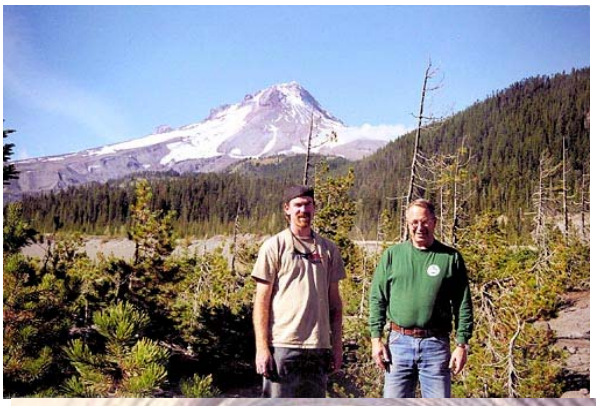
Oregon Department of Forestry



Forest Practices Monitoring Program Strategic Plan

April 2002

Forest Practices Monitoring Program Strategy
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Oregon Department of Forestry:
Forest Practices
Monitoring Program Strategic Plan
April 2002

Oregon's forest ecosystems are diverse and dynamic. Management of these systems on private forestland over the past 20 years has adapted in response to improved knowledge about interactions between forest management and resource protection. Continued monitoring and research is necessary to provide information about the adequacy of the Oregon Forest Practices Act (FPA) and rules and how to improve them. The Oregon Department of Forestry's Forest Practices Monitoring Program (FPMP) provides scientific information for adapting regulatory policies, management practices, and volunteer efforts on non-federal forest land.

The FPMP was established in 1988, updated in 1994 following the adoption of new stream rules by the Board Forestry (BOF), and revised again in 1998. The purpose of this document is to re-define the overall approach to monitoring, what the key questions are, and how the monitoring efforts are to be prioritized. A brief summary on current projects is also provided. This strategy is intended to establish a monitoring framework at multiple spatial and temporal scales. The time scales range from 2 to 30 years. Therefore, while the strategy document is updated periodically, there is commitment for longer term monitoring such that studies designed to cover that time period are meaningful at the end of that period.

GOALS/OBJECTIVES

Motivations for monitoring can range from educational in nature to testing the validity of scientific findings. The goals of the FPMP are to:

- Provide timely, pertinent, and sound information at multiple temporal and spatial scales regarding the forest practice rule effectiveness, implementation and assumptions
- Coordinate with other monitoring and research efforts to maximize state resources
- Determine if rules and regulations are being implemented in accordance with the FPA and whether they are effective in meeting resource protection goals
- Investigate the cumulative effects of forest practices on forest resources
- Support efforts to establish benchmarks/criterion used to measure effectiveness and define the range of desired conditions/regional goals
- Monitor the implementation and effectiveness of the Oregon Plan for Salmon and Watersheds (OPSW)
- Monitor temporal and spatial trends in forest and stream conditions

ADAPTIVE MANAGEMENT CONCEPT

The Board of Forestry (BOF) continually assesses the adequacy of the FPA. This strategy is based on an adaptive approach to forest management. Sound forest management considers the best available information to guide management decisions (FPFO 1995).

Adaptive management is a system of making, implementing, and evaluating decisions that recognizes that there is uncertainty about the outcome of management activities and that ecosystems and social values are always changing. It can be defined as a scientifically based, systematically structured approach that tests and monitors management plans, assumptions, predictions and actions, and then uses the resulting information to improve management plans, policies, or practices. The FPMP is an important component of the adaptive management process. The FPMP is responsible for monitoring the implementation and effectiveness of the forest practice rules and reporting those findings and recommendations to the Board of Forestry on an annual basis (OAR 629-635-0110 3d). The Board of Forestry considers the findings and recommendations and takes appropriate action with regard to rule revision. The role of monitoring is further articulated in the forest practice rules with regard to the water protection rules (OAR 629-635-0110 (3)) and under statute with regard to stewardship plans (527.662 (d)) and sensitive resource sites (527.710 (3)).

The success of the adaptive management process depends on

- Commitment to a long-term process
- Deliberate monitoring designs that test policies and practices
- Careful implementation of policies and plans
- Scientifically sound monitoring designs that track indicators at multiple scales
- Analysis of outcomes that consider objectives and predictions
- Incorporating results into future decisions, policies, and practices

While adaptive management must be flexible to accommodate change, monitoring data and efforts will be of the greatest value if there is a structured approach to managing such change. One approach is to develop a schedule for rule evaluation/revision that aligns with the prioritization of monitoring issues. For example, if, through the internal and public review process it is determined that small Type N stream studies are the highest priorities and spotted owl studies are the lowest priority, then the rules designed to protect small Type N streams should be evaluated by the Board of Forestry prior to those rules that are designed to protect owl habitat and productivity. The rule evaluation schedule and monitoring prioritization will be determined with input from a collaborative review process.

TYPES OF MONITORING

This monitoring strategy focuses on four types of monitoring to address forest practice program and OPSW goals and objectives. The monitoring types include implementation, effectiveness, trend, and validation.

> *Implementation* - The process of evaluating whether forest practice rules were complied with and whether voluntary measures were implemented. The objective is to assess whether the activities or rules were carried out as intended. An example of an implementation

monitoring question is: Was streamside vegetation maintained in accordance with the water protection rules?

