




May 8, 2009

To: Forest Practices Board

From: Darin Cramer, Adaptive Management Administrator 

Subject: Fiscal Year 2010 CMER Work Plan and Budget - Action Requested

Attached is the Policy recommended Fiscal Year 2010 (FY10) CMER Work Plan and budget for Forest Practices Board (Board) consideration. Also attached is a table showing the Policy preferred CMER budget for FY 10 - 18, which reflects a recent prioritization in response to the Clean Water Assurances review. This budget table also shows the estimated fiscal impacts if no new funding is acquired by July 1, 2010 (attachment A). Policy recognizes the significant budget challenges facing the Adaptive Management Program (AMP), and will be working together to address the funding gap and restore the AMP to a level of effort acceptable to each caucus. This strategy will likely involve some combination of state and federal funding. If we're not successful in obtaining additional funding over the next year, Policy has developed a strategy for reducing the level of effort to match available funding. However, no caucus supports the reduced level of effort as a viable AMP.

As you may know, the AMP has operated for several years with the assistance of federal grants passed through the Recreation and Conservation Office to DNR. Since 2000 these grants have averaged approximately \$2 million per year. The AMP has also received \$1.2 million per biennium as part of the Forest Practices operating budget. Beginning last year, the Forests and Fish Support Account (FFSA) became available and considering other uses of the funds from the account, may provide approximately \$900,000 over the upcoming biennium. The FFSA is dependent upon timber market activity and is therefore bringing in considerably less than the maximum allowed under the law. The federal grants have provided the majority of the funding over the last several years, and are the primary reason we've been able to operate an annual program of more than a dozen different research and monitoring projects.

The federal grants are quickly coming to a close and will be expended by the end of FY10, or very early in FY11. In FY11 and 12 the remaining funding sources are projected to provide approximately 35% of the funding available in FY10. Assuming the estimated carry forward amount at the end of FY10 is accurate and no new funding is secured, the AMP will need to reduce expenditures by approximately 40% in FY11 and another 25% in FY12. In addition to implementing their strategy to address the funding gap, Policy has directed CMER to immediately implement cost saving measures across all activities, including determining the effect of reducing project direct expenditures by at least 10%.

FY10 CMER Work Plan

The CMER work plan presents an integrated strategy for conducting research and monitoring to provide scientific information to support the Forest Practices AMP. The primary purpose of the work plan is to inform CMER participants, Policy constituents, the Board and interested members of the public about CMER's activities. Continued annual revisions are anticipated in response to research findings of CMER and the broader scientific community, changes in policy priorities and funding. More than 90 projects are listed in the work plan. The projects cover a range of topics related to the Forest Practices Rules and are at various stages of development or completion. Projects originated as priority research topics in Schedule L-1 of the Forests and Fish Report, which was adopted by the Board in February 2001, and later incorporated into the Forest Practices HCP. The work plan is organized in a hierarchical format consisting of rule groups, programs, and projects. Section 3.0 describes the CMER research and monitoring strategy and approaches used to address critical questions relevant to the AMP. Section 4.0 describes CMER procedures for prioritization at the program and project level, and Section 5.0 presents the proposed FY10 projects and budget allocations (Table 4 - page 14).

Orientation to FY10 Projects in the CMER Work Plan

Beginning in Section 6.0 of the work plan, each rule group subsection (Type N Streams, Type F Streams, Unstable Slopes, etc.) is arranged consistently with a rule group description followed by program level descriptions (rule tools, effectiveness monitoring, extensive status and trend monitoring, etc.) and finally project descriptions/status under each program (attachment B).

Given the upcoming budget challenges and no certainty of additional funding, the FY10 budget only funds "active" projects - those currently on the ground. No new projects are started in FY10. There are three ongoing projects in the Type N Rule Group (page 22) and five in Type F Rule Group (page 41). While specific project descriptions can be found on the pages listed below, I recommend you read the whole rule group subsection to better understand the different programs and projects within each rule group. Please note Table 4 in the work plan does not show three projects under the Type N Rule Group; the Extensive Riparian Status and Trend Monitoring project, although only shown under the Type F Rule Group in Table 4, is conducted in both Type N and Type F streams.

FY10 Projects

Type N Experimental Buffer Treatment in Basalt Lithologies - pages 30, 36

Buffer Integrity - Shade Effectiveness - page 37

Bull Trout Overlay Temperature - page 59

Solar Radiation/Effective Shade - page 59

Eastside Type F Riparian Effectiveness Monitoring (BTO add-on) - page 59

Hardwood Conversion - page 61

Extensive Riparian Status and Trend Monitoring, Temperature Component - pages 39-40, 64-65

Conclusion

Policy is requesting approval of the FY10 CMER Work Plan and budget, as well as Board support and commitment in addressing the future funding need. Updates on the status of the funding strategy will be provided at each upcoming Board meeting.

DC/
Attachment

FY 2010 CMER WORK PLAN

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COOPERATIVE MONITORING, EVALUATION AND RESEARCH COMMITTEE
January 2010

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1.0 EXECUTIVE SUMMARY

This is the Forests and Fish Policy (Policy) recommended Fiscal Year 2010 (FY10) CMER Work Plan and budget for Forest Practices Board (Board) consideration. The CMER work plan presents an integrated strategy for conducting research and monitoring to provide scientific information to support the Forest Practices Adaptive Management Program (AMP). The primary purpose of the work plan is to inform CMER participants, Policy constituents, the Board and interested members of the public about CMER's activities. Continued annual revisions are anticipated in response to research findings of CMER and the broader scientific community, changes in policy priorities and funding.

More than 90 projects are listed in the work plan. The projects cover a range of topics related to the Forest Practices Rules and are at various stages of development or completion. Projects originated as priority research topics in Schedule L-1 of the Forests and Fish Report, which was adopted by the Board in February 2001, and later incorporated into the Forest Practices Habitat Conservation Plan. The work plan is organized in a hierarchical format consisting of rule groups, programs, and projects. Section 3.0 describes the CMER research and monitoring strategy and approaches used to address critical questions relevant to the AMP. Section 4.0 describes CMER procedures for prioritization at the program and project level, and Section 5.0 presents the proposed FY10 projects and budget allocations. Section 6.0 provides an overview of CMER's research and monitoring program, with program and project descriptions organized by rule group.

The AMP has operated for several years with the assistance of federal grants passed through the Recreation and Conservation Office to DNR. These federal grants are quickly coming to a close and will be expended by the end of FY10, or very early in FY11. In FY11 and 12 the remaining funding sources are projected to provide approximately 30 - 35% of the funding available in FY10. Given the upcoming budget challenges and no certainty of additional funding, the FY10 budget only funds "active" projects - those currently on the ground. No new projects are started in FY10. Proposed budget allocations for FY10 projects and activities can be found on page 14 (Table 4).

There are three ongoing projects in the Type N Rule Group (page 22) and five in Type F Rule Group (page 41). Specific project descriptions can be found on the pages listed below; however, reading the whole rule group subsection is recommended in order to better understand the different programs and projects within each rule group.

FY10 Projects

Type N Experimental Buffer Treatment in Basalt Lithologies - pages 30, 36

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Solar Radiation/Effective Shade - page 59

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2.0 INTRODUCTION

The Washington State Forest Practices Board (FPB) adopted an adaptive management program in concurrence with the Forests and Fish Report (FFR) legislation (State Forest Practices Rules WAC *222-12-045). This legislation, guided primarily by the Washington Forests and Fish Report (1999), has since been federally approved as the Washington Forest Practices Habitat Conservation Plan (FP HCP 2006). The purpose of the Forest Practices Adaptive Management Program is to:

“...provide science-based recommendations and technical information to assist the board in determining if and when it is necessary or advisable to adjust rules and guidance for aquatic resources to achieve resource goals and objectives.”

To provide the science needed to support adaptive management, the FPB established the Cooperative Monitoring, Evaluation and Research Committee (CMER). The FPB appoints core CMER members and empowers CMER to implement research, and effectiveness and validation monitoring per guidelines established by the FFR and implemented under the FP HCP.

Currently, CMER is supported by five scientific advisory groups (SAGs). One former SAG has been merged with another SAG, and one SAG is inactive. The SAGs consist of both CMER members and additional scientific advisors representing the various stakeholders of the forest practices rules. The purpose of the SAGs is to design and implement the research and monitoring prioritized by CMER. Each SAG focuses on specific aspects of the forest practices rules, according to their areas of scientific expertise. Table 1 provides a brief description of the SAGs.

Table 1. CMER Scientific Advisory Group Structure

Scientific Advisory Group	Acronym	Develops and Oversees Projects Related To:
Landscape-Wildlife Advisory Group	LWAG	Wildlife, including stream-associated amphibians
Riparian Scientific Advisory Group	RSAG	The FP HCP riparian strategy
Scientific Advisory Group-Eastside	SAGE	Issues specific to Eastside of the Cascade Mountains
Upland Processes Scientific Advisory Group	UPSAG	Roads, mass wasting and channel processes
Wetlands Scientific Advisory Group	WETSAG	Wetland identification and protection
Bull Trout Scientific Advisory Group	BTSAG	Bull trout biology and the Forest Practices Rules designed to maintain bull trout habitat. In 2008, this SAG was merged with RSAG.
Instream Scientific Advisory Group	ISAG	In-stream issues, including stream typing and fish passage. This SAG is inactive pending further assignments from Policy.

The goal of the CMER work plan is to present an integrated strategy for conducting research and monitoring to provide credible scientific information to support the Forest Practices Adaptive Management Program. The purpose of the work plan is to inform CMER participants, Policy constituents, the Forest Practices Board, and interested public about CMER’s activities. The plan will be revised annually in response to research findings of CMER or the scientific community,

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changing technology, changes in policy objectives, and funding. This version supercedes the FY 2009 work plan. Annual revisions to the work plan are anticipated in the future.

The remainder of the document describes the CMER research and monitoring program and CMER recommendations for the FY 2010 work plan. Section 3.0 describes the organization of the CMER research and monitoring strategy and the approaches used to address research and monitoring questions relevant to Forest Practices Adaptive Management. Section 4.0 describes CMER procedures for prioritization at the program (topic areas) level, and at the project level. Section 5.0 presents the proposed CMER FY 2010 work plan, including recommendations for project prioritization, scheduling and budget allocations. Section 6.0 provides an overview of CMER's research and monitoring program, with program and project descriptions organized by rule group.

3.0 CMER RESEARCH AND MONITORING STRATEGY

The CMER work plan consists of more than 90 projects covering a range of topics related to the Forest Practices Rules. These projects are at various stages of development or completion. The work plan is organized in a hierarchical format consisting of rule groups, programs, and projects.

3.1 FOREST PRACTICE RULE GROUPS

At the highest level, the CMER work plan is organized by forest practices “rule groups.” A rule group is a set of forest practices rules relating either to a particular resource, such as wetlands, or fish-bearing streams, or to a particular type of forest practice, such as road construction and maintenance. The ten rule groups are shown in Table 2. Although the rule group divisions are somewhat arbitrary, they provide a useful framework for the research and monitoring strategy.

Table 2. Description of the Rule Groups Used as a Framework for the CMER Work Plan

Rule Group	Description	Rule Context
Stream Typing	Prescriptions for identification of fish-bearing and non-fish bearing streams.	WAC 222-16
Type N riparian prescriptions	Prescriptions for identification of non-fish-bearing streams and management of adjacent riparian areas	WAC 222-30
Type F riparian prescriptions	Prescriptions for management of fish-bearing streams and adjacent riparian areas	WAC 222-30
Channel Migration Zone	Prescriptions for delineation of channel migration zones	WAC 222-30
Unstable Slopes	Prescriptions for identification and management of areas potentially susceptible to mass wasting/erosion processes	WAC 222-24,30
Roads	Prescriptions for identification and management of erosion and runoff from forest roads	WAC 222-24
Fish Passage	Prescriptions for identification and prevention of fish-passage barriers	WAC 222-24
Pesticides	Prescriptions for application of forest chemicals	WAC 222-38
Wetland Protection	Prescriptions for the identification and management of wetlands	WAC 222-30
Wildlife	Prescriptions for protection of wildlife	WAC 222-10,30

3.2 RESEARCH AND MONITORING PROGRAMS

Critical research and monitoring questions are identified at the rule group level to address information gaps related to scientific uncertainty and resource risk associated with the rules. Once research and monitoring questions are identified, programs are developed to address them. Programs consist of one or more related projects designed to strategically address a set of related scientific questions. Thirty-two programs containing more than 90 projects are identified in the CMER work plan.

CMER research and monitoring programs utilize a variety of approaches that address critical questions at different spatial and temporal scales. The work plan incorporates an integrated research and monitoring approach as recommended by the Monitoring Design Team (MDT) Report (MDT, 2002). This includes effectiveness monitoring to evaluate prescription effectiveness at the site or landscape scale; extensive status and trend monitoring to evaluate status and trends of resource condition indicators across FP HCP lands; and intensive/validation monitoring to identify causal relationships and document cumulative effects at the watershed

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scale. CMER also conducts rule- implementation tool projects to develop, refine or validate science-based management tools necessary for implementing the rule(s) (e.g., predictive models, protocols, etc.) or for establishing performance standards. These approaches are summarized below:

Effectiveness Monitoring: Effectiveness monitoring programs are designed to evaluate the performance of the prescriptions in achieving resource goals and objectives. Effectiveness monitoring differs from the other approaches in that it is directed at prescription effectiveness, primarily at the site-scale.

Extensive Status and Trend Monitoring: Extensive monitoring programs evaluate the current status of key watershed input processes and habitat condition indicators across FP HCP lands and document trends in these indicators over time as the forest practices prescriptions are applied across the landscape. Extensive monitoring provides a statewide, landscape-scale assessment of the effectiveness of forest practices rules to attain specific performance targets on FP HCP lands. Extensive monitoring is designed to provide report-card-type measures of rule effectiveness (i.e., To what extent are FP HCP performance targets and resource condition objectives being achieved on a landscape scale over time) that can be used to determine the degree to which progress is consistent with expectations.

Intensive Monitoring and Cumulative Effects: Intensive monitoring is designed to evaluate cumulative effects of multiple forest practices at the watershed scale. Analysis of these effects improves our understanding of causal relationships and effects of forest practices rules on aquatic resources. Intensive monitoring integrates effects of multiple management actions over space and through time within the watershed. Evaluation of monitoring data requires an understanding of the effects of individual actions on a site and the interaction of those responses through the system. Evaluating biological responses is similarly complicated, requiring an understanding of (1) how various management actions and site conditions interact to affect habitat conditions and (2) how aquatic resources respond to these habitat changes. This sophisticated level of understanding of physical and biologic systems can be achieved with an intensive, integrated, monitoring effort. CMER has identified several potential monitoring topics and is currently scoping an intensive monitoring program.

Rule Implementation Tool Development: Rule implementation tool projects are designed to develop, refine or validate tools used to implement the forest practices rules.

1. Methodology Tool Development Projects develop, test or refine protocols, models, and guides that allow the identification and location of Forest Practices Rule-specified management features, such as the Last Fish Model, landslide screens, the Np/Ns break and Sensitive Sites Identification, or the achievement of specified stand conditions such as the DFC Basal Area Target.
2. Target Verification Projects consist of studies designed to verify performance targets developed during FFR negotiations, that authors identified as having a weak scientific foundation, such as the DFC basal area targets for Type F streams.

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Rule implementation tools differ from tools needed to implement a specific monitoring program or project. For example, the Road Surface Erosion Model is a tool necessary to implement several projects in the Roads Rule Group Effectiveness Monitoring Program. Monitoring implementation tools are typically included with the effectiveness monitoring programs.

4.0 CMER PRIORITIES

CMER's long-term goal is to address the full range of critical questions identified in the CMER work plan, yet recognizing that availability of funding, time and human-resources limit the number of projects that can be developed and implemented each year. In order to focus effort and resources on the most critical issues for Forest Practices Adaptive Management, CMER prioritizes proposals for research and monitoring at both the program and project levels. Establishing priorities allows CMER to pursue the most pressing research and monitoring issues in an orderly manner over time.

The first step in CMER's initial prioritization process was to rank the relative importance of proposed programs in meeting FP HCP goals and objectives. CMER projects have since gone through several rankings in response to budget priorities and changes in workload allocation. The program prioritization strategy was to:

1. Rank effectiveness/validation monitoring and extensive status and trend monitoring programs on the basis of scientific uncertainty and risk to aquatic resources;
2. Evaluate the importance of rule implementation tool programs by consulting with DNR and then establish priorities on a project basis;
3. Defer integration of the intensive monitoring program into the CMER work plan until further scoping and coordination with other efforts occurs.

Effectiveness monitoring and extensive status and trend monitoring programs were ranked initially by CMER members in attendance at the December 19, 2002 CMER meeting, where they evaluated each program by asking two questions:

1. How certain are we of the science and/or assumptions underlying the rule?
2. How much risk is there to aquatic resources if the science or assumptions underlying the rule are incorrect?

These questions were selected as the criteria to rank programs because the need for scientific information to inform adaptive management is most critical when there is a high level of scientific uncertainty concerning the interaction between forest practices, watershed processes and aquatic resources; and where the sensitivity of the processes and aquatic resources to potential disturbance creates the greatest risk of resource impacts.

Uncertainty is a measure of confidence in the science underlying a rule, including the causal relationships providing the conceptual foundation for the prescriptions, and assumptions about prescription effectiveness and resource response when it is applied on the ground. High uncertainty (low certainty) indicates that little is known about the underlying science and the rule is likely based on assumptions that have not been validated. It may also indicate that the prescription is untested and performance under field conditions is unknown. Low uncertainty (high certainty) indicates that the science underlying the rule is well known and accepted, or that the prescription (or similar treatment) has been evaluated under similar conditions. Risk is a measure of the potential for detrimental impacts to aquatic resources including fish, stream associated amphibians, and water quality. High risk indicates the activity covered by the prescription has a greater potential to affect aquatic resources due to its magnitude, frequency, or direct linkage to the resource. Low risk indicates the rule has less potential to affect resources.

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Individual scores were averaged to obtain mean risk and uncertainty scores for each program. These were multiplied to get a combined score that was used to rank the programs (Table 3). The Policy Committee (Policy) accepted the rankings and instructed CMER to use them as the basis for prioritizing effectiveness/validation and extensive status and trend monitoring projects.

Table 3. Rankings for Effectiveness Monitoring and Extensive Status and Trend Monitoring Programs

Program Title	Overall Ranking	Uncertainty		Risk	
		Mean	Rank	Mean	Rank
Effectiveness/Validation Programs					
Type N Buffer Characteristics, Integrity Function	1	4.4	1	3.9	1
Eastside Type F Desired Future Range and Target	2	4.2	2	3.8	2
Type N Amphibian Response	3	4.2	2	3.7	3
Road Sub-basin-scale Effectiveness Monitoring	4	3.4	5	3.4	4
Type F Statewide Prescription Monitoring	5	3.2	7	3.1	6
Mass Wasting Effectiveness Monitoring	6	3.2	6	2.9	8
Eastside (BTO) Temperature	7	3.0	9	3.2	5
Wetlands Revegetation Effectiveness	8	3.5	4	2.7	11
Road Site-scale Effectiveness Monitoring	9	2.6	14	3.1	6
Hardwood Conversion	10	3.0	8	2.6	12
Wetland Mitigation	11	2.8	11	2.7	10
Fish Passage Effectiveness Monitoring	12	2.6	14	2.9	9
Wildlife Program	13	2.9	10	2.4	14
Wetland Management Zone Effectiveness Mon.	14	2.8	12	2.5	13
CMZ Effectiveness Monitoring	15	2.7	13	2.1	15
Forest Chemicals	16	2.0	16	2.1	16
Extensive Status and Trend Monitoring Programs					
Extensive Riparian Monitoring	1	3.5	2	3.5	1
Extensive Mass Wasting Monitoring	2	3.7	1	2.9	3
Extensive Fish Passage Monitoring	3	3.1	3	3.1	2

Program rankings for effectiveness/validation programs and extensive status and trend monitoring programs shown in Table 3, as well as information on the relative importance of rule implementation tool programs gleaned from consultation from DNR, were used to provide guidance to the SAGs on where to focus time and energy in program and project scoping and development.

The second stage of prioritization occurs at the project level in order for CMER to make recommendations to Policy concerning scheduling and allocation of funding among the projects developed by the SAGs. Projects are prioritized based on (1) the extent to which projects are deemed essential to inform the Forest Practices Adaptive Management Program, (2) input from DNR on their importance in improving implementation of forest practice rules, (3) status of projects relative to Policy decisions on adaptive management, and (4) need to follow through and

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complete work already underway. CMER and the Adaptive Management Program Administrator (AMPA) develop each fiscal year's proposed projects based on those criteria.

5.0 FY 2010 CMER WORK PLAN RECOMMENDATIONS

Table 4 presents information on current and proposed CMER projects, organized by rule group. In past fiscal year budget proposals to the FPB, recommended project budgets were categorized as either Tier 1 or Tier 2 projects. Tier 1 projects are those projects CMER is certain to implement in a given fiscal year. Tier 2 projects are those projects that CMER may initiate in the specific fiscal year, but which have not yet been approved by Policy and/or CMER, and/or still involve considerable scientific or fiscal uncertainty. For FY 2010, all projects in the recommended budget proposal are categorized as Tier 1 projects.

Table 4. FY 2010 CMER Projects and Budget

	Tier One
Type N Rule Group	
Type N Experimental Buffer Treatment Project - Basalt Lithologies	\$811,000
Buffer Integrity - Shade Effectiveness	\$120,000
Type F Rule Group	
Bull Trout Overlay Temperature	\$202,000
Solar Radiation/Effective Shade	\$88,000
Eastside Type F Riparian Prescription Monitoring (BTO add-on)	\$32,000
Hardwood Conversion Project	\$22,000
Extensive Riparian Status & Trend Monitoring - Temp. Component	\$320,000
Subtotal Projects	\$1,595,000
CMER Principal Investigator Staff	363,000
Total Project Costs	\$1,958,000
Project Support	
Contingency Fund for Active Projects	\$100,000
CMER Project Managers	\$311,000
Program Administration	
AMP Administrator	\$105,000
Contract Specialist	\$68,000
CMER/Policy Coordinator	\$45,000
CMER Website	\$10,000
AMP Data Management	\$20,000
Independent Science Review Panel	\$90,000
Co-op Fish & Wildlife Research Unit Dues (U of W)	\$16,000
Subtotal Support and Administration	\$765,000
Total FY 08 Expenditures for Projects/Activities	\$2,723,000

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6.0 RULE GROUP DESCRIPTIONS AND MONITORING STRATEGIES

This portion of the work plan presents the research and monitoring strategy for each forest practice rule group, along with a description of related programs and projects. Information on each rule group is presented separately, in a similar format. The “Rule Overview and Intent” briefly describes a summary of the rule and its intent; the “Rule Group Resource Objectives and Performance Targets” lists the resource objectives and performance targets from Schedule L1 of the Washington Forest Practices Habitat Conservation Plan; and the “Rule Group Strategy” describes the programs and how they work together to answer the Rule Group Critical Questions. The programs for each rule group are organized by approach, i.e. rule implementation tools, effectiveness monitoring, extensive monitoring, and intensive monitoring. The “Program Strategy” describes how the specific Program research projects work together to answer the Rule Group Critical Questions, specific to that Program. For some programs, there are additional Program Research Questions, which are sub-questions to the specific Rule Group Critical Questions. These Program Research Questions are identified in tables under the specific Program strategies. The description, goals and status of each project are also described under each program.

