 1999. Upper Emigrant Creek subwatershed to be completed 2000. Fall, Camp, Scotch, Upper Cottonwood, Lower Cottonwood, Upper Jenny, Lower Jenny, remainder of Middle Jenny Creek subwatersheds proposed repeat at 10-25 year intervals.	Landscape	Baseline
Baseline stream temperature monitoring	Monitor for long term changes in stream temperatures, as context for judging success of riparian/aquatic management, restoration, and protection	Seasonal 30-minute interval data	13 sites in addition to the 9 project-specific sites listed above 10 proposed new sites	Landscape	Baseline
Gaging station and staff gages: flow and water quality assessment	Provide flow and water quality information at key locations as context for other types of aquatic condition assessment	15-minute interval gage height, air temperature, water temperature at gaging station Monthly grab sample collection of turbidity, air temperature, water temperature, pH, flow, fecal coliform, dissolved oxygen	1 gaging station ongoing 11 staff gage-only sites ongoing 5 new staff gage- only sites proposed	Landscape	Baseline

Table ALL-1. Existing and Proposed Monitoring Projects in the CSNM.

Monitoring Project	Objectives	Data Type	Replication	Scale	Monitoring type
Stream channel cross sections throughout the CSNM	Provide site- specific trend of width/depth ratios, entrenchment, and other indicators of channel form, and provide reference points for assessment of large flood flows.	Cross-section measurement to calculate entrenchment, width/depth ratio; bankfull channel length to calculate slope and sinuosity.	12 existing monumented sites 5 new sites proposed measured at ~5-year intervals and after major flood events	Landscape	Baseline
Lower Jenny Creek rain gage	Provide rainfall data as context for flow assessment and other types of monitoring	15-minute interval rainfall data	1 site. Precipitation stations also located at Howard Prairie Dam (NOAA), Parker Mountain (RAWS), Buckhorn Springs (RAWS)	Landscape	Baseline
Jenny Creek riparian restoration aerial photo monitoring	Aerial photo monitoring of change in riparian and morphologic condition portion of Jenny Creek undergoing restoration activities.	Digitally ortho-corrected GIS layer photo mosaics of Jenny Creek and tributaries in 40s 4e sections 22,27, and 28 using photos from 1939, 1953, 1962, 1966, 1975, 1980, 1985, 1991, 1996, ~2001, and ~5 year intervals after that.	Not applicable	Project	Baseline, effective-ness
Jenny Creek riparian restoration stream temperature monitoring	Document long- term change in WATER temperatures resulting from passive and active restoration activities attempting to reverse past management impacts	Seasonal 30 minute interval data	9 monumented sites along 2.5 miles of Jenny Creek, repeated annually. Two sites monitored since 1991, seven additional sites monitored since 1997.	Project	Effective-ness

Table ALL-1. Existing and Proposed Monitoring Projects in the CSNM.

Monitoring Project	Objectives	Data Type	Replication	Scale	Monitoring type
Jenny Creek riparian restoration channel morphology monitoring	Document long-term change in stream dimension, pattern, and profile resulting from passive and active restoration activities attempting to reverse past management impacts. Provide context for other aquatic monitoring activities	Cross-section measurement to calculate entrenchment, width/depth ratio; bankfull channel length to calculate slope and sinuosity.	8 monumented cross-sections along 2.5 miles of Jenny Creek, measured at ~ 5-year intervals or after major flood events	Project	Effective-ness
Aquatic macro-invertebrate monitoring	Long term monitoring of aquatic macroinvertebrate community change as indicator of habitat/water quality.	Taxa abundance, taxa richness, other metrics	12 sites ongoing 10 new sites proposed Monitored at 5-6 year intervals	Landscape	Baseline
Fish distribution surveys	Determine upstream limits of fish distribution.	Electrofishing, visual observations, snorkeling.	All potentially fish-bearing streams.	Landscape	Baseline
Fish habitat use monitoring: watershed scale, responses to watershed change	Quantify Jenny Creek sucker habitat use for all age classes. Further explore the relationship between habitat use and various environmental variables. Further understand how the patterns of habitat use vary between years, in order to provide a basis for the other projects aimed at understanding "why."	"Habitat-type" based surveys, snorkeling.	5 sites on Jenny and Keene Creeks, approximately 400 - 800 m long.	Landscape Reach	Validation
Fish population monitoring	Estimate population levels within Jenny Creek for the three native fish species: Jenny Creek suckers, redband trout, and speckled dace.	Snorkeling.	At least 5 sites scattered throughout Jenny and Keene Creek watersheds; perhaps up to 5 additional sites.	Landscape	Baseline, Validation

Table ALL-1. Existing and Proposed Monitoring Projects in the CSNM.

Monitoring Project	Objectives	Data Type	Replication	Scale	Monitoring type
Fish habitat use monitoring: reach-scale responses to riparian and channel restoration on the former Box-O ranch	Track changes in the fish community to physical changes in the channel through the former Box-O Ranch, as restoration projects restore floodplain connectivity.	Habitat-type stream surveys, snorkeling	4 established sites along the former Box-O ranch	Reach	Validation
Jenny and Keene Creeks channel restoration monitoring	See if original project objectives were met. Look for unforseen impacts. Determine how (or if) fish habitat responds to channel changes as a consequence of these projects.	Stream channel mapping, photo points, channel cross sections, habitat-type surveys, snorkeling.	2 sites, one at the Lower Crossing on Jenny Creek and one on Keene Creek.	Site-specific	Effective-ness
Identifying Jenny Creek sucker spawning areas	Confirm suspected spawning locations of Jenny Creek suckers	Specially-made drift nets	4 sites downstream of assumed spawning areas	Landscape	Baseline
OTHER					
Yellow starthistle invasion in grass/shrub/ woodlands	Long-term monitoring of yellow starthistle on susceptible sites	Frequency data and photo- monitoring	20	Landscape	Baseline
Visitation impacts	Monitor visitor impacts on plant communities at potentially high impact/sensitive sites	Canopy cover, permanent photo-point	Determined at the time of project implementation	Landscape	Baseline
Sedge community assessment	Examine composition and condition of sedge meadows/springs	Walk-through - species list	Not applicable	Landscape	Baseline

Table ALL-1. Existing and Proposed Monitoring Projects in the CSNM.

Monitoring Project	Objectives	Data Type	Replication	Scale	Monitoring type
Spring/wetland photo-monitoring	Visual trends of structural and compositional changes in springs and wetlands, livestock impact	Permanent photo-points	50% of perennial springs & wetlands	Landscape	Baseline
Aquatic mollusk distribution	Identify spring characteristics and history important to the distribution of aquatic molluscs	Plant life-form point cover, photo monitoring, and modified proper functioning condition	To be determined	Landscape	Baseline
Fire regimes/ fire effects (baseline data)	Long term effects of prescribed burning and wildfires in forest plant communities.	Pre- and post-fuels and vegetation inventory	Representative plant communities	Landscape	Baseline
Herbicide treatment of Canada thistle	Examine the feasibility of using herbicide to treat Canada thistle	Canopy cover, photo	10 paired plots, 3 sites	Project	Effective-ness
Management activities	Monitor all future management activities using permanently marked plots and transects	The most appropriate variable	Determined at the time of project implementation	Project	Effective-ness
Special habitat delineation	Identify special plant community habitats, determine distribution	Satellite imagery	Synoptic, once only	Landscape	Baseline
Bird point count transects and associated vegetation	Repeat SVIM bird point count transects	Bird point counts and associated vegetation transects	8	Project	Baseline
Neotropical bird dynamics	Monitor neotropical birds utilizing riparian areas of Box-O	Continuous effort mist netting	1 site, repeated mist netting, banding	Landscape	Baseline
Neotropical bird monitoring	Identify neotropical birds utilizing riparian areas of Box-O	Random Ornithological Inventory	1 site, 1-15 hours mistnetting	Rroject	Baseline
Noxious weed surveys	Add to existing noxious weed database	Weed presence/absence	Synoptic	Landscape	Baseline

II. Individual Monitoring Projects Contributing to Understanding the CSNMLandscape: Terrestrial

A. Oregon Gulch RNA: Protecting, Maintaining and Restoring Natural Values

Note: Project Lead on this study is Coreen Francis, who is pursuing a Master's Degree in Forestry at Oregon State University. This study is part of the work towards her degree and is subject to change before implementation.

Introduction

In 1989 Oregon Gulch was nominated by the Natural Heritage Program for Research Natural Area (RNA) designation because it contains two Natural Heritage Program cells: Rogue Valley mixed conifer and chaparral vegetation (USDI, 2000). A cell is defined as a "unique ecosystem type used by the Natural Heritage Plan to inventory, classify and evaluate natural areas" (Oregon Natural Heritage Advisory Council, 1998). The United States Department of the Interior (USDI) Bureau of Land Management (BLM) Resource Management Plan (RMP) established the following restrictions: no timber harvest, no off-highway vehicle (OHV) use, and no mineral entry (USDI, 1995). RNAs are intended as scientific research and baseline study areas. One objective is to preserve its natural values and lack of accessibility (USDI, 2000).

Two unique communities prompted the RNA designation (USDI, 1992). The first is a mixed conifer community that occurs mostly on the north facing slopes south of the Gulch. These stands contain scattered old-growth sugar pine (*Pinus lambertiana*), incense cedar (*Calocedrus decurrens*), Douglas-fir (*Pseudotsuga menziesii*), and ponderosa pine (*Pinus ponderosa*). These species are also found in the understory with Douglas-fir the dominate species. Oregon White Oak (*Quercus garryana*) is found around stand edges and in openings. California Black Oak (*Quercus kelloggii*) is found scattered among conifers and overtopped by them (USDI, 2000). The second community is a wedgeleaf ceanothus/bunchgrass chaparral found mostly on the north facing slopes above the Gulch. The mixed conifer stands are the focus because of concerns about maintaining a healthy overstory and a heterogeneous understory. The integrity of these stands needs to be maintained by protecting them from catastrophic fire. The long-term objective is to manage the stands with prescribed fire.

