

RESOURCE-SPECIFIC MONITORING PROGRAMS

PHYSICAL ENVIRONMENT

SOIL PRODUCTIVITY

Monitoring Purposes

- (1) Determine if soil physical properties, including levels of soil organic matter and other nutrients, are being maintained after timber harvest and site preparation.
- (2) Determine if tree growth is being maintained at satisfactory rates.

Threshold of Concern/Variability

- (1) Observable reductions of organic residues or measurable changes in biological or chemical soil properties, due to timber harvest and site preparation, that are detrimental to soil productivity;
- (2) Mineral soil exposure greater than 40% for low-to-moderate soil erosion hazard, 30% for high hazard, and 15% for very high hazard.
- (3) Compaction, displacement, puddling or severely burned conditions exceed 15% of a project area, including roads.
- (4) Tree growth in harvested areas at less than acceptable levels.

Data Collection

Methods for assessing the effects of organic residues on soil biological and chemical properties will be developed by research scientists in cooperation with Forest personnel. Seedling and tree growth will be surveyed in monitoring plots at intervals of one, three, five and ten years for crop and non-crop species.

Responsibility

Forest and District soil scientists & silviculturists.

WATER RESOURCES

Monitoring Purposes

- (1) Determine if properly implemented BMPs and related standards & guidelines are effective in (a) maintaining/enhancing water quality for dependent beneficial uses, and (b) ensuring compliance with State-mandated water quality objectives for the Klamath/Trinity and other North Coast basins.
- (2) Evaluate appropriateness of basin water quality objectives.
- (3) Determine if any BMP design criteria or the way they are applied need modification to protect beneficial uses and meet basin water quality objectives more fully.
- (4) Evaluate the adequacy of BMPs to minimize adverse cumulative watershed effects on stream channel conditions, water quality, and beneficial uses. Examples of these effects include channel aggradation, loss of riparian vegetation & streambank stability, and reduction in fish habitat quality or diversity.

Threshold of Concern/Variability

- (1) Failure to implement or improper implementation of any BMPs.
- (2) Water quality parameters or channel conditions not satisfactory to maintain existing beneficial uses.
- (3) BMPs or other standards & guidelines not effective in maintaining water quality in compliance with State water quality objectives for the Klamath/Trinity and other North Coast basins.
- (4) Any measurable, management-related loss of favorable conditions of stream flow, including adverse cumulative effects.
- (5) Detectable cumulative effects on stream beneficial uses or conditions of stream flow off-Forest that can be reasonably attributed to Forest management activities.
- (6) Measurable increase in the frequency or magnitude of mass-wasting events (principally landslides) that can be reasonably attributed to Forest management activities.

Data Collection

Implementation and effectiveness of BMPs will be monitored and evaluated in accordance with the Regional BMP Effectiveness Program which includes comprehensive project reviews, individual site evaluations and in-channel monitoring. Data collection methods include visual observations & measurements, water sampling, and qualitative assessment of beneficial uses. Baseline conditions will be sampled in both reserve areas and project areas prior to proposed management disturbances.

Harvest levels specified in the Forestwide standards and guidelines will be verified within planning basins by reviewing timber harvest records. Aerial photo inventories will be used to estimate frequency and magnitude of mass wasting associated with management, and to evaluate downstream effects of Forest practices on stream channels. Selected stream reaches will be re-evaluated every 5 years. Supplementary field data will be collected to verify apparent impacts; this data collection will be coordinated to the extent possible with fisheries habitat monitoring. Cumulative watershed effects monitoring data will be evaluated and summarized periodically.

Responsibility

Forest & District fisheries biologists, earth scientists & watershed staff.

BIOLOGICAL ENVIRONMENT

SENSITIVE PLANTS

Monitoring Purposes

- (1) Does management ensure the conservation of sensitive plant populations?
- (2) Have management activities adversely affected sensitive plant species?
- (3) Do project-level mitigations protect sensitive plant occurrences?

Threshold of Concern/Variability

Twenty percent decline in number of individuals within sampled populations averaged over a 5-year period.

Data Collection

Prioritize species based upon estimated inherent threat, status of population, quality of existing documentation, and project implementation. Apply a three-tiered approach to monitor populations:

Level 1 - census and map species with unknown or poorly known distribution; for relatively widespread species or species of little-known threat, collect semi-quantitative information on habitat characteristics and ocular estimates of population size and vigor; capture information in the form of a population report.