Effectiveness - The process of evaluating whether forest practices regulations achieve the desired goals for resource protection. The objective of this type of monitoring is to assess whether forest practice rules had the anticipated effect. An example of an effectiveness question is: Are the water protection rules effective at preventing increases in stream temperatures that otherwise might occur from forest management activities?

Trend - The process of evaluating patterns over time and space. The objective in this type of monitoring is to determine the range of conditions across the landscape and how such conditions change over time in response to management, restoration, and the OPSW. An example of a trend monitoring question is: What are the riparian conditions in the Coast Range and how do those vary over time?

Validation – The process of evaluating whether the original assumptions used to build the regulations were correct. The objective is to assess whether the assumptions underlying the design of the Forest Practices Act or specific rules were valid. An example of a validation monitoring question is: Will the desired future condition of riparian area be met under the forest practices riparian management strategies? Because validation monitoring requires addressing complex cause-and-effect questions, these issues will usually be pursued through research and other studies.

SAMPLING APPROACH

The sampling approaches are scientifically based, and designed to overlap with OPSW and other ODF monitoring efforts. The goals of the sampling methods are to:

- capture the range of upland and riparian conditions across the landscape
- address multiple types of monitoring questions at multiple scales
- reflect management under current forest practice rules
- capture the representative range of practices that occur under the current rules
- test effectiveness across a range of stream classifications (Small, Medium, or Large and Fish-bearing, Non-fish bearing and Domestic Water Source)
- represent various landowner types (state, industrial, non-industrial)
- complement other monitoring efforts that are being carried out within the department, by other agencies and states, watershed councils, private landowners, and research communities.

To meet these goals, sampling methods are proposed at multiple spatial and temporal scales.

Landscape Trend Sampling

Sampling at the landscape scale is needed to answer integrated questions regarding trends in upland and riparian forest conditions, These studies can be implemented over a long time period and through out the entire state. This level of monitoring will also facilitate coordination with other OPSW activities.

- *Riparian Conditions*: ODF will consider utilization of the same randomly-selected OPSW sites currently monitored by Oregon Department of Fish and Wildlife and Oregon Department of Environmental Quality. This type of monitoring would provide data to evaluate trends in landscape conditions over time.

- *Upland Conditions*: Trends in upland forest conditions are currently addressed through the ODF Resource Planning and State Forests assessments. Evaluation of high landslide hazard locations and road-related issues can also be assessed at this scale.

- *Reference Sites*: Comparisons between managed conditions and "reference conditions" are often used as measures of effectiveness. A randomized approach to identifying reference sites across the landscape will be used (Mrazik 1999). There is a need for reference sites that represent the range of desired conditions, in multiple georegions and throughout small, medium, and large streams.

Current Forest Practices and the OPSW

This scale of sampling is designed to answer questions about implementation and effectiveness of *current* forest practices at a state-level on a shorter-term scale (3-10 years). This scale will also be utilized to answer questions about OPSW volunteer efforts. Multiple sample designs will be applied:

- *Randomly Selected Harvest Units.* ODF will randomly select candidate sites harvested under the current forest practice rules from the Forest Activities Computerized Tracking System database. These sites will provide post-harvest measurements only.

- *Volunteered Sites.* Sites will be identified through a volunteer basis from landowners, forest practice foresters, and service foresters. At these sites, pre-harvest and post-harvest measurements will be collected to answer effectiveness questions.

- *OPSW.* Volunteered sites will be monitored to study the implementation and effectiveness of OPSW volunteer efforts. Sites may also be randomly selected from the Oregon Watershed Enhancement Board restoration database for evaluation.

Watershed Effects

This scale of monitoring is designed to answer watershed/sub-basin scale questions for a wide range of time scales (3-30 years). Studies coordinated and funded with other agencies and groups will be designed to address how forest practices affect watershed processes and cumulative effects. There will be opportunities to set up pre-harvest and post-harvest studies within these watersheds, as well as evaluate OPSW projects. Watersheds will be selected on the basis of

- Available existing data (for example: ODF&W Index Basins)
- Activity at the local level (watershed councils, Blue Mountain Demonstration Project, TMDLs, Senate Bill 1010 plans)
- State Forest watershed assessment activities
- Volunteer OPSW activities

Processes/Testing Hypotheses

Distinctions between research and monitoring can be difficult to identify. An important distinction is that research tests hypothesis to define cause and effect relationships, while monitoring tests those known relationships through time and space. In both cases, a scientifically sound process is needed. Research issues and questions will be addressed through contractual and cooperative agreements with university systems. To meet the needs of the Forest Practices Program, monitoring is conducted by means of the scientific process.

MONITORING AND RESEARCH QUESTIONS AND PRIORITIZATION

While the FPMP is charged to provide input on all aspects of the forest practice rules, the recent focus has been on the stream protection rules and activities that affect the waters of the state. This emphasis is largely driven by concerns regarding fish habitat, and water quality. Specific resource issues include: riparian function and structure, slope stability and effects of landslides on aquatic habitat, road-related erosion, stream temperature, pesticide applications, wetland protection, and fish and wildlife habitat.

Issues or concerns with particular Best Management Practices (BMPs) are phrased in the form of a question to provide purpose and direction for individual monitoring and research projects. The following ***general*** questions illustrate the types of issues to be addressed under each of the three sampling schemes. Specific questions are provided in Appendix A. The questions were drawn from the previous monitoring strategy, OPSW Workplan, the Forest Practices Advisory Committee final report, and citizen and stakeholder group input in 1994 and 2000.