Justification and Expected Accomplishments

This project was originally suggested by Dave Russell, silviculturist, Ashland Resource Area, Medford BLM because of concerns for the health of the old-growth sugar pine in the RNA. In 1995 mountain and western pine beetles, attacked and killed approximately one- third of these old-growth dominant sugar pine. Russell recognized that high tree densities due to fire suppression should be addressed. He also noted Douglas-fir was the dominant understory species which would eventually become the dominate overstory species without intervention.

The Medford District Resource Management Plan (RMP) states that the Oregon Gulch RNA will be managed according to the values and the goals of the Natural Heritage Program (USDI, 1995). The RMP states that management objectives will be to "preserve, protect, or restore native species composition and ecological processes of biological communities in research natural areas."

In the spirit of the RNA program it is imperative to investigate the natural processes that created and maintained this uneven-aged, old growth mixed conifer forest. The scattered nature of the overstory indicates the pre-European settlement condition was more open (Walstad et al. 1990). Fire scars on these trees indicate fire was a natural process that may have served to maintain the species mix. Initial observations noted the high understory density resulting from fire exclusion. Douglas-fir, a the more shade-tolerant species, has been successful at regenerating in the understory during the last 80-100 years. This project will investigate the stand conditions, reference them to pre-European settlement conditions, and attempt to create a more open, fire resistant, truly mixed conifer community by using various silviculture treatments over a period of time. The purpose of the outlined project is to protect and maintain Oregon Gulch as a healthy mixed conifer ecosystem in the Natural Heritage Program.

Objectives

Objective 1: The primary objective of this project is to develop a serious of site-specific silviculture prescriptions for mixed conifer stands in the Oregon Gulch RNA that support the RMP objectives. The prescriptions will address the following issues: high fuel loading, mortality to overstory sugar pine, high stocking densities, and the dominance of Douglas-fir in the understory. The five objectives of the prescriptions are:

Prescription Objective 1: Reduce the risk of a stand-replacing fire. Maintaining the Oregon Gulch RNA as a representative mixed conifer ecosystem is crucial. The inaccessibility of the RNA and the high fuel loading sets it up as a prime candidate for a stand-replacing fire. The current understory structure and composition either sets it up for a stand-replacing fire or conversion to Douglas-fir through succession without intervention.

Prescription Objective 2: Reduce stocking densities and minimize mortality from insects and disease. Reducing densities serves to increase the vigor of remaining trees. Increasing vigor will make the stand more resistant insect populations or root diseases thus increasing the long-term integrity of the stands (Filip et al., 1999; Knutson et al., 1986; Larsson et al., 1983).

Prescription Objective 3: Perpetuate the historic mixture of sugar pine, ponderosa pine, Douglas-fir, incense cedar, and black oak. Currently, the overstory of the RNA provides evidence of the complex natural mixture of sugar pine, ponderosa pine, Douglas-fir, incense cedar, and black oak that is found in the mixed conifer stand type. The understory however, is much different because Douglas-fir is the dominant understory tree species. Typically sugar pine and ponderosa are the dominant overstory with only a few scattered old-growth Douglas-fir and incense cedar.

Prescription Objective 4: Provide a multi-layered stand structure for wildlife and plant diversity. Oregon Gulch is used by several wildlife species that depend on the multi-layered canopy structure that it currently provides. These structural needs will be integrated into the prescriptions. Plant diversity will be maintained by opening up the understory, allowing shrubs and herbs to become reestablished.

Prescription Objective 5: Reintroduce the range of natural variability. It is important to investigate the range of natural variability if these stands are to be restarted in the direction that they were going prior to European settlement. Old-growth trees in these stands may be able to indicate whether the disturbance regime was patchy or uniform across the landscape.

Methods and Materials

The overall approach to prescription development is to: 1) collect stand and tree data, 2) summarize the current stand condition, 3) define the desired stand condition, 4) utilize several models to evaluate the effectiveness of the treatment, 5) evaluate models outputs for meeting the five objectives of the prescription, and 6) selection of the preferred treatment. Other considerations to be evaluated are adjacency to private land, riparian corridor management, sensitive species, cost, and operational constraints.

The Oregon Growth Analysis and Projection (ORGANON) growth-and-yield model (Hann et al. 1997) will be used. For each plot, a fuels inventory transect method (Brown, 1974) will be done. This was added because of the need for a quantitative assessment of the fuels. This will be used to project tree mortality in response to prescribed burning. The last element of data collection is the coring, measuring and mapping of all old-growth pines in the heritage stand. This is intended as a reference to pre-European settlement growth and stand dynamics. The data collected from the plots in each of the six stands will be entered into ORGANON (Hann et al. 1997), Forest Vegetation Simulator (FVS)(Teck et al. 1996), and Fire Area Simulator (FARSITE)(Finney, 1998) models to assess current and future growth, mortality, species composition, stand structure, and fire behavior. Silviculture treatments such as thinning, modified group and single tree selection, pruning, and burning will be applied and their effects will be projected with these models (Smith, 1997). The outputs will be evaluated based on the five objectives of the prescription. Alternative treatments will be developed and the preferred treatment will be discussed in the final prescription.

Inventory Design

The first step in designing the inventory is to delineate the stands from aerial photos. The digital orthophotos can be used to digitize the stand boundary in the GIS. Approximate acres are calculated by GIS and a scaled map generated. Plot locations can be placed on the aerial photo by using a dot grid. The sampling intensity for this project will be a plot every 5 to 6 acres. The permanent plots will be used by the BLM for long-term monitoring of the RNA. Each plot center will be mapped with a GPS machine.

Standard Inventory

The standard inventory method will be to evaluate the current stand structure and composition. This inventory will provide data that will used in analysis for the five objectives. Table ALL-2 provides a summary of all variables examined in each plot and the plot design. Aspect, slope, topographic position, percent crown closure, and plant association are recorded for each plot in addition to the tree, log, and vegetation variables listed in the Table ALL-2.

Table ALL-2. Standard Inventory Plot Measurements

Type	Size	Variables	Measurements Taken
Fixed	r = 7.8 ft.	Trees 0.0-4.0" dbh	species, DBH, height, crown ration, crown class, damage, mortality, decay class
Fixed	r = 15.56 ft.	Trees 4.0-8.0" dbh	species, dbh, height, crown ration, crown class, damage, mortality, decay class
Variable	20 BAF	Trees > 8.0" dbh	species, dbh, height, crown ration, crown class, damage, mortality, decay class, site tree type, age of site tree, radial growth
Fixed	r = 11.8 ft.	Seedlings	species, height, amount
Fixed	r = 11.8 ft.	Vegetation	species, height, percent cover
Transect	100 ft.	Downwood >5.0" at intersect	species, diameter at intercept, length, decay class, small and large end diameters

Data in Table ALL-2 will be used in the growth and yield model, ORGANON, in order to develop treatment options. Another model, FVS, will be also be used because in addition to growth and mortality, it also projects impacts from insects, pathogens, and fire. The FARSITE model will be discussed later because its use is specific to objective 1. Model outputs for the various treatment options will be evaluated for the best fit to the five objectives and a selection of the best option will be made. The evaluation of data specific to each objective is essential to choosing the best option. The methods for these are discussed below.

Prescription Objective 1: Reduce the risk of a stand-replacing fire

The fuel inventory method selected for this project is a transect method developed by (Brown 1974). He revised this method in (Brown et al. 1982) to include live fuels, but this method will not be used because live fuel data is collected in the stand inventory (Brown et al. 1982). The direction of the transect is chosen by spinning the compass three random turns at plot center. A logger's tape is laid out 50 ft. in each direction. Fuel depths are collected at 38, 44, and 50 ft. along this transect. Duff depths are collect at 44 and 50 ft. Down dead material in the 0-0.25 and 0.25-1 inch size classes are counted if they transect the tape between 44 and 50 ft. 1-3 inch material is counted between 38 and 50 ft. along the transect. Material 3 inches and larger are recorded by diameter at transect by size and categorized as rotten or sound. The calculations for computing tons/acre are:

$$\text{0-3 in. material:} \quad \frac{11.64 \times n \times d^2 \times s \times a \times c}{N\ell}$$

$$\text{3+ in. material:} \quad \frac{11.64 \times \sum d^2 \times s \times a \times c}{N\ell}$$

Where: 11.64 = constant; n = number of pieces; d^2 = diameter squared; s = specific gravity; a = non-horizontal angle.

Prescription Objective 2: Reduce stocking densities and minimize mortality from insects and disease

The standard inventory plot data can be used to evaluate density and mortality. All dead trees are measured and insects and diseases on live trees are noted. ORGANON and FVS provide density information in the form of basal area, trees per acre, relative density, and stand density indexes (Hann et al. 1997; Teck et al. 1996). Site trees that are cored at each plot can provide a relationship between density and tree vigor.

Prescription Objective 3: Perpetuate the historic mixture of tree species
The data on the overstory composition provided by the standard inventory will provide for an analysis of the historic species composition. This will be the target composition for analyzing model outputs for the various treatments. Ponderosa pine, white oak, Douglas-fir, incense cedar, black oak, and sugar pine are the tree species that will be evaluated.