Because of the complexity of the riparian strategy, it is divided into four rule groups: Stream Typing Rule Group (Type F/N delineation), Type N Rule Group (non-fish-bearing streams), Type F Rule Group (fish-bearing streams), and Channel Migration Zone Rule Group. Sections on the remaining rule groups appear in the following order: unstable slopes, roads, fish passage, pesticides, wetland protection and wildlife rule groups. Last is a section on the intensive monitoring program, which addresses cumulative effects and validation of performance targets/resource objectives.

6.1 STREAM TYPING RULE GROUP

Rule Overview and Intent

The Forest Practices Board adopted rules delineating waters of the state into three categories, Type S Waters (shorelines of the State), Type F waters (fish-bearing), and Type N waters (non fish-bearing). Distinguishing the upstream limits of Type F (or S) waters is particularly important, because presence or absence of fish and fish habitat in streams creates differences in the aquatic resources of concern, the forest management strategies and the prescriptions applied.

Prior to the Forests and Fish Rules (1999), stream typing was based on a set of physical and beneficial-use criteria. Due to questions about the accuracy of this system, the Forest Practices Rules require development of a statewide stream type map using a multi-parameter, field verified, GIS logistic regression model to identify the upper extent of Type F streams.

The intent of this rule group is to develop a statewide stream typing map, described as follows in the Forest Practices Rules:

“The department will prepare water type maps showing the location of Type S, F, and N (Np and Ns) Waters within the forested areas of the state. The maps will be based on a multi-parameter, field-verified geographic information system (GIS) logistic regression model. The multi-parameter model will be designed to identify fish habitat by using geomorphic parameters such as basin size, gradient, elevation and other indicators. The modeling process shall be designed to achieve a level of statistical accuracy of 95% in separating fish habitat streams and nonfish habitat streams. Furthermore, the demarcation of fish and nonfish habitat waters shall be equally likely to over and under estimate the presence of fish habitat. These maps shall be referred to as “fish habitat water typing maps” and shall, when completed, be available for public inspection at region offices of the department. Fish habitat water type maps will be updated every five years where necessary to better reflect observed, in-field conditions.”

Until the fish habitat water type maps described above are adopted by the FPB, WAC 222-16-031 – the Interim Water Typing System – will continue to be used.

Rule Group Resource Objectives and Performance Targets

Resource Objectives:

- Streams should be typed to include fish habitat. Fish habitat is defined in the Rules to mean “habitat, which is used by fish at any life stage at any time of the year, including potential habitat likely to be used by fish, which could be recovered by restoration or management, and including off-channel habitat.”
- The Rules also direct that the department (DNR) will prepare water type maps, which will be based on a multi-parameter, field-verified, peer-reviewed, geographic information system (GIS) logistic regression model. The multi-parameter model will be designed to identify fish habitat by using geomorphic parameters such as basin size, gradient, elevation, and other indicators.

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Performance Target:

- The predictive fish habitat model should have a statistical accuracy of +/- 5% with the line of demarcation between fish and non-fish habitat waters equally likely to be over and under inclusive.

Placeholder for Important Link to Policy and Decision Making

[To include: Uncertainties, Work done to date, What we have learned so far, Next Steps., etc.]

Uncertainties

Work Done to Date

What Has Been Learned

Next Steps

Rule Group Strategy

The FFR provided rationale and guidance for a strategy related to the stream typing system. The FFR report indicated that the current approach to stream typing was not adequately precise, defined a modeling approach for developing a new map, and set specifications for the accuracy of the model. It also called for development of a field protocol for inclusion in the Forest Practices Board Manual.

The Instream Scientific Advisory Group (ISAG) was tasked with developing and validating a GIS-based model to predict the upstream extent of fish habitat (Table 5). This task falls under one Program, the “Stream Typing Program”, which is categorized as a rule tool.

Table 5. Stream Typing Rule Group Critical Questions and Programs

Rule Group Critical Questions	Program Name	Task Type	SAG
How can the demarcation between fish- and non-fish-habitat waters be accurately identified?	Stream Typing Program	Rule Tool	ISAG

6.1.1 Stream Typing Program (Rule Tool)

Program Strategy

Table 6. Stream Typing Program: Applicable Rule Group Critical Questions with Associated Research Projects

Rule Group Critical Questions	Project Names
How can the demarcation between fish- and non-fish-habitat waters be accurately identified?	Last Fish/Habitat Prediction Model Development Project
	Annual/Seasonal Variability Project
	Last Fish/Habitat Prediction Model Field Performance Project

Last Fish/Habitat Prediction Model Development Project

Description:

A GIS-based logistic regression model was developed, associating geomorphic parameters (i.e., basin size, gradient, elevation and other indicators) with last fish points in order to determine and map the upstream boundary of Type F (fish habitat) streams. However, the Rules specified that once the model was developed, with an accuracy of 95%, the resulting map would be used as rule. However, based on the results of the Last Fish Habitat Model Validation Project, the model did not achieve the target accuracy. In response, DNR developed new hydro-maps based on the model in March 2006, but the maps are to be used as a starting point for delineating fish habitat, not as rule. The DNR maps are currently used as part of the Forest Practices Application process in combination with the Forest Practices Interim Water Typing Rule (WAC 222-16-031). This water typing rule specifies physical criteria for identifying fish-bearing streams (channel width, channel gradient and contributing basin area), unless overridden by a protocol survey for determining fish use.

Status:

The model was completed in 2006. Based on the results of the Last Fish Habitat Model Field Performance project, and the CMER recommendation that further efforts to improve the model would likely not increase its level of accuracy, Policy decided that additional CMER work on the model was not necessary at this time. Policy has identified “stream typing” as a priority task to-be-resolved on their Policy Worklist; however other higher priority tasks have superceded Policy Subgroup efforts until at least summer of 2009.

Annual/Seasonal Variability Project

Description:

This project was intended to help validate the last fish/habitat model. The project goal was to assess whether or not the upstream extent of fish distribution in Eastern Washington varies on an annual basis and/or from season to season. The study sampled for changes in fish movement at both “terminal” (mid-stream) and “lateral” (tributary junctions) fish distribution points. Key questions related to this project include:

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- Does the upstream extent of fish distribution vary with seasons?
- What is the magnitude of the variation in the upstream extent of fish distribution between seasons?
- Are there trends in fish movement upstream or downstream related to season or year?
- What is the magnitude of observed variability?
- Is there a drought impact?

Annual variability estimates were obtained from two years of summer data, collected during the low flow period (2001–2002). Project results indicated a range of observed annual variability from 943 meters downstream to 400 meters upstream of terminal last fish points (n=172). Last fish points did not change from 2001 to 2002 at 51 of 172 locations and, when movement occurred (in either direction), the last fish point shifted by 25 m or less at 61 of the 172 terminal points. Last fish shifted by more than 100 m in either direction at 17 of 172 locations, and moved more than 200 m at only 8 locations. Last fish shifted by more than 500 m at only three locations; all of these were downstream movements. For all 2002 last fish points (terminal and lateral combined), 94% of last fish points shifted by 50 m or less. Of 309 terminal and lateral sites resurveyed in 2002, last fish points did not change at 150 sites.

Seasonal/annual variability estimates were obtained in the summer and fall of 2005 and later compared, to the extent possible, with the annual variability estimates from 2001/2002. Project results showed similar differences in the seasonal variability of fish movement between years, with the majority occurring within 100 meters of the original survey. Seasonal variability results compared fish movement between years and seasons, and included the average upstream/downstream movements, as well as trends in upstream/downstream movement. The project also included an assessment of sampling error to help determine the degree to which the field survey protocol (using a single pass electroshocking survey) was likely to detect the “last fish” at the maximum upstream extent of fish distribution.

Status:

Work began in 2000-2001 to identify annual and seasonal variability of last fish points and also assess sampling error. Additional field survey data were collected in 2002 and 2003. In 2005, a seasonal variability study was completed and a final report was provided in spring 2006. This study was conducted as a sub-project to inform the Last Fish Habitat Model Field Performance project. However, since the Model did not meet the required target accuracy (95%), Policy decided that additional CMER work on annual and seasonal variability was not necessary at this time.

Last Fish/Habitat Prediction Model Field Performance Project

Description:

The objective of this project was to assess the performance of the model predictions in western Washington. A study design was developed by ISAG and approved by CMER and a pilot field-test of the study design was performed. The pilot field test primarily included resurveying a randomized sample of last fish points and comparing those points to the predicted model point. If the field identified last fish point occurred upstream of the model predicted point, the prediction was considered to be an underestimation of fish habitat; if the field identified last fish point

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occurred downstream of the model predicted point, the prediction was considered to be an overestimation of fish habitat. ISAG compiled existing information related to water typing and presented this, along with the model performance assessment study design and pilot field effort results, to the Policy Subgroup on Water Typing.

Status:

Because the model did not achieve the level of accuracy specified in the rules (95%), and further work was unlikely to improve upon that level of accuracy, Policy decided that no additional CMER work was necessary at this time.

6.2 TYPE N RIPARIAN PRESCRIPTIONS RULE GROUP

Rule Overview and Intent

Type N streams either do not provide suitable habitat to support fish or do not contain fish because of a natural barrier to fish migration. Type N streams are protected under Forest Practices Rules for several reasons. First, they provide habitat for stream-associated amphibians (SAA) covered by the agreement. Second, water quality standards pertaining to these streams need to be met. Finally, Type N streams contribute water, nutrients, woody debris, and sediment that affect downstream fish habitat and water quality.

Two buffering strategies are prescribed for Type Np streams, the clear-cut and the partial-cut strategies. The clear-cut strategy is prescribed for the westside, whereas landowners on the eastside have the flexibility to use either clear-cut or partial-cut strategies. The clear-cut strategy on the westside involves a patch buffering system where portions of the riparian stand can be clear-cut to the stream, but the remaining areas are protected with a 50-ft wide no-cut patch buffer. The patch buffer includes fixed and flexible components. Fixed components include 50-ft buffers around the sensitive sites (e.g., connected springs and seeps, Np initiation points; and stream junctions) and on both sides of the stream 300-500 ft upstream from the Type F/Type Np junction. The flexible component allows the landowner to choose where to place the remaining buffer to bring the total buffer length to 50% of the Type-Np length. Eastside landowners have the 2nd option of using the ‘partial-cut’ strategy’, a continuous 50 ft buffer along the length of the Type Np stream. The partial-cut buffer can be thinned, provided that the appropriate basal area and leave tree requirements are met. A 30 ft wide equipment limitation zone (ELZ) is established on all Type N streams (Np and Ns) statewide to minimize sediment input from bank and soil disturbance. Operations within the ELZ are designed to avoid soil disturbance, and sediment delivery must be mitigated.

The Type N rules are based on the assumption that riparian buffering strategies will result in aquatic conditions that meet resource objectives and consequently achieve the three Forests and Fish Report performance goals. However, a high level of uncertainty exists in the science underlying these assumptions because the functional relationships between riparian management practices, riparian functions and aquatic resource response are not well studied or understood. Several major areas of uncertainty include: (1) How to identify the upper boundary of perennial flow in Type N streams; (2) How riparian stands and the inputs and functions they provide respond to management practices and the level of protection provided by the prescriptions; (3) The habitat utilization patterns of Stream Associated Amphibians and their response to riparian management practices; and (4) The effects of Type N riparian management practices on sediment, large woody debris (LWD), temperature and nutrient regimes in downstream fish-bearing streams.

Rule Group Resource Objectives and Performance Targets

Resource Objectives:

The Type N riparian prescriptions are designed to accomplish the following FP HCP resource objectives:

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- Provide cool water by maintaining shade, groundwater temperature, flow, and other watershed processes controlling stream temperature;
- Provide complex in- and near-stream habitat by recruiting large woody debris and litter;
- Prevent delivery of excessive sediment to streams by protecting stream-bank integrity, providing vegetative filtering, protecting unstable slopes, and preventing routing of sediment to streams; and
- Provide conditions that sustain SAA population viability within occupied sub-basins.

Performance Targets:

- Stream Temperature: Water Quality Standards
- Shade: Westside and eastside high elevation streams, shade available within 50 feet for at least 50% of the stream length.
- LWD/Organic Inputs (Westside): At least 50% of recruitable litterfall available from within 50 feet.
- LWD/Organic Inputs (Eastside): At least 70% of litterfall recruitment available from within 50 feet.
- Sediment: <10% streambank disturbance caused by forest practices.

Placeholder for Important Link to Policy and Decision Making

[To include: Uncertainties, Work done to date, What we have learned so far, Next Steps., etc.]

Uncertainties

Work Done to Date

What Has Been Learned

Next Steps

Rule Group Strategy

As mentioned in the rule overview section above, there were scientific uncertainties concerning the assumptions on which the Forest Practices Type N riparian prescriptions were based. The Type N riparian strategy is designed to address those areas of scientific uncertainties by focusing on critical questions related to delineation of Np/Ns streams, characterization of Np streams, identification and characterization of sensitive sites, and the effectiveness of the rules in achieving FP HCP goals and resource objectives. The critical questions, programs, task types and responsible scientific advisory group (SAG) are listed in Table 7. The first step in the strategy involves Rule Tool Programs on how to delineate and characterize Type N streams and Sensitive Sites. The Type N Delineation Program addresses how to characterize and delineate the uppermost boundaries of Type N streams, including perennial and seasonal streams. The purpose

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of the Sensitive Site Program is to refine the descriptions of stream- associated amphibian (SAA) sensitive sites in the Forest Practices Rules and to estimate their importance to SAAs.

After rule tools have been developed to characterize and/or delineate Type N streams, the next step in the strategy is to assess the effectiveness of the riparian prescriptions in meeting resource goals and performance targets. The Type N Riparian Effectiveness Program assesses how the forest practices riparian prescriptions, as well as alternative buffer prescriptions, address the FP HCP resource objectives (i.e., riparian processes and functions) within Type N streams, as well as their contribution to downstream Type F streams. The Type N Amphibian Response Program addresses how SAA population viability is maintained by the Type N prescriptions on the Westside. The Extensive Riparian Status and Trend Monitoring Program is then designed to provide a snapshot of temperature and riparian vegetation conditions in Type N streams across the FP HCP landscape and document how those conditions change over time.

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Table 7. Type N Riparian Prescriptions Rule Group Critical Questions and Programs

Rule Group Critical Questions	Program Names	Task Type	SAG
How should the initiation point of Type Np streams be identified for management purposes?	Type N Delineation Program	Rule Tool	UPSAG
Can the methods used to identify and characterize sensitive sites be improved?	Sensitive Site Program	Rule Tool	LWAG
How do survival and growth rates of riparian leave trees change following Type Np buffer treatments? Are riparian processes and functions provided by Type Np buffers maintained at levels that meet FP HCP resource objectives and performance targets for shade, stream temperature, LWD recruitment, litter fall and amphibians? How do other buffers compare with the forest practices Type N prescriptions in meeting resource objectives? How do the Type N riparian prescriptions affect downstream water quality and fish populations? Are the Type N performance targets valid and meaningful measures of success in meeting resource objectives? What is the frequency and distribution of windthrow in forest practices buffers on Type N and F streams? What site and habitat conditions are associated with sites with significant blowdown?	Type N Riparian Effectiveness Program	Effective-ness	RSAG SAGE
Is Stream Associated Amphibian (SAA) population viability maintained by the Type N prescriptions?	Type N Amphibian Response	Effective-ness	LWAG
What is the current status of riparian conditions and functions in Type N streams on a statewide scale, and how are conditions changing over time?	Extensive Riparian Status and Trend Monitoring Program	Extensive	RSAG

6.2.1 Type N Delineation Program (Rule Tool)

Program Strategy

Because the Type N protections differ between perennial and seasonal stream reaches, it is important that perennial and seasonal reaches can be identified before management activities occur. This is difficult because flow regime determination requires walking extensive stream lengths during the summer dry season. The need for a simpler year-around determination method led to the basin area default method contained in the FFR. The Type N Delineation Program is designed to determine whether regulatory delineation methods are sufficiently accurate and whether there are preferable alternatives.

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The Type N Delineation Program attempts to evaluate existing and alternative delineation methods using observational field studies. In 2001, a pilot study (administered by UPSAG) was initiated to validate existing methods for defining perennial and seasonal streams for both western and eastern Washington, as described below.

Table 8. Type N Delineation Program: Applicable Rule Group Critical Questions with Associated Research Projects

Rule Group Critical Questions	Project Names	SAG
How should the initiation point of Type Np streams be identified for management purposes?	Perennial Initiation Point Survey: Pilot Study	UPSAG

Perennial Initiation Point Survey: Pilot Study

Description:

The PIP pilot study was initiated in 2001 to evaluate field methods and inform sampling needs for a subsequent statewide field study. The field portion of the study was done by F&F cooperators (tribes, timber companies and WDFW) on a voluntary basis. Data analysis and reporting was done by CMER staff under the direction of the Np technical sub-group and UPSAG.

Key results were that the field methods were adequate with some modifications and that 30 to 300 sites (depending on metric) would be needed for a statistically robust study. The pilot failed to identify any reliable field indicators (e.g. channel width, indicator plant species, etc.) but found that the proximity of perennial flow initiation to the channel head or upslope ridge to be promising alternative methods. Basin areas were substantially smaller than the default values for all regions of the state where data were collected. Although variability was high between sites, differences were better correlated with average annual precipitation than existing rule regions (i.e. west Cascade, east Cascade, and coastal Spruce zones).

Completion of the Pilot Study in 2004 was followed by ISPR review and revisions and the preliminary scoping of a coordinated statewide study.

Status:

The Pilot Study was completed in 2004. A coordinated statewide study has not been scoped or initiated pending direction from Policy. A follow-up study design for eastern Washington (described below) was under CMER review at the writing of this Work Plan.

6.2.2 Sensitive Site Program (Rule Tool)

Program Strategy

This program, which began in 1999, consists of two rule-tool implementation projects. The purpose of this program is to refine the descriptions of stream-associated amphibian (SAA) sensitive sites in the Forest Practices Rules and to estimate their importance to SAAs. The strategy is to first develop a field methodology to assist forest managers in identifying sensitive sites and then characterize sensitive sites that are the most important to the FP HCP SAAs.

Table 9. Sensitive Site Program: Applicable Rule Group Critical Questions with Associated Research Projects

Rule Group Critical Questions	Project Names
Can the methods used to identify and characterize sensitive sites be improved?	SAA Sensitive Sites Identification Methods Project
	SAA Sensitive Sites Characterization Project

SAA Sensitive Sites Identification Methods Project

Description:

The purpose of the SAA sensitive site identification method project is to develop a practical methodology for identifying SAA sensitive sites, such as headwall seeps, side-slope seeps, and headwater springs. It is designed to answer the following critical questions:

- Are sites important to amphibians correctly identified by rule?
- Are rule-identified sites valuable for amphibians?
- Does sensitive site field identification need to be improved?

This project is intended to inform the Type N riparian rule by providing a standard methodology (field guide) for field managers to identify SAA sensitive sites when designing harvest units.

Status:

This project was completed in 2007. Two manuscripts have been submitted to a peer-reviewed journal and two additional manuscripts are in preparation. This project is administered by LWAG.

SAA Sensitive Sites Characterization Project

Description:

The purpose of this project is to document the distribution and characteristics of sensitive sites as described by the Forest Practices Rules and to verify their utilization and habitat value for SAAs. It will generate information on the characteristics of sensitive sites, validate the extent to which they are utilized by amphibians, and determine if other sensitive sites exist. Information from this project could result in changes to the sensitive site criteria in the rules to better focus buffer protection on areas important to SAA.

Status:

This project was completed in 2006. One manuscript has been submitted to a peer-reviewed journal and another is in preparation. This project is administered by LWAG.

6.2.3 Type N Riparian Effectiveness Program

The effectiveness of the Type N riparian management prescription package is uncertain because there are many gaps in the scientific understanding of headwater streams, their aquatic resources, and the response of riparian stands, amphibians, water quality and downstream fish populations to different riparian management strategies. Consequently, prescriptions are based on assumptions that have been neither thoroughly studied nor validated. This program is ranked first among the 16 CMER programs. This program has been divided into two sections, one for the

Westside and one for the Eastside, due to differences in the prescriptions and critical questions, which lead to unique program strategies.

Program Strategy (Westside)

The purpose of this program is to evaluate the Westside Type N riparian management prescriptions, including response of riparian vegetation, growth and mortality of buffer trees, level of riparian functions provided, biotic and water quality responses to prescriptions (both within the Type N system and in downstream fish-bearing waters), and their effectiveness in achieving performance targets and meeting water quality standards. Critical questions for this Program, along with the projects designed to answer them, are shown in Table 10.

There are two CMER projects currently underway to evaluate the effectiveness of the westside Type N riparian prescriptions. These projects utilize two different, but complementary approaches to inform adaptive management. The Type N Buffer Characteristics, Integrity and Function Project-Westside examines a random sample of westside Type N forest practice applications to evaluate performance of Type N prescriptions as they are applied operationally over the range of conditions occurring in the FP HCP landscape. The Type N Experimental Buffer Treatment Project (basalt lithology) focuses on aquatic resource response to Type N prescriptions in streams with competent lithologies in western Washington. This study utilizes a manipulative experimental design that compares effectiveness of a range of Type N treatments (that vary in the percentage of stream length buffered) with untreated control sites. This study measures amphibian response, litter fall, temperature, downstream export of nutrients, detritus, macroinvertebrates, and sediment, and fish response.