Landscape Level Trends

- *What are the riparian and upslope conditions that occurred under "historic" disturbance regimes and under current conditions?*
- *How do the riparian and upslope conditions change over time?*
- *What are the current fish and wildlife habitat conditions?*

Current Forest Practices and OPSW:

- *Are the forest practice rules, stewardship plans and other management strategies effective at achieving the resource protection goals (site productivity, water and air quality, fish and wildlife) of the FPA?*
- *Are the forest practice rules based on scientifically valid assumptions?*
- *Are the forest practice rules implemented properly and in compliance with the FPA?*
- *To what level are non-federal forest landowners implementing the volunteer OPSW activities?*
- *Are the OPSW activities effective at increasing protection of stream and riparian condition and function?*

Watershed Level Questions

- *What are the basin level trends in stream temperature, sediment routing, and large wood recruitment?*
- *What are the cumulative watershed effects of forest practices on temperature, sediment routing, and large wood?*
- *How do the upslope & riparian conditions on non-federal forestlands relate to instream & channel conditions at a watershed scale?*

Proposed Priorities

Prioritization of the issues and related questions will be used to guide the activities of the monitoring program. The timing of the projects will be prioritized through a stakeholder input process. Availability of funding and cooperative resources will dictate the level of monitoring accomplished over this planning period. Prioritization will be reevaluated every 2 years. The current prioritization of general issues is as follows:

Top:

- Riparian Function, Structure, and Stream Temperature on Type F Streams: Effectiveness and trend monitoring using landscape scale sampling under current forest practices and watershed sampling designs.
- Wet Weather Hauling: Effectiveness of alternative road surfacing practices using landscape scale sampling under current forest practices sampling design.
- OPSW: Implementation, effectiveness, and trend using landscape scale sampling under current forest practices sampling design.
- Headwaters Streams (Type N and NT): Effectiveness using landscape scale sampling under current forest practices sampling design.
- Wildlife: Compliance and effectiveness using landscape scale sampling under current forest practices sampling design.

High:

- Wetlands (significant and other): Compliance and effectiveness using landscape scale sampling under current forest practices sampling design.
- Other Roads Issues: Improvement in road conditions over time at the landscape scale sampling under current forest practices sampling design.

Moderate:

- Landslides: Factors that affect debris flow run out and implementation of new rules for landslides and public safety.
- Pesticides: Effectiveness using landscape scale sampling under current forest practices sampling design.

Low:

- Reforestation

Project Protocols

The purpose of this document is to establish the overall framework for the FPMP, articulate key questions, and prioritize efforts. Detailed field methods and protocols are developed on a project-by-project basis for each question with appropriate assistance from experts and input from various interested parties. Specific monitoring protocols for each project are outlined in a plan addressing:

- specific objectives for addressing the monitoring question;
- related monitoring questions;
- study design, data collection protocols, quality control and assurance procedures;

- responsibilities of the Department of Forestry and cooperators;
- data analysis process;
- measures of effectiveness;
- time lines, products, reports; and
- data storage, security, public access to results, and documentation.

The monitoring program currently draws on established field measurement techniques (MacDonald 1991, Dissmeyer 1994, EPA 1996, ODF 1996-1999, OWEB 1999). The 2001 field season was used to test ways of streamlining field methods, to ensure the necessary data are being collected in the most time efficient manner. Appropriate monitoring parameters must be selected in order to evaluate effectiveness of management strategies in protecting natural resources. Selecting the correct monitoring parameter is challenging. A given parameter may be affected by multiple activities and a given resource is affected by multiple parameters. Therefore, it is important to select monitoring parameters that have a strong link to management, are sensitive to change, and are directly related to the resource in question. Examples of recently used protocols (e.g. stream temperature, shade, riparian structure, landslides monitoring protocols) are available on the ODF web site: http://www.odf.state.or.us/FP/MonitoringBMPs/default.htm.

Measures of Effectiveness

Monitoring effectiveness of the forest practice rules to date has lacked agreed-upon measures or standards of effectiveness. The measures of success should be determined prior to the implementation of a project. There are a number of sources to consider when establishing these measures. The FPMP will draw on these sources when determining if the rules are achieving the desired resource protection goals. They will include comparison of data collected from managed sites to:

- Paired reaches, basins, or "reference sites."
- Benchmarks, criteria as established through the Forest Practices Program, the Montreal Process, OPSW, and the Oregon Progress Board.
- Numeric standards as established by the DEQ.
- Numeric standards as established through policy decisions.
- Conditions as represented in research findings.
- Data collected at control reaches and/or from a pre-harvest period.

Peer Review Process

An evaluation of monitoring approaches and reports by peers from the research community is an important component of promoting a scientifically credible program that produces meaningful results for adaptive management processes. Peer review is currently sought on a project-by-project basis. Lead researchers are solicited to review papers and protocols that pertain to their area of expertise. This process will be formalized and the following elements added:

- Project Review Committees: Formed for each project with representation from environmental advocates, private landowners, ODF, other state agencies, and the research communities. The committee will be formed during the early stages of the project and will remain active through

the completion of the project. The review committee will agree on a list of scientists for peer review.

- Formalize the Current Peer Review Process: Establish a list of scientists from the Pacific Northwest with expertise in productivity, water and air quality, geosciences, watershed function, or fish and wildlife that will review project designs and reports.
- Establish a process for submitting monitoring findings to peer reviewed journals.