Prescription Objective 4: Provide a multi-layered stand structure for wildlife and plant diversity
The data specific to this objective is collected on the plots and represented by the model outputs. The vegetation portion of the inventory provides information on vegetative species, height and percent cover. This information can be compared with the canopy cover which is also collected on each plot to identify the relationship between canopy cover and vegetation. The plot data also provides information on the stand structure such as average diameter at breast height (DBH), and heights. Prior to data analysis, desired structure and vegetation composition will be developed according to wildlife structural needs and vegetative response thresholds.

Prescription Objective 5: Reintroduce the range of natural variability
The old-growth ponderosa pine and sugar pine trees are a testimony to the growth patterns of this stand over several centuries. A separate inventory of these trees in the heritage stand can be used to determine the growth patterns of the stand over time. The heritage stand was chosen for this because it contains the best overstory old-growth pines in the RNA. The contiguous nature of the stand will also allow for a spatial analysis of within stand dynamics. The old-growth Douglas-firs were not chosen for this because they have too much rot to be useful in this analysis. Each pine will be cored and standard tree measurements will be collected.

Analytical Process

Prescription Objective 1: Reduce the risk of a stand-replacing fire
The information from the fuels inventory will be used by the fuels specialist to develop a burn plan for the prescribed burns in the implementation phase of this project. It will also be used in the FARSITE model. The FARSITE model requires the use of five GIS layers:

- elevation
- slope
- aspect
- fuels
- canopy cover

The elevation, slope, aspect, and canopy cover layers are created from plot data collected in the standard inventory. The fuels layer will be created from the fuel inventory data. The model will be applied to the existing stand in order to demonstrate the risk of a severe wildfire. In addition to this, a number of simulations will be done on the treatment alternatives as identified by the other ORGANON and FVS. These simulations will identify the effectiveness of the treatment in reducing the risk of a severe wildfire. They can also aid in identifying potential "hot spots" during prescribed burns.

As mentioned earlier, the FVS model has an extension that assesses fire risk, behavior, and impacts. It simulates the dynamics of live tree growth and mortality, snags and surface fuels, and fire (Table ALL-3). All the standard silviculture tools are offered with the bonus fuel treatments and prescribed burns also available to the user. This extension will be used to evaluate the impacts of prescribed burning on the structure and compositon of the treated stands.

Table ALL-3. FVS Simulation of the Effects of Fire on a Stand (Beukema et al. 1999).

First Order Effects	Second Order Effects
Fuel consumption Tree mortality Crown consumption Smoke production Mineral soil exposure	Reduced growth of scorched living trees Increased fall rate of snags Potentially altered growth, mortality or regeneration

Prescription Objective 2: Reduce stocking densities and minimize mortality from insects and disease

In the data analysis phase the first step is to identify an acceptable level of stocking. This will be determined by examining the overstory stocking, making the assumption that these were the natural stocking densities, and utilizing research indices of basal areas that are most likely to promote tree resistance to insects and disease (Filip et al., 1999; Knutson et al., 1986; Larson et al., 1983). ORGANON and FVS will be utilized to identify the appropriate treatments to achieve lower densities and more resistance to insects and diseases. Specifically, the insect and disease extension of FVS will provide a more detailed analysis of these impacts (Teck et al., 1996).

Prescription Objective 4: Provide a multi-layered stand structure for wildlife and plant diversity

ORGANON and FVS models the change in vegetation over time and for each treatment. The outputs will be evaluated against the desired structure and vegetation cover.

Prescription Objective 5: Reintroduce the range of natural variability

In order to determine spatial dynamics on tree growth, a GPS point file will be collected at each sample tree (or at a group of sample trees). These locations will be mapped in the GIS. Spatial distribution of these trees can be used to determine the patterns of disturbance and growth within the stand.

B. Influence of Commercial Thinning of White Fir Stands on Soil, Litter and Coarse Wood-Chewing Arthropod Communities in southwest Oregon

Introduction

Plant growth and the long-term sustainability of forest ecosystems depends on the interaction of soil fungi, microbes and invertebrates due to their roles in nutrient cycling and decomposition (Coleman & Crossley 1996; Freckman 1994). The soil and litter foodweb is among the most biologically diverse part of any terrestrial ecosystem. Beyond numeric abundance, these organisms play critical roles in maintaining soil fertility, health and productivity (Coleman et al. 1992). Arthropods both above and below ground are essential to the shredding of plant material, making nutrients available for microbial digestion. Through their grazing on bacteria and fungi, invertebrates also play a fundamental role in mineralizing the immobilized nutrients pooled within the microbial biomass, making them once again available to plants. Coarse wood chewers (CWC) as a functional group are extremely important to nutrient cycling, decomposition, and serve as an important source of food for other wildlife species. Although there are several orders of wood chewing arthropods, we will focus on ants as they are early invading representatives of this guild and have been demonstrated to be valuable indicator taxa that are readily discernable for future monitoring (Torgersen and Bull 1995). More specifically their ability to bore into the wood not only begins the process of structural breakdown of a fallen tree, and hence release of bound nutrients,

but their entrance holes serve as infection courts for many decomposing fungi and bacteria which they often transport on their bodies (Harmon et al. 1986; Shaw et al. 1991). The effects of forest management practices on these organisms and consequently on long-term soil productivity are largely unknown.

Problem

As part of the Record of Decision for the Northwest Forest Plan, federal land management agencies are directed to survey for four guilds of arthropods in the southern range of the Northern Spotted Owl. Designation of these four guilds was based on an assessment that under the land allocations for Alternative 9, there is a considerable likelihood that the key ecological functions of these groups would not be maintained over much or all of the federal landscape (Holthausen et al. 1994). The Standards and Guidelines accept the use of commercial thinning as a silvicultural tool to reduce the risk of stand-replacing fires, but also recognize that this practice may reduce the quality of habitat for some organisms, including soil and litter arthropods and CWC. A retrospective assessment is essential in determining both the short- and long-term effects of thinning as a management tool on the abundance, diversity and function of these arthropods within the time limitations of the Record of Decision for general regional surveys. Such an approach will assess changes over a broad temporal scale, examining immediate effects as well as longer term recovery from thinning.

Background

Commercial thinning of overstocked stands has been recognized as being an effective tool for reducing the hazard of wildfire, increasing stand productivity, improving wildlife habitat (and increasing biodiversity), and as a means for hastening the transition to old-growth conditions (Smith 1986). One management goal of thinning densely stocked stands is to open the forest canopy, thereby increasing the structural complexity of the vegetation, and ultimately enhancing microhabitat diversity for arthropods and other wildlife. However, opening the forest canopy often increases exposure of the forest floor to solar radiation and wind, generally increasing temperatures, decreasing relative humidity and accelerating the drying of litter, soil, and woody debris. For forest floor organisms sensitive to fluctuations in microclimate, this change could be profound. Although little is known about the physical requirements of most soil, litter, and coarse wood chewing arthropods, many species are known to be highly specific to particular site conditions, and would be expected to be affected by such microclimatic changes.

Numerous studies investigating the effects of timber harvesting on arthropod communities have been performed since the 1960s. However, nearly all of this work has been concerned with conventional clear-cutting, or modifications of this practice (e.g. cable logging) (Huhta et al 1967, 1969; Huhta 1976; Vlug and Borden 1973; Seastedt and Crossley, Jr. 1981; Bird and Chatarpaul 1986, McIver et al. 1992; Niemela et al. 1993) . In contrast, very few studies have investigated how thinning influences arthropods. In one landscape scale study in Douglas-fir forests in western Oregon, Madson (1998) found no statistical differences in macroarthropods collected in pitfall traps or in microarthropods extracted from soil and litter samples among late-successional, pole-sized (80 yrs old) and thinned (9-23 yrs in age) stands. However, within sites a trend toward treatment differences was often seen. To better understand the influence of thinning on these arthropod communities, it is clear that further research needs to be performed.

Objectives

Objective 1: Measure the short and longer term effects of timber thinning on the abundance, diversity, and function of soil, litter, and CWC arthropods.

Objective 2: Determine the ability of soil, litter and CWC arthropods and their functions to recover after thinning.

Objective 3: Identify species, or groups of species, that can act as indicators of thinning as a disturbance, or of recovery.

Methods and Materials

Location

This retrospective study will take place on BLM land within the Ashland Resource Area of the Medford District. The study area, located between 5,300-5,400 feet elevation, is largely comprised of a white fir-Douglas-fir (ABCO-PSME) plant association. The structure of the forest has been heavily influenced by large scale stand-replacement wildfires occurring in 1910 and 1917; this resulted in relatively dense stands dominated by even-aged white fir over much of the landscape. However, small pockets of forest, dominated by ponderosa pine, sugar pine and red fir are also found in the area, depending upon elevation, aspect and proximity to riparian zones. To minimize sampling heterogeneity, we will restrict sampling to portions of the study areas that have an ABCO-PSME overstory.

Experimental design and plot selection

The primary variable that will be evaluated will be time since thinning. Therefore, sites will be comparable in terms of extent of thinning (approximately 15%), stand structure (i.e., tree species composition, age and density), elevation, slope and aspect.

Depending upon the availability of sites meeting our selection criteria, we will attempt to classify sites into the following age class categories:

1. 1 yr since thinning
2. 2 yrs since thinning
3. 10-15 yrs since thinning

If land treatment data shows thinned stands older than 15 yr., samples in such stands could be substituted for the 1 yr. thinning sample.

Two to four replicate sites for each age class will be chosen. For each age class, an equal number of unthinned sites (acting as controls) will be used.