Two additional projects that address Westside Type N riparian prescriptions are in the scoping stage. Scoping is underway on a project to evaluate the effectiveness of Type N riparian prescriptions in incompetent lithologies. This project, initially called the Type N Experimental Buffer Treatment Project (incompetent lithology), was intended to complement the study in basalt lithologies by using a similar design to evaluate prescription performance in more erosive lithologies. The scoping process is focusing on temperature and sediment response to the Type N riparian prescriptions. In addition, RSAG is planning to begin scoping on a project to focus on assessment of windthrow in riparian buffers.

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Table 10. Type N Riparian Effectiveness Program - Westside: Applicable Rule Group Critical Questions with Associated Research Projects

Rule Group Critical Questions	Project Names
How do survival and growth rates of riparian leave trees change following Type Np buffer treatments?	Westside Type N Buffer Characteristics, Integrity and Function Project (BCIF) Type N Experimental Buffer Treatment Projects (basalt and incompetent lithologies)
Are riparian processes and functions provided by Type Np buffers maintained at levels that meet FP HCP resource objectives and performance targets for shade, stream temperature, LWD recruitment, litter fall and amphibians?	Westside Type N Buffer Characteristics, Integrity and Function Project (BCIF) Type N Experimental Buffer Treatment Projects (basalt and incompetent lithologies)
How do other buffers compare with the forest practices Type N prescriptions in meeting resource objectives?	Type N Experimental Buffer Treatment Projects (basalt and incompetent lithologies) DNR Type 5 Experimental Buffer Treatment Project
How do the Type N riparian prescriptions affect downstream water quality and fish populations?	Type N Experimental Buffer Treatment Projects (basalt and incompetent lithologies)
What is the frequency and distribution of windthrow in forest practices buffers?	Windthrow Frequency, Distribution and Effects Project
What site and habitat conditions are associated with sites with significant blowdown?	

Westside Type N Buffer Characteristics, Integrity and Function (BCIF) Project

Description:

The Westside Type-N Buffer Characteristics, Integrity, and Function project is designed to evaluate the effectiveness of the Westside Type-N riparian prescriptions, including survival of buffer leave trees, stand condition and trajectory over time, and changes in riparian functions including shade, LWD recruitment, and stream bank protection. A random sample of 15 Type Np treatment sites were selected from forest practices applications and paired with un-harvested control sites to provide an unbiased estimate of variability in performance of the buffers relative to the Type N performance targets.

Status:

Initial post-harvest sampling at 15 treatment/control pairs in the western Washington western hemlock zone strata was initiated in the fall of 2003. Post-harvest low altitude photography and field measurements of canopy conditions were collected in 2004. After a pilot project to evaluate feasibility of aerial photography, RSAG determined that field data were needed to accomplish the project objectives. Field data on riparian stand conditions, fallen trees, LWD recruitment, shade, channel wood loading and soil disturbance from windthrown trees was collected. Field data was collected 3 and 5 years after timber harvest in the summer/fall of 2006 and 2008. These data are currently being analyzed. A draft final report is scheduled to be presented to RSAG in the spring of 2009.

Type N Experimental Buffer Treatment in Basalt Lithologies Project

Description:

This study is a field experiment, which assesses the effects of three riparian buffer strategies (compared to unharvested reference or control basins) on amphibians, water quality, and exports of nutrients, detritus, macroinvertebrates and suspended sediment, and downstream fish populations. The study design includes randomized blocks; with each block consisting of four sites, including a reference. Pre- and post-harvest data on variables such as amphibian populations, riparian stand characteristics, tree mortality and LWD recruitment, shade and stream temperature, litter fall, light, stream flow, water chemistry, particulate and invertebrate export and stream bank erosion have been collected. Downstream effects on water quality and fish populations will also be assessed. To include amphibians, study sites are confined to basins with basalt or other competent lithologies.

Status:

The study plan for this project was reviewed by SRC and approved by CMER. Site selection, site setup, and the first 2 years of pre-harvest sampling are complete. Data have gone through QA/QC and stored in a database. Harvest treatments began April 2008 and most will be completed by May 2009. However, due to economic conditions in 2009, one basin will have a delayed harvest, pushing post-treatment data collection back one year. Two years of post-harvest sampling will occur once harvest treatments are completed. If harvest treatments are substantially delayed, the project may need to extend into FY2012.

Type N Experimental Buffer Study in Incompetent Lithologies

Description:

After funding the Type N Experimental Buffer Study in Basalt Lithology at the August 2005 meeting, Policy asked that CMER assess the feasibility of using the existing, approved study plan as the basis for conducting a study on more erosive (incompetent) lithologies in western Washington.

Status:

This project is currently being scoped by members of RSAG and UPSAG. The intent is to combine the study with the Type N Experimental Buffer Study in Basalt Lithologies, and to address sediment and stream temperature.

Windthrow Frequency, Distribution and Effects Project

Description:

Preliminary results of the Type N BCIF Project indicate that windthrow mortality in Westside Type N buffers is widespread. Many land managers have observed this as well. In response to this concern, RSAG plans to scope the inclusion of a windthrow assessment into existing Type N riparian projects.

Status:

To be scoped within existing Type N riparian projects.

DNR Type 5 Experimental Buffer Treatment Project

Description:

This is a cooperative project with DNR and USFS that compares response of riparian stands, temperature, litter fall, nutrients, small mammals, amphibians, and downed wood to a range of buffer treatments applied in sets of small paired watersheds. CMER was a cooperator in the early stages of this project.

Status:

Baseline data collection is complete, and post-harvest data collection on recently harvest sites was completed in summer 2007. Data analysis has begun. No additional CMER funding is anticipated.

Program Strategy (Eastside)

The purpose of this program is to evaluate forest practices Type N riparian management prescriptions, including response of riparian vegetation, growth and mortality of buffer trees, level of riparian functions provided, biotic and water quality responses to prescriptions (both within the Type N system and in downstream fish-bearing waters), and their effectiveness in achieving performance targets and meeting water quality standards.

RSAG was overseeing a project entitled “Eastside Type N Buffer Characteristics, Integrity and Function Project (BCIF).” As part of the project, RSAG intended to examine a random sample of east-side Type N riparian forest practice applications to evaluate the performance of Type N prescriptions as they were applied operationally over the range of eastside Type N streams. However, this study has been placed on hold at the present time, due to a lack of suitable study sites.

Within SAGE, no studies have yet been scoped to perform effectiveness monitoring of eastern Washington Type N streams. Before effectiveness monitoring can be developed for Eastern Washington Type N streams, two important issues specific to eastern Washington and the associated Forest Practices Rules need to be understood. First, unlike the Westside, the Eastside contains a very diverse climate ranging from dry Ponderosa Pine conditions to high precipitation rates that mimic the Westside. Second unlike the Westside, no DFC’s were developed for Type N streams. These two issues do not allow SAGE to simply move into Effectiveness Monitoring Studies that would provide any meaningful information as to whether or not Goal 2 of the Forests and Fish Report is being achieved, which then satisfies Goals 1 and 3 of the FP HCP. Additionally an abbreviated approach would not result in data required to develop DFC’s for Type N Streams on the Eastside.

The Eastside Type N Characterization Project developed by SAGE contains a series of studies that will examine eastern Washington headwater streams with the final intent of Effectiveness Monitoring. Given the importance of flow as a transport mechanism between non-fish and fish-bearing streams and the unique functions these streams exhibit, SAGE decided that determining the hydrology of Type N streams would be the first step in laying the groundwork for additional studies. By understanding forest hydrology we will better understand spatially intermittent reaches and where they are likely to occur across eastern Washington thus providing additional information to help correctly delineate the Type Np/Ns break.

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The Eastside Type N Forest Hydrology Study is the first in a series of SAGE proposed studies that will examine eastern Washington headwater streams. The primary objective of this study is to describe the spatial and temporal flow conditions of Type N streams, the physical components affecting the flows, and ultimately how these factors influence stream function. These components may be used to classify streams into groups that appear to exhibit similar characteristics and processes, and which may therefore function similarly. The strategy developed by SAGE is designed toward Effectiveness Monitoring, once the groundwork has been established by the Forest Hydrology Study. Once the diversity of various flow regimes have been identified then CMER will be able to implement studies to examine how these streams function and whether or not the current rules are meeting the goals of the FP HCP. Although SAGE will not have the results of the forest hydrology work until the end of 2009, SAGE predicts that the next studies will be as follows:

- Studies to determine how the different flow regimes function.
- Effectiveness Monitoring studies to determine if the rules are meeting the goals of the FP HCP.

Table 11. Type N Riparian Effectiveness Program - Eastside: Applicable Rule Group Critical Questions with Associated Research Projects

Rule Group Critical Questions		Project Names	SAG
How do survival and growth rates of riparian leave trees change following Type Np buffer treatments?		Eastside Type N Buffer Characteristics, Integrity and Function Project (BCIF)	RSAG
Are riparian processes and functions provided by Type Np buffers maintained at levels that meet FP HCP resource objectives and performance targets for shade, stream temperature, LWD recruitment, litter fall and amphibians?			
Program Research Questions	<i>What are the characteristics of eastern Washington Type N stream channels and riparian areas and how do they vary across eastern Washington?</i>	Eastside Type N Forest Hydrology Study	SAGE
	<i>Do different types of Type N channels explain the variability in the response of Type N channels to forest practices?</i>		
How do the Type N riparian prescriptions affect downstream water quality and fish populations?		No projects yet scoped	SAGE
Are the Type N performance targets valid and meaningful measures of success in meeting resource objectives?		No projects yet scoped	SAGE

Eastside Type N Buffer Characteristics, Integrity, and Function Project (BCIF)

Description:

The Eastside Type N Buffer Characteristics, Integrity, and Function project, managed by RSAG, is designed to evaluate the effectiveness of the Eastside Type-N riparian prescriptions, including survival of buffer leave trees, stand condition and trajectory over time, and changes in riparian functions including shade, LWD recruitment, and stream bank protection. RSAG proposes to examine a random sample of eastside Type N riparian forest practice applications to evaluate the performance of Type N prescriptions as they are applied operationally over the range of eastside Type N streams.

Status:

RSAG attempted to implement this project in 2004 and again in 2006, but was unable to find an adequate number of study sites because there were very few FPAs where landowners proposed to apply the Eastside Type N prescriptions. Most landowners opted to simply stay out of the 50 ft Type N management zone, rather than to implement the thinning or patch-cut prescription. RSAG documented these findings in a series of memos. Due to the lack of suitable study sites, this study has been placed on hold for the present time.

Eastside Type N Characterization Project: Eastside Type N Forest Hydrology Study

Description:

The Eastside Type N Forest Hydrology Study will help determine what the spatial and temporal characteristics of surface water discharge across eastern Washington FP HCP lands, what landforms, management activities, and/or independent physical characteristics are related to different flow characteristics across eastern Washington FP HCP lands, and are there a set of readily identified external characteristics that can be used to group and/or remotely identify stream reaches that exhibit similar hydrologic characteristics. The study won't tell if the forest practices rules are meeting the goals of the FP HCP or give us enough information to develop DFC's for Type N streams in Eastern Washington.

Status:

The Eastside Forest Hydrology Study Plan is being submitted to ISPR for review and field work is slated to start in the summer of 2009.

6.2.4 Type N Amphibian Response Program (Effectiveness)

Program Strategy

The restricted distribution of SAAs and the lack of information about them required development of an amphibian- response strategy that differs from that of many other rule groups or programs. This program began with development of tools needed to implement the Type N buffer rule for sensitive sites (i.e., SAA sensitive sites identification methods and characterization) and procedures to detect and determine the relative abundance of SAAs for monitoring purposes. During this time, other projects designed to determine critical monitoring questions for some species (i.e., tailed- frog literature review and meta-analysis) or to answer species-specific L-1 questions were undertaken (i.e., Dunn's and Van Dyke's salamanders). After completion of these projects, effectiveness monitoring will begin. This program is administered by LWAG. This program is ranked third among the 16 CMER programs.

The restricted distribution of SAAs and uneven abundance further limited the amphibian response program. LWAG determined that an extensive monitoring project for SAAs would not provide useful information for the Forest Practices Adaptive Management Program and cooperation with other monitoring projects was not possible. LWAG concluded that any monitoring program must focus on those physical factors (e.g., geology) that appear to effect SAA distribution, abundance, and response to timber harvest (i.e., the Type N Experimental Buffer Treatment Project).

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The purpose of this program is to address critical questions about response of stream-associated amphibians (SAAs) to forest practices, particularly the Type N riparian prescriptions. Many uncertainties exist about the distribution of SAAs, their life history and habitat utilization patterns, population dynamics, effects of forest practices on SAA habitats, and the response of SAA populations to these changes. Consequently, the Type N riparian rule is based on the assumption that buffering of perennial Type N streams around ‘sensitive’ sites (sites thought to provide high- quality SAA habitat), will maintain the viability of SAA populations. These assumptions and uncertainties have been examined and used to develop a series of sub-questions under the main critical question (Table 12).

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Table 12. Type N Amphibian Response Program: Applicable Rule Group Critical Questions with Associated Research Projects

Rule Group Critical Questions		Project Names
Is Stream Associated Amphibian (SAA) population viability maintained by the Type N prescriptions?		
Program Research Questions	<i>Do SAAs continue to occupy and reproduce in the patch buffers?</i>	SAA Detection/ Relative Abundance Methodology Project
	<i>Do SAAs continue to occupy and reproduce in the ELZ only reaches?</i>	
	<i>If SAAs do not continue to occupy the ELZ only reaches, do they re-occupy those reaches before the next harvest?</i>	
	<i>How does SAA habitat respond to the sensitive site buffers?</i>	
	<i>How does SAA habitat respond to variation in inputs, e.g. sediment, litter fall, wood?</i>	
	<i>How do SAA populations respond to the Type N prescriptions over time?</i>	Type N Experimental Buffer Treatment
	<i>What are the common findings and inconsistencies in published studies on the effects of timber harvest on tailed frogs?</i>	Tailed Frog Literature Review
	<i>What can be learned from a meta-analysis of published data and unpublished data on tailed frogs in managed forests?</i>	Tailed Frog Meta-analysis Project
	<i>Are published generalizations on the relationship between parent geology and tailed frog abundance correct and consistent?</i>	Tailed Frog and Parent Geology Project
	<i>What are the common findings and inconsistencies in published studies on the habitat associations of Dunn's and Van Dyke's Salamanders?</i>	Dunn's and Van Dyke's Salamander Project
<i>What are the effects of various levels of shade retention on the stream-breeding SAAs?</i>	Buffer Integrity-Shade Effectiveness Project	
<i>Is there an optimum level of shade retention?</i>		
<i>Does territoriality in high quality habitat confound interpretation of SAA relative abundance estimates?</i>		
<i>What are the effects of three buffer treatments on SAAs, 2 years post-harvest?</i>	Amphibian Recovery Project	
<i>How do stream associated amphibians utilize intermittent stream reaches at or near the origins of headwater streams?</i>	Amphibians in Intermittent Streams Project	

SAA Detection/Relative Abundance Methodology Project

Description:

The SAA Detection/Relative Abundance Methodology Project is designed to evaluate and develop a standard methodology for sampling SAAs in headwater forest streams. It addresses the need for a research/monitoring methodology to detect amphibians and determine their relative abundance. The most widely used methods produce high variance estimates and detection probabilities are unknown.

Status:

This project was completed in 2006. A journal publication gives details of the findings of this project.

Type N Experimental Buffer Treatment Project

Description:

This study is an experimental test of the effects of three riparian buffer strategies (compared to unharvested control basins) on amphibian, water quality, and downstream exports of nutrients, detritus, macroinvertebrates and suspended sediment, and down stream fish populations. The study design employs four blocks; each block consists of four sites including a reference basin. Pre- and post-harvest data on variables such as amphibian populations, riparian stand characteristics, tree mortality and LWD recruitment, shade and stream temperature, litter fall, light, stream flow, water chemistry, particulate and invertebrate export and stream bank erosion have been collected during 2 pre-harvest years. Downstream effects on water quality and fish populations will also be assessed. Genetic analyses of samples collected from both *Ascaphus truei* and *Dicamptodon copei* are being completed to detect whether a significant change in genetic variation exists within a treatment. Change in genetic variation will be averaged within each treatment and compared through time within treatments. To include amphibians, study sites are confined to basins with basalt or other competent lithologies.

Status:

The study plan for this project was reviewed by SRC and approved by CMER. Site selection, site set-up, and the first 2 years of pre-harvest sampling are complete; harvest treatments began April 2008 and will be completed May 2009. Two years of post-harvest sampling will occur once harvest treatments are completed.

Tailed Frog Literature Review

Description:

Of the 7 FP HCP SAAs, the two tailed frog species may be the most extensively studied due to its wide distribution in the coastal Pacific Northwest. There are enough published studies on this species that a synthesis of those results will be useful in helping LWAG develop a research and monitoring program. A draft literature review was completed in 2008.

Status:

The review was completed in 2008. The draft report will be submitted to LWAG for review in early 2009, then to CMER.

Tailed Frog Meta-analysis

Description:

Published data, as well as some that is not published, will be subjected to a meta-analysis that will relate tailed frog abundance with habitat conditions created by timber harvest. That analysis may or may not support the conclusions of literature review described above and will likely identify other factors related to tailed frog distribution and response to timber harvest that will be useful in developing LWAG's program. The recent reclassification of the two species of tailed frogs required the review to be restructured in mid-stream to reflect that taxonomic revision.

Status:

The 6 data sets have been formatted, quality control completed, and the analysis is underway. A draft report should be completed by October 2009.

Tailed Frog and Parent Geology Project

Description:

Recent studies in managed forests have emphasized the relationship between parent geology, stream substrate composition, and tailed frog abundance. A general hypothesis has emerged that tailed frogs are most abundant in streams on lithologies that produce hard or competent rock (e.g., volcanic basalt) vs. those that do not (e.g., marine sandstones). However, a study in Olympic National Park found that tailed frogs were abundant on both marine and volcanic parent material, and a recent broader regional study (2008) did not find a clear pattern with regard to lithologies. These studies were largely observational and the distinction between geologies was an extrapolated finding of the results. This proposed project would test the parent geology hypothesis throughout Washington.

Status:

This project is currently on hold.

Dunn's and Van Dyke's Salamander Project

Description:

The FP HCP indicates that LWD may be important for Dunn's and Van Dyke's salamanders. However, general habitat descriptions for both these species emphasize the importance of streamside rocky substrates. A literature review to determine the basis for the LWD connection to these species was done external to CMER in 2000. The initial field phase of this project, done in cooperation with the Forest Service in 2001, was designed to provide additional information on the role of LWD in these species habitats. The initial field phase collected data across too few sites to complete an effective analysis, so a second phase of field data was collected in 2003.

Status:

Analysis of data from both phases has been completed and a manuscript was submitted to a peer-referred journal in 2008.

Buffer Integrity-Shade Effectiveness Project

Description:

Blow down can be difficult to predict in time and space, and the effects on SAAs in Type N patch buffers are largely unknown. One of the primary effects of blow down is a reduction in shade from standing trees. This project will examine the effects of four levels of shade retention on tailed frog and torrent salamander density, body condition, and spatial distribution, water temperature, primary productivity, and macro-invertebrates. This is a cooperative project between Longview Timberlands LLC and CMER. Longview Timberlands LLC completed a pilot study in 2003, and initiated a broader study in 2004. The latitudinal breadth of this study was increased with CMER-approval to include sites on the Olympic Peninsula.

Status:

The first two years of pre-treatment sampling occurred in FY 2006 and 2007. Treatments were implemented during winter 2007-2008, and the first year of post-treatment sampling has been completed. The final year of post-treatment sampling will occur in 2009. A draft report will be completed in June 2010.

Amphibian Recovery Project

Description:

In 1998, the National Council for Air and Stream Improvement (NCASI) funded a study by Dr. Rhett Jackson on the effects of three buffer treatments on headwater streams in the Willapa Hills and Olympic Peninsula. Many of the FP HCP SAAs occurred on these sites. The NCASI funding covered a year of pre-treatment data and immediate post-harvest sampling. This project collected an additional two years of post-harvest data.

Status:

This project was completed in 2003, and four journal articles have been published.

Amphibians in Intermittent Streams Project

Description:

This project seeks to provide an understanding of amphibian use of the stream segments exhibiting spatially discontinuous perennial flow that often occur at or near the origins of headwater streams. This project will provide information that will directly inform the efficacy of buffering these stream segments in terms of SAA occupancy and ecology. The study plan included 3 phases: 1) an assessment of data collected under previous CMER funded projects for its applicability to the goals and objectives, 2) an analysis of the data, if any, identified in Phase 1, and 3) based on the results of Phases 1 or 2, additional data collection if needed.

Status:

Phase 1 identified only 10 streams from previous LWAG-sponsored western Washington work with data appropriate to the project, thus LWAG determined there was not enough data to warrant undertaking Phase 2 and that Phase 3 should be implemented. Phase 3 scoping and study design has been completed and is currently being reviewed by CMER. LWAG will request that the study plan be reviewed by the Independent Science Review Panel; once that is completed release of an RFQQ will follow. LWAG will administer this project. The suggested approach will be to have a consultant(s) conduct the field sampling and members of LWAG will conduct the analysis of the data and report/manuscript writing.

6.2.5 Extensive Riparian Status and Trend Monitoring Program

Program Strategy

The purpose of the Extensive Riparian Status and Trend Monitoring Program is to provide data needed to evaluate landscape-scale effects of implementing forest practices riparian prescriptions and to provide data needed by State and Federal regulatory agencies to provide assurances that forest practices rules meet Clean Water Act requirements and achieve riparian resource objectives. Critical questions for the Extensive Riparian Status and Trends Monitoring Program are shown in Table 13. The projects of this program will obtain an unbiased estimate of the

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distribution of stream temperature and shade, and riparian stand characteristics on Type N streams across FP HCP lands, and with re-sampling, will identify trends in these indicators over time.

The Extensive Riparian Status and Trend Monitoring Program is stratified by region (eastside/westside) and by stream type (fish-bearing and perennial non-fish-bearing). Stratification at this coarse scale is necessary because riparian buffering strategy differs both for Type F/S (fish-bearing) and Type Np (perennial non-fish-bearing) streams and for eastern vs. western Washington forestlands. Organizing the sampling effort into separate strata creates projects of a manageable size and allows project-specific adjustments in the sampling strategy and effort to leverage sample site permitting and related data collection among other concurrent riparian studies. This program was ranked first by CMER among the three extensive monitoring programs.