COMMUNICATION PLAN

An important component of this monitoring program is the exchange of information and about the monitoring strategy, approaches, and findings both internally and externally. The communication plan (Whalen 2002) relies on multiple avenues of soliciting input and reporting findings within our department, to stakeholders, the public, special interest groups and other agencies.

- The monitoring unit manager attends area and district meetings to solicit input on the monitoring strategy and projects, and provide feedback on findings.
- The forest practices monitoring unit has developed a web page with final reports, executive summaries, protocols, photographs, monitoring staff contact names, manuals, and the current monitoring strategy.
- The monitoring unit manager meets with stakeholders and other agencies to achieve understanding, acceptance and support of the monitoring strategy. (Oregon Forest Industry Council, Family Forests, Environmental Advocates, DEQ, ODF&W, Oregon Department of Agriculture)
- Monitoring unit staff participates and supports education and training programs.
- Review committees are formed to give input on individual projects and final reports.
- The monitoring unit produces an annual newsletter that documents current monitoring activities and findings.
- Project publications: As each project is completed, a technical report and executive summary are written, posted on the web, and circulated to project participants and interested parties.

COORDINATION

Coordinating the FPMP efforts with ongoing efforts within the department, other agencies, watershed councils, research communities, and private landowners will be achieved through the following:

- As described in this document, coordination with other monitoring efforts is built into proposed landscape and watershed study designs.
- Participation and leadership by the monitoring unit manager on the OPSW Monitoring Team. The OPSW Monitoring Team provides a forum for coordination among state and federal agencies.
- Participation and leadership by the monitoring unit manager on the ODF Monitoring Team. The ODF Monitoring Team provides a formalized process for monitoring staff from different ODF programs to share findings, ideas, and approaches.

Resources and Workplan

At the current service level, the total personal services budget for the forest practices monitoring program is $313,762. This budget funds five permanent positions: Monitoring Unit Manager, Monitoring Coordinator, Monitoring Specialist, Monitoring Assistant, and a Project Coordinator (Table 1). The budget also provides for hiring 2-6 seasonal employees, not to exceed a total of 40 months per biennium.

Table 1. FPMP personal services budget.

Position	Personal Services
Monitoring Unit Manager (PEMD)	$52,752
Monitoring Coordinator (NRS3)	$38,496
Monitoring Specialist (NRS2)	$36,648
Monitoring Assistant (NRS1)	$29,088
Project Coordinator (LMC)	$27,756
Seasonal Positions (FMT)	$42,624
OPE @38%	$86,398
Total	**$313,762**

Additional resources are needed to cover travel and equipment costs associated with data collection. Budgets for individual projects vary widely and are established on a per-project basis. A workplan for completing existing projects, implementing new projects, and maintaining ongoing commitments is shown in Table 2.

Table 2. Workplan for the 2001-2003 biennium.

Task	Time Line	Responsibility
New Priority Projects (in order of priorities and dependent on available resources)		
***FPAC-related data collection (perennial, wet weather hauling, NT analyses)	Initiate Summer 2001 Complete Winter 2003	**Jim Paul, Jerry Clinton**, Liz Dent, Josh Robben, Keith Mills
*Headwaters/Small Type N	Initiate Spring 2002 through Headwaters Research Coop.	**Liz Dent,** Jerry Clinton, Josh Robben, New NRS3
Riparian and Stream Temperature	Initiate Spring 2002 in Coastal Georegion Complete 2009	**Jeff Peck, Liz Dent,** Jerry Clinton, Kyle Abraham, Kristin Cotugno, Josh Robben
Oregon Plan Pilot Study: Compliance/Effectiveness	Initiate Spring 2002 (Funding Dependent)	**Josh Robben, Liz Dent,** Jerry Clinton, Josh Robben
Wildlife Rules Pilot Study: Compliance/Effectiveness	Initiate Spring 2002 (Funding Dependent)	**Rod Krahmer, Josh Robben, Jeff Peck**, Liz Dent, Jerry Clinton
Hardwood Conversion Synthesis	Initiate Summer 2002 Complete Winter 2002	**Liz Dent,** Josh Robben
***Submit monitoring reports to peer-reviewed journals	Initiate Summer 2002	**Liz Dent,** Josh Robben, Jim Paul, Keith Mills, Jerry Clinton
***Completion of Current Projects**		
Wet Weather Hauling	Initiate Winters 2001-2002 Complete 2002	**Josh Robben, Keith Mills**, Kristin Cotugno, Kyle Abraham
Bald Eagle Study	January 2003	Rod Krahmer
**Stream Temperature	Winter 2002	Kyle Abraham, Liz Dent
Fish Presence Surveys	Ongoing	Jerry Clinton
Other Commitments		
Education and Outreach	Ongoing	ALL
***Salmon Plan Mon. Team	Ongoing	Liz Dent, Jerry Clinton
***ODF Monitoring Team	Ongoing	Liz Dent
***Headwaters Research Coop. (HRC)	Ongoing	Liz Dent
Riparian Protocol Team	Winter 2002	Liz Dent
Web Page	Ongoing	Kyle Abraham
Evaluate FPMP role in monitoring: certification, stewardship plans	Initiate Winter 2001-2002	Liz Dent, Scott Hayes, David Morman

* This work will be completed under contract with a research group, through the proposed Headwaters Research Cooperative.

** Evaluate need for continued data collection at current sites beyond 2002.

*** Identified as part of the vital few in the Forest Practices Strategic Plan.

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APPENDIX A: SPECIFIC MONITORING QUESTIONS

Table A1. Specific monitoring questions potential and priority rating.