Intensity: census one species or group of species per year, or make ocular estimates as needed for species of relatively stable habitat or low risk.

Level 2 - estimate population size using permanently defined quadrats or belt transects, recording abundance and qualitative or semi-quantitative assessment of population health. **Intensity:** begin every other year.

Level 3 - monitor demographics of species most at risk using permanent quadrats (Menges, 1993). **Intensity:** begin annually for baseline information.

Project level - utilize ocular evaluations or sample marked quadrats or belts before and after project implementation, as appropriate.

Responsibility

Forest botanist and District staff.

WILDLIFE

The FSEIS ROD significantly changed how the Forest will monitor implementation of this Plan. The Memorandum of Understanding for Forest Ecosystem Management (FSEIS ROD, APP. E) established a Research and Monitoring Committee that is currently developing short-, mid- and long-term monitoring priorities. Monitoring strategies are gradually evolving. While an interagency team has completed initial guidance for implementation monitoring, direction for effectiveness and validation monitoring are still under development. The Chief has recently assigned oversight for research and monitoring to the research branch of the Forest Service (ltr to 4810, dtd 1/3/95). The primary goal of this direction is to assure production and stewardship of quality data that are consistent, can be aggregated across large geographic areas and can easily be shared and used.

The following interim monitoring outline for threatened and endangered species displays specific monitoring elements that may be revised by Research and monitoring oversight groups. This outline reflects Recovery Plan objectives, and consultation recommendations from USFWS for those species not yet covered by a Recovery Plan. The Forest had developed interim monitoring outlines for the candidate wildlife species and management indicator species [MIS] that were published in the Draft Forest Plan, but they have been omitted from the Final Forest Plan. As the Forest begins to implement ecosystem management, there will be major changes in the way we monitor whole ecosystems, including appropriate environmental indicators. Refer to Chapter 5 of this plan for a summary of this new methodology to manage and monitor ecosystems.

Threatened and endangered species (federally listed): American peregrine falcon [endangered-CA], bald eagle [endangered-CA], northern spotted owl [threatened-CA], marbled murrelet [threatened-CA].

These are species considered not to have viable populations at present. The Forest Service is responsible under the federal Endangered Species Act to cooperate with the USFWS in implementing existing recovery plans or developing recovery plans as required by the Act. All management activity must be consistent with recovery goals and in consultation with the USFWS.

Monitoring Purposes**Peregrine Falcon/Bald Eagle:**

- (1) Promote & document recovery of federally listed species.
- (2) Evaluate how well recovery plan goals are being achieved as a result of management prescriptions & direction.
- (3) Evaluate if protection of potential nest and roost sites is adequate.
- (4) Verify occupancy and productivity of nest sites.
- (5) Complete surveys to locate new or previously unknown nest and roost sites.

Northern Spotted Owl:

- (1) Ensure recovery and eventual delisting through compliance with management direction and maintenance of environmental conditions that support a self-sustaining population Forest-wide.
- (2) Evaluate trends in pair occupancy, breeding status, and reproductive success of spotted owls within LSRs and within 1.3 miles of proposed management activities through the planning period. Are HCAs occupied by at least 20 (+) pairs of reproductively successful owls in any given year?
- (3) Verify assumptions and expected outcomes of implementing the Forest plan, including pertinent direction from the Presidents Forest Plan.
- (4) Monitor general population trends of spotted owls within the Forest matrix. Does the active adaptive management strategy developed from the Willow Creek Demographic Study accurately predict the effects of management activities within the forest matrix?
- (5) Evaluate effectiveness of surveys for spotted owls in potential habitat.
- (6) Determine if LSRs and 100 acre core areas are being managed as required by Standards & Guidelines for spotted owls.

Marbled Murrelet:

- (1) Determine habitat requirements and distribution on Forest.
- (2) Inventory species occurrence and occupancy within suitable habitat on Forest.

Threshold of Concern/Variability

Peregrine Falcon/Bald Eagle:

- (1) Active nest sites do not produce young for two successive years
- (2) Occupied territories are inactive for three consecutive years
- (3) Surveys are not completed on schedule
- (4) Standards & guidelines for these species not complied with.

Northern Spotted Owl:

- (1) Inventories or surveys not completed on schedule.
- (2) Documented non-compliance with Forest Standards & Guidelines.
- (3) Thresholds for pair occupancy, reproductive status & success, and effectiveness of various strategies are established in the Region 5 monitoring standards for spotted owl

Marbled Murrelet:

Inventories or surveys not completed on schedule.