A study design for the entire Extensive Riparian Trend Monitoring Program was developed by RSAG. RSAG is currently implementing the stream temperature monitoring component while further developing the vegetation monitoring component methodology in response to independent scientific peer review comments. The vegetation assessment component will use aerial photography evaluation methods and is not dependent on field work to implement. All vegetation assessment is expected to occur in FY10-11 once the methodology has been finalized. Existing data from other riparian projects will be used to help calibrate and validate results of the remote sensing characterization.

Table 13. Extensive Riparian Status and Trend Monitoring Program: Applicable Rule Group Critical Questions with Associated Research Projects

Rule Group Critical Questions		Project Names
What is the current status of riparian conditions and functions in Type N streams on a statewide scale, and how are conditions changing over time?		
Program Research Questions	<i>What is the distribution of maximum summer stream temperature and 7-day mean maximum daily water temperature on FP HCP lands, and how is the distribution changing over time as the forest practices prescriptions are implemented?</i>	Extensive Riparian Status and Trend Monitoring – Temperature, Type Np Westside Extensive Riparian Status and Trend Monitoring – Temperature, Type Np Eastside
	<i>What proportion of stream length on FP HCP lands meets water quality standards for water temperature, and how is the proportion changing over time as the forest practices prescriptions are implemented?</i>	Extensive Riparian Status and Trend Monitoring – Temperature, Type Np Westside Extensive Riparian Status and Trend Monitoring – Temperature, Type Np Eastside
	<i>What are current riparian stand attributes on FP HCP lands, and how are stand conditions changing over time as the forest practices prescriptions are implemented?</i>	Extensive Riparian Status and Trend Monitoring – Vegetation, Type Np Westside
		Extensive Riparian Status and Trend Monitoring – Vegetation, Type Np Eastside

Extensive Riparian Status and Trend Monitoring – Temperature, Type Np Westside

Description:

This project is intended to develop unbiased estimates of the distribution of Type Np stream temperatures across FP HCP lands in Western Washington. Stream temperatures are monitored using recording thermographs at upstream and downstream locations as well as one measuring

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air temperature at the stream reach. Along with stream temperature, shade, riparian vegetation type, large woody debris, and several channel measurements are collected.

Status:

This project is being implemented simultaneously with the Westside Type F project. Over one-half of the intended sites were sampled in 2008. Sampling will be completed in spring of 2010. A report covering both years of sampling will be produced over the summer of 2010. The timing of the second sampling event has not been scheduled, but should occur before 2020 to allow time for the expected changes in canopy cover and stream temperature to occur.

Extensive Riparian Status and Trend Monitoring – Temperature, Type Np Eastside

Description:

This project is intended to develop unbiased estimates of the distribution of Type Np stream temperatures across Eastern Washington. Stream temperatures are monitored using recording thermographs at upstream and downstream locations as well as one measuring air temperature at the stream reach. Along with stream temperature, shade, riparian vegetation type, large woody debris, and several channel measurements are collected.

Status:

Initial site screening occurred in summer of 2008. Only 10% of the sites inspected had flow during the summer (peak temperature) monitoring season (site requirement). Therefore this project is hoping to take advantage of results from the Eastside Type N Forest Hydrology Study in order to better target appropriate study sites that have flow year round. Site screening will continue during summer of 2009, and sites will be measured and installed in spring 2010. If suitable sample sites cannot be located by October 2009, then sampling cannot occur in 2010.

Extensive Riparian Status and Trend Monitoring – Vegetation, Type Np Westside and Eastside Projects

Description:

The Type Np and Type F/S, eastside and westside studies will be performed concurrently. These projects will assess riparian conditions in randomly-selected Type Np, F, and S stream reaches across FP HCP lands in the state in order to estimate conditions statewide. The vegetation assessment component will use aerial photography evaluation methods and is not dependent on field work to implement. All vegetation assessment is expected to occur in FY10-11 once the methodology has been finalized. Existing data from other riparian projects will be used to help calibrate that effort and also to validate results of the remote sensing characterization. The plan is to assess conditions at the same sites used in the temperature study and to use the ground data collected in that study (as well as any other riparian studies) as verification for aerial photo interpretations.

Status:

A study protocol that defines precise measurement methods is currently under development.

6.3 TYPE F RIPARIAN PRESCRIPTIONS RULE GROUP

Rule Overview and Intent

The FP HCP recognizes differences in riparian systems and processes between eastern (Eastside) and western (Westside) Washington. However though the Type F riparian rules prescribe different protection strategies for eastern and western Washington riparian management zones (RMZs), they also share common basic characteristics. The common characteristics are RMZs equal in width to a site-potential tree height and divided into three zones: core, inner and outer. All zones are intended to provide key riparian functions including bank stability, shade, wood recruitment, litterfall, and preventing sediment entrainment caused by surface erosion. The core zone is adjacent to the stream and is a no-harvest zone. The core zone is intended to provide the majority of several key riparian functions. The inner zone extends outward from the core zone and is primarily intended to provide additional shade and large woody debris recruitment. The outer zone extends the RMZ out to one site-potential tree height.

During development of the Forests and Fish rules, the protection of bull trout was determined to be an area of special concern because they were listed under ESA as “Threatened” throughout their geographical distribution in Washington. A main factor contributing to their “Threatened” status is the degradation of habitat, especially increasing stream temperatures. Bull trout require cooler stream temperatures than other salmonids. The water quality standards in place at the time of FFR rule development were assumed to be too warm for bull trout. The proposed rule protection strategies, shade and stream temperature were assumed to be more at risk in eastern Washington than in western Washington because of the potential for more shade removal from within eastside RMZs combined with warmer eastside air temperatures. Therefore, an additional shade rule to be applied within the Bull Trout Habitat Overlay was prescribed for eastern Washington riparian rules in order to provide adequate stream temperature protection for bull trout (see section below on Eastside Type F rules for further details). The additional shade rule does not apply to western Washington.

The specific rule protection strategies for western and eastern Washington are described separately in the sections below.

Westside Type F Rules:

The FFR report described the goal of the riparian strategies for Westside Type F (fish-bearing) streams as follows:

“...Riparian silvicultural treatments and conservation measures that are designed to result in riparian conditions on growth and yield trajectories towards what are called ‘desired future conditions.’ As used in this report, desired future conditions are the stand conditions of a mature riparian forest, agreed to be 140 years of age (the midpoint between 80 and 200 years) and the attainment of resource objectives. ...These desired future conditions are a reference point on the pathway to restoration of riparian functions, not an endpoint of riparian stand development.”

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The western Washington Type F riparian rules are based upon the following assumptions:

- The DFC basal area targets adequately describe mature riparian forest conditions (140 years old).
- Stands meeting the DFC targets will provide the aquatic habitat conditions needed to achieve functions and to meet the overall performance goals and resource objectives
- The growth model used for DFC adequately projects riparian growth and mortality.
- Some hardwood-dominated riparian stands need to be converted to conifer in order to achieve DFC.

Western Washington RMZs consist of three zones, including:

1. A 50 foot no-harvest core zone.
2. An inner zone extending from 10 to 100 feet beyond the core zone (depending on the Site Class and stream size) where the timber harvest management objective is to place the combined core and inner zone on a trajectory to grow into the desired future condition (DFC).
3. An outer zone extending beyond the inner zone to the edge of the RMZ where timber harvest is managed to protect special sites and wildlife habitat, and to provide for one site potential tree height, required by the Federal Services under the Forest Practices Habitat Conservation Plan.

Eastside Type F Rules:

The goals for the Eastern Washington Type F riparian rules are to provide for stand conditions that: 1) vary over time within the range of historic disturbance regimes, 2) provide riparian functions needed to meet resource goals for fish, amphibians and water quality, and 3) maintain forest health by minimizing risk of catastrophic damage from insect, disease or fire.

The eastern Washington Type F riparian rules are based upon the following assumptions:

- The management strategies in the Type-F rules will put stands in the RMZ on a trajectory that is within the range of natural variability.
- The defined elevation bands are reasonably accurate reflections of the spatial distribution of historical disturbance regimes and species compositions.
- The management strategies will minimize risk of catastrophic events within the RMZs.
- The management strategies will put stands on a trajectory that will provide the riparian functions needed to support harvestable populations of fish.
- The temperature overlays are necessary to provide stream temperatures that meet the state water- quality standards and the needs of bull trout.

Eastern Washington Type-F rules consist of three riparian zones, including:

1. A 30 foot no-harvest core zone.
2. An inner zone that is 45 to 70 feet wide (depending on Site Class and stream size).
3. An outer zone between 0 to 55 feet wide.

The sum of the core, inner and outer zones approximates the height of a site-potential tree, which varies with Site Class. Allowable harvest within the inner and outer zones is different for each of three elevation bands, referred to as timber habitat types in the rules. These elevation bands were intended to emulate variations in natural disturbance regimes, variations in species distributions,

and other riparian characteristics. Guidance for selecting RMZ leave trees based on size and species are intended to move riparian stand conditions towards larger trees of fire- and disease-resistant species.

Two shade rules exist for the Eastside Type F riparian rule package. The first is the Standard Shade Rule which defines the amount of shade needed to meet state water-quality standards (in place at the time of rule development), using the nomograph in Section 1 of the Board Manual. The second is the “All Available Shade” Rule, which applies to areas within the Bull Trout Habitat Overlay (BTO). The BTO is a map depicting the distribution of known and potentially suitable bull trout habitat in eastern Washington. When a timber harvest unit is located within the BTO, all available shade (as determined by a densiometer) must be retained within 75 feet of the bankfull channel width or channel migration zone, whichever is greater. When outside of the BTO, prescriptions fall under the standard shade rule, which can allow for harvest of a portion of shade trees within the 75 feet, depending on elevation and the amount of canopy cover prior to harvest.

The FP HCP assumes that riparian forests managed in accordance with Western and Eastern Washington riparian rule strategies will provide adequate levels of key riparian functions (providing large woody debris, bank stability, shade, and nutrients; and preventing sediment input to streams) necessary to meet the resource objectives and performance targets outlined in the Washington Forest Practices Habitat Conservation Plan.

Rule Group Resource Objectives and Performance Targets

Resource Objectives:

- Heat/Water Temperature: Provide cool water by maintaining shade, groundwater temperature, flow, and other watershed processes controlling stream temperature.
- LWD/Organic Inputs: Develop riparian conditions that provide complex habitats for recruiting large woody debris and litter.
- Sediment: Provide clean water and substrate and maintain channel forming processes by minimizing to the maximum extent practicable, the delivery of management-induced coarse and fine sediment to streams (including timing and quantity) by protecting stream bank integrity, providing vegetative filtering, protecting unstable slopes, and preventing the routing of sediment to streams.
- Hydrology: Maintain surface and groundwater hydrologic regimes (magnitude, frequency, timing, and routing of stream flows) by disconnecting road drainage from the stream network, preventing increases in peak flows causing scour, and maintaining the hydrologic continuity of wetlands.

Performance Targets:

- Stream Temperature: Water Quality Standards
- Shade: Type F and S streams, except Eastside bull trout habitat: that produced by shade model or, if model not used, 85-90% of all effective shade. Eastside: all available shade within 75' of designated bull trout habitat per predictive model.
- Riparian Condition: Westside and high elevation eastside habitats: riparian stands are on pathways to meet Desired Future Condition (DFC) targets (species, basal area, trees per

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acre, growth, mortality). Eastside: (except high elevation): DFC; current stands on pathways to achieve eastside condition ranges for each habitat series.

- Pool frequency: < 2 channel widths per pool.
- Sediment: Mass wasting: virtually none triggered by new roads, favorable trend on old roads. Timber harvesting-related: no increase over natural background rates from harvest on a landscape scale on high risk sites. Old roads (ratio of road length delivering to streams/total stream length in miles): Not to exceed 0.15-0.25 in Coast (Spruce) zone and West of Crest; 0.08-0.12 East of the Crest. Old roads (ratio of road sediment production delivered to streams/total stream length in tons/year/mile): Not to exceed 6-10 T/yr in Coast (Spruce) zone, 2-6 T/yr West of the Crest, and 1-3 T/yr East of the Crest. No streambank disturbance outside road crossings on S/F streams. $\leq 10\%$ of the equipment limitation zone. Less than 12% embedded fines (<0.85 mm).
- Instream LWD: Westside: 85% of recruitment potential for stand on the trajectory toward DFC conditions; additional recruitment from trees in the outer zone. See Schedule L-1¹ for details on numbers of pieces. Eastside: To be developed, based on eastside disturbance regimes.
- Residual Pool Depth: See Schedule L-1² for details.
- Stream/equipment limitation zone disturbance: No streambank disturbance outside road crossings.
- Peak flows: Westside: Do not cause a significant increase in peak flow recurrence intervals resulting in scour that disturbs stream channel substrates providing actual or potential habitat for salmonids, attributable to forest management activities.³ Increases in 2-year peak flows related to forest management (roads and harvest) are $\leq 20\%$ ⁴.

Placeholder for Important Link to Policy and Decision Making

[To include: Uncertainties, Work done to date, What we have learned so far, Next Steps., etc.]

Uncertainties

Work Done to Date

What Has Been Learned

Next Steps

¹ Details for number of instream LWD pieces are found in Schedule L-1 version adopted by the Forest Practices Board on 02-14-01.

² Details for residual pool depths are found in Schedule L-1 version adopted by the Forest Practices Board on 02-14-01.

³ From Schedule L-1, Appendix H to Forests and Fish Report.

⁴ From Schedule L-1, version adopted by Forest Practices Board on 01-14-01.

Rule Group Strategy

Uncertainties about the validity of the above-mentioned assumptions and effectiveness of the rules to achieve resource objectives and performance targets, lead to a series of critical questions and Programs to address them (Table 14). The Programs include:

1. The DFC Validation Program, a rule tool program that addresses uncertainties regarding the validity of the westside DFC performance targets and the accuracy of the DFC model that is used to project stand trajectory to age 140. The purpose of this program is to validate the DFC approach for management of western Washington, conifer-dominated riparian stands on fish-bearing streams.
2. The Eastside Riparian Type F Rule Tool Program, which assesses current riparian stand and stream conditions on Type F streams across the eastside to provide a baseline for effectiveness monitoring and for establishing eastern Washington targets.
3. The Eastside Type F Riparian Effectiveness Program addresses the effectiveness of Eastside Type F prescriptions in meeting riparian functions and resources conditions. This Program currently includes a study which compares and tests the effectiveness of the two eastern Washington shade rules for protecting and maintaining shade and stream temperature. A second component of this study assesses whether the “all available shade” rule actually achieves all effective shade by testing the attenuation of solar radiation to the stream before and after harvest. Another study uses some of the same sites to test the effect of the Eastside Type F riparian prescriptions on stand development, buffer tree survival and LWD recruitment.
4. The Westside Type F Riparian Effectiveness Program, which addresses effectiveness of the Type F riparian rules in meeting performance targets and achieving resource objectives;
5. The Bull Trout Habitat Identification Program is a Rule Tool Program. The primary goal of this program was to develop protocols and/or predictive models for determining sampling efficiency, presence/absence of bull trout, and for identifying habitat suitable to support bull trout. Site-specific data on bull trout presence/absence above barriers or habitat suitability would help to identify areas that might be added or removed from the Bull Trout Habitat Overlay, as defined in Rule. The work for this Program has been completed and no further work is planned at this time.
6. The Hardwood Conversion Program, which addresses uncertainty regarding strategies and prescriptions for managing hardwood-dominated stands;
7. The Extensive Riparian Status and Trend Monitoring Program, which documents status and trends of riparian conditions on Type F streams on a regional scale;
8. The Intensive Monitoring/Cumulative Effects Program, which is designed to evaluate the cumulative effects of multiple forest practices on a watershed-scale level, and to provide information that will improve our understanding of causal relationships and the biological effects of forest practices rules on aquatic resources.

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Table 14. Type F Riparian Prescriptions Rule Group Critical Questions and Programs

Rule Group Critical Questions	Program Name	Task Type	SAG
Does the DFC model adequately project stand basal area growth to age 140? Do the basal area targets adequately describe mature riparian forest conditions?	DFC Validation Program	Rule Tool	RSAG
What is the current range of conditions for eastside riparian stands and streams? What are appropriate LWD performance targets? Can the shade/temperature relationships in the eastside temperature nomograph be refined? Will application of the prescriptions result in stands that achieve eastside FP HCP objectives (forest health, riparian function and historic disturbance regimes)?	Eastside Type F Riparian Rule Tool Program	Rule Tool	SAGE
How can habitat suitable for bull trout be identified?	Bull Trout Habitat Identification Program	Rule Tool	Former BTSAG
Are the Type F riparian rules effective in meeting the performance targets, resource objectives, and overall performance goals of FP HCP?	Westside Type F Riparian Effectiveness Program	Effectiveness	RSAG
Are the Type F riparian rules effective in meeting the performance targets, resource objectives, and overall performance goals of FP HCP? Will application of the prescriptions result in stands that achieve eastside FP HCP objectives (forest health, riparian function and historic disturbance regimes)? Are both the standard eastside prescriptions and the “all available shade” rule effective in protecting shade and stream temperature and in meeting water quality standards? Are there differences between the standard eastside rules and the “BTO all available shade” rules in the amount of shade provided and their effect on stream temperature? Is “all available shade” actually achieved with the densiometer methodology under the BTO shade rule? Are forest practices riparian prescriptions effective at protecting groundwater flow and temperature?	Eastside Type F Riparian Effectiveness Program	Effectiveness	SAGE RSAG
Where and how should hardwood- conversion projects be conducted, and what are the ecological outcomes?	Hardwood Conversion Program	Effectiveness	RSAG

(Table 14 cont. next page)

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(Table 14 cont.)

Rule Group Critical Questions	Program Name	Task Type	SAG
What is the current status of riparian conditions and functions in Type F and S streams on a regional scale, and how are conditions changing over time?	Extensive Riparian Status and Trend Monitoring Program	Extensive	RSAG
How do aquatic organisms respond to changes in habitat and water quality associated with changes in riparian inputs and functions?	Intensive Monitoring/Cumulative Effects Program	Intensive	RSAG

6.3.1 DFC Validation Program (Rule Tool)

Program Strategy

The program is administered by RSAG, and is designed to address uncertainties about the DFC approach, including uncertainties about: 1) how well the current targets reflect mature unmanaged riparian conditions for conifer and mixed stands, 2) how prescription options and constraints affect leave tree requirements and future basal area, 3) the accuracy of site class maps, 4) how accurately the DFC model predicts growth of riparian stands to age 140, 5) what sort of habitat conditions will be provided by mature riparian stands, and 6) how young stands of different composition and density develop as they mature.

The program consists of several projects designed to answer a series of critical questions (Table 15). The DFC Target Validation Project was identified as a high priority by CMER and the MDT. To manage conifer and mixed riparian stands to achieve functions associated with mature stands, the DFC approach requires stand targets that reflect mature stand conditions, and a model that can accurately predict the trajectory of young stands to maturity.

Work on the DFC Target Validation Project began in 2000, and the project results were transmitted to Policy in March of 2005. In response to the DFC Report, Policy requested that CMER undertake three additional tasks: (1) Conduct scoping for a project to standardize the width of the plots used in the DFC study to address concerns raised in the ISRP review (DFC Plot Width Standardization Project); (2) Undertake preparation of a scoping document to identify and evaluate potential approaches for validating the accuracy of the DNR Site Class maps in riparian areas (DFC Site Class Map Validation Project); and (3) Complete a study, originated by NWIFC staff, to determine how the westside Type F riparian prescriptions are being applied by landowners and to evaluate how the different prescription options and constraints influence the amount of timber available for harvest and projected future basal area (the FPA Desktop Analysis).

Validation of the DFC model is another important issue to be addressed by this program. Development of a study to quantify the growth and dynamics of riparian buffers created by implementation of DFC rule was put on hold while RSAG waited to assess the feasibility of the regional riparian stand growth-mortality cooperative effort to address this issue in a cost-effective manner. The DFC-Aquatic Habitat Project was ranked as a lower priority project, consequently scoping on this project has not begun; although, RSAG proposed conducting this study as part of the DFC Plot Width Standardization Project. That RSAG recommendation was rejected by Policy. The Pathways of Riparian Stand Development to Maturity Project is an

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outgrowth of the DFC Target Validation Project, based on the realization that many young low density stands of mixed composition may not achieve DFC on a timeline consistent with policy objectives without some form of intervention. Finally, a better understanding of the development of such stands is needed to identify appropriate management approaches.

Table 15. DFC Validation Program: Rule Group Critical Questions and Associated Research Projects

Rule Group Critical Questions	Project Names	
Does the DFC model adequately project stand basal area growth to age 140?		
Do the basal area targets adequately describe mature riparian forest conditions?		
Program Research Questions	<i>Do the DFC targets accurately reflect stand conditions for mature, unmanaged conifer-dominated westside riparian stands?</i>	DFC Target Validation Project DFC Plot Width Standardization Project
	<i>How are the westside Type F riparian prescriptions being applied by landowners? What is the effect of various prescription options and constraints on current harvest and projected future basal area?</i>	FPA Desktop Analysis
	<i>What is the accuracy of the DNR site class maps in riparian areas, and what factors influence map accuracy?</i>	DFC Site Class Map Validation Project
	<i>Does the DFC growth and mortality model accurately predict the trajectory of westside conifer-dominated riparian stands to age 140?</i>	DFC Trajectory Model Validation Project
	<i>What aquatic habitat conditions are associated with mature westside riparian stands?</i>	DFC-Aquatic Habitat Project DFC Plot Width Standardization Project
	<i>How do mature stand structures develop from younger stands in a variety of stand compositions and densities?</i>	Pathways of Riparian Stand Development to Maturity Project
	<i>What growth trajectories and successional pathways are characteristic of hardwood-dominated riparian stands?</i>	Red Alder Growth and Yield Model Project

DFC Target Validation Project

Description:

The purpose of this project was to collect data on stand characteristics from a random sample of mature (140 years) unmanaged conifer-dominated riparian stands in western Washington; compare basal area per acre from the field sample with the current DFC targets in rule; and evaluate alternative parameters for characterizing DFC.

Status:

This project has been completed. The results are available in a CMER document entitled “Validation of the Western Washington Desired Future Conditions (DFC) Performance Targets

in the Washington State Forest Practices Rules with Data from Unmanaged, Conifer-dominated Riparian Stands.” The results were transmitted to Policy for consideration in the summer of 2005. The FPB is currently in the process of considering rule changes based on the results of the DFC Validation Study.