Number	Riparian Structure and Function Questions	Priority
1.	*What levels of large wood recruitment are retained in riparian areas of small, medium, and large streams when measured under the current rules? (Current findings indicate 40%, 68%, and 82% of potential large wood recruitment from adjacent RMAs is maintained on small, medium, and large streams, respectively). Are the retained levels desirable? (effectiveness)*	*Top*
2.	*Do the riparian rules promote streamside forest stand structure and large wood recruitment levels that mimic mature riparian stand conditions? (trend, effectiveness, validation)*	*Top*
3.	*Are forest practice rules effectively protecting headwater (small Type N) streams such that local and downstream beneficial uses are protected? Key issues include effects on stream temperature, large wood recruitment, stream flow, sediment delivery, debris torrent processes, macroinvertibrates, and how those effects are translated downstream. (effectiveness, trend, research)*	*Top*
4.	*Is there a threshold streamflow at which small Type N streams affect the temperature regime of downstream Type F streams (e.g. when they contribute 10% or more of the streamflow)? (validation)*	*Top*
5.	*What are the effects (on temperature, flow, and sediment, and large wood regimes) on Type F streams of harvesting multiple contributing small Type N streams? (effectiveness, research)*	*High*
6.	*What is the effect of slash loading in headwater streams on water quality, fish habitat of downstream Type F streams, and debris torrents? (effectiveness, research)*	*High*
7.	*What percent of landowners and riparian prescriptions implement no-harvest riparian areas in support of the salmon plan? (implementation, OWEB database, OPSW activity 3.8)*	*High*
8.	*What is the implementation rate of active placement of large wood during forest operations? (implementation, OWEB database, OPSW activity 3.5)*	*Moderate*
9.	*Are large wood recruitment incentives (OPSW activity 4.5) providing desired results?*	*Moderate*
10.	*Are landowners leaving 25% of in-unit leave tree and additional voluntary retention along Type F streams and is this effectively meeting resource protection goals? (OPSW activity 3.6)*	*Moderate*
11.	*Are efforts to place large wood in streams improving fish habitat? (effectiveness)*	*Low*
12.	*Are the rules and guidance for the placement of large wood in streams implemented correctly? (implementation)*	*Low*
13.	*What are the compliance rates with the water protection rules? Current findings indicate a 96.3% statewide compliance rate for water protection rules. (compliance)*	*Low*

Number	Riparian Structure and Function Questions	Priority
14.	*What are the compliance rates with felling conifers away from small Type N streams? Current findings indicate an 83.1% statewide compliance rate. (compliance)*	*Moderate*
15.	*Do the stream improvement activities encouraged under the new water protection rules and the OPSW contribute to salmon recovery? (research)*	*Top*
16.	*What are the implementation rates and effectiveness (maintaining stream temperature, hydrologic, sediment, and wood routing regimes) of limited RMAs on small Type N streams? (implementation, effectiveness, OPSW activity 3.4)*	*Top*
17.	*What is the distribution of fish presence throughout the state? (trend, fish presence surveys, OPSW activity 4.7)*	*High*
18.	*How many miles of stream receive increased protection measures as a result of changing the stream classification from N to F or from N to NT? (trend, OPSW activity 4.8)*	*High*
19.	*Develop methods for predicting fish presence. (research)*	*Top*
20.	*What are the ranges in large wood recruitment, instream large wood, shade and riparian characteristics that occur under "natural" disturbance regimes, under current conditions, and under current forest practice rules? (research, trend)*	*Top*
21.	*How do riparian stand, channel and upland characteristics on non-federal forestlands vary by georegion, stream size, forest practice "era"? (trend)*	*Moderate*
22.	*What are the relationships between trends in riparian condition, instream condition, and salmon populations over time?*	*Low*
23.	*In hardwood-dominated riparian stands, are silvicultural approaches resulting in increased conifer establishment? (effectiveness)*	*High*
24.	*What are the regeneration characteristics (species composition, density, relationships to understory and overstory characteristics) within riparian areas? (effectiveness, trend)*	*High*
25.	*How are the microclimates of riparian areas affected by harvesting under current rules? (research)*	*Moderate*

Number	**Wetlands Questions**	***Priority***
26.	*Do the vegetation retention standards for significant and other wetlands protect wildlife habitat and hydrologic functions? (OPSW activity 4.3, effectiveness)*	*High*
27.	*What are the compliance rates for rules designed to protect significant and other wetlands? Current findings indicate 88.1% and 69.8% compliance, respectively. (implementation)*	*High*