Sampling

Soil and litter arthropods

Soil and litter arthropods will be collected using two standard methods: microarthropods will be sampled by directly collecting soil and litter followed by extraction in the laboratory and macroarthropods will be collected using pitfall traps. Within each site, sampling points will be placed along transects. Transects will run along terrain contours and will be placed no closer than 30 m from a site boundary. No sample point will be closer than 0.5 m to a live tree with DBH >10 cm. Soil and litter samples will be taken 2 times over the course of the study: late early summer (early-mid June), and fall (October). Samples from successive dates will be taken adjacent to earlier samples. Pitfall traps will be opened for four to six 2-week intervals over the course of the study.

1. Microarthropods - Litter collection will be guided using a plastic panel containing a 10 x 10 cm opening in the center. Litter within this opening will be collected by carefully scooping it from the soil using a putty knife and placing it into zip-lock plastic bags and labeled. Soil beneath the litter layer will be collected using a stainless steel corer (8 cm diameter by 10 cm deep), lined with two 5-cm long thin-walled PVC plastic sheaths. The soil will be fractioned into layers 0-5 cm and 5-10 cm below the surface. Each plastic sheath will be sealed tightly in a zip-lock plastic bag, bound with a rubber band and labeled. Both litter and soil samples will be immediately placed into chilled coolers and stored for transport to the laboratory where they will be maintained at 5 deg C until microarthropod extraction takes place. Litter and soil samples for each depth at each site will be composited into groups of 4 for extraction (4 samples consecutive along the transect), but compositing will take place in the lab as cores are placed into extractors rather than in the field at the time of collection. Microarthropods from both litter and soil samples will be extracted using Berlese funnels that create a heat and humidity gradient. Timers attached to powerstrips controlling 40 watt incandescent lights will create a gradual increase in soil and litter temperatures driving the arthropods from the substrate into collection jars. Lights will alternate being on and off for 2 hr intervals for the first 24 hrs, and then left on continuously until litter or soil has desiccated (dry to touch).

2. Macroarthropods - Pitfall traps will consist of a 1 qt plastic bucket (14 cm diameter opening) fitted with a metal funnel and covered with a 25 cm x 25 cm plastic rain cover, suspended with nails, 5 cm above the trap. Trap buckets will be buried in the ground with their tops placed flush with the level of the forest floor. An 8 oz canning jar partially filled with ethylene glycol (50% solution) will be placed beneath each funnel to catch and preserve arthropods caught in traps.

Coarse wood chewers

The quantity and quality of downed woody debris within the thinned and unthinned areas will be measured using line transects as described in Bull et al. (1997). Measurements will be taken on all logs down to 6 inches diameter at the large end. Data to be collected will include:

1. diameter at the large and small end of the log
2. length
3. species
4. log decomposition class (BLM 1965)
5. wood condition (sound, moderate decay, advanced decay)

In addition, all logs will be assessed for ant activity. Logs will be chopped into with hatchets and a representative sample of the ants present will be placed into alcohol for later identification in the laboratory. A densiometer will be used to estimate canopy closure in the thinned and control plots.

Taxonomic Identification

All arthropods collected in this study will be identified to the lowest taxonomic level that expertise and resources allow. Particular effort will be made to identify Oribatid mites and Collembola in soil (due to their abundance and well documented function and taxonomy); spiders and carabid beetles in litter; and ants in coarse woody debris to the genus or species level. Voucher material for all taxa will be established and maintained as part of USFS Western Forest Insect Collection housed at Oregon State University, Corvallis, OR.

Nutrient Analysis
If funding allows, we will incorporate a litterbag study to assess functional changes due to arthropods. Litter decomposition and mineralization would be measured using litterbags which are designed to include the effects of either : a) microbes only; or b) microbes and microarthropods. Weight loss, total carbon and total nitrogen levels in the two different types of litterbags would be analyzed to determine changes in decomposition rates due to arthropod function. If funding allows, soil nutrient analysis will include:

1. Soil pH
2. Total carbon
3. Total nitrogen
4. Available nitrogen

Analytical Process

An analysis of variance test will be used to determine whether differences exist in the abundance of arthropods (at the species or guild level) found within the three thinning age classes. If differences are found, then *a priori* orthogonal contrasts will be made to determine which thinning age classes differ significantly from each other. Multivariant clustering analyses will be used to determine if species, or assemblages of species, can be used to define thinning age classes. Data will be transformed as necessary to meet the assumptions of each statistical test.

C. Historic Fire Frequence in Old-growth Forests

Introduction

An understanding of the type, frequency and influence on stand development by historic disturbances can assists ecologist in evaluating potential ecosystem effects and response to various silvicultural treatments. It also provides a basis for developing management options, as well as the ability to recognize when stands are developing on an undesirable trajectory. Therefore the frequency of fire during stand development may influence the size and number of surviving trees. In the absence of fire, species like white fir that are relatively susceptible to fire, become established and steadily displace the more fire adapted species such as Douglas-fir and ponderosa pine. During extended periods without fire the abundance of fire dependent species may decline and eventually disappear altogether, therefore the lack of fire may result in a shift in relative abundance of both overstory and understory trees, shrubs and herbs, influencing the dynamics of forest succession and stand development. Thus, the lack of fire may result in a shift in stand development thereby altering, species composition, density and structure. Presently, the lack of fire may well replace the occurrence of fire as the most significant ecological disturbance factor influencing the development of southwestern Oregon forests. This is a regional study involving sites throughout southwest Oregon; however several of the study locations are near and within the CSNM.

Objectives

Objective 1: Quantify fire occurrence in old-growth forest stands from 1700-1900, through the detections of fire scars in three forested ranges, Cascade, Siskiyou and mid-Coast forests in Southwestern Oregon.

Objective 2: Compare the frequency of fire occurrence among stands and among these forest types.

Objective 3: Determine the length of fire free periods from 1700 -1900 in these three forest types.

Objective 4: Compare the frequency of fire with the recruitment of trees during stand development among sites and forest types.

Objective 5: Determine the developmental tree and stand characteristics including, tree establishment, growth and density of old-growth stands in relation to their fire environment.

Methods and Materials

All stumps within each 8 ha sample units were cleared of debris, cleaned and wire brushed if necessary and then examined for fire scars. When a fire scar was detected the growth rings after the fire were counted. A pin was inserted into the stump to mark each tenth annual ring grown subsequent to the fire to facilitate counting. A hand lens was used where growth rings were small or difficult to delineate. The number of years since harvesting was added to the years of growth subsequent to the fire event and the fire dates calculated. Where stumps recorded multiple fires, each fire was individually dated and a record of the fire interval in that tree was recorded. Where scars occurred on two sides of the same stump (cat-face) which resulted from the same fire, both scars were dated for comparison. The stump height diameter at the time each tree survived its first fire was measured in cm for each tree recording multiple fires.

Analytical Process

The dates (yr) of all fire scars were calculated and compiled for each 8 ha plot in all forest types. Each date became a fire record and when compiled formed a composite sample fire history for that stand. The intervals between each fire record were calculated and averaged to establish a composite fire frequency. Composite fire frequencies were compared among stands and between forest types using ANOVA (analysis of variance).

The dates (yr) of all fire scars on individual trees recording multiple fires were calculated and compiled for each 8ha plot in all forest types. Each date became a fire record and when compiled formed a point sample fire history for that stand. The intervals between fire scars on individual trees recording multiple fires from 1700 - 1900 were compiled to establish a point sample fire frequency. Point sample fire frequency intervals were compared among stands and between forest types using ANOVA.

D. The effect of thinning on the decomposition food web: a key to understanding the function of the soil and litter arthropod community

Introduction

Forest health and productivity are strongly influenced by rates at which dead organic matter is decomposed and nutrients are recycled. The decomposition food web, which is comprised of soil and litter organisms, is largely responsible for controlling the rates at which these processes take place. The diversity of organisms within this food web is

large, both in terms of form and function, but is dominated by decomposers (fungi and bacteria), fungivores (microarthropods), and predators (micro- and macroarthropods). The decomposer guild, which is primarily composed of bacteria and fungi, is directly responsible for transforming organic molecules into inorganic forms (nutrients) that are available to plants for growth.

In forest ecosystems, fungi are the dominant microbial decomposer. The primary role of fungivorous microarthropds in this food web is to regulate the abundance and growth rates of fungi through grazing. However, fungivorous microarathropods also contribute significantly to rates of decomposition through comminution of organic particles, effectively increasing the surface area available to microbes, and by facilitating microbial innoculation of new organic substrates by transporting fungal spores during their movement (Anderson et al. 1984). Predatory arthropods dominate the highest trophic level of the food web. They feed on a variety of organisms, with their preference for prey associated with their body size. Studies have shown that fungivorous microarthropods are common components to the diet of both micro-and macroarthropod predators (Yeargan 1975, Nentwig 1987). Because food webs are inherently linked, when one organism within the web changes in abundance, organisms within other trophic levels may be affected as well (Paine 1966, Pimm 1982). For example, a decrease in predator abundance could ultimately decrease decomposition rates because as fungivore abundance increased with reduced predator abundance, the abundance of fungi would be expected to decrease. If management actions such as prescribed fire or thinning alter the composition and structure of this food web, then it would be expected that decomposition rates would also be affected. In fact, recent studies in grasslands have suggested that changes in arthropod predator abundance do cascade down through the decomposition food web, resulting in changes in the rate of plant decomposition (Kajak et al. 1991, Kajak 1997). However, it is not known whether a similar response would be found in forest ecosystems. Clearly, understanding how disturbance effects the functional relationship among members of the decomposition food web is important to understanding the consequences of management activities on ecosystem health and productivity.