DFC Plot Width Standardization Project

Description:

In response to the DFC Target Validation Project described above, Policy requested that CMER undertake several additional tasks including scoping a follow-up sampling effort to standardize the width of the plots used in the DFC study to address concerns raised in the ISRP review pertaining to mixing plots from mapped Site Classes with field-verified Site Classes. In addition, CMER held several DFC Workshops for Policy to inform them of the implications of mixing plots for the purpose of potential rule changes.

Status:

RSAG completed scoping of this document in the spring of 2006. A scoping paper with options for follow-up sampling and simultaneously conducting aquatic habitat validation research was approved by CMER and presented to Policy in the summer of 2006. Policy has not approved moving forward with this project.

FPA Desktop Analysis

Description:

This project was intended to determine how westside Type F Prescriptions are being applied by landowners and to evaluate the effect of various riparian prescription options and constraints on timber available for current harvest and on projected future basal area. Although originated by NWIFC staff outside of the adaptive management program, Policy requested that CMER complete an office (desktop) analysis of a random set of FPAs that had active management of the inner zone, and to conduct a field- verification project on a sub-sample of those FPAs.

Status:

A draft report on the desktop analysis was presented to RSAG in December of 2005. Data collection for the field verification project occurred in the winter of 2006 and a draft report was submitted to RSAG in the spring of 2006. Later in 2006, CMER approved a contract to finalize the “desktop analysis”, “field check” and “model and manual” reports, along with a document that synthesized findings from each of the reports. This work was completed in 2007 and is currently being peer-reviewed.

DFC Site Class Map Validation Project

Description:

The third request from Policy was to prepare a scoping document that identifies and evaluates approaches for validating the accuracy of the DNR site class maps in riparian areas

Status:

CMER staff prepared a scoping document that was approved by CMER and presented to Policy in the summer of 2006. Policy has not approved moving forward with this project.

DFC Trajectory Model Validation Project

Description:

This project will assess the accuracy of the DFC model in predicting riparian stand growth and trajectory from harvest age to the DFC target (age 140). This project will be designed to validate the DFC model as a tool to predict trajectory to the DFC target for both conifer-dominated and mixed stands.

Status:

This study has neither been scoped nor designed. RSAG does not plan to begin scoping on this project at this time.

DFC-Aquatic Habitat Project

Description:

The purpose of this project is to determine the range of aquatic habitat associated with mature (DFC) riparian forest conditions.

Status:

This study has been neither scoped nor designed, except for the work proposed in the DFC Plot Width Standardization Project. RSAG does not plan to begin scoping this project or implementing the DFC Plot Width Standardization Project unless directed by Policy.

Pathways of Riparian Stand Development to Maturity Project

Description:

The purpose of this project is to determine the development sequence of younger stands of various compositions and densities to mature stands. The study is intended to inform management of uneven-aged stands and those of low density or mixed composition.

Status:

RSAG does not plan to begin scoping on this project at this time.

Red Alder Growth and Yield Model Project

Description:

The purpose of this project is to develop a growth and yield model for red alder. Existing models either do not include red alder amongst the species simulated or use equations that are based on too few field data. In this project, cooperators from across the PNW have contributed existing data that was compiled and cleaned at the UW Stand Management Cooperative. A growth and yield model for red alder will be developed from these data in a second phase of the project. Red alder is a dominant component of many riparian forests and although the model is not specific to riparian areas it will provide better information on the growth dynamics of these riparian stands than is currently available.

Status:

CMER has contributed project development funds to this cooperative effort in the past, and in the fall of 2006, received a request from the Washington Hardwood Commission to fund

additional sampling at some existing sites. This request was approved and the work occurred in the winter of 2007.

6.3.2 Eastside Type F Riparian Rule Tool Program

Program Strategy

The Eastern Washington Riparian Assessment Project consists of the following studies: Phase 1 and Phase 2 of the riparian assessment study, and the Eastside Channel Wood Characterization Study. Both the Phase 1 and the channel wood characterization study are designed to sample the current condition of riparian and instream conditions (baseline conditions) on FP HCP lands. Phase 2 of the riparian survey is designed to complete the analysis of the information collected in Phase 1 to answer the Critical Questions of the study. Phase 2 also contains a modeling approach where the Phase 1 data will be analyzed to help address the Rule Group Critical Question “Will the application of the prescriptions result in stands that achieve eastside FP HCP objectives (forest health, riparian function and historic disturbance regimes)?” By modeling the riparian data collected in Phase 1, SAGE can begin to explore what conditions are sustainable when the current Forest Practice Rules are applied to various stand conditions in eastern Washington.

Based on the final results of Phase 2, SAGE will then decide what additional data is needed before DFC’s can be developed for riparian forest stands. Still in the study plan stage, the results of the Instream Channel Wood Characterization Study will be evaluated similarly in order to determine the next steps necessary for developing DFC’s for LWD. Once these DFC’s have been established, effectiveness monitoring can begin.

Uncertainties about the validity of assumptions and effectiveness of the rule led to the critical questions listed in Table 16.

Table 16. Eastside Type F Riparian Rule Tool Program: Applicable Rule Group Critical Questions with Associated Research Projects

Rule Group Critical Questions	Project Names
What is the current range of conditions for eastside riparian stands and streams?	Eastern Washington Riparian Assessment Project - Phase 1 Eastside Channel Wood Characterization Study
What are appropriate LWD performance targets?	Eastside LWD Literature Review Project Eastside Channel Wood Characterization Study
Can the shade/temperature relationships in the eastside temperature nomograph be refined?	Eastside Temperature Nomograph Project
Will application of the prescriptions result in stands that achieve eastside FP HCP objectives (forest health, riparian function and historic disturbance regimes)?	Eastside Disturbance Regime Literature Review Project

Eastside Disturbance Regime Literature Review Project

Description:

A literature review entitled “A Review and Synthesis of Available Information on Riparian Disturbance Regimes in Eastern Washington” was produced to gain an understanding of what disturbance regimes existed in the past and how they affected riparian forests. The information

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from this review will help determine whether we can apply these past conditions to present riparian stands and meet the Desired Future Conditions for riparian function.

The literature review states that “despite a very large information base on historical and current disturbance regimes within Eastern Washington forests, differences in riparian and upslope forest disturbance regimes and post-disturbance responses are not well known. Much of the scientific literature describing Eastern Washington disturbance regimes and forest responses is at the forest series or plant association group level and does not distinguish between riparian and upslope communities. The differences between current and historical disturbance regimes for fire are better defined than for insects, pathogens, and other disturbance types. No clear consensus exists on whether there is a difference between disturbance regimes and forest responses of riparian and upslope areas. In fact, available information on riparian ecosystem disturbance regimes and responses was often contradictory. Additional research aimed at regional-scale forest stand disturbance processes is recommended to supplement existing data and better define the role of disturbance in riparian and upslope forest habitats. The likelihood of duplicating historical disturbance regimes, to reestablish historical forest conditions, is low given current forest stand conditions and global climate change.

Status:

This document was approved by CMER in June 2002.

Eastside LWD Literature Review Project

Description:

A literature review entitled “A Review of the Available Literature Related to Wood Loading Dynamics in and around Streams in Eastern Washington Forests” was undertaken to help gain an understanding of the dynamics of functional stream wood, and to a lesser degree, the linkage between the level of LWD recruitment and the health of aquatic habitat. Addressing the uncertainty will require additional information on the relationship of LWD recruitment and habitat function. There is uncertainty about the response of aquatic habitat to different types or levels of LWD input and loading, and how much LWD riparian buffers need to produce.

SAGE’s literature review consisted of forty-one questions concerning channel wood issues in eastern Washington. Ten of the forty-one questions were answered at least in part by studies in eastern Washington but these were usually limited to a few specific regions of eastern Washington. The other questions could not be answered by literature currently available for eastern Washington.

Status:

This document was approved by CMER in 2004.

Eastside Temperature Nomograph Project

Description:

The Eastside Temperature Nomograph Project developed an Eastern Washington-specific nomograph using existing data and identified gaps for future study. The study identified site characteristics necessary to produce a better predictive model of stream temperatures in eastern Washington.

Status:

The report was reviewed by SAGE and CMER and was not accepted as an approved project because technical shortcomings were identified. The document was retired to the file with comments noted. The data used in the analysis have been obtained and archived for potential future use and analysis. Further work on the eastside temperature nomograph project has been put on hold pending the results of an evaluation by WDOE of the approach for achieving water quality criteria, which will determine if the nomograph will be needed.

Eastern Washington Riparian Assessment Project – Phase 1

Description:

Eastern Washington has a wide range of climatic conditions, elevations, forest types, riparian zones, and management history. The focus of the Eastern Washington Riparian Assessment Project is to document the current range of conditions of riparian stands on eastside forestlands. Information gathered through this project provided CMER and Policy with a common understanding of status and characteristics of riparian stands in lands managed under the eastside Type F prescriptions. The data was analyzed to identify patterns in the distribution of riparian stand types across eastern Washington, and relationships between riparian stand conditions and factors such as precipitation, elevation, and geology.

Status:

To answer questions specific to Phase 1, data were collected on 103 sampling sites in 2007. The report for the Phase 1 was approved by CMER in 2007. Phase 2 of this study is currently being implemented and will include completing the statistical analysis and synthesis in the Phase 1 report as well as the modeling component necessary to address specific critical questions in the study.

Eastside Type F Channel Wood Characterization Project

Description:

Characterizing eastern Washington's Type F streams is important, because information is scarce or simply does not exist that describes the current status of channel wood conditions and its influence on instream habitat conditions. SAGE has identified three primary problems due to this lack of information. First, the scarcity of data limits the ability to make informed management decisions needed by land managers and regulators. Second, a lack of information hinders the ability to address forest health risks (insects, disease and fire) in upland and riparian forests. Finally, land managers and regulators have little guidance or context to evaluate alternate plans to meet necessary stream and riparian functions.

SAGE believes that better information is needed to determine the appropriate frequency and distribution of channel wood for meeting properly functioning aquatic habitat conditions. In addition, desired channel wood conditions need to consider and approximate the historic disturbance regimes.

Status:

The study design is currently before CMER for approval. Upon approval by CMER, this study design will go to ISPR. After approval by CMER and Policy, plans are for implementation to begin in fiscal year 2010.

6.3.3 Bull Trout Habitat Identification Program (Rule Tool)

Program Strategy

The Bull Trout Habitat Identification Program is a Rule Tool Program. This program was developed to address possible modifications of the Bull Trout Habitat Overlay, as defined in the rule. Because knowledge of the current and potential distribution of the species is imprecise, large areas of forestland in eastern Washington may be included in the BTO. These areas may result in excessive restrictions and in riparian conditions that do not meet the intent of the Eastside riparian strategy. Site-specific data on bull trout presence/absence or habitat conditions were thought to be able to help in identifying areas that might be added or removed from the BTO. There were two primary tasks identified for this program: (1) development of sampling efficiency models and protocols for detection of bull trout; and (2) development of habitat prediction models for helping to make determinations of habitats unsuitable to support bull trout.

This program was originally administered by the former BTSAG. The work for this Program has been completed. Because of the difficulty in stakeholder agreement in removing areas from the BTO, efforts have moved to comparing and assessing the effectiveness of the two shade rules in protecting and maintaining shade and stream temperature. Results from this effort could lead to modifications of the BTO, in part or as a whole. No further work is planned for this Program at this time.

Table 17. Bull Trout Habitat Identification Program: Applicable Rule Group Critical Questions with Associated Research Projects

Rule Group Critical Questions	Project Names
How can habitat suitable for bull trout be identified?	Bull Trout Presence/Absence Protocols
	Bull Trout Habitat Prediction Models
	Yakima River Radiotelemetry

Bull Trout Presence/Absence Protocols

Description:

Because sampling efficiency and probability of detection for bull trout were believed to be less than that known for other salmonids, work was focused first on developing sampling efficiency models for bull trout specifically. These sampling efficiency models were intended to prescribe the effort necessary to be able to detect bull trout, using three different survey methods (i.e., electroshocking, day snorkeling, and night snorkeling). The models also included the influence of physical channel features on the response of bull trout to sampling activities, and compared probabilities of detection with and without the use of blocknets.

Status:

Sampling efficiency models for detecting bull trout have been developed that are part of the development of presence/absence protocols. Two papers were finalized and approved by CMER, relating to sampling efficiency models: (1) Development of Bull Trout Sampling Efficiency Models, by Thurow et al., March 2004; and (2) Analysis of Movement Patterns of Stream-Dwelling Salmonids in Response to Three Survey Methods, by Peterson et al., July 2003. The results of these papers provide valuable information towards understanding the probability of detection and associated effort needed to survey for bull trout presence under various habitat conditions, some of which could be included in a bull trout field protocol, but additional work would be needed to achieve the program goal of a bull trout field protocol. The two CMER reports have been forwarded to Policy, who accepted the reports and decided that no further action was needed at this time.

Bull Trout Habitat Prediction Models

Description:

This project was designed to develop bull trout habitat suitability models, which would help in identifying those areas on the Bull Trout Habitat Overlay which might actually be “unsuitable” for supporting bull trout. According to the forest practices rules, if areas were found to be “unsuitable” for potentially supporting bull trout, those areas could be exempt from the requirements of the “all available shade” rules. The project was focused on bull trout juveniles; it did not include adult bull trout. The primary habitat predictor was the stream temperature at which juvenile bull trout could be supported.

Status:

To date, preliminary draft models have been developed, but found to be too coarse for forest practices purposes. One report from this project was finalized and approved by CMER, entitled: Models to Predict Suitable Habitat for Juvenile Bull Trout in Washington State, by Dunham and Chandler, July 2001. This report provided valuable information pertaining to habitat suitability for juvenile bull trout. However, the study only resulted in setting up a preliminary model, which was too coarse of a screen for determining what would represent “unsuitable bull trout habitat” within forested lands. Predictive models tend to be more appropriate for determining “suitable” habitat rather than “unsuitable” habitat. Additional work would be needed to incorporate additional variables, resulting in a finer screen for determining what might be “suitable” or “unsuitable” habitat. It is likely, however, that a model would not be adequate by itself to determine habitat suitability; additional field surveys would probably be needed on a site-by-site basis. The CMER report has been forwarded to Policy, who accepted the report and decided that no further action was needed at the time.

Yakima River Radiotelemetry

Description:

This project is designed to evaluate the migratory patterns of adult bull trout and to identify their distribution and habitat preferences in the Yakima River watershed. The information gained from this project will inform bull trout presence/absence protocols and habitat prediction models.

Status:

The draft final report from this project is currently being finalized by the authors and is expected to be delivered to CMER for review in early 2009 when it is complete.

6.3.4 Westside Type F Riparian Effectiveness Program

Program Strategy

The purpose of this program is to undertake research and monitoring to evaluate the effectiveness of Westside Type F riparian prescriptions, compare and evaluate alternative Type F buffer treatments, and to validate Type F performance targets. The program is designed to address scientific uncertainty about prescriptions for type F streams, including:

1. Survival of buffer trees and rates of buffer tree mortality from competition, windthrow, disease, insects and other factors,
2. Post-harvest changes in conifer-dominated westside RMZs, and whether westside stands will remain on trajectory to achieve DFC performance targets,
3. Uncertainty about the level of riparian functions provided by riparian stands produced by Type F prescriptions, and whether or not FP HCP resource objectives and performance targets will be achieved.
4. Efficacy of alternative buffer designs in providing riparian functions and meeting resource objectives and performance targets.
5. Validity of performance targets for Type F streams.

RSAG has focused on other programs with higher levels of risk and scientific uncertainty and has not implemented any Westside Type F riparian prescription effectiveness programs. RSAG is currently working on the design for a Type F riparian prescription effectiveness monitoring project.

Table 18. Westside Type F Riparian Effectiveness Program: Applicable Rule Group Critical Questions with Associated Research Projects

Rule Group Critical Questions		Project Names
Are the Type F riparian rules effective in meeting the performance targets, resource objectives, and overall performance goals of FP HCP?		
Program Research Questions	<i>How do survival and growth rates of riparian leave trees change following the forest practices Type F buffer treatments?</i>	Westside Type F Riparian Prescription Monitoring Project
	<i>Do stands in Type F RMZs remain on trajectory to DFC (Westside) or within desired ranges (Eastside)?</i>	
	<i>Do riparian functions meet FP HCP resource objectives and performance targets for shade, stream temperature, LWD recruitment, and litter fall following application of riparian Type F prescriptions?</i>	
	<i>Would alternative approaches to the forest practices Type F prescriptions be more effective in meeting FP HCP resource objectives and performance targets, while reducing costs or increasing flexibility for landowners?</i>	Type F Experimental Buffer Treatment Project
	<i>Are Type F performance targets valid and meaningful measures of success in meeting resource objectives?</i>	Type F Performance Target Validation Project

Westside Type F Riparian Prescription Monitoring Project

Description:

This project will evaluate the effectiveness of the Westside Type F riparian prescriptions in meeting FP HCP resource objectives.

Status:

In January of 2003, CMER approved the Type N/F Riparian Prescription Monitoring study design, which included a study design for monitoring the effectiveness of the Westside Type F riparian prescriptions. The Westside Type F component of this study had not been implemented because other components were higher priorities. RSAG is currently reviewing the study plan to determine if the approach should be revised to reflect what has been learned from implementing other components.

Type F Experimental Buffer Treatment Project

Description:

This project may be developed and designed based on the results of the Type F riparian prescription monitoring project, particularly the identification of appropriate alternative prescriptions for testing.

Status:

This project has been neither scoped nor designed.

Type F Performance Target Validation Project

Description:

This project has been neither scoped nor designed.

Status:

This project has been neither scoped nor designed.

6.3.5 Eastside Type F Riparian Effectiveness Program

Program Strategy

Table 19. Eastside Type F Riparian Effectiveness Program: Applicable Rule Group Critical Questions with Associated Research Projects

Rule Group Critical Questions	Project Names
Are the Type F riparian rules effective in meeting the performance targets, resource objectives, and overall performance goals of FP HCP?	Eastern Washington Riparian Assessment Project – Phase 2 BTO Temperature (Eastside Riparian Shade/Temperature) Project Solar Radiation/Effective Shade Project Eastside Type F Riparian Effectiveness Monitoring Project (BTO add-on)
Will application of the prescriptions result in stands that achieve eastside FP HCP objectives (forest health, riparian function and historic disturbance regimes)?	BTO Temperature (Eastside Riparian Shade/Temperature) Project Solar Radiation/Effective Shade Project Eastside Type F Riparian Effectiveness Monitoring Project (BTO add-on)
Are both the standard eastside prescriptions and the “all available shade” rule effective in protecting shade and stream temperature and in meeting water quality standards? Are there differences between the standard eastside rules and the “BTO all available shade” rules in the amount of shade provided and their effect on stream temperature? Is “all available shade” actually achieved with the densiometer methodology under the BTO shade rule?	BTO Temperature (Eastside Riparian Shade/Temperature) Project Solar Radiation/Effective Shade Project
Are forest practices riparian prescriptions effective at protecting groundwater flow and temperature?	Groundwater Conceptual Model Project

Eastern Washington Riparian Assessment Project – Phase 2 (SAGE)

Description:

Phase 2 of the riparian survey is designed to complete the analysis of the information collected in Phase 1 (See Eastside Type F Riparian Rule Tool Program) to answer the Critical Questions of the study. Phase 2 also contains a modeling approach where the Phase 1 data will be analyzed to help address the Rule Group Critical Question “Will the application of the prescriptions result in stands that achieve eastside FP HCP objectives (forest health, riparian function and historic disturbance regimes)?” By modeling the riparian data collected in Phase 1, SAGE can begin to explore what conditions are sustainable when the current Forest Practice Rules are applied to various stand conditions in eastern Washington.

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Based on the final results of Phase 2, SAGE will then decide what additional data is needed before DFC's can be developed for riparian forest stands. Still in the study plan stage, the results of the Instream Channel Wood Characterization Study (See Eastside Type F Riparian Rule Tool Program) will also be evaluated similarly in order to determine the next steps necessary for developing DFC's for LWD. Once these DFC's have been established, additional effectiveness monitoring studies can be designed and implemented.

Status:

Phase 2 of this study is currently being implemented.

Bull Trout Overlay Temperature Project (RSAG)

Description:

The BTO Temperature Project is designed to evaluate the effectiveness of both the "all available shade" rule and the standard Eastside riparian prescriptions in meeting FP HCP resource objectives, and to determine if a difference exists between shade and stream temperature provided by the BTO "all available shade" prescriptions and the standard shade requirements. This field study was originally administered by BTSAG, but is currently administered by RSAG. The study design specified a 2-year pre-harvest data collection period, a year for harvesting, and a 2-year post-harvest data collection period; however due to delays in landowner harvest schedules, post-harvest data collection has also been delayed for many sites, extending the project timeline for several years. This study is combined with the Solar Radiation /Effective Shade Project.

Status:

This project is currently in the post-harvest data collection phase. Due to delays in landowner harvest schedules, the projected final timeline is 2011.

Solar Radiation/Effective Shade Project (RSAG)

Description:

The Solar Radiation/Effective Shade Project is designed to evaluate whether "all available shade" is actually achieved under the BTO shade rule. This study is being done in conjunction with the BTO Temperature (Eastside Riparian Shade/Temperature Effectiveness Study).

Status:

As is true for the BTO Temperature Project, this component of the project is in the post-harvest data collection phase. The projected end timeline for the project is 2011.

Eastside Type F Riparian Effectiveness Monitoring Project (BTO add-on)

Description:

The original RSAG study design for Eastside Type F riparian prescription effectiveness monitoring called for random sampling of Type F Forest Practice Applications paired with untreated control sites to determine the effectiveness of the prescriptions as applied operationally across the range of conditions on FP HCP lands. The eastside was to be sampled as a separate stratum. However, the Bull Trout Overlay Temperature Study demonstrated the great expense and difficulty in finding suitable treatment and control sites in eastern Washington. Consequently, the decision was made to utilize the BTO temperature study sites for the eastside

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riparian prescription monitoring component despite the fact they were not randomly selected in order to save money, expedite implementation of the project, and provide an integrated package of results for the adaptive management process. This will be accomplished by collecting additional data on changes in vegetation, buffer integrity and LWD recruitment at the BTO temperature study sites. (Consequently, this study is sometimes referred to as the BTO add-on study).

Status:

Initial post-harvest sampling was conducted at four sites in 2006, six sites in 2007 and five sites in 2008 for a total of 15 due to the staggered harvest schedule of the sites. The study sites will be revisited 5 years after harvest for a follow-up sampling effort.