Number	Wildlife Habitat/Sensitive Resource Sites Questions	*Priority*
28.	*What are the potential effects of forest practices on bald eagles nesting in Oregon? (effectiveness)*	*Top*
29.	*What are the compliance rates for rules designed to protect threatened and endangered fish and wildlife species that use resource site on forestlands (i.e., northern spotted owl nesting sites, bald eagle nesting sites, bald eagle roosting sites, and bald eagle foraging perches)? (compliance)*	*Top*
30.	*What are the compliance rates for rules designed to protect significant wetlands and other wetlands? (compliance)*	*Top*
31.	*What are the compliance rates for rules designed to protect sensitive bird nesting, roosting, and watering sites (i.e., osprey nesting sites, great blue heron nesting sites)? (compliance)*	*Top*
32.	*What are the compliance rates with retention of wildlife trees and downed wood? (compliance)*	*Top*
33.	*Do the protection measures for northern spotted owl nesting sites ensure that forest practices do not lead to resource site destruction, abandonment, or reduced productivity? (effectiveness)*	*High*
34.	*Do the protection measures for significant wetlands ensure that forest practices do not lead to resource site destruction or reduced productivity? (effectiveness)*	*High*
35.	*Do the protection measures for osprey ensure that forest practices do not lead to resource site destruction, abandonment, or reduced productivity? (effectiveness)*	*High*
36.	*Do the protection measures for great blue heron nesting sites ensure that forest practices do not lead to resource site destruction, abandonment, or reduced productivity? (effectiveness)*	*High*
37.	*Describe the species composition and abundance levels of wildlife and plant communities occurring in forest stands of varying seral stages, size classes, and landscape configurations in watersheds managed primarily for timber production. (research)*	*High*
38.	*Develop methods for analyzing wildlife responses to stand- and landscape-level habitat conditions in managed watersheds. (effectiveness, research)*	*High*
39.	*Do the wildlife leave tree and downed wood requirements provide for wildlife habitat as intended?*	*High*
40.	*What are the implications of preferentially retaining wildlife leave trees along streams in support of the Oregon Salmon Plan?*	*High*
41.	*Do current forest practices protection measures adequately protect headwater amphibian species?*	*High*
42.	*Will current and projected future forest habitat conditions be sufficient to maintain viable populations of forest-dwelling wildlife species in Oregon?*	*High*

43.	*Develop methods to assess and monitor elements of sustainable forestry and biodiversity conservation. (research)*	*High*
44.	*What are the compliance rates for the water protection rules for lakes? (compliance)*	*Moderate*
45.	*Do the riparian management area and protection measures for lakes maintain the functions and values of lakes, including those related to water quality, hydrologic functions, aquatic organisms, fish and wildlife? (effectiveness)*	*Moderate*
46.	*Do the protection measures for "other" wetlands, seeps, and springs prevent soil and vegetation disturbances which would cause adverse effects on water quality, hydrologic function, and wildlife and aquatic habitat? (effectiveness)*	*Low*

Number	**Stream Temperature Questions**	***Priority***
47.	*What are the basin-level trends in stream temperature on a variety of basins? How does harvesting affect basin-level trends in stream temperature? (trend, effectiveness)*	*High*
48.	*How do stream temperatures on forested streams vary over time and space? (trend)*	*High*
49.	*Are best management practices resulting in temperature increases at the site or watershed levels? (effectiveness)*	*Top*
50.	*What are the effects of hardwood conversions on stream temperature? Current findings are mixed, however, indicate high likelihood for localized increases in temperature. Further document these and determine if they are an acceptable risk given the benefits for long-term conifer wood recruitment. (effectiveness)*	*Top*
51.	*How do localized increases in stream temperature affect aquatic biota? (research)*	*Top*
52.	*Develop effective methods for scaling site-specific temperature impacts from multiple harvest operations to an evaluation of effects at the basin-scale. (research).*	*Moderate*
53.	*What levels of shade are retained under the current vegetation retention rules as compared with pre-harvest levels? (effectiveness)*	*High*
54.	*How do shade levels vary with stand, channel, valley type, and georegion? (trend)*	*Moderate*
55.	*What are the ranges in stream temperature and shade provided under "historic" disturbance regimes and under current conditions? (trend)*	*Low*
56.	*What is the role of groundwater input and hypereic flow in cooling stream reaches? What are the geomorphic characteristics of stream reaches in which subsurface flow contributes to cooling? (research)*	*High*

Number	Roads and Slope Stability Questions	*Priority*
57.	*Do crossings installed under current guidance provide juvenile and adult fish passage over time? (effectiveness, research)*	*Top*
58.	*Do crossings installed under current juvenile fish passage guidance have unique maintenance issues? (effectiveness)*	*High*
59.	*What are the compliance rates with juvenile fish passage requirements and guidelines? Current findings suggest improved compliance over time as landowners and operators perfect the process and understand the goals. (compliance)*	*Moderate*
60.	*How do different surfacing and road use practices affect turbidity in streams? (effectiveness, research)*	*Top*
61.	*Are best management practices minimizing unacceptable increases in turbidity levels for domestic water systems? (effectiveness)*	*Moderate*
62.	*Are forest practice erosion-related rules, dealing with road construction, maintenance, and harvest activities, preventing and limiting surface erosion and landslides and sediment delivery to waters of the state? Current focus is on wet weather hauling. (effectiveness)*	*High*
63.	*What are the ranges in sediment delivery and routing in stream systems that occur under "historic" disturbance regimes and under current conditions? (trend, research)*	*Low*
64.	*What are the frequency distributions of landslides, debris flows and channel impacts from forested land of various stand ages and management histories? Storm impacts study indicated higher rates for very young stands. (trend, research, effectiveness)*	*Low*
65.	*Are high-risk sites consistently identified during the forest practices notification process? (effectiveness)*	*Moderate*
66.	*What are the compliance rates with BMPs for roads, skid trails, and high risk sites? Current findings indicate 97.6%, 96.4%, and 100% compliance rates with road, skid trails, and high risk site yarding BMPs, respectively. (compliance)*	*Moderate*
67.	*What are the relative contributions of inherent and management-related sediment sources to the sediment budget of a variety of watersheds? (research, effectiveness)*	*Low*
68.	*Is the road hazard and risk reduction project being implemented and resulting in improved road conditions? (implementation, OPSW measure #1, OWEB Database)*	*High*
69.	*Develop information and analytic tools for evaluating the cumulative effects of forest harvests on stream sedimentation and turbidity. (research)*	*Low*