Problem

Under the Record of Decision (ROD) for the Northwest Forest Plan, it was determined that additional information needed to be gathered for the four arthropod guilds considered to be at risk for losing their key ecological functions on federal lands (Holthausen et al. 1994). The survey and manage arthropod core team considered retrospective studies to be an important element of a plan to assess short- and long-term effects of ecosystem disturbance (human-induced or natural) on the abundance, diversity and function of these guilds. During FY 1998, the influence of prescribed fire on the abundance and diversity of arthropods within the soil and litter and those inhabiting coarse wood debris was investigated, while in FY 1999 the impact of thinning was studied on these same arthropod groups. Wildfire is the third form of disturbance considered to present a risk to these arthropod groups. Unfortunately, a retrospective study investigating the effect of wildfire on these arthropod communities, similar in approach to the previous two studies, does not appear feasible, and would likely lead to inconclusive results. This conclusion is based on the following reasons: 1) a GIS analysis performed during FY 1998, associating wildfire to elevation, forest type and land ownership, revealed that many wildfires have taken place outside of the forest types considered most important under the NWFP; 2) replicate sites within forest type or within appropriate age-of-burn classes are poorly represented, weakening statistical rigor and inference abilities of the research; 3) burn intensity within and among sites are extremely variable; and it is difficult to accurately quantify the intensity and extent of each burn, and; 4) burned sites are often difficult to access or are on terrain too steep to study

effectively. Therefore, the focus of research proposed for FY 2000 is to address questions that will link data gathered during FY 1998 and FY 1999 to the critical question of whether the observed response of arthropods to disturbance leads to loss of ecosystem function. Within the continued context of the 1999 retrospective study, direct examination of the relationship between changes in the decomposition food web after disturbance will help bridge the gap between data gathered in the previous two years to the key ecological functions of the soil and litter arthropod guild.

Background

It is not entirely clear how disturbance to forest ecosystems affects arthropod communities, but a mounting body of evidence suggests that the structure and species composition of soil and litter communities are altered, at least initially after disturbance (e.g., Niemela et al. 1993, Seastedt and Crossley 1981, Holliday 1984, Michaels and McQuillan 1995). Results from the first two years of Northwest Forest Plan retrospective studies support this conclusion. In FY 1998, prescribed fire in the Ashland watershed (Rogue River NF) was found to significantly decrease the overall abundance of microarthropods (fungivores and predators) found in the litter. Prescribed fire also affected predatory spider and carabid beetle abundances, but the direction of the response varied among taxa; abundances of some species decreased after fire while some increased. For example, the abundance of relatively sedentary spiders (e.g. web-builders and lay-and-wait predators) was lower in burned sites, possibly due to a simplification of habitat after fire (reduction in the availability of web attachment points or foraging sites). In contrast, active hunting spiders were more abundant in burned sites than unburned sites. For these species, a structurally more simple habitat may have enabled them to hunt more effectively. Although as yet inconclusive, preliminary results from the FY 1999 study in the Jenny Creek LSR (now the CSNM)(Medford District, BLM) comparing arthropod abundance between unthinned, late-successional old-growth (LSOG) stands to sites thinned 10-20 years prior also suggest that changes in habitat structure have influenced arthropod community structure. Although it appears that disturbance does affect individual arthropod taxa (species, families, or functional groups), it is not clear how changes in the abundance of one taxa effects other members of the food web, or how such changes effect ecosystem processes. That is, does a change in spider abundance influence rates of decomposition? Understanding this relationship is fundamental to understanding the influence of management activities to concerns outlined in the ROD.

Within the southern range of the Northern Spotted Owl (NSO), spiders are the dominant invertebrate predator within the decomposition food web. Many species of spiders are considered to be opportunistic predators, capturing a wide range of prey, but most are thought to feed extensively on *Collembola* (Hallander 1970, Yeargan 1975, Nentwig 1987). *Collembola* are a common and ubiquitous fungivore in the soil and litter of forest communities (Peterson, H.1971). Due to their abundance, these tiny insects are considered to be important regulators of fungal colonization and growth (Swift et al. 1979). In studies where *Collembola* abundance is high, fungal growth has been shown to be low, and where Collembola abundance was low, fungal growth has been high (Coleman et al. 1983). Interestingly, at intermediate levels of grazing intensity, fungal growth has been shown to be enhanced due to a stimulating effect of grazing on senescent fungal hyphae (Hanlon 1981, Warnock et al. 1982). Although understanding the relationship among spiders, collembola, fungi and decomposition rates is clearly important, no study in forest ecosystems has shown that changes in the predator community effects either fungi abundance or rates of decomposition. Before changes in arthropod abundance associated with disturbance can be linked to this important ecosystem process, a better understanding of the dynamics within this food web need to be determined.

Objectives

Objective 1: The primary objective of the proposed research is to understand how thinning affects the decomposition food web. More specifically, the work is designed to determine how changes in predatory arthropod abundance influence rates of decomposition and nutrient cycling. This objective will be obtained by manipulating spider abundance within forest litter in thinned and unthinned LSOG stands, followed by measuring the response of *Collembola* abundance, fungal growth, and the rates at which conifer foliage decomposes and nutrients within the foliage tissues are mineralized. These results will allow, for the first time, a direct assessment of how forest thinning influences one of the key ecological functions of the soil and litter arthropod community.

Methods and Materials

Location

The proposed study will take place within the former Jenny Creek LSR, located in the CSNM. This area was also used during 1999 to determine the effect of thinning on the abundance and community structure of soil and litter inhabiting and coarse wood chewing arthropods. For the 1999 study, arthropod abundance was compared between eight LSOG (Type 1 habitat; habitat suitable for supporting nesting NSO) and eight adjacent sites thinned 10-20 years earlier (Type 5 habitat; considered dispersal habitat for NSO); the thinned sites were similar in overall structure to LSOG sites prior to thinning. This study area represents an ideal location to perform the proposed work because the relationship between stand condition and arthropod abundance will already be known. Furthermore, work at this location will allow comparison of this ecosystem process between forest conditions considered ideal (NSO nesting habitat) to those representing stand conditions currently unsuitable for nesting NSO but which is being intensively managed to be converted to the future desired condition of NSO nesting habitat.

Study Design

The effect of spider abundance on the decomposition food web will be performed in thinned and LSOG sites. A subset of four of the eight paired sites used in 1999 will be chosen for use in the proposed research. Each pair of sites will be similar in elevation, aspect, slope and in the structure of the forest prior to thinning. Site choice will be based upon differences in spider abundance between thinned and LSOG sites found in 1999; choosing sites with known differences will ensure the greatest applicability to management considerations.

Spider density will be influenced in two ways: natural and manipulated. Natural differences in spider abundance among sites will have been identified during 1999 and will be associated with thinning. Manipulated differences will result from a process of removing spiders from manipulated plots. These differences in spider density will provide the basis for which the response of the rest of spiders on the rest of the decomposition food web will be made.

Within each site, four types of plots will be established: 1) sift/removal plot - plots in which barriers will prevent movement of spiders and *Collembola* into and out of the plot and in which spiders have been removed by sifting the litter; 2) sift/no-removal plot - plots in which barriers exist and sifting took place but spiders were left in the plot; 3) no-sift/no-removal plots – plots with barriers but in which litter was not sifted and spiders not removed, and; 4) non-exclusion/undisturbed plots – plots without exclusion barriers and in which no sifting of the litter took place. This combination of plots will allow the effect of spiders on the rest of the food web to be separated from effects of the exclusion barrier and disturbance of the litter during sifting.

Within each site, four 2 m x 2 m plot locations will be identified. Plots will be 5-10 m apart and will be similar in terms of surrounding forest and litter structure. Each of the four plot types will be assigned randomly within each site. The perimeter of exclusion plots will consist of sheet metal driven into the ground to prevent movement of spiders and *Collembola*. Within the three plots receiving sorting treatment, spiders will be collected by hand sorting all litter within a plot. Spiders from the exclusion/removal plot will be preserved for identification while spiders collected from the two non-removal plots will be counted and returned to their respective plots. All litter will be returned to their respective plot after spiders are sorted. Spider density will be determined again at the end of the study by resorting litter and removing all spiders from each plot.

Collembola abundance will be determined by extraction from litter that has been collected within each plot. Within each plot, two 10 cm x 10 cm samples of litter will be collected. Sample locations will be determined by randomly choosing points within each plot. Collections will be taken on four occasions: just prior to sorting the litter (pre-treatment), and at 4, 8 and 16 weeks after litter had been sorted. Extraction will take place in the laboratory using Berlese-type funnels. A light bulb at the top of each Berlese funnel generates a heat and humidity gradient that forces organisms from the litter into collecting vials below. All *Collembola* collected will be identified to the morpho-species level and counted.

Litterbags containing conifer needles will be used to determine fungal growth and rates of decomposition and mineralization. Eight litterbags, each 10 cm x 10 cm, and containing 4 grams of conifer needles, will be placed between the soil and the litter that has been sorted for spiders within each plot. Four litterbags will be used to analyze fungi and 4 litterbags will be used to measure decomposition and mineralization rates. Litterbags will be collected at 5 and 12 months after placement in the field. Each litterbag sample will be replicated once within each plot; these paired bags will be combined for each analysis.

Analytical Process

An analysis of variance test will be used to determine whether differences exist in the abundance of *Collembola* and fungi, and rates of decomposition and mineralization between thinned and unthinned sites and between treatments of different spider density. Data will be transformed as necessary to meet the assumption of the test.

E. Habitat Type “1” & “2” vs. “5” Effectiveness Monitoring

Introduction

Plots were established and forest stand data collected in 1998-99 in these habitat types to assist with writing the assessment for what was originally the Jenny Creek LSR and to characterize forest stand components for the Microarthropod studies (see preceeding --study proposals). The existing information will be the baseline data for monitoring treatments and trends in CSNM. Various pre- and post-treatment stand density, growth and fuels data, etc., will help determine effectiveness in meeting goals and objectives during management activities. Current Vegetative Survey plots in the Monument will also be used to those ends.