Groundwater Conceptual Model Project

Description:

The Groundwater Conceptual Model Project was designed to investigate the potential impacts of timber harvest on groundwater temperatures, which subsequently could have the potential to discharge to streams and thereby affect the temperature regime of fish habitat. A draft literature review has been completed. However, the draft conceptual model developed from the original contract did not meet the expectations or objectives described by the former BTSAG to identify areas that might be highly susceptible to groundwater heating after timber harvest. The staff from CMER and USFWS was able to make additional progress on development of the intended conceptual models; however, due to limited staffing availability and higher priorities, that progress has not yet reached completion.

Status:

This project has currently been put on hold, and it is unknown whether or not further CMER work will occur.

6.3.6 Hardwood Conversion Program (Effectiveness)

Program Strategy

The purpose of this program is to inform the FP HCP strategy for converting from hardwood to conifer dominated riparian stands. These hardwood dominated stands may include a variety of hardwood species, but especially apply to red alder (*Alnus rubra*), which are the legacy of past timber harvest practices. Many riparian stands that were formerly conifer-dominated are currently dominated by hardwoods as a result of past logging practices. This program is ranked tenth among the 16 CMER programs.

Table 20 presents the critical questions and projects of the Hardwood Conversion Program. The program began by implementing an initial project (the Riparian Hardwood Conversion Study) to provide information for Policy on the effectiveness of hardwood conversion treatments, and the economic costs and benefits of hardwood conversion. In response to comments on the study design, a component to examine stream temperature response was added to the project.

In the spring of 2005, another project was initiated in response to a request from the Small Forest Landowners Advisory Committee working on a small landowner hardwood conversion template.

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This group requested information on the effect of hardwood conversion on stream temperature as a function of buffer width and stream length treated. In response to this request, WDOE submitted a proposal to CMER for the hardwood conversion water temperature modeling project. The project was carried out and is described below under “WDOE Temperature Modeling Project.”

Table 20. Hardwood Conversion Program: Rule Group Critical Questions with Associated Research Projects

Rule Group Critical Questions		Project Names
Where and how should hardwood conversion projects be conducted, and what are the ecological outcomes?		
Program Research Questions	<i>How effective are different hardwood conversion treatments in re-establishing conifers in hardwood-dominated riparian stands?</i>	Riparian Hardwood Conversion Study
	<i>Is hardwood conversion in riparian stands operationally feasible and what are the economic costs and benefits of the hardwood conversion treatments?</i>	
	<i>What effects do hardwood conversion treatments in riparian stands have on shade, stream temperature, and LWD recruitment?</i>	Riparian Hardwood Conversion Study – Temperature Component Annotated Bibliography: Riparian Hardwood Conversion
	<i>What is the effect of hardwood conversion practices on stream temperature as a function of buffer width and length of stream treated?</i>	WDOE Water Temperature Modeling Project

Riparian Hardwood Conversion Study

Description:

The Riparian Hardwood Conversion Study is a series of case studies at eight sites. Each site consists of landowner-designed and implemented site-specific harvests of hardwood trees in riparian buffers. In each case, harvest is followed by replanting of conifers. Tree regeneration and current stand condition data are collected at each site. Data collection also includes surveying participating landowners to document their silvicultural strategies, and costs and benefits associated with each conversion.

Status:

Harvest has occurred at all sites, and post-harvest monitoring of regeneration is ongoing. In 2009, it is anticipated that 2nd year post-harvest data collection will be completed at all sites, and 3rd and 4th year post harvest data collection will occur at several sites. A draft report that describes the pre-harvest and harvest silviculture, and costs and benefits at each site, is currently in review by RSAG. This report is titled “The Draft Case Study Reports: Hardwood Conversion Study”, and the principal investigators are with Duck Creek Associates.

Riparian Hardwood Conversion Study – Temperature Component

Description:

Stream temperatures were measured upstream and downstream, and at 25m intervals along stream reaches on 8 sites in western Washington where hardwood conversion harvests occurred. These temperature measurements occurred before and after harvests. Pre-harvest data collection began in 2003, with the final post-harvest data collected in 2006. The minimum buffer width was 25 feet, but ranged from 25 feet to more than 100 feet. Significant increases in stream temperature were detected at four of the eight sites, although only two of these exceeded 0.3°C (0.37 and 0.48°C). Temperature decreased at one site and did not change at three sites. This project used the same study sites as the Riparian Hardwood Conversion Study and was contracted with WDFW.

Status:

The final report has been forwarded to CMER for review.

Annotated Bibliography: Riparian Hardwood Conversion

Description:

The annotated bibliography describes the silviculture and effects of hardwood conversion on riparian functions including shade, stream temperature moderation, and nutrient inputs.

Status:

After major revisions to the scope of the annotated bibliography during 2007 and 2008, RSAG is in the process of finalizing a strategy to finish the document.

WDOE Temperature Modeling Project

Description:

This study used an existing stream temperature model and an existing shade model to explore the relative effect on stream temperature of different hardwood conversion strategies. The management strategies that were evaluated include a one-sided harvest with a continuous 30-ft buffer with treated stream lengths ranging from 500 to 1500 feet. A sensitivity analysis was performed on a range of stream conditions (width, flow, gradient, groundwater, and hyporheic flow).

Status:

A draft report was completed in 2006 and was reviewed by CMER. The report was completed in 2007 and submitted to the Small Forest Landowner Advisory Group, who forwarded the report on to the full Policy committee with a recommendation of no further action warranted at this time.

6.3.7 Extensive Riparian Status and Trend Monitoring Program

Program Strategy

The purpose of the Extensive Riparian Status and Trend Monitoring Program is to provide data needed to evaluate landscape-scale effects of implementing forest practices riparian prescriptions and to provide data needed by regulatory agencies to provide assurances that forest practices rules meet Clean Water Act requirements and achieve riparian resource objectives. Critical questions for the Extensive Riparian Status and Trend Monitoring Program are shown in (Table 21). The projects in this program will obtain an unbiased estimate of the distribution of stream temperature and shade, and riparian stand characteristics on Type F streams across FP HCP lands, and with re-sampling, will identify trends in these indicators over time.

The Extensive Riparian Status and Trend Monitoring Program is stratified by region (eastside/westside) and by stream type (fish-bearing and perennial non-fish-bearing). Stratification at this coarse scale is necessary because riparian buffering strategy differs both for Type F/S (fish-bearing) and Type Np (perennial non-fish-bearing) streams and for eastern vs. western Washington forestlands. Organizing the sampling effort into separate strata creates projects of a manageable size and allows project-specific adjustments in the sampling strategy and effort to leverage sample site permitting and related data collection among other concurrent riparian studies. This program ranked first among the three CMER extensive monitoring programs.

A study design for the entire Extensive Riparian Status and Trend Monitoring Program was developed by RSAG. RSAG is currently implementing the temperature monitoring component while further developing the vegetation monitoring component methodology in response to Independent Scientific Peer Review comments.

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Table 21. Extensive Riparian Status and Trend Monitoring Program: Applicable Rule Group Critical Questions with Associated Research Projects

Rule Group Critical Questions		Project Names
What is the current status of riparian conditions and functions in Type F and S streams on a regional scale, and how are conditions changing over time?		
Program Research Questions	<i>What is the distribution of maximum summer stream temperature and 7-day mean maximum daily water temperature on FP HCP lands, and how is the distribution changing over time as the forest practices prescriptions are implemented?</i>	Extensive Riparian Status and Trend Monitoring – Temperature, Type F/S Westside
	<i>What proportion of stream length on FP HCP lands meets water quality standards for water temperature, and how is the proportion changing over time as the forest practices prescriptions are implemented?</i>	Extensive Riparian Status and Trend Monitoring – Temperature, Type F/S Eastside
	<i>What are current riparian stand attributes on FP HCP lands, and how are stand conditions changing over time as the forest practices prescriptions are implemented?</i>	Extensive Riparian Status and Trend Monitoring – Vegetation, Type F/S Westside Extensive Riparian Status and Trend Monitoring – Vegetation, Type F/S Eastside
	<i>What proportion of westside Type F/S stream length on FP HCP lands meet DFC basal area performance targets, and how is the proportion changing over time as the forest practices prescriptions are implemented?</i>	
	<i>What proportion of eastside Type F/S stream length on FP HCP lands are within the eastside basal area ranges, and how is the proportion changing over time as the forest practices prescriptions are implemented?</i>	

Extensive Riparian Status and Trend Monitoring – Temperature, Type F/S Westside

Description:

This project is intended to develop unbiased estimates of the distribution of Type F and S stream temperatures across FP HCP lands in Western Washington. Stream temperatures are monitored using recording thermographs at upstream and downstream locations as well as one measuring air temperature at the stream reach. Along with stream temperature, shade, riparian vegetation type, large woody debris, and several channel measurements are collected.

Status:

This project is being implemented simultaneously with the Westside Type Np project. Approximately half of the intended sites were sampled in 2008. Sampling will be completed in spring of 2010. A report covering both years of sampling will be produced over the summer of 2010. The timing of the second sampling event has not been scheduled, but should not occur before 2020 to allow time for the expected changes in canopy cover and stream temperature to occur.

Extensive Riparian Status and Trend Monitoring – Temperature, Type F/S Eastside

Description:

This project is intended to develop unbiased estimates of the distribution of Type F and S stream temperatures across FP HCP lands in Eastern Washington. Stream temperatures are monitored using recording thermographs at upstream and downstream locations as well as one measuring air temperature at the stream reach. Along with stream temperature, shade, riparian vegetation type, large woody debris, and several channel measurements are collected.

Status:

Reporting is currently in progress. A plan was developed to integrate site selection and sampling of this project with the Eastside Riparian Current Condition Assessment project. Temperature and channel data collection began in spring 2007 and continued through summer 2008. The draft report was sent to RSAG for review in March 2009. The timing of the second sampling event has not been scheduled, but should not occur before 2018 to allow time for the expected changes in canopy cover and stream temperature to occur.

Extensive Riparian Status and Trend Monitoring – Vegetation, Type F/S Westside and Eastside Projects

Description:

The Type N and Type F/S, eastside and westside studies will be performed concurrently. These projects will assess riparian conditions in randomly-selected Type N, F, and S stream reaches across FP HCP lands in the state in order to estimate conditions statewide. The vegetation assessment component will use aerial photography evaluation methods and is not dependent on field work to implement. All vegetation assessment is expected to occur in FY10-11 once the methodology has been finalized. Existing data from other riparian projects will be used to help calibrate that effort and also to validate results of the remote sensing characterization. The plan is to assess conditions at the same sites used in the temperature study and to use the ground data collected in that study (as well as any other riparian studies) as verification for aerial photo interpretations.

Status:

A study protocol that defines precise measurement methods is currently under development.

6.3.8 Intensive Monitoring/Cumulative Effects Program

Program Strategy

Intensive monitoring is watershed-scale research designed to evaluate the cumulative effects of multiple forest practices and to provide information that will improve our understanding of causal relationships and the biological effects of forest practices rules on aquatic resources. The evaluation of cumulative effects of multiple management actions on a system requires an understanding of how individual actions influence a site and how those responses propagate through the system. This sophisticated level of understanding can only be achieved with an intensive, integrated, monitoring effort. Evaluating biological responses is similarly complicated, requiring an understanding of how various management actions interact to affect habitat

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conditions and how aquatic organisms respond to these habitat changes. This program was identified in the MDT report as an essential component of an integrated monitoring program. CMER is in the process of scoping its intensive monitoring needs, but currently has not finalized a strategy for the Intensive Monitoring Program. Contacts with outside programs with similar interests in intensive monitoring (such as the State's Intensively Monitored Watersheds Program) are being pursued to identify opportunities for collaboration.

6.4 CHANNEL MIGRATION ZONE RULE GROUP

Rule Overview and Intent

The channel migration zone (CMZ) is an area within a river or stream valley where the active channel is prone to move laterally. The intent of the CMZ rule is to maintain riparian forest functions (e.g. woody debris recruitment, bank reinforcement, shade, and litter) along migrating channels, in their present or future location. No timber harvest, salvage, or road construction (except for road crossings) is allowed within CMZs without an alternate plan that specifies the conditions which will provide equal and overall effective protection of public resources as described in the rules and the Forest Practices Act.

Rule Group Resource Objectives and Performance Targets

Resource Objectives:

- Same as for Type F Riparian Prescriptions (see Section 6.3.2).

Performance Targets:

- Same as for Type F Riparian Prescriptions (see Section 6.3.2).

Placeholder for Important Link to Policy and Decision Making

[To include: Uncertainties, Work done to date, What we have learned so far, Next Steps., etc.]

Uncertainties

Work Done to Date

What Has Been Learned

Next Steps

Rule Group Strategy

The strategy for the CMZ rule group is intended to answer a set of critical questions that address uncertainties concerning CMZ delineation and effectiveness (Table 22). The first question arises from the need to identify and delineate the CMZ so that the prescriptions can be implemented as intended. The rule assumes that the CMZ can be identified and the extent of the channel migration zone can be and will be consistently delineated by landowners. This assumption has high uncertainty because although many CMZs are relatively easy to recognize, their boundaries are difficult to define in the field. Incorrect delineation of the CMZ edge results in incorrect placement of the adjacent RMZ, making it potentially vulnerable to channel disturbance.

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The second question addresses the future patterns of channel migration. The CMZ rule is based on the assumption that the area subject to channel migration during the last 100 years is the same area that will be subject to channel migration during the next 100 years. A high level of uncertainty exists for this assumption because changes in land-use and other factors (i.e. in channel wood, sediment and flow) during the next 100 years could change the frequency of channel avulsion (the most common form of channel migration in forested conditions).

Table 22. CMZ Rule Group Critical Questions and Programs

Rule Group Critical Questions	Program Names	Task Type	SAG
What field/map criteria allow consistent, repeatable delineation of the CMZ lateral boundaries (“edge”)?	CMZ Delineation Program	Rule Tool	UPSAG
Will the physical processes that drive channel migration change appreciably due to the application of forest practices rules?	CMZ Validation Program	Intensive	UPSAG

6.4.1 CMZ Delineation Program

Program Strategy

The purpose of the CMZ program is to assess the available methods and criteria for accurately identifying and delineating CMZs. The program will develop materials and procedures to aid field managers in the consistent and accurate delineation of CMZs. It consists of two projects. The first would provide a screening tool to locate areas with potential CMZs, and the second would provide a methodology to accurately delineate their boundaries once located. The program is not being actively developed because of its low ranking in the CMER priority list.

Table 23. CMZ Delineation Program: Applicable Rule Group Critical Questions with Associated Research Projects

Rule Group Critical Questions	Project Names
What field/map criteria allow consistent, repeatable delineation of the CMZ lateral boundaries (“edge”)?	CMZ Screen and Aerial Photograph Catalog Project and CMZ Boundary Identification Criteria Project Consistency and Accuracy of CMZ Boundary Delineations

CMZ Screen and Aerial Photograph Catalog Project and CMZ Boundary Identification Criteria Project

Description:

The need for the CMZ delineation project, which was outlined in the 2005 Work Plan, may have been resolved with the recent revision of the Board Manual for CMZs (i.e. Section 2), which provides more detailed guidance.

Status:

Aside from the preliminary scoping, no CMER work on these topics has been proposed.

Consistency and Accuracy of CMZ Boundary Delineations

Description:

The recent development of revised CMZ delineation guidelines (i.e. Board Manual Section 2) leaves open questions as to whether new methods result in accurate and consistent CMZ delineations. Although this project has not yet been scoped, it would likely involve field evaluation of a sample of CMZ delineations.

Status:

Not yet scoped. This issue may be included in the Compliance Monitoring Program.

6.4.2 CMZ Validation Program (Intensive)

Program Strategy

There is general interest in learning how the protection and recovery of mature forests in channel migration zones will influence channel migration rates, aquatic habitat formation and other functions. These questions could presumably be addressed by field and/or remote-based (photos, LIDAR) studies. Such issues have never been elevated among CMER priorities and thus no studies have been scoped to date.

Table 24. CMZ Validation Program: Applicable Rule Group Critical Questions with Associated Research Projects

Rule Group Critical Questions	Project Names
Will the physical processes that drive channel migration change appreciably due to the application of forest practices rules?	No projects scoped at this time

6.5 UNSTABLE SLOPES RULE GROUP

Rule Overview and Intent

The FP HCP goal for the management of potentially unstable slopes is to prevent forest practices from increasing or accelerating mass wasting (landslides) beyond the naturally occurring rate. The intent of the goal and its related rules is to protect water quality and aquatic habitat by minimizing sediment delivery from management-related increases in mass wasting.

The rules assume: 1) That the administrative process of identifying, reviewing, and regulating forest practices on potentially unstable slopes will maintain a naturally-occurring rate of mass wasting following forest practices; 2) Implementation of the unstable slopes prescriptions will achieve the Schedule L-1 Resource Objectives of clean water and substrate, and maintain channel-forming processes; and 3) Implementation of the unstable slopes prescriptions will meet FP HCP landscape-scale performance targets (there are no site-scale targets).

The Forest Practices Rules default protective measure for potentially unstable slopes is avoidance. The rule protection strategy begins with definition of unstable landforms and the identification of unstable slopes. The strategy then is either to avoid the area or conduct a risk evaluation through the SEPA process. The rule protection strategy relies on the ability of forest managers and regulators to recognize and mitigate for unstable slopes within the forest practice application (FPA) and approval process. If forest practices are planned on potentially unstable slopes, the FPA application process includes a SEPA review. The correct identification and assessment of unstable slopes is achieved by the rules defining unstable landforms at a statewide level and DNR regions defining regional unstable landforms using local knowledge. As further protection, a specific forest practices rule relates to timber harvest on the groundwater recharge areas of deep-seated landslides in glacial sediments.

Rule Group Resource Objectives and Performance Targets

Resource Objectives:

- Sediment: Provide clean water and substrate and maintain channel forming processes by minimizing to the maximum extent practicable, the delivery of management-induced coarse and fine sediment to streams (including timing and quantity) by protecting stream bank integrity, providing vegetative filtering, protecting unstable slopes, and preventing the routing of sediment to the streams.

Performance Targets:

- Road-related: Virtually none triggered by new roads; favorable trend on old roads.
- Timber harvesting-related: no increase over natural background rates from harvest on a landscape-scale on high risk sites.

Placeholder for Important Link to Policy and Decision Making

[To include: Uncertainties, Work done to date, What we have learned so far, Next Steps., etc.]

Uncertainties

Work Done to Date

What Has Been Learned

Next Steps

Rule Group Strategy

Table 25 presents critical questions for the unstable slopes rule group and identifies a series of programs to address them. The strategy is to immediately implement an unstable-landform identification program to address the first two critical questions, and then to design and implement mass wasting effectiveness monitoring and validation programs to assess the effectiveness of landform recognition and mitigation at various scales. All effectiveness, extensive and intensive tasks are administered by UPSAG; rule tools are administered by DNR in collaboration with UPSAG.

Table 25. Unstable Slopes Rule Group Critical Questions and Programs

Rule Group Critical Questions	Program Names	Task Type	SAG
What screening tools can be developed to assist in the identification of potentially unstable landforms that minimize the omission of potentially unstable landforms?	Unstable Landform Identification Program	Rule Tool	UPSAG
Does harvesting of the recharge area of a glacial deep-seated landslide promote its instability?	Glacial Deep-Seated Landslides Program	Rule Tool	UPSAG
Are unstable landforms being correctly and uniformly identified and evaluated for potential hazard? How does the rate of landsliding on managed lands compare to an estimate of the natural (background) rate? Are the forest practices unstable-landform rules reducing the rate of management-induced landsliding at the landscape scale? Are the mass wasting prescriptions and mitigation measures effective in preventing landslides from roads and harvest units? Does wind-throw on mass-wasting buffers (leave areas) increase mass wasting?	Mass Wasting Effectiveness Monitoring Program	Effectiveness	UPSAG
What levels of cumulative sediment inputs are harmful to aquatic resources at the basin scale?	Mass Wasting Validation Program	Intensive	UPSAG

6.5.1 Unstable Landform Identification Program (Rule Tool)

Program Strategy

The purpose of the unstable landform identification program is to provide a set of screening tools to identify forested areas containing potentially unstable slopes to focus field verification activities on potential problem areas and thereby improve our ability to avoid them.

The management strategy for regulating forest practices on unstable slopes consists primarily of an administrative process for identifying and reviewing forest practices on potentially unstable

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slopes. The main elements include defining and screening unstable slopes and improvements to the State Environmental Protection Act (SEPA) process. The success of the management strategy for unstable slopes is dependent on early recognition of potentially unstable slopes by forest managers in order to avoid or mitigate the hazards posed by them. The projects in this program are specifically referenced in the FP HCP as necessary for implementing forest practices that meet resource objectives.

This program consists of five projects that provide statewide information on the distribution of unstable landforms. Two projects are completed, two are underway, and one has not been started. Because the projects consist of the development of screening tools which are used for information only and not as regulatory tools, we do not anticipate that program results will require Policy Committee action.

Table 26. Unstable Landform Identification Program: Applicable Rule Group Critical Questions with Associated Research Projects

Rule Group Critical Questions	Project Names
What screening tools can be developed to assist in the identification of potentially unstable landforms that minimize the omission of potentially unstable landforms?	Shallow Rapid Landslide Screen for GIS Project
	Technical Guidelines for Geotechnical Reports Project
	Regional Unstable Landforms Identification Project (RLIP)
	Landslide Hazard Classification System and Mapping Protocols Project
	Landslide Hazard Zonation Project

Shallow Rapid Landslide Screen for GIS Project

Description:

This project has three phases. The first phase of this project compared different slope stability models. Based on the results of that study, Policy directed DNR to develop a GIS-based screen of modeled slope stability based on DEM topography for the Westside. This first phase was completed in 2001 and released as TFW Report 118. The second phase produced a modeled slope stability screen, which is available on the DNR Forest Practices web site. A third phase has been proposed to identify topographic model(s) appropriate for similar mapping on the Eastside. This phase is on hold while the Landslide Hazard Zonation (LHZ) Project is being conducted. Should the LHZ Project not complete mapping of the Eastside, the Eastside GIS screen could be used to create a complete coverage.

Status:

- Phase 1 – Complete
- Phase 2 – Complete
- Phase 3 – On hold

Technical Guidelines for Geotechnical Reports Project

Description:

This project develops technical guidelines for geotechnical reports used in the SEPA review process. The guidelines will include identification of appropriate analytical tools and techniques appropriate for different projects and at different scales.