70.	*What factors affect debris-flow travel potential impacts to homes, roads, and streams? Current findings suggest initiating landslide size, channel gradient, and junction angle are important. The importance of streamside vegetation, debris loading need further evaluation. (research)*	*High (post storm)*
71.	*What is the role of root strength versus canopy alteration of water delivery in slope stability? (research)*	*Moderate*
72.	*Are culverts being designed to pass a 50-year peak flow? (OPSW activity 4.10) Current results indicate 95% compliance.*	*Low*
73.	*Are road crossings being installed with no greater than 15-foot fills (OPSW activity 4.11) unless there is prior approval? Current results indicate 66.7% compliance.*	*High*
74.	*Are the upgraded stream crossing construction and fill requirements being implemented? (OPSW activity 4.12 OWEB) Current results indicate 90.4% compliance. However, proper fill removal was only 47.8%.*	*High*

Number	**Pesticides Questions**	***Priority***
75.	*What level of contamination is injurious (including acute toxicity, chronic toxicity, and sub-lethal behavioral effects) to aquatic biota? (research)*	*Top*
76.	*Is water quality, including the integrity of aquatic communities and public health, being effectively protected when herbicides or insecticides are applied near streams? Current monitoring data indicate BMPs are protective from herbicide drift contamination on Type F streams. (effectiveness, research, OPSW activity)*	*Low*
77.	*Is water quality, including the integrity of aquatic communities and public health, being effectively protected when forest management chemicals are applied near small Type N streams? What are the downstream effects on water quality, aquatic biota, and human health if contamination does occur on small Type N streams?*	*Moderate*
78.	*What concentrations of chemicals are found in streams when runoff events occur after the initial forest application near streams? Do these concentrations threaten water quality, aquatic biota, or public health, either locally or downstream? (effectiveness, research)*	*Moderate*
79.	*Is water quality protected from surfactants, carriers, and "inert" ingredients when chemical applications take place near streams? (research)*	*Moderate*

Number	**Air Quality Questions**	***Priority***
80.	*Has smoke from prescribed burning in regulated forest operations met the requirements of the clean air standards? Current results indicate forest operations meet the requirements. (compliance)*	*High*

Number	Productivity and Reforestation Questions	*Priority*
81.	*What is the level of compliance with reforestation rules? (compliance)*	*High*
82.	*Are the reforestation rules resulting in productive forests with characteristic growth and stocking potentials for the site and species? (effectiveness)*	*Low*
83.	*Are BMPs minimizing soil disturbance and compaction and maintaining long-term forest site productivity? (validation, effectiveness)*	*Moderate*
84.	*What are the compliance rates with rules that are designed to maintain soil productivity? (compliance)*	*Moderate*

Number	Oregon Plan Questions	*Priority*
85.	*Are volunteer OPSW activities being implemented and are they effective at achieving the salmon protection and restoration goals? The multiple resources imbedded in this question are addressed through specific questions above. (OPSW activity 1.1)*	*Top*

Number	Additional FPAC Recommendations Questions	*Priority*
86.	*What is the extent of environmental protection, economic, landscape impacts of the proposed NT designation that came out of FPAC?*	*Top*
87.	*What are the predictors of perenniality and fish presence and how does that affect the NT designation?*	*High*
88.	*Are Stewardship Plans effective and being implemented in accordance with the agreements?*	*Moderate*
89.	*Can the FPMP aid in monitoring associated with certification programs?*	*Moderate*

Appendix B: Status of Current Monitoring Projects and Available Technical Reports

Oregon Department of Forestry
Forest Practices Monitoring Project Summary
August 2001

What follows is a brief summary of ODF monitoring project status and results. Technical reports are available for some of these projects and are listed at the end of this document. Numbers in parentheses represent the OPSW Monitoring Measure Numbers.

- Fish Presence Surveys (ODF32S): In 1999, 561 miles of stream were surveyed. There were 361 miles newly identified as fish bearing while 79 miles of stream previously identified as fish-bearing were determined to be non-fish bearing. There were 174 culverts identified as impassable. There was a net gain of 282 stream miles receiving Forest Practices Act protection.

  To date, approximately **6,205** miles of stream channel have been classified as confirmed Type F or Type N. A very rough estimate of remaining stream miles to be surveyed on nonfederal timberlands is between **5,860** and **17,560** miles.

- Fish Passage and Stream Crossing Compliance Monitoring (ODF1): A pilot study was completed on 57 stream crossings. This is part of a 3-year study in which an additional 100 randomly selected crossings were monitored. The objective of the study was to determine if culverts and bridges were installed to provide for passage of juvenile fish and a 50-year streamflow event. A pilot study report is available (ODF Technical Report #6). As described in the written plans, 78% of the crossings met the installation design criteria. An average of 67% of the crossings were likely to allow upstream passage of juvenile fish. Of the installations, 91% were estimated to pass a 50-year peak flow. Opportunities for education and training and the need for improved implementation of ODF fish passage guidelines were identified in the pilot study report. A final project report will be available in 2001.