Methods and Materials

Establish plots in the habitat types in order to monitor post treatment effects. Baseline data has been collected previously. Use BLM stand exam to collect data and maintain database. This is the Atterbury stand exam format.

Objectives

Objective 1: Monitor stand structural characteristics, stocking levels, canopy, fuels, CWD and snags over time.

Objective 2: Determine effectiveness in meeting protection and maintenance goals after treatments.

Objective 3: Use information to further assist decision making and planning future activities.

Analytical Process

Compare pre- and post-treatment stand tables and other information using existing Atterbury, Farsite and Organon data systems. Use analysis of variance when applicable.

F. Root Rot Incidence and Insect Activity in CSNM

Introduction

Root rots and insects, especially bark beetles are common agents of disturbance in CSNM. See Chapter 2 disturbance agents. This will be a project aimed at developing baseline data in determining the location of and the extent to which root rots and beetles are affecting forest stands in the Monument.

Objectives

Objective 1: The insect and root rot baseline data would be linked to global fiducial data and other aerial flights to assist in tracking trends and aiding in decision making in the Monument.

Materials and Methods

Annual flights will continue map out insect occurrence in CSNM. Locations will be field checked. Root rot occurrence and severity has been and will continue to be added to the database as inventory work is accomplished.

Analytical Process

Develop maps, determine severity, link to effectiveness monitoring involving established plots and input into the decision making process for prioritizing treatments in forest stands. Specifically, protection of LSOG habitat types is desired.

G. Aerial and Satellite Imagery

Introduction

Satellite and aerial imagery can be obtained on a regular basis to be used during analysis of plant community changes and trends over time. Currently aerial photos are flown every 5 years. Satellite imagery can be flown annually and used in a variety of way to observe changes in vegetation and condition of plant communities over time. With designation of the CSNM baseline data becomes important for tracking long term changes within that designation. The Global Fiducial (NIIR) program seeks nominations for sites in order to track ecologically significant events over time. The Monument fits that need and has been designated a Global Fiducial site which is to represent major elements or critical processes that can be monitored remotely as indicators of long-term environmental variability or change.

Objectives

Objective 1: Develop baseline data for tracking plant communities over time on the Monument that will assist in meeting stated goals and objectives while managing the CSNM.

Methods and Materials

Obtain satellite imagery annually for this Global Fiducial Site. Analyze the data, compare with existing data and photos. The project, dependent on funding, is expected to last 20 years.

Analytical Process

Review and compare annual data to track plant community trends and changes. Track forest disturbance agents. Use data and observations to assist in making management decisions.

III. INDIVIDUAL MONITORING PROJECTS CONTRIBUTING TO UNDERSTANDING THE CSNM LANDSCAPE: AQUATIC (PHYSICAL AND BIOLOGICAL)

A. Landscape Hydrologic/Riparian Surveys

Introduction

Management, protection, and monitoring of aquatic/riparian resources can only be accomplished if the location of those resources is known. Detection of change in many of those resources, especially due the site-specific nature of many aquatic/riparian features, can only be accomplished through the collection of existing condition data, and then monitoring change over time.

Objectives

Objective 1: Provide general hydrologic/riparian spatial information, morphologic description, flow regime, and ecological condition, as context for other studies, input to transportation planning, and protection of aquatic/riparian objects identified. Will serve as baseline for long-term monitoring.

Objective 2: Provide data to assist in assessment of all ACS objectives.

Methods and Materials

Location, flow duration, channel classification/morphology data for streams, wetlands, and other hydrologic features; instream large wood; impact descriptions and restoration opportunities, especially related to livestock, transportation, and vegetation throughout the Monument. Assessment of functioning condition. Surveys conducted using the Ashland Resource Area Stream Survey Protocol. On BLM lands within the Monument, initial data collection in the Keene Creek and a portion of the Middle Jenny Creek subwatersheds was completed in 1999; portions in the Upper Emigrant Creek Subwatershed were completed in 2000. Portions in Fall, Camp, Scotch, Upper Cottonwood, Lower Cottonwood, Upper Jenny, Lower Jenny, and the remainder of Middle Jenny Creek subwatersheds are proposed for initial data collection. Surveys would be repeated at 10-25 year intervals.

B. Baseline Stream Temperature Monitoring

Introduction

Changes in vegetative cover, channel dimensions, and bank/floodplain water storage are known to influence stream temperatures. Changes in riparian management, upland management to increasingly protect riparian resources, and cooperative restoration activities targeted at meeting MACS objectives and state water quality standards should lead to detectable changes in summer stream temperature at locations throughout and adjacent to the CSNM as stream and riparian function improves.

Objectives

Objective 1: Monitor for long term changes in stream temperatures, as context for judging success of riparian/aquatic management, restoration, and protection.

Objective 2: Provide data to assist in assessment of MACS objectives 2, 4, and 9, for assessment of compliance with state water quality standards, and to assist in development of State of Oregon/EPA-required Water Quality Management Plans for this area.

Methods and Materials

Seasonal 30-minute interval stream temperature data collected using USGS and ODEQ-established methodologies. Data collection at 13 existing and 10 proposed sites in addition to the 9 project-specific sites listed above.

C. Gaging station and Staff Gages: Flow and Water Quality Assessment

Introduction

Calculation and assessment of peak, high, and low flows is extremely difficult without actual field measurement and reference over time. Flow data is also required for the meaningful analysis of water quality parameters. Because of rapid fluctuation in stream levels, continuous records are required at a key location to interpret data collected in non-continuous sampling from other locations.

Objectives

Objective 1: Provide flow and water quality information at key locations as context for other types of aquatic condition assessment.

Objective 2: Provide data to assist in the assessment of ACS objectives 1, 2, 4, 5, 6, 7, and 8, and to monitor compliance with state water quality standards.

Methods and Materials

Monthly grab sample collection of turbidity, air temperature, H2O temperature, pH, flow, fecal coliform, dissolved oxygen at 11 existing and 5 proposed locations. Continuous record (15-minute interval) of stream stage, water and air temperature at one location. Standard methods using USGS, Oregon DEQ and EPA approved protocols.

D. Stream Channel Cross Sections Throughout the CSNM

Introduction

Calculation and assessment of peak, high, and low flows is extremely difficult without actual field measurement and reference over time. Flow data is also required for the meaningful analysis of water quality parameters. Cross-sections provide a reference point from which to document changes in channel morphology, conduct flow measurements, and estimate flood flows. Documentation of changes in channel morphology provides an indication of stability and functioning of the upstream surface hydrologic system.

Objectives

Objective 1: Provide site-specific trend of width/depth ratios, entrenchment, and other indicators of channel form, and provide reference points for assessment of large flood flows.

Objective 2: Provide data to assist in the assessment of MACS objectives 1, 2, 3, 5, 6, 7, and 8.

Methods and Materials

Cross-section measurement to calculate entrenchment, width/depth ratio; bankfull channel length to calculate slope and sinuosity. Measurement methodologies including standard cadastral survey techniques and those outlined in Rosgen (1996). 12 existing and 5 proposed Monumented sites measured at ~5-year intervals and after major flood events.

E. Lower Jenny Creek Rain Gage

Introduction

Assessment of hydrologic response and water quality parameters, as well as many other aspects of ecosystem function, can only be accurately analyzed in the context of recent precipitation. Although year-to-year trends in precipitation tend to be uniform over an area of this size, there is substantial variability in precipitation between locations based on terrain, elevation, etc. Precipitation data from a number of sites at varying elevations and locations in and around the Monument is needed for interpretation of related data including hydrologic, vegetation conditions, etc.

Objectives

Objective 1: Provide rainfall data as context for flow assessment and other types of monitoring.

Objective 2: Provide data to assist in assessment of ACS objectives 4, 5, 6, and 7.

Methods and Materials

Fifteen minute interval rainfall data collected at 1 site in Lower Jenny Creek using tipping bucket rain gauge. Daily precipitation collected at Howard Prairie Dam (NOAA), Parker Mountain (RAWS), and Buckhorn Springs (RAWS). Daily snowfall and snow-on-the-ground collected at Howard Prairie Dam (NOAA).

F. Jenny Creek Riparian Restoration Aerial Photo Monitoring

Introduction

Past practices in vegetation management and utilization, stream channelization, and flood control have dramatically changed riparian condition and morphologic character of portions of Jenny Creek. Changes in management, riparian vegetation restoration activities, and removal of flood control structures should allow the stream channel of Jenny Creek to recover from a straightened and constrained state to an increasingly sinuous, non entrenched condition as described by Rosgen (1996) and others. The extent and size of woody riparian vegetation should likewise increase. Aerial photo monitoring of this change over time is a relatively inexpensive technique that can dramatically demonstrate the magnitude of change occurring.

Objectives

Objective 1: Aerial Photo monitoring of change in riparian and morphologic condition in a portion of Jenny Creek undergoing restoration activities.

Objective 2: Provide data to assist in assessment of ACS objectives 1, 2, 3, 5, 7, 8, and 9.

Methods and Materials

Digitally-orthocorrected GIS layer photo mosaics of Jenny Creek and tributaries in 40s 4e sections 22,27, and 28 using photos from 1939, 1953, 1962, 1966, 1975, 1980, 1985, 1991, 1996, ~2001, and ~5 year intervals after that.