Status:

On hold

Regional Unstable Landforms Identification Project (RLIP)

Description:

This completed project provided a coordinator to work with TFW cooperators within each DNR region in order to identify unstable landforms that do not meet the statewide landform descriptions. Its results also serve as an interim screen for deep-seated landslides by identifying lithologies that promote deep-seated landslides; however, it did not actually map individual deep-seated landslides, but rather the areas where they occur in abundance. The information created by the RLIP was recommended by UPSAG and CMER to be incorporated into the LHZ Project. In 2005, data from this project was placed into the hazard zones spatial database that is used by DNR for classifying applications, and by the LHZ team as pre-existing work that they incorporate into their studies.

Status:

Complete

Landform Hazard Classification System and Mapping Protocols Project

Description:

This project developed a detailed protocol to be used to map landslides and potentially unstable landforms in a consistent manner, leading to the assignment of hazard to unstable slopes in the forested environment. This project was completed in 2004; the protocol has subsequently been used for the implementation of the Landslide Hazard Zonation (LHZ) Project (described below) and by state lands geologists for large blocks of state ownership.

Status:

This project was completed in 2004 and was incorporated into the Landslide Hazard Zonation Project.

Landslide Hazard Zonation Project

Description:

This is a multi-phase project. During Phase 1, all mass wasting modules from completed watershed analyses and other information on unstable landforms, landslides, and unstable slopes were collected and compiled in a GIS database. This database has been made available for free download to the public, and is utilized as a screening tool in the Forest Practice Application Process. During Phase 2, mass wasting modules from incomplete watershed analyses were either finished, reviewed, and added to the database or were rejected. During Phase 3, which is ongoing, the protocol is being implemented at the watershed scale following a list of priority watersheds based on presence of steep slopes and FP HCP lands.

Status:

Phase 1 – Complete

Phase 2 – Complete

Phase 3 – Ongoing

6.5.2 Glacial Deep-Seated Landslides Program (Rule Tool)

Program Strategy

The purpose of the Glacial Deep-seated Landside Program is to develop science, tools, and/or guidance for assessing the resource impact potential of deep-seated landslides in glacial sediments resulting from changes in groundwater hydrology during and after timber harvest in the landslide recharge area. Each of the five listed projects develops tools or science that help us address the critical question “Does harvesting of the recharge area of a glacial deep-seated landslide promote its instability?”

Recent Developments:

At the budget retreat in 2006, Policy requested that UPSAG investigate pathways to resolve difficulties in the application of rules governing timber harvest on groundwater recharge areas of deep-seated landslides. In 2007, UPSAG hired a contractor to provide assistance in scoping several alternative studies. UPSAG evaluated the scoped projects and presented their findings to CMER in fall 2007. When there is time available, UPSAG plans to develop recommendations about these three scoped projects and about a fourth project and will present them to CMER and Policy. These four potential projects and one completed project are described below.

Table 27. Glacial Deep-Seated Landslides Program: Applicable Rule Group Critical Questions with Associated Research Projects

Rule Group Critical Questions	Project Names
Does harvesting of the recharge area of a glacial deep-seated landslide promote its instability?	Model Evapo-Transpiration in Deep-Seated Landslide Recharge Areas Project
	Evapo-transpiration Model Refinement Project
	Landslide Classification Project
	Groundwater Recharge Modeling Project
	Board Manual Revision Project

Model Evapo-Transpiration in Deep-Seated Landslide Recharge Areas Project

Description:

This completed project developed an analytical model for assessing the evapo-transpiration changes resulting from timber harvest. The model was intended to be applied to timber harvest within the recharge area of deep-seated landslides in glacial sediments. The model has been developed but was not directly validated and refined because of insufficient field data to verify model parameters. As such, UPSAG and CMER did not recommend a policy change, even though the results of the model suggest that there is likely a non-significant, detectable change in water availability when converting an entire groundwater recharge area from mature forest to a clearcut. A follow-up validation/refinement study could be pursued as a second phase as described below.

Status:

Complete

Evapo-Transpiration Model Refinement Project

Description:

This potential project would use fine-scale meteorological data to validate or refine the evapo-transpiration model developed previously and would develop materials to facilitate application of the model. UPSAG presently recommends that this project not be pursued due to the low likelihood that fundamental scientific uncertainties will be resolved.

Status:

Scoped and on hold

Landslide Classification Project

Description:

This potential project would categorize the common stratigraphic and geomorphic situations present among deep-seated landslides in glacial sediments to hypothetically evaluate which situations are most sensitive to changes in groundwater produced by upslope timber harvest. UPSAG recommends that this project, in its present form, not be pursued. However, this project may be more attractive if expanded to include an empirical component that evaluates movement of active landslides where harvest occurred in the groundwater recharge area. With CMER and Policy support, UPSAG could further scope a revised version of this study as time and resources allow.

Status:

Scoped and on hold

Groundwater Recharge Modeling Project

Description:

This potential project would use groundwater modeling to determine whether there are ways of evaluating which parts of the groundwater recharge zone are most influential on landslide movement. This project might be useful if modeling efforts were focused on the common and probably sensitive types of stratigraphic and geomorphic situations as might be identified by the Landslide Classification Project.

Status:

Scoped and on hold

Board Manual Revision Project

Description:

This potential project would involve revising the Forest Practices Board Manual (Section 16) to more clearly describe which deep-seated landslides are at risk and what intensity of study is required by the activity level of the landslide described by the groundwater recharge rule. This project would not require additional science but would use the expertise of geologists that have extensive experience with deep-seated landslides. It would not require contractors but would require input from Policy and regulatory personnel. UPSAG will recommend that this project be conducted at the time the recommendations about the 3 scoped projects are presented.

Status:

On hold

6.5.3 Mass Wasting Effectiveness Monitoring Program

Program Strategy

The purpose of this program is to assess the degree to which implementation of the forest practices rules is preventing or avoiding an increase in landsliding beyond natural background levels. The Mass Wasting Effectiveness Program will address the critical question that defines the program: “Are the mass-wasting prescriptions effective in meeting the performance targets?” The strategy is to 1) evaluate the effectiveness of identifying unstable slopes for applying prescriptions (avoidance or mitigation), and then 2) to evaluate effectiveness at two scales, the landscape scale (extensive monitoring) and the site scale (prescription effectiveness monitoring).

Four projects are proposed. The first, Testing the Accuracy of Unstable Landform Identification Project, has a completed study design in the review process. The second, Mass Wasting Prescription-Scale Effectiveness Monitoring, is being implemented. The third, Mass Wasting Landscape-Scale Effectiveness Monitoring, has been preliminarily scoped and UPSAG plans to begin work on a study design soon. The fourth, Mass Wasting Buffer Integrity and Windthrow Assessment Project, is on hold. Table 28 lists critical questions identified for the Mass Wasting Effectiveness Monitoring Program and the associated projects.

Table 28. Mass Wasting Effectiveness Monitoring Program: Applicable Rule Group Critical Questions with Associated Research Projects

Rule Group Critical Questions	Project Names
Are unstable landforms being correctly and uniformly identified and evaluated for potential hazard?	Testing the Accuracy of Unstable Landform Identification Project
How does the rate of landsliding on managed lands compare to an estimate of the natural (background) rate?	
Are the forest practices unstable-landform rules reducing the rate of management-induced landsliding at the landscape scale?	Mass Wasting Landscape-Scale Effectiveness Monitoring Project
Are the mass wasting prescriptions and mitigation measures effective in preventing landslides from roads and harvest units?	
Are the forest practices unstable-landform rules reducing the rate of management-induced landsliding at the landscape scale?	Mass Wasting Prescription-Scale Effectiveness Monitoring Project
Are the mass wasting prescriptions and mitigation measures effective in preventing landslides from roads and harvest units?	
Does wind-throw on mass-wasting buffers (leave areas) increase mass wasting?	Mass Wasting Buffer Integrity and Windthrow Assessment Project

Testing the Accuracy of Unstable Landform Identification Project (aka Accuracy and Bias)

Description:

This project tests the accuracy and bias in the identification and delineation of potentially unstable landforms. The extent of variability and/or bias, and the degree of influence it has on

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accurately identifying hazards in the field are unknown. This study will test the extent of accuracy and bias in slope hazard identification, specifically:

1. Are unstable slopes currently being uniformly recognized?
2. Are some unstable slopes currently going unrecognized?
3. Is the hazard of unstable slopes being correctly and uniformly recognized?

This study will provide recommended improvements to reduce variability related to proper landform identification and hazard assessment.

Status:

The study design is currently within the CMER review process, and UPSAG is making modifications to the study design, based on CMER comments.

Mass Wasting Landscape-Scale Effectiveness Monitoring Project

Description:

This project will be designed to evaluate trends in the number and volume (or area) of landslides over time at the watershed scale using landslide inventory methods similar to those of watershed analysis. In broad terms, the trend monitoring will include sites that sample statewide variability in the factors that control landslide occurrence. These sites will consist of tracts containing both FP HCP-regulated lands and other forest lands under no or less extensive management (representative of natural or background conditions). Landslide rates and volume fluxes from both will be compared. Data to infer status and trends may consist of an inventory of landslides using data collected through the Landslide Hazard Zonation Project, complemented with aerial photography, terrain, topographic, forest cover, and road network maps. It appears likely that the assessment of natural background will be scoped as an add-on to the Mass Wasting Prescription-Scale Monitoring Protocol. During 2009, UPSAG will work to better understand how to isolate mass wasting trend in response to the Forests and Fish Rules from the dynamic noise of the natural system.

Status:

Scoped and on hold

Mass Wasting Prescription-Scale Effectiveness Monitoring Project (aka Post-Mortem)

Description:

This project is designed to statistically compare landslide rates among 5 harvest treatments and 5 road treatments. This will be accomplished by randomly selecting section corners in the delineated study area, stratifying harvest and road treatments within the 4-square-mile areas centered on each section corner, and counting and evaluating landslides. In addition, data which will lead to inferences about site-specific triggers will be collected for each landslide. The statistical design will answer three critical questions in Table 28: “Are the forest practices unstable-landform rules reducing the rate of management-induced landsliding at the landscape scale?” and “Are the mass wasting prescriptions and mitigation measures effective in preventing landslides from roads and harvest units?” The detailed data collection at individual landslides will inform the effectiveness of specific best management practices.

Independent Science Panel Review of the study design was completed over the summer of 2007. UPSAG was revising the study design and asking for final CMER review when the landslide-

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producing December 2-3, 2007, storm occurred. Final approval of the study design was given by CMER in January 2008. Policy and the Forest Practices Board approved moving forward with implementation in February 2008. UPSAG is implementing this project in the spring of 2008 with an estimated completion date, including final approvals, of December 2009.

Status:

Implementation

Mass Wasting Buffer Integrity and Windthrow Assessment Project

Description:

This project will be designed to test the effect of windthrow in mass wasting leave areas on overall landslide rates. There is a school of thought that suggests that mass wasting leave areas are especially prone to windthrow. If that is true, then mass wasting leave areas would be counter-productive for reducing sediment load to streams. However, downed timber from windthrow has been documented as being effective at slowing the rate of sediment movement on the hillslope. How these two divergent effects affect actual sediment yield to streams is not known.

Status:

There has been no action on this project, but site-specific buffer data collected during the Mass Wasting Prescription-Scale Effectiveness Monitoring Project may help UPSAG with future recommendations about this project.

6.5.4 Mass Wasting Validation Program (Intensive)

Program Strategy

No program strategy has been developed, but it is presumed that when UPSAG has time to work on this program that the efforts of the Monitoring Design Team will be a useful starting point.

Table 29. Mass Wasting Validation Program: Applicable Rule Group Critical Questions with Associated Research Projects

Rule Group Critical Questions	Project Names
What levels of cumulative sediment inputs are harmful to aquatic resources at the basin scale?	No projects have been developed

6.6 ROADS RULE GROUP

Rule Overview and Intent

The intent of the rules for roads is to protect water quality and riparian/aquatic habitat by minimizing sediment delivery to Type S, F, and N waters from road erosion and mass wasting, as well as minimizing changes in hillslope and stream hydrology due to roads. Fish passage at road crossing structures is treated as a separate rule group. The road rules protect water quality and riparian/aquatic habitats through prescriptions and road Best Management Practices (BMPs). Implementation of these prescriptions through road maintenance and abandonment plans (RMAP) is intended to minimize road-surface sediment production and the hydrologic connection between the road system and the stream network, and the risk of road-related landslides caused by inadequately built and maintained roads. The road rules specify prescriptions for road construction, maintenance and abandonment, landings, and stream-crossing structures. In addition, the Board Manual identifies BMPs for roads and landings. The rules required RMAPs for all forest roads to be developed by 2006 for large forest landowners, and timed with timber harvest activity for small forest landowners. Mass wasting harvest rules also minimize management activities, including road construction, in landslide-prone locations. Monitoring conducted under the Unstable Slopes Rule Group programs includes mass wasting associated with roads. The Roads Rule Group programs are primarily directed toward monitoring surface erosion and hydrologic disconnection.

The basic assumptions of the road rules are the following:

1. Implementation of road prescriptions will result in achieving FP HCP performance goals and resource objectives, including:
 - a. Meeting water quality standards,
 - b. Providing clean water and substrate, and maintaining channel forming processes by minimizing the delivery of management-induced coarse and fine sediment to streams by protecting stream-bank integrity, providing vegetative filtering, protecting unstable slopes, and preventing the routing of sediment to streams,
 - c. Minimizing the effects of roads on surface and groundwater hydrologic regimes (magnitude, frequency, timing, and routing of stream flow). This will be accomplished by disconnecting road drainage from the stream network, preventing increases in peak flows causing scour, and maintaining the hydrologic continuity of wetlands.
2. Assessment and planning using RMAPs is the best method to assure effective implementation of BMPs and this will achieve the above objectives.
3. Roads differ in their degree and importance of impact to the resources of concern, and landowners and other F&F cooperators can identify and prioritize roadwork based on these differences.
4. Appropriately identified standard BMPs are effective at achieving functional objectives.

Rule Group Resource Objectives and Performance Targets

Resource Objectives:

- Sediment: Provide clean water and substrate and maintain channel forming processes by minimizing to the maximum extent practicable, the delivery of management-induced coarse and fine sediment to streams (including timing and quantity) by protecting stream bank integrity, providing vegetative filtering, protecting unstable slopes, and preventing the routing of sediment to the streams.
- Hydrology: Maintain surface and groundwater hydrologic regimes (magnitude, frequency, timing, and routing of stream flows) by disconnecting road drainage from the stream network, preventing increases in peak flows causing scour, and maintaining the hydrologic continuity of wetlands.

Performance Targets:

- Road sediment delivered to streams: New Roads: virtually none.
- Ratio of road length delivering to streams/Total stream length (miles/mile):
Old roads not to exceed: Coast (Spruce) 0.15-0.25; West of Crest 0.15-0.25; East of Crest 0.08-0.12
- Ratio of road sediment production delivered to streams/Total stream length (tons/year/mile):
Old roads not to exceed: Coast (Spruce) 6-10 T/yr; West of Crest 2-6 T/yr; East of Crest 1-3 T/yr
- Fines in gravel: less than 12% embedded fines (<0.85 mm)
- Road run-off: Same targets as road-related sediment; significant reduction in delivery of water from roads to streams.

Placeholder for Important Link to Policy and Decision Making

[To include: Uncertainties, Work done to date, What we have learned so far, Next Steps., etc.]

Uncertainties

Work Done to Date

What Has Been Learned

Next Steps

Rule Group Strategy

The effectiveness-monitoring program for roads is planned for two scales: 1) monitoring at the sub-basin scale and, 2) monitoring at the site scale. The FP HCP contains performance targets at the sub-basin scale. At the sub-basin scale, road monitoring assesses the effectiveness of the rules at meeting the FP HCP performance targets for surface erosion sediment delivery and hydrologic connectivity across ownerships and regions of the state. Site-scale effectiveness monitoring assesses the effectiveness of individual prescriptions.

Site-scale effectiveness monitoring provides more insight into the effectiveness of individual road prescriptions than does sub-basin-scale monitoring program. The time-table for forest landowners to implement forest practices prescriptions is tied to RMAPs. The site-scale monitoring program requires the development of site-specific road performance measures (based on prescription objectives), the testing of site-level effectiveness using RMAP-implemented areas as a sampling stratum, and the development of field protocols for site-scale performance measures. The road site-scale effectiveness monitoring program will inform the rules at several levels by determining the degree to which strategies are achieving resource objectives at the site scale, assessing the need to modify individual RMAPs to achieve resource objectives, and assessing the need to modify guidelines and rules for road maintenance and abandonment planning.

Assessment of the rules leads to five critical questions to be addressed by three monitoring and validation programs (Table 30). The monitoring strategy is based on CMER's experience with road sediment problems and BMPs, and implementation realities as well as on the data from numerous Watershed Analyses used to develop the forest practices road performance targets for sediments. The effectiveness monitoring strategy includes both a site-scale program and a basin-scale program. Validation of the road performance targets, which is more complex and time-consuming, will come later. This approach will first inform the uncertainties about BMP effectiveness and their ability to meet performance targets. If BMPs are ineffective, validation monitoring is unwarranted. If BMPs are proving to be effective, then validating the performance targets should begin (i.e. Do we have the right target?).

Table 30. Roads Rule Group Critical Questions and Programs

Rule Group Critical Questions	Program Names	Task Type	SAG
Are road prescriptions effective at meeting sub-basin scale performance targets for sediment and water? (Exclusive of mass wasting prescriptions, which are covered under the Mass Wasting Rule Group)	Road Sub-Basin Scale Effectiveness Monitoring Program	Effectiveness	UPSAG
Does the RMAP process correctly identify and prioritize road problems for repair? Are road prescriptions effective at meeting site-scale performance targets for sediment and water? (Exclusive of mass wasting prescriptions, which are covered in the Mass Wasting Rule Group section)	Roads Prescription - Scale Effectiveness Monitoring Program		
Have the correct performance targets for sediment delivery and connectivity been identified? What levels of cumulative sediment inputs are harmful to the resource at the basin scale?	Roads Validation Program and Cumulative Sediment Effects	Intensive	UPSAG

6.6.1 Roads Sub-basin Scale Effectiveness Monitoring Program

Program Strategy

The purpose of the roads sub-basin scale effectiveness-monitoring program is to determine the degree to which the road rule package is effective at meeting performance targets for surface erosion sediment and water established at the sub-basin scale as a whole across the state. This program is ranked fourth among the 16 CMER programs.

The road sub-basin scale effectiveness-monitoring program currently consists of three projects that are related to critical questions in Table 31. Two projects revise and validate the analytical model to estimate road-surface erosion (WARSEM) that is used in the monitoring program to estimate sediment contributions and connectivity from selected road segments and road systems. The third project measures changes in the road conditions known to generate sediment and hydrologic connectivity between those road segments and the stream channel network. Because the rules provide a 15-year window for implementation of RMAP upgrades, this program is long-term and results will provide a periodic evaluation of the trend and the trajectory toward meeting the performance targets by 2016.

Table 31. Road Sub-basin Scale Effectiveness Monitoring Program: Applicable Rule Group Critical Questions with Associated Research Projects

Rule Group Critical Questions		Project Names
Are road prescriptions effective at meeting sub-basin scale performance targets for sediment and water?		Road Sub-Basin-Scale Effectiveness Monitoring Project
Program Research Questions	<i>Are field or analytical methods needed to support the monitoring program?</i>	Road Surface Erosion Model Update Project
	<i>How accurate is the road surface erosion model in predicting average road sediment from run-off at the site scale?</i>	Road Surface Erosion Model Validation/ Refinement Project

Road Sub-Basin-Scale Effectiveness Monitoring Project

Description:

The main purpose of this project is to provide data that can be used to assess the degree to which sub-basin scale performance targets, and therefore resource objectives, are being met throughout the state. It also characterizes the extent of road conditions that reduce surface erosion (e.g., improved surfacing, reduced runoff to streams). Data collected at the sub-basin scale will determine the status and assess trends of key indicators of road connectivity using WARSEM sediment delivery through time. It does not address performance targets for road performance relative to mass wasting erosion processes, which are more readily evaluated through other monitoring projects. Forest road systems in randomly selected sample areas that are proportionately distributed statewide in areas under Forest Practices Rules, independent of ownership, are being monitored. Small forest landowner properties are included in the study whenever they fall within the sampling blocks. Data are collected to determine the degree to which roads meet established performance targets and the strength of the relationship between those reported measures and the percent of sample area under implemented RMAPs. Because road monitoring at the sub-basin scale extends through the 15-year road rule implementation period, this piece was put in place before model validation and performance target validation.

Status:

Results from Phase 1 will be available in FY09 and will reflect the effectiveness of road improvements made up to that time. Remeasurement Phases 2 and 3 are scheduled to occur, respectively, later within the RMAP implementation period and following completion in 2016.

Road Surface Erosion Model Update Project

Description:

The road surface erosion model within the Surface Erosion Module of the Washington Forest Practices Board Manual on Standard Methodology for Conducting Watershed Analysis (version 4.0, November 1997) is an empirically derived model widely used for estimating surface erosion and sediment delivery to streams from forest roads. The primary purpose of this project was to refine and adapt the model for use in forest road monitoring and an assessment method. Revisions include standardizing input variables and developing repeatable application protocols. This project also included development, testing, and refinement of standardized protocols for field application of the revised road surface erosion model for use at the site and road segment scale.

Status:

This project was completed in 2003 and produced the Washington State Road Surface Erosion Model (WARSEM).

Road Surface Erosion Model Validation/Refinement Project

Description:

WARSEM is based on a range of empirically derived data available in 2003. This project would measure sediment from selected Washington road sites to evaluate the accuracy of modeled sediment delivery rates. This study could be designed to also evaluate the effectiveness of individual sediment control strategies, such as sediment traps, silt fences or enhanced cutslope vegetation.

Status:

Scoping and design are not anticipated before 2010. The need for this project depends largely on the expansion of available relevant road erosion datasets and/or modeling tools due to research occurring outside of CMER.

6.6.2 Roads Prescription Scale Effectiveness Monitoring Program

Program Strategy

The dual purposes of the roads site-scale effectiveness monitoring project are to (1) determine the degree to which maintenance activities within RMAPs have been appropriately identified, and (2) assess the effectiveness of specific best management practices (BMP) in meeting their intended objective(s).

As described in Table 32, an important issue related to road effectiveness monitoring is the degree to which maintenance activities targeted in the RMAP assessments are appropriately identified and prioritized based on rule language to fix the “worst first.” Monitoring this aspect of the prescription strategy for roads is important because individual or collective prescriptions that are effective in meeting resource protection goals, if not applied to the right locations may not achieve resource objectives, and yet still incur cost to the landowner. Equally important is the assessment of the degree to which BMPs are effective in meeting their stated objective of either reducing sediment delivery or disconnecting roads from typed surface water. This program is ranked ninth among the 16 CMER programs. We anticipate that the results of these studies will inform the Forest Practices Adaptive Management process about the effectiveness of RMAP rules in achieving the FP HCP goals. Should RMAPs prove to be ineffective, Policy may have to revisit the rule to refine its requirements and application.