- Riparian Function (ODF11S): The Oregon Department of Forestry monitored 27 sites to determine if the forest practice riparian rules are effective at maintaining function and structure that will promote the recovery of fish habitat. ODF also investigated the validity of the assumptions that were used to craft the 1994 riparian rules. Both shade and large wood recruitment potential were reduced on small and medium streams as compared to pre-harvest conditions. Results indicate that stand characteristics of these riparian forests vary greatly across the landscape, making a single regulatory target or goal problematic. However, it appears the current rules underestimated the prevalence of conifer trees within the first 20 feet of small and medium streams, thereby underestimating the amount of coniferous basal area that is available on these streams. A final report is available (ODF Technical Report #12). Recommendations were made to the Forest Practices Advisory Committee to increase leave-tree requirements along small and medium streams.

- ODF/DEQ Shade Study: This study was designed to evaluate the range of stream shade conditions provided under the current forest practice rules and how those shade conditions relate to riparian stand structure. There were 30 sites monitored in northeast Oregon and

30 sites in northwest Oregon. Average shade was lower on harvested sites than on unharvested sites. However, results suggest overall stand structure influences stream shade (as opposed to a single variable). Combinations of basal area, stand density (trees/acre), species composition, average stand diameter (QMD), and live crown ratios were evaluated. Furthermore, the interaction between stand structure and aspect were clearly important when predicting shade. Managers must consider carefully what their objectives are for stream shading in relation to stand structure and the myriad of other functions produced by a riparian stand. For example, maximizing shade could promote stands in the stem exclusion stage. This may not, however, meet other goals, such as recruiting large woody material to act as stable key pieces in the stream. A final study report is available (ODF Technical Report #13).

- Stream Temperature (ODF14S): ODF has been monitoring stream temperature at a sub-basin scale at four sites and seven reach-level sites. Pre- and post-harvest data were collected. Preliminary results indicate the rules are generally effective at preventing increases in stream temperature on large Type F streams, beyond background variability.

- Strategic Monitoring Plan: The monitoring program is founded in the adaptive management model. Using this model, monitoring and research findings are reported to the Board of Forestry. When needed, improvements are identified and recommendations are made for rules revision.

  The monitoring program results described in this document have been reported to the Governor's Forest Practices Advisory Committee. This committee has representation from environmental, landowner and agency groups and is currently assessing the adequacy of the ODF rules in promoting the recovery of salmon populations and fish habitat.

- Best Management Practice (BMP) Compliance Monitoring Project (ODF23S): The focus of this study is on water quality and fish habitat protection rules. A pilot study was completed on 52 randomly selected harvest units. This was part of a 3-year study in which an additional 189 randomly selected sites were monitored. A pilot study report is available (ODF Technical Report #5), and a Final Study Report will be available in 2002. Of harvest units, 57% had 100% compliance. However, the average compliance rates on a rule-by-rule basis were 98.5% and on a unit-by-unit basis were 98%. A few of the rule divisions that were monitored are reported below.

  Road Construction and Maintenance Rules (OAR 629-625). Compliance averaged 97% with rules that establish standards for locating, designing, constructing, maintaining and vacating forest roads, rock pits, and quarries to provide the maximum practical protection of water quality and fish habitat.

  Harvesting Rules (OAR 629-630). Compliance averaged 95% for rules that establish harvest practice standards that will minimize soil and debris from entering waters of the state and protect wildlife and fish.

  Water Protection Rules: Vegetation Retention Along Streams (OAR 629-640). The compliance rate averaged 95% with streamside vegetation retention rules. The purpose of streamside

vegetative requirements is to produce the desired future conditions for the wide range of stand types, channel conditions and disturbance regimes that exist throughout forestlands in Oregon. The desired condition varies depending on the site conditions. In general, the goal is to grow and retain stands that mimic mature forest conditions on fish-bearing streams. The goal along non-fish bearing streams is to support the functions and processes important to downstream fish and domestic uses.

Water Protection Rules: Riparian Management Areas and Protection Measures for "Other Wetlands," Springs and Seeps (OAR 629-655). Compliance with rules designed to protect soil and understory vegetation around "other" wetlands springs and seeps averaged 91%.

Oregon Department of Forestry Monitoring Reports

ODF Technical Report Number	Report Title
1	OFPA Water Protection Rules: Policy And Scientific Considerations
2	Cooperative Stream Temperature Monitoring Project Completion Report For 1994 - 1995 (Small Type N Streams)
3	Effectiveness Of Riparian Management Areas And Hardwood Conversions In Maintaining Stream Temperature.
4	ODF Storm Impacts And Landslides Of 1996
5	ODF Forest Practices Compliance Monitoring Project: 1998 Pilot Study Results
6	ODF Compliance With Fish Passage And Peak Flow Requirements At Stream Crossings: Pilot Study Results
7	ODF Aerial Pesticide Application Project Final Report
8	Evaluation of the Effectiveness of Forest Road Best Management Practices to Minimize Stream Sediment Impacts
9	Forest Roads, Drainage, and Sediment Delivery in the Kilchis River Watershed.
10	Forest Road Sediment and Drainage Monitoring Project Report for Private and State Lands in Western Oregon
11	ODF/DEQ Temperature Sufficiency Analysis
12	Harvest Effects on Riparian Function and Structure Under Current Oregon Forest Practice Rules
13	Shade Conditions Over Forested Streams in the Blue Mountain and Coast Range Georegions.

For a copy of the executive summaries and/or full reports, please contact: Ray Gress: rgress@odf.state.or.us, (503) 945-7470, Oregon Department of Forestry, 2600 State Street, Salem, Oregon, 97310. They can also be downloaded from the Oregon Department of Forestry Web Page: http://www.odf.state.or.us/FP/MonitoringBMPs/default.htm