Data Collection

Peregrine Falcon:

Perform annual aerial monitoring of occupied territories, suspected occupied sites and designated suitable habitat, in cooperation with USFWS and USFS Research. Establish an annual monitoring schedule for each site during the breeding season to determine nesting chronology and reproductive success.

- (a) Make first examination in April to verify occupancy and nesting.
- (b) Make second examination in mid-May to determine nesting success. Nest site will be considered a failure if birds not present at that time.
- (c) Assess selected sites for post-fledging survival and ledge conditions between June 15 and July 15. Band young, collect eggshell fragments and prey remains, and improve ledge conditions.
- (d) Evaluate cliff conditions at selected potential sites. Investigate specific reports of peregrine falcon nesting.

Bald Eagle:

- (1) Monitor active nest sites and survey suspected occupied territories in conjunction with interagency peregrine falcon surveys. Active sites will be monitored in cooperation with California Dept. of Fish & Game, consistent with the protocol established by the State (minimum of three visits).
- (2) Collect habitat data from occupied territories and investigate specific reports of bald eagle nesting. Sighting information should be gathered regularly from commercial river guides (white-water rafting and fishing).

Northern Spotted Owl:

Data collection protocols for pair occupancy, reproductive status & success, and effectiveness of various strategies are established in the Region 5 & 6 Spotted Owl Inventory and Monitoring Handbook. LSRs (including the Willow Creek Demographic Study Area) will be monitored throughout the life of the LRMP. Once LSR inventories are complete, randomly selected areas will be monitored annually. Willow Creek Demographic Study area would be monitored continuously through the planning period, consistent with Forest plan direction and eventually Final Recovery Plan direction. Additional random sample areas (including designated critical habitat) outside LSRs may be established for annual monitoring. Inventory areas will be surveyed as necessary.

All projects planned within or adjacent to LSRs and critical habitat units will be reviewed as they occur to determine if areas are being maintained as intended, and to verify that applicable Standards & Guidelines are being followed.

Marbled Murrelet:

Follow established survey and monitoring protocols, and verify that applicable standards & guidelines are being followed.

Responsibility

District Rangers are responsible for District monitoring; Forest Wildlife Staff will coordinate sampling methods, compilation of data and reporting.

Candidate and Sensitive Species/ Survey and Manage Species

These are species that require special consideration by the Forest Service because there is generally insufficient information available regarding their occurrence, distribution and particular local habitat use and needs to ensure continued viability of populations. Current management objectives for federal candidate species are to cooperate with the USFWS and the States to assess the relative risks of forest management on them, and to provide well distributed habitat that will preclude their becoming listed. Population viability of sensitive species is also a concern. The Forest must evaluate the distribution, status, and trend of both populations and their habitat (FSM 2670.45), and implement management practices to ensure that these species do not become threatened or endangered because of Forest Service actions.

The survey and manage species identified in the FSEIS ROD include invertebrate species that are likely to occur on the Forest and for which little is known. Surveys to determine distribution and confirm occupancy at documented collection sites will be needed before monitoring can start.

Indicator Species and Assemblages

All MIS monitoring will be coordinated with Forest Service Research, as well as with adjacent Forests in the Klamath Province, to the extent possible, to minimize costs and to ensure consistent methodologies.

Note: Research is needed to determine habitat relationships and corresponding population levels by vegetation types within the Klamath Province. Forest will need to work with State and Federal Fish & Wildlife agencies, universities, and the National Biological Service to develop census methods and determine effectiveness of standards. Local conservation groups may assist in establishing and reading transects to determine use by wildlife assemblages dependent on riparian, cavity/decadence and hardwood habitat types.

Responsibility

District Rangers are responsible for District monitoring. Forest Staff will coordinate sampling methods, compilation of data and reporting.

FISHERIES

Monitoring Purposes

- (1) Determine if the structure and function of aquatic ecosystems are being maintained to ensure sufficient quality and quantity of spawning and rearing habitat for anadromous fish throughout the Forest.
- (2) Evaluate changes in numbers or composition of populations of fish on the Forest.
- (3) Evaluate the effectiveness of standards & guidelines designed to recruit and preserve large woody material in streams.
- (4) Ensure that stream temperatures are being maintained or decreased to meet desired conditions.
- (5) Determine if levels of fine sediment in streambeds are affecting habitat condition or the diversity of macro-invertebrate communities.
- (6) Evaluate habitat quantity and quality in lakes and ponds areas for native and compatible non-native aquatic organisms.
- (7) Assess the effects of fish habitat improvements on stream habitat diversity, channel configuration, fish populations, and other aquatic community members. Do improvements increase use by anadromous juveniles in localized sections?