G. Jenny Creek Riparian Restoration Stream Temperature Monitoring

Introduction

Changes in riparian vegetative cover, channel dimensions, and bank/floodplain water storage are known to influence stream temperature. Restoration activities and management strategies targeted at meeting ACS objectives should lead to detectable changes in summer stream temperature over the next few decades on this portion of Jenny Creek as the stream channel and adjacent riparian/floodplain areas regain functionality.

Objectives

Objective 1: Document long-term change in water temperatures resulting from passive and active restoration activities attempting to reverse past management impacts.

Objective 2: Provide data to assist in assessment of ACS objectives 2, 4, and 9.

Methods and Materials

Seasonal 30-minute interval stream temperature data collected according to USGS and Oregon DEQ-established methodologies. Data collection at 9 Monumented sites along 2.5 miles of Jenny Creek, repeated annually. Two sites monitored since 1991, seven additional sites monitored since 1997.

H. Jenny Creek Riparian Restoration Channel Morphology Monitoring

Introduction

Recovery of riparian vegetation and removal of flood control structures should allow the stream channel to recover from a straightened and constrained state to an increasingly sinuous, non entrenched condition as described by Rosgen (1996), Leopold (1992) and others.

Objectives

Objective 1: Document long-term change in stream dimension, pattern, and profile resulting from passive and active restoration activities attempting to reverse past management impacts.

Objective 2: Provide context for other aquatic monitoring activities.

Objective 3: Provide data to assist in assessment of ACS objectives 1, 2, 3, 5, 7, and 8.

Methods and Materials

Cross-section measurement to calculate entrenchment, width/depth ratio; bankfull channel length to calculate slope and sinuosity. Measurements methodologies including standard cadastral survey techniques and those outlined in Rosgen (1996). Data collection at 8 cross-sections along 2.5 miles of Jenny Creek, measured at ~ 5-year intervals or after major flood events.

I. Aquatic Macroinvertebrate Monitoring

Introduction

When monitored over the long term, composition of macroinvertebrate communities can serve as a sensitive indicator of condition and change in aquatic habitat/water quality conditions.

Objectives

Objective 1: Long term monitoring of aquatic macroinvertebrate community change as indicator of habitat/water quality.

Objective 2: Provide data to assist in assessment of ACS objectives 4, 6, and 9, and compliance with state water quality standards.

Methods and Materials

Monitor taxa abundance, taxa richness, other metrics measured at 12 existing and 10 proposed sites using methods which meet or exceed state or EPA protocols for the sampling of benthic macroinvertebrates. Revisit sites at 5-6 year intervals.

J. Fish Distribution Surveys

Introduction

Throughout southern Oregon, BLM, the USFS, and ODFW constantly update fish distribution maps. All agencies share information with each other. Although these agencies have a good idea of which fish use larger streams and rivers, fish use in small streams varies throughout the year and from year to year. Some fish use intermittent streams to spawn in the spring; summer surveys would not find any fish in those streams. Similarly, in years with high spring flows, more streams are accessible to spawning fish. The fish distribution information in the CSNM is twenty years old.

Objectives

Objective 1: To determine the upstream limit of any fish species throughout the CSNM.

Methods and Materials

BLM follows a protocol designed by ODFW. Two people use an electroshocker to slightly charge the water and stun fish. The stunned fish can be scooped up in nets and identified quickly before being returned to the water. If four pools in a row do not contain fish, the last pool with fish is considered the upstream limit. Repetitions depend on the presence of fish barriers like waterfalls, time since last survey, and water year.

K. Fish Habitat Use Monitoring: Watershed Scale, Responses to Watershed Change

Introduction

Habitat relationships of western suckers are poorly understood. Most studies on sucker habitat relationships have been conducted at the microhabitat scale (Moyle and Nichols 1973; Alley 1977; Baltz and Moyle 1984; Moyle and Baltz 1985; Decker 1989): how suckers use habitat within a pool, for example. This is important information, but without understanding habitat use at more than one spatial scale, serious misinterpretations could lead to inaccurate conclusions about JCS habitat needs (Dunham and Vineyard 1997). In addition, little is known about the habitat use of suckers at different ages (i.e. young-of-the-year, juvenile, adult). Examining the habitat requirements of different age classes is important in identifying potentially limiting or sensitive physical habitat requirements (Imhof et al. 1996). Finally, the paucity of studies describing habitat relationships of western suckers at different spatial scales is exacerbated by the almost complete lack of studies examining habitat use for longer than one year. Only Rossa (1999) studied sucker habitat use for two concurrent years. This monitoring study continues the work begun in Rossa (1999). It is an effort to further understand sucker habitat use in Jenny Creek in order to ensure that the isolated population remains healthy and viable.

Rossa (1999) did find that sucker habitat use differed in the two years of that study. To understand why, other projects will have to be conducted in conjunction with this study. Some projects are being discussed, or are in the preliminary stages. None are developed enough to include in this monitoring section. Topics include: food availability and possible competition from other grazers, the influence of reduced stream flows due to the Talent Irrigation District system and Howard Prairie Reservoir, and impacts of small irrigation dams.

Objectives

Objective 1: To quantify JCS habitat use within study reaches and throughout the watershed for all JCS age classes.

Objective 2: To further explore the relationship between JCS habitat use and various environmental variables (e.g. cover, substrate, etc.).

Objective 3: To further understand how the patterns of habitat use vary between years, in order to provide a basis for the other projects aimed at understanding "why."

Methods and Materials

Study locations are distributed throughout the entire watershed, to sample a wide variety of reach types. Five monitoring sites are located within the CSNM. A habitat-type based stream survey is used to quantify habitat. Randomly selected habitat units are snorkeled to collect fish numbers and estimated fish lengths.

This project's stream survey methods are a somewhat truncated version of that described in Rossa (1999). Statistical analysis requires that some environmental variables, specifically the numerous cover categories, be lumped into two basic cover categories. Details can be obtained by contacting the Project Lead at Medford BLM: (541) 618-2351.

Analytical Process

Related to Objective 1: Chi-square goodness-of-fit tests. See Rossa (1999) for details.
Related to Objective 2: Multiple stepwise regression and/or discriminant functions analysis. See Rossa (1999) for details.

L. Fish Population Monitoring

Introduction

Only two research projects have been conducted on Jenny Creek suckers (JCS) (Hohler 1981, Rossa 1999). Both projects found that the JCS population separated into somewhat distinct size classes; Rossa (1999) found that there appears to be a pronounced year-to-year variation in young-of-the-year survival. Unpublished data collected with that used in Rossa (1999) indicate that both JCS and redband trout densities are low relative to other streams in the west (Platts and McHenry 1988). Related suckers in other parts of the west are threatened, endangered, or at risk. It is important to monitor the population levels of all fishes in Jenny Creek, to make sure that their populations remain stable and healthy in this isolated watershed.

Objectives

Objective 1: To estimate population levels within Jenny Creek for the three native fish species: Jenny Creek suckers, redband trout, and speckled dace.

Objective 2: To estimate whether the populations are stable, increasing, or declining.

Methods and Materials

The information gathered for this survey is also used for fish habitat use monitoring. Stream habitat areas will be measured as described below. Randomly selected habitat units will be snorkeled to collect fish numbers and estimated fish lengths. Sampling will be conducted at sampling locations throughout the watershed, to ensure that all age classes are represented (Rossa 1999). Sampling will be repeated in two concurrent years every five years, because population levels may fluctuate with water year and habitat condition.

Analytical Process

Simple density models and length-frequency histograms (a standard fisheries method for estimating age classes) will be used.

M. Fish Habitat Use Monitoring: Reach Scale Responses to Riparian and Channel Restoration on the former Box-O Ranch

Introduction

Stream channelization, riparian vegetation removal, pasture management, and construction of flood control structures have dramatically altered Jenny Creek's channel through

the former Box-O ranch. Changes in management, riparian vegetation restoration, and removal of flood control structures should allow the stream channel to recover to an increasingly sinuous, non-entrenched condition as described by Rosgen (1996) and others. Aerial photo monitoring and monumented cross sections completed by the Hydrology shop track the physical changes; this additional survey work monitors the response of the aquatic community.

Objectives

Objective 1: To track changes in the fish community to physical changes in the channel through the former Box-O Ranch, as restoration projects restore floodplain connectivity.

Methods and Materials

See "Fish Habitat Monitoring" above.

Analytical Process

See "Fish Habitat Monitoring" above.

N. Jenny Creek, Keene Creek Channel Restoration Monitoring

Introduction

In 1991 and 1992, three large, complicated channel restoration projects were constructed as part of the Jenny Creek Work Day (now part of Public Lands Day). Two projects cabled logs to bankside trees to protect eroding banks, allow the return of riparian vegetation, and reduce fine sediment input into stream. The third project embedded logs across an eroding meadow channel to trap sediment and stop downcutting. Normally, when these kinds of projects are undertaken, effectiveness monitoring is not included, so it becomes difficult to celebrate successes or to learn from mistakes. Fortunately, BLM made sure to take "pre-project" data on these three projects in order to monitor their effectiveness.

Objectives

Objective 1: To see if original project objectives were met.

Objective 2: To determine if any unforseen impacts (girdling of streamside trees with cable, worse erosion) happened.

Objective 3: To determine how (or if) fish habitat responds to channel changes as a consequence of these projects.

Methods and Materials

Methods used at the three sites vary, but include some or all of the following: marked photo points, contour channel mapping, channel cross sections, Wolman pebble counts, habitat type survey (Rossa 1999). Two of the three sites are also snorkeled to observe

fish use of the project area; however, because fish use of a site varies so greatly (Rossa 1999), this information is of qualitative use only.