Environmental Indicators

- (1) Anadromous population trends: a 3-year or longer declining trend in the population numbers as determined by methods such as; spawning counts, juvenile densities, age class distribution, and downstream migrant trapping.
- (2) Levels of large woody material in stream channels less than 50 percent of desired conditions sustained for 10 years or longer. Desired condition for individual index streams defined by watershed analysis.
- (3) Stream temperature: streams that exceed 68 degrees at summer low flow will be assessed for shade canopy, channel condition, and ground water contributions.

- (4) Levels of fine sediment: increase 20 percent or more in index streams; exceed 30 percent of total particle size distribution averaged over index reaches; residual pool depths or volumes on index streams decreasing more than 20 percent over three consecutive years.
- (5) Habitat improvements will be at least 80 percent effective during the projected life span.

Data Collection and Establishment of Reference Variability

Establish baseline for environmental indicators of aquatic ecosystems and population structure and function. Index stream reaches have been or will be selected representing various sequences of habitat types throughout the Forest. Baseline data on juvenile and adult fish populations, adult spawning, aquatic macro-invertebrate community composition, sedimentation, and temperature have been collected for the past 2-12 years. Data will continue to be collected in existing index reaches. Additional Integrated Stream Inventory (ISI) reaches will be added to the monitoring schedule to complete the sampling matrix.

Fine sediment will be monitored in ISI and index stream reaches using methods such as V* (residual pool depth), Riffle Stability Index (RSI), and surface fines estimates. Fine sediment will also be characterized for the invertebrate, temperature and habitat survey areas. Temperature will be monitored with thermographs in selected index streams and ISI reaches during summer near aquatic invertebrate sampling stations. Adult spawning populations will be assessed by spawning counts in index reaches during fall and winter. Populations of summer steelhead and spring chinook will be measured by snorkel dive counts in index reaches during the summer. On selected streams, the extent of anadromous juvenile out-migrants will be monitored with downstream traps. Large woody material will be counted in index reaches. Pools and other fish habitat variables will be monitored according to standard Region 5 Fish Habitat Evaluation Procedures (FSH 2609.23) in 1/3 of the sample index reaches per year.

Continue to establish baseline data for lakes and ponds on habitat condition and population structure. Data to include water quality parameters, habitat structure and condition, and biological surveys.

All habitat improvement projects will be evaluated to determine structural and functional success and possible effects upon other aquatic community members. Effectiveness will be evaluated using pre-treatment/post-treatment comparisons of project sites, and comparisons with untreated control reaches or sites. Fish utilization will be monitored annually.

Responsibility

District Rangers, fishery biologists, and Forest staff.

RESOURCE MANAGEMENT PROGRAMS

RESEARCH NATURAL AREAS

Monitoring Purposes

- (1) Does management ensure the maintenance of the biodiversity of these areas adequately to conserve the areas' ecological components and meet the needs of researchers?

Threshold of Concern/Variability

Sampling indicates more than a 25 percent change in variable of concern (ie. composition and extent of exotic species, encroachment of conifers, decline in the abundance of certain plant species) over a 5 to 10 year period.

Data Collection

Map vegetative elements. Determine desired future condition. Identify variables that serve as sound indicators of plant community change. Establish of permanent, point-intercept transect for monitoring change in plant communities and other vegetative elements in keeping with the protocol established by the California Native Plant Society (CNPS).

Sampling Intensity:

Baseline to be established in concert with mapping effort. Subsequent monitoring periodically but within 5 years after baseline establishment.

Responsibility

Forest Ecologist/Forest Botanist and District staff.

SPECIAL INTEREST AREAS

Monitoring Purposes

- (1) Does our management ensure the conservation of diverse plant communities and associated rare plant species in the areas?
- (2) Are restoration efforts effective in restoring degraded habitats?
- (3) Does public use compromise the integrity of the areas' natural features?

Threshold of Concern/Variability

Sampling indicates more than a 25 percent change in variable of concern (ie. composition and extent of exotic species, encroachment of conifers, decline in the abundance of certain plant species) over a 5 to 10 year period. Thresholds for rare plants identified under Sensitive Plants monitoring.

Data Collection

Map rare plant populations, plant communities and degraded habitat. Determine desired future conditions. Identify variables that serve as sound indicators of plant community change. Establish of permanent, point-intercept transect or fixed area plots for monitoring change in the variable of concern in keeping with the protocol established by the California Native Plant Society (CNPS 1992). See Data Collection section under Sensitive Plants monitoring for a more detailed sampling approach related for rare plants.

Sampling Intensity:

Baseline to be established in concert with the annual SIA mapping effort. Subsequent monitoring periodically but within 5 years after baseline establishment. For rare plants see Census Intensity section under Sensitive Plants monitoring.

Responsibility

Forest Botanist and District staff.

LANDS: SPECIAL USE PERMITS

Monitoring Purposes

- (1) Evaluate the administration of special use permits, licenses, easements and land exchanges for compliance with standards & guidelines.
- (2) Determine if land exchanges are being added to or deleted from the data base, and if illegal occupancies are being managed appropriately.

Threshold of Concern/Variability

Five percent increase in Special Use Permit applications or illegal occupancy/use cases.

Data Collection

- (1) Perform field inspections according to FSM 2716.53 and Title VI compliance reviews according to FSH 1709.11, Sec.73.
- (2) Perform activity reviews of 25 percent of Special Use Permit cases on all units every 5 years.

Responsibility

District Rangers & Forest staff.

WILD AND SCENIC RIVERS

Monitoring Purposes

- (1) Determine if the Forest's wild, scenic & recreational river segments are managed and protected as prescribed by the Wild & Scenic Rivers Act and pursuant management direction in individual River Management Plans.
- (2) Evaluate user satisfaction in terms of meeting public expectations for scenic quality, as measured by prescribed VQOs.

Threshold of Concern/Variability

- (1) Visible degradation within or adjacent to the river corridors;
- (2) reduction in the aesthetic character of the landscape within or adjacent to the river corridors;
- (3) measured visual quality less than the VQOs inventoried for or allocated to the area.

Data Collection

Annual reviews of:

- (1) campsites - photograph, measure & record disturbance effects on vegetation at individual sites due to compacted soils, tent pads, or other activities for annual comparison;
- (2) social factors - assess solitude along trails and at campsites, plus conflicts among users with respect to party size and noise;
- (3) evidence of humans - discarded debris;
- (4) VQO compliance - assess past and planned management activities against recommended levels of harvest for the various visual objectives; review compliance with the LRMP and River Management Plans every 2 years.

Responsibility

Recreation Staff, District Rangers, Forest landscape architect.

SPECIAL FOREST PRODUCTS**Monitoring Purposes**

- (1) Are Special Forest Products (SFPs) managed to ensure sustainability of the resource while maintaining other forest values?
- (2) Are publics adequately educated in terms of products available, sustainable harvesting techniques and lands unavailable to harvest?

Data Collection

Census and map little known species (i.e., lichens, mosses, and non-vascular plants; see Survey and Manage section of Chapter 4) as warranted. Annual evaluation of permits by an interdisciplinary team to identify resource pressures, market demand and areas for improvement in managing SFPs. Install long-term quadrats or belts where collection occurs with a paired control to assess the effects of harvesting on particular species of concern. Not all species will be monitored until information about the potential for impacts is suspected. Monitor periodically, but no longer than 5 years after baseline measurements.

Responsibility

Forest botanist and silviculturist, District staff.

PESTS: PORT-ORFORD-CEDAR**Monitoring Purposes**

- (1) Determine infected locations, rates of spread and overall trends of Port-Orford-cedar root disease.
- (2) Evaluate effectiveness of strategies to control spread of the disease.

Threshold of Concern/Variability

Measured acceleration or deceleration of spread as an indicator of positive or negative effectiveness of control strategies.

Data Collection

Conduct aerial photographic inventories to identify healthy and diseased stands. Intensively sample infected road systems to determine the extent and rate of spread of Port-Orford-cedar root disease along transportation routes. Regularly scheduled reforestation surveys after the first, third and fifth growing seasons will indicate performance in plantations. Perform aerial detection surveys at least every two years to indicate spread along streams and roads and within forest stands. Research will be initiated to measure genetic diversity, develop disease-resistant trees, and evaluate methods of control.

Responsibility

Forest ecologist, Forest and District silviculturists,