O. Identifying Jenny Creek Sucker Spawning Areas

Introduction

Two scientific studies have been completed on the Jenny Creek suckers (JCS) (*Catostomus rimiculus*): Hohler (1981) and Rossa (1999). While both researchers observed fish in spawning colors, neither pinpointed the exact spawning areas of JCS. All closely-related sucker species migrate upstream to spawn in the spring (Moyle 1976, Bond and Coombs 1985, Villa 1985). Until now, it has been assumed that the suckers spawn in Corrall, Beaver and Johnson Creeks (Hohler 1981). This information needs to be collected so that the spawning areas can be protected or restored. In the future, sucker spawning should be tracked in different water years to determine if sucker spawning areas are influenced by water flows (i.e. low water years or high water years) (Barton 1980, White et al. 1990).

Objectives

Objective 1: Identify important spawning areas so JCS can be protected and/or restored.

Methods and Materials

Other related suckers drift downstream at night after hatching (Villa 1985, White et al. 1990). Therefore, netting stream drift at night with a specially-designed net should collect drifting fish. Once a week, nets will be set up in several streams at dusk. Nets will be checked after 2 hours, and again at dawn. A few alevins will be collected and preserved for positive identification. Sampling season is short: April 15 - June 15.

P. CSNM Visitor Use Monitoring

Purpose and Scope:

The purpose of this plan is to outline a procedure to gather visitor use data for lands within the CSNM.

The scope of this plan is focused on public lands within the Monument, but it is not limited to public lands. Private lands and businesses which are within the boundary of the Monument also receive visitors who might be there because of the Monument, and if not, they will still view the Monument while passing through, so in this sense, all lands within the Monument will be included if at all possible.

Goals and Objectives

Goals

The goal of this plan is to gather visitor use data or in the absence of accurate data, make estimates, of visitation to the Monument. Accurate data can be obtained from the Hyatt

Lake Recreation Complex, the only developed BLM recreation facility within the Monument. Data will also be gathered from the Pacific Crest Trail and the Pilot Rock areas using traffic or trail counters, but these types of counters require some corrections for number of occupants or animals which might be counted. In areas where no public vehicle access is allowed, gathering accurate use data will be difficult at best. In these areas, estimates will be made based on best available data.

Businesses within the Monument boundary, should have some estimates of visitors associated with the Monument. These businesses will be asked to provide estimates of such use. The Oregon Department of Forestry lookout tower on Soda Mountain receives many visitors and these visitor totals will also be useful.

A third type of visitation occurs on the State and Federal highways which traverse the Monument. Traffic data from Oregon Department of Transportation (ODOT), when available, can show the number of visitors passing through the Monument, regardless of their purpose for travel.

The goal will be achieved by accomplishing the following objectives:

Collect accurate visitor use data at the Hyatt Lake Recreation Complex. This data is already required for the Recreation Management Information System yearly submission so the mechanism is already in place to gather this data.

Install trail counters along the Pacific Crest Trail. A relatively small number of people hike the entire PCT during a season. Most use of the PCT within the Monument comes in the form of day use on stretches of the trail. Popular segments of the PCNST within the Monument include Soda Mountain to the Greensprings summit and Pilot Rock to Soda Mountain. The segment near the Hyatt Lake Recreation Complex also receives a lot of use with hikers going from Hyatt Lake to Howard Prairie Reservoir, or from Hyatt Lake to Little Hyatt Reservoir. Trail counters installed along these segments should provide acceptable use figures. The exact locations will to be determined from field studies, but the objective is to count people who hike these four segments.

A number of people go to the Pilot Rock area to hike up to or climb Pilot Rock. A trail counter placed on the path to the base of the rock would provide visitor use data.

The Soda Mountain WSA needs to be monitored at least once per month during the time it is accessible to the public. Since all the boundary roads except portions of the Pilot Rock jeep road have been closed, the WSA will be monitored from the air. This monthly overflight would be an opportunity to gather visitor use data for the Monument area south of Keene Ridge.

The area within the Monument north of Keene Ridge receives a large portion of its use during big game hunting season. To gather use data , hunter patrols should be conducted during the first two weekends at the beginning of big game rifle season. Major access roads to the Monument should be staffed from the afternoon of the Friday before rifle season begins and both weekend days thereafter; then again on the following weekend, at the same times.

Businesses which are located within the boundary of the Monument or adjacent to the boundary should be contacted for visitor use data or at the least visitor trend data, including the Box-R Ranch, the Greensprings Inn, Hyatt Lake Resort, Camper's Cove, Buckhorn Springs, and Callahan's Restaurant. These establishments should be contacted at the beginning of each year and asked to participate in this visitor use data gathering effort. They should be told of the purpose of the data gathering effort, how

the data will be used, how they can help gather and supply data, and when to report the data to BLM. At the end of the year these establishments should be contacted to acknowledge receipt of the data or to remind them to submit data, and they should be thanked for their cooperation.

The Oregon Department of Forestry lookout tower on Soda Mountain receives many sightseers yearly, and the lookout maintains a log for visitor registration. The lookout should be contacted yearly and asked to supply this visitor data to BLM.

Another source of sightseer data is highway traffic data gathered by ODOT for both Interstate 5 and Highway 66. Both of these highways traverse the Monument so every person who travels over these routes visits and views the Monument. Data for the segments within the Monument will be requested yearly and used in compiling a visitor use report.

The data from all the objectives will then be totaled for a yearly report.

Implementation:

The purchasing and installation of trail counters will be accomplished by the Monument maintenance staff. Data from the counters needs to be gathered weekly to ensure accurate operation, and this should be done by seasonal staff assigned to the Monument. Campground data for the Hyatt Lake Recreation Complex will be gathered by the campground staff throughout the season.

Contacting the businesses and the Lookout can take place initially by the Monument Manager in an introductory letter or meeting if desired. Monument staff can contact the businesses at the end of the year to collect the data.

Hunter patrol should be conducted on major access roads or entry points and should be done by Monument personnel who are familiar with the area and issues concerning the Monument.

Overflights of the WSA will need to be started once the area is accessible to the public, probably April, and continue through November. The WSA will not need to have an overflight every month because the northwest portion of the WSA can be monitored from the Pilot Rock jeep road, but this only allows viewing about a third of the WSA so the remainder must be monitored from the air.

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Appendix MM- Summary of Meetings held regarding the CSNM

March 28, 2001

Pre-Monument Designation Forums:

1990 to 1995 - Worked with the local community prior and subsequent to the area's designation as the Cascade-Siskiyou Ecological Emphasis Area (CSEEA), as part of the 1995 Medford District Resource Management Plan.

Federal Register Notices required as a part of Resource Management Plan (RMP)

1. Notice Announcing Intent to being the Draft EIS
2. Notice Announcing Availability of the Draft EIS
3. Notice Announcing Availability of the Final EIS
4. Notice Announcing Availability of the Record of Decision

Spring 1999 - Field Tour with Associate Secretary in charge of Natural Resources.

Summer 1999 - Flyers mailed to interested public and included in five local newspapers announcing the management plan process for the CSEEA.

August 1999 - Federal Register Notice announcing scoping.

September 1999 - Four public field trips to the CSEEA planning area to scope for issues and concerns *(9-28-1999, 10-2-1999, 10-6-1999. 10-18-1999)*.

October 1999 - Public meeting held at Southern Oregon University.

Fall 1999 - Interior Secretary tours area with local and federal government officials, representatives from interested local groups and the media.

Fall 1999 - Met with Siskiyou County, California officials and Redding BLM.

Fall 1999 - Open field trip with interested citizens from Siskiyou County citizens.

Winter 2000 - Briefed Jackson County Commissioners.

Winter 2000 - Congressman Walden arranges panel discussion with Secretary of Interior, local government, and interest group representatives.

CSEEA Draft Environmental Impact Statement (DEIS) Plan published March 2000

April 2000 - Met and discussed draft plan with the Jackson County Commissioners in a public forum.

April 2000 - Met and discussed draft plan with the Siskiyou County Commissioners.

April 2000 - Tele-conference with Secretary of Interior, local government, interested local groups and media.

April 2000 - Field trip and briefing for the Provincial Advisory Council to discuss draft plan.

Spring 2000 - Field Tour with Aides of Congressman Walden, Senator Wyden, Senator Smith, Solicitor Department of Interior, and Assistant Secretary of the Interior.

Spring 2000 - Public forum at Southern Oregon University to present EIS/draft plan.

Cascade Siskiyou National Monument (CSNM) Designation - June 9, 2000

July 2000 - Advertisements in five local newspapers explaining Monument designation and inviting public comment for upcoming Monument planning effort.

July 2000 - Federal Register notice of scoping for CSNM EIS/plan.

July 2000 - Letters to CSEEA public mailing list soliciting input on Monument Plan.

July 2000 - Letters to grazing lessees explaining Monument implications and enclosures.

Area planners from the Medford BLM met with Don Rowlett, Box R Ranch.

Met with grazing lessees three times concerning grazing impacts study plan and administrative assess. County Commissioner Sue Kupillas attended several meetings.

Fall 2000 - Met with the Talent Irrigation District and representatives from the Bureau of Reclamation.

Fall 2000 - Met with Oregon Department of Fish and Wildlife to discuss wildlife/Monument issues.

Fall 2000 - Met with Oregon Department of Forestry to discuss fire suppression access.

March 2001 - Met with a local group of citizens interested in CSNM issues.

Spring 2001 - Public Field Tour including Media of Californina/Oregon Trail.

Summer 2001 - Field Trip with Local News Media.

Fall 2001- Briefing and Field Tour with BLM Director and Media.

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Cascade-Siskiyou National Monument

Draft Resource Management Plan / EIS
Volume 2 - Maps and Appendicies

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