Table 32. Roads Prescription Scale Effectiveness Monitoring Program: Applicable Rule Group Critical Questions with Associated Research Projects

Rule Group Critical Questions	Project Names
Does the RMAP process correctly identify and prioritize road problems for repair?	Effectiveness of RMAP Fixes Project
Are road prescriptions effective at meeting site-scale performance targets for sediment and water?	Road Prescription-Scale Effectiveness Monitoring Project

Effectiveness of RMAP Fixes Project

Description:

The primary purpose of this project is to evaluate the degree to which RMAP road repairs have been appropriately identified and implemented. The project is envisioned to follow the completion of the Road Sub-Basin-Scale Effectiveness Monitoring (for surface erosion and connectivity issues) and Mass Wasting Site-scale Effectiveness Monitoring projects (for road instability issues), so that results of these studies can be used to refine the list of treatments to be investigated and inform a sampling design for the RMAP project described here.

This project would determine the extent to which identified road problems were located in areas where RMAP repairs had been implemented and attempt to determine why site scale benefits were not achieved.

Status:

As suggested above, the need for this project will be informed by the results of the Road Sub-Basin-Scale Effectiveness Monitoring (for surface erosion and connectivity issues) and Mass Wasting Site-scale Effectiveness Monitoring projects, both of which will become available by mid-2009.

Road Prescription-Scale Effectiveness Monitoring Project

Description:

The concept for implementing this study has changed since the 2006 work plan. Rather than doing a separate study, we intend to investigate the effectiveness of site-scale road treatments as a component of the site-scale mass wasting study (i.e., Post Mortem), which is presently being implemented within the mass wasting program. The objectives of monitoring of forest roads at the prescription scale are to: (1) evaluate the effectiveness of road prescriptions in meeting site-scale road stability performance targets, and (2) identify sensitive situations where prescriptions are not effective. Prescriptions to be investigated will likely include those designed to remove or reinforce unstable road material and/or provide effective water control and stream passage. This approach does not address surface erosion sediment reductions from site-specific measures because an extensive body of research already exists and was used to develop WARSEM and because data collected during the Road Sub-basin Monitoring Project can be evaluated to determine which measures are proving most effective at reducing sediment production, sediment delivery, and hydrologic connectivity.

Status:

The Prescription-scale mass wasting study was nearing completion at the preparation of this document in February 2009.

6.6.3 Roads Validation Program and Cumulative Sediment Effects

Program Strategy

Validation of road effects and performance targets is envisioned to occur in coordination of CMER or external cumulative effects research. This is because of the need to coordinate research on sediment generation with parallel study of potentially affected biota including fish and amphibians.

Table 33. Roads Validation Program and Cumulative Sediment Effects: Applicable Rule Group Critical Questions with Associated Research Projects

Rule Group Critical Questions	Project Names
Have the correct performance targets for sediment delivery and connectivity been identified? What levels of cumulative sediment inputs are harmful to the resource at the basin scale?	Intensive Watershed-Scale Monitoring to Assess Cumulative Effects

Intensive Watershed-Scale Monitoring to Assess Cumulative Effects

Description:

For preliminary study description, see Section 6.11 “Intensive Watershed-Scale Monitoring to Assess Cumulative Effects.”

Status:

Initial scoping began in 2008. Additional effort depends on prioritization.

6.7 FISH PASSAGE RULE GROUP

Rule Overview and Intent

Fish passage blockages at road crossing structures are to be addressed as part of the road maintenance and abandonment plan (RMAP) process. Road crossing structures will be inventoried and evaluated, and those functioning as fish barriers are to be prioritized based on the quantity and quality of potential fish-bearing stream affected upstream of the barrier. Those structures that do not provide fish passage must be repaired or replaced within 15 years, typically on a “worst-first” basis. WDFW’s hydraulic code rules, the associated barrier-assessment manual, and DNR’s forest practices rules apply to crossing structures on forest roads.

The fish passage rule is based on the following assumptions:

- Achieving the objective of no fish barriers is critical for recovery of depressed stocks and the health of fish at all life history stages.
- Implementation of the forest practices rules will result in achieving the objective to maintain or provide passage for fish at all life history stages and to provide for the passage of some woody debris likely to be encountered.
- Assessment, prioritization, and implementation of RMAPs will achieve the objectives in a timely manner.
- Current stream crossing replacement standards are adequate to address fish passage at all life history stages.
- Hydraulic code criteria are effective at achieving resource objectives.
- Fish species and the extent of distribution for all life history stages can be characterized statewide.
- Performance targets can be developed for fish at all life history stages.
- Stream simulation methods provide passage for fish (definition WAC 222-16-010) at all life history stages.

Rule Group Resource Objectives and Performance Targets

Resource Objectives:

- Maintain or restore passage for fish in all life stages and provide for the passage of some woody debris by building and maintaining roads with adequate stream crossings.

Performance Targets:

- Eliminate road-related access barriers over the time-frame for road management plans.
- Test the effectiveness of fish passage prescriptions at restoring and maintaining passage.

Placeholder for Important Link to Policy and Decision Making

[To include: Uncertainties, Work done to date, What we have learned so far, Next Steps., etc.]

Uncertainties

Work Done to Date

What Has Been Learned

Next Steps

Rule Group Strategy

Based on an analysis of the Forest Practices Rules, assumptions and uncertainties underlying the rules were identified. To address these uncertainties, ISAG developed critical questions. Two Programs were set up to address these critical questions (Table 34). The goal of the Fish Passage Effectiveness/Validation Monitoring Program is to validate the assumptions and test the effectiveness of the Forest Practices Rules in providing passage at road crossings for fish (as defined by WAC 222-16-010) at all life history stages. The Monitoring Design Team defines extensive monitoring as a population-scale assessment of the effectiveness of the Forest Practices Rules in attaining forest practice related performance targets across FP HCP lands (Monitoring Design Team, 2002). The implied FP HCP performance target for fish passage based upon the requirements for Road Maintenance and Abandonment Plans (RMAPs) is to eliminate fish blockages on FP HCP regulated lands. The purpose of this program is to evaluate status and trends in fish passage conditions at forest road crossings. The strategies for each of the two Programs are described in the sections below.

Table 34. Fish Passage Rule Group Critical Questions and Programs

Rule Group Critical Questions	Program Names	Task Type	SAG
Are the corrective measures effective in restoring fish passage for fish at all life history stages?	Fish Passage Effectiveness/ Validation Monitoring Program	Effectiveness	Former ISAG
What is the current status of fish passage on a regional scale, and how are conditions changing over time?	Extensive Fish Passage Monitoring Program	Extensive	Former ISAG

ISAG presented the proposed CMER research strategy for fish passage to Policy. Due to differing stakeholder perspectives on what the CMER research strategy should focus on, Policy has designated a subgroup to determine which important issues and/or critical questions should be prioritized for the Fish Passage Rule Group. After determining what the important policy issues for fish passage are, the Policy Subgroup will more clearly define an appropriate research and monitoring strategy for CMER.

The following sections describe ISAG efforts to-date on the fish passage research and monitoring strategy. Currently, ISAG is inactive. It is possible that a CMER Fish Passage SAG will be developed, pending direction by Policy.

6.7.1 Fish Passage Effectiveness/Validation Monitoring Program

Program Strategy

There are key questions concerning the adequacy of current fish passage design methods, existing fish passage criteria, and the definition of a fish passage barrier. This is particularly true for passing ‘all species and life stages’ as required in the Forests and Fish Rules. Some of these questions are applicable to high gradient headwater streams where only resident fish species are present, a particular area of interest for ISAG because adequate information on these streams is lacking. The primary purpose of the Fish Passage Effectiveness/ Validation Monitoring Program is to address scientific uncertainties surrounding fish passage in headwater streams. The Fish Passage Effectiveness/Validation Monitoring Program is composed of three principal elements: (1) fish movement capability, (2) fish life history and movement ecology, and (3) road crossing structure designs that provide fish passage (barrier solutions).

Table 35. Fish Passage Effectiveness/Validation Monitoring Program: Applicable Rule Group Critical Questions with Associate Research Projects

Rule Group Critical Questions		Project Names
Are the corrective measures effective in restoring fish passage for all life history stages?		
Program Research Questions	<i>What is fish passage capability (e.g., probability of passage) through culverts under different flow and slope conditions for native headwater species and life stages?</i>	Fish Passage Capability – Culvert Test Bed Study
	<i>How well does laboratory derived passage capability criteria apply to fish passage through culverts in the field?</i>	No project defined yet
	<i>Are the solutions (existing tools) we are implementing working to provide fish passage as needed?</i>	Effectiveness of Design Criteria for Stream Simulation Culverts
	<i>Are our assumptions about fish movement and fish passage in headwater streams correct?</i>	Literature review of headwater fish ecology and movement

Fish Passage Capability – Culvert Test Bed Study

Description:

The overall goal of the proposed investigation is to gain scientific and engineering information concerning fish passage through small culverts in moderate and steep stream gradients. The primary objective is to perform a series of experimental trials at a test facility to determine passage success for juvenile and adult cutthroat trout under varied water discharge and culvert slope combinations for a bare 4-ft diameter round, spiral corrugated metal culvert.

Status:

ISAG completed the study design in 2007. CMER delivered the study design to Policy, along with the study design for the Stream Simulation Study. The FP HCP assumes that riparian forests managed in accordance with Western and Eastern Washington riparian rule strategies will provide adequate levels of key riparian functions (providing large woody debris, bank stability, shade, and nutrients; and preventing sediment input to streams) necessary to meet the resource

objectives and performance targets outlined in the Washington Forest Practices Habitat Conservation Plan Rule Group Resource Objectives and Performance Targets Policy was uncertain about the direction and focus of the proposed fish passage research strategy, as well as the proposed studies presented to them. A Policy subgroup was formed to further assess the fish passage research and monitoring strategy. During the interim, Policy directed CMER to send both study designs through the Independent Scientific Peer Review (ISPR) process. After CMER reviewed the results of the ISPR in May, 2008, Policy decided to not proceed with either study (i.e., Culvert Test Bed Study or Stream Simulation Study). The Policy Subgroup continues to meet to discuss and clarify what the fish passage research and monitoring strategy should entail before providing feedback to CMER.

Effectiveness of Design Criteria for Stream Simulation Culverts

Description:

Stream simulation is a design method used to mimic natural stream processes within a culvert. The operating premise is that the simulated stream channel inside a culvert should present no more of an obstacle to movement of fish than the adjacent upstream and downstream natural channel conditions. This is based on the assumption that important stream characteristics inside the culvert are no different from characteristics within comparable reaches of the channel outside the culvert. The stream simulation study assesses the effectiveness of the design criteria used to simulate adjacent stream characteristics.

Status:

ISAG completed the *Effectiveness of Design Criteria for Stream Simulation Culverts* study design in 2007. CMER delivered the study design to Policy, along with the study design for the Culvert Test Bed Study. Policy was uncertain about the direction and focus of the proposed fish passage research strategy, as well as the proposed studies presented to them. A Policy subgroup was formed to further assess the fish passage research and monitoring strategy. During the interim, Policy directed CMER to send both study designs through the Independent Scientific Peer Review (ISPR) process. After CMER reviewed the results of the ISPR in May, 2008, Policy decided to not proceed with either study (i.e., Culvert Test Bed Study or Stream Simulation Study). The Policy Subgroup continues to meet to discuss and clarify what the fish passage research strategy should entail before providing feedback to CMER.

Literature Review of Headwater Fish Ecology and Movement

Description:

The purpose of the literature review was to gather and assess current literature addressing the ecology of fish in steep headwater streams; the timing, extent and change in their distribution, associated behavior and the risks associated with fragmenting stream channel connectivity within their natural home range. This literature review considered the fluctuations of fish populations in steep headwater streams over time, as well as the dynamics of stream channel morphology over time (due to disturbance, etc.).

Status:

Due to the fact that the CMER approval and implementation process was delayed for this project, WDFW used available funds to contract the USGS scientists to conduct the literature review. A report was finalized in 2007 by the USGS titled: "Fish Movement Ecology in High Gradient

Headwater Streams: Its Relevance to Fish Passage Restoration through Stream Culvert Barriers” by Hoffman and Dunham. Since this report was funded and contracted by WDFW, it did not go through the standard CMER approval and independent peer review process.

6.7.2 Extensive Fish Passage Monitoring Program

Program Strategy

ISAG completed an extensive fish passage monitoring study design in 2005. CMER delivered the study design to Policy. Policy decided not to fund the project due to budget considerations and limitations in scope, due to absence of “small” forest landowners in the sampling design. Implementation of the study design has been delayed indefinitely.

Table 36. Extensive Fish Passage Monitoring Program: Applicable Rule Group Critical Questions with Associate Research Projects

Rule Group Critical Questions	Project Names
What is the current status of fish passage on a regional scale, and how are conditions changing over time?	Extensive Fish Passage Trend Monitoring Project

Extensive Fish Passage Trend Monitoring Project

Description:

A study design for fish passage trend monitoring was developed using guidelines consistent with the Forests and Fish Report, and supplied by ISAG. The contractor (WDFW) reviewed possible monitoring approaches and presented a recommended study design and methodology that was reviewed and approved by ISAG and CMER. Any future consideration of an Extensive Fish Passage Trend Monitoring project will require a re-evaluation of the completed study design. In order to explore possible cost savings, ISAG will assess stream-crossing data collected by UPSAG’s Roads Sub-basin Scale Effectiveness Monitoring project, and evaluate whether or not that data can be used to report on certain aspects of status and trends for extensive fish passage.

Status:

Due to budgetary considerations and potential limitations in scope, implementation of the design has been delayed indefinitely by Policy.

6.8 PESTICIDES RULE GROUP

Rule Overview and Intent

The objectives of the pesticides rule group is to manage pesticide use to achieve water quality standards, meet label requirements, and avoid harm to riparian vegetation. In the context of the forest practices rules, pesticide means “any insecticide, herbicide, fungicide or rodenticide, but does not include nontoxic repellents or other forest chemicals.”

The pesticide rules include a series of regulations that cover: 1) aerial application of pesticides, 2) ground application of pesticides with power equipment, and 3) hand application of pesticides. The rules for aerial application of pesticides prescribe a setback (offset) to prevent application of pesticides within the core and inner zones of Type F and S streams, or the wetland management zone (WMZ) of Type A or B wetlands. In these cases the offset is from the outer edge of the inner zone or the WMZ. Offsets are also prescribed for flowing Type N streams and Type B wetlands < 5 acres, however in these cases the offsets are measured from the edge of the bankfull channel or wetland. The offset distances vary depending on water type, the type of nozzle used and wind conditions at the time of application. Separate guidelines govern ground application of pesticides with power equipment and hand equipment within RMZs and WMZs.

Strategy and Rationale

The main assumption is that the pesticide rules will be effective in achieving the objectives of meeting water quality standards, label requirements and preventing damage to vegetation in RMZs and WMZs. A level of uncertainty exists for the aerial application of pesticides because of the potential difficulties caused by terrain and wind conditions.

Rule Group Resource Objectives and Performance Targets

Resource Objectives:

- Provide for clean water and native vegetation (in the core and inner zones) by using forest chemicals in a manner that meets or exceeds water quality standards and label requirements by buffering surface water and otherwise using best management practices.

Performance Targets:

- Entry to water: No entry to water for medium and large droplets; minimized for small droplets (drift).
- Entry to RMZs: Core and inner zone: levels cause no significant harm to native vegetation.

Placeholder for Important Link to Policy and Decision Making

[To include: Uncertainties, Work done to date, What we have learned so far, Next Steps., etc.]

Uncertainties

Work Done to Date

What Has Been Learned

Next Steps

Rule Group Strategy

A single critical question has been developed, with a corresponding effectiveness program (Table 37).

Table 37. Pesticides Rule Group Critical Questions and Programs

Rule Group Critical Questions	Program Name	Task Type	SAG
Do the pesticide rules protect water quality and vegetation within the core and inner zones of Type S and F RMZs or the WMZs of Type A or B wetlands?	Forest Chemicals Program	Effectiveness	RSAG

6.8.1 Forest Chemicals Program (Effectiveness)

Program Strategy

The purpose of this program is to address uncertainty concerning the effectiveness of the chemical application rules in protecting water quality and vegetation in riparian and wetland buffers. Alternative strategies with lower costs will also be considered.

This program is ranked last among the 16 CMER programs. Scoping has not occurred and no projects have been identified.

6.9 WETLAND PROTECTION RULE GROUP

Rule Overview and Intent

Wetland adaptive management goals were identified in the FFR report as:

“The goal ... is to clarify the mapping of wetlands and provide for an assessment of the functions of associated wetlands. This is intended to include an assessment of the functions served by forested wetlands and the potential impacts of harvest activities in forested wetlands. The assessment may include the determination of harvest activities that cannot be adequately mitigated or recovered. Where such assessments suggest that changes in forest practices are required, this Appendix is intended to provide the mechanism for the consideration of additional rules for the protection of such wetlands.”

WETSAG understands that the intent of the WAC 222 wetland rules is to achieve no net loss of wetland function (water quality, water quantity, fish and wildlife habitat, and timber production) by avoiding, minimizing, or preventing sediment delivery and hydrologic disruption from roads, timber harvest, and timber yarding; and by providing wetland buffers.

Wetland Classification in WAC 222-16: The forest practices rules classify wetlands into three general categories. Type A wetlands include non-forested wetlands with an area greater than 0.5 acres or forested and non-forested bogs having an area greater than 0.25 acres. Forested wetlands are defined as having a mature crown closure is 30% or greater. Type B wetlands include non-forested wetlands with an area greater than 0.25 acres.

Mapping Requirements in WAC 222-16: Wetlands greater than 0.1 acre, that will be crossed by a road during forest practices, are required to be mapped and typed. Forested wetlands greater than 3 acres are required to be delineated using the methods in the Forest Practices Board Manual, section 8.

Wetland Management Zones (WMZ) and Harvest Methods: WMZs are prescribed for all Type A and Type B wetlands greater than 0.5 acres. WMZ widths vary based on the wetland type and area; harvest is allowed within the maximum width WMZ. The specific leave tree requirements within WMZs differ for eastern and western Washington. The use of ground based harvesting equipment is restricted within WMZs. Harvest methods are limited to low impact harvest or cable systems within forested wetlands and landowners are encouraged to leave a portion of the wildlife reserve tree requirement within the wetland.

Road Construction: Additional rules apply to road construction to address no net loss of wetland function. The preferred option is to prevent impacts by locating roads outside of wetlands (avoidance), however where this is not possible, the mitigation sequence and FP Board Manual guidelines seek to minimize and mitigate impacts.

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The wetland rules are based on the following assumptions:

- Implementation of the wetland prescriptions for timber harvest (WAC 222-30) will result in no net loss of wetland functions over a timber rotation, assuming that some wetland functions may be reduced until the mid-point of a timber rotation cycle.
- Assessment and planning in watershed analysis and implementation of forest practices rules will achieve the stated resource objectives.
- Appropriately identified, standard BMPs are effective at achieving resource objectives.
- Forested wetlands will successfully regenerate following timber harvest.
- Application of the mitigation sequence in WAC 222-24 for road construction will result in no net loss of wetland function.

Several uncertainties exist about the validity of these assumptions. The wetland functions listed in the rules are limited to broad categories, and some uncertainty exists regarding the adequacy of the rules in meeting the resource objectives of the FP HCP. The degree to which current rules related to road construction for wetland mitigation will achieve the “no net loss of wetland functions” policy is unclear because no objective performance measures are available for determining:

- The range of wetland functions affected by road construction or harvest, or
- Net loss or gain of these functions over time;
- Net loss of one or more functions with a concurrent net gain of another function; and
- The cumulative impact of filling or draining less than 0.10 acres of wetland across the FP HCP landscape.

Rule Group Resource Objectives and Performance Targets

Resource Objectives:

- Hydrology: Maintain surface and groundwater hydrologic regimes (magnitude, frequency, timing and routing of stream flows) by disconnecting road drainage from the stream network, preventing increases in peak flows causing scour, and maintaining hydrologic continuity of wetlands.

Performance Targets:

- No net loss in the hydrologic functions of wetlands.

Placeholder for Important Link to Policy and Decision Making

[To include: Uncertainties, Work done to date, What we have learned so far, Next Steps., etc.]

Uncertainties

Work Done to Date

What Has Been Learned

Next Steps

Rule Group Strategy

The assumptions and uncertainties listed above guided development of critical questions and research and monitoring programs to address them (Table 38).

The Wetlands Rule strategy was first to conduct a comprehensive literature review (i.e., the Forested Wetlands Literature Review and Workshop Project) to establish the current scientific basis for evaluating wetland functional relationships for salmonids, covered species and water quality and quantity. WETSAG then conducted a pilot study, the Forested Wetland Regeneration Pilot Project, to establish a study design and determine its ability to evaluate regeneration of forested wetlands harvest. The Wetlands Mitigation Effectiveness Pilot is assessing the impact of wetland functions of placing road fill in wetlands, and whether the mitigation sequence is effective in achieving the goal of not net loss of functions.

In combination, these efforts resulted in an acknowledgement that the mapping data available to locate wetlands in order to study the effect of forest practices activities needed improvement. The DNR GIS Wetlands Data Layer Project identified specific deficiencies, and resulted in the addition of 165,000 polygons to FPARS. Work on a process for continued improvement of the data layer is ongoing in Policy. Linking the mapping to the studies, in order to characterize, describe, and assess impacts to wetland functions, a hydro-geomorphic (HGM) classification system, will be developed in the future.

The strategy going forward is to improve the tools and methodologies for identifying and evaluating wetland functional impacts – completing the study design for Phases 1 and 2 of the mitigation effectiveness study, and focusing on the HGM characterization. Projects related to hydrology and water quality are also identified as priorities by WETSAG; both important to CWA assurances and no net loss wetland of functions.

Specific effectiveness/validation studies will be developed to answer questions about the effects of rule implementation at the landscape and site scales. All effectiveness tasks are administered by WETSAG; while rule tools are administered by DNR.

Table 38. Wetlands Rule Group Critical Questions and Programs

Rule Group Critical Questions	Program Names	Task Type	SAG
How should wetlands be classified and mapped for management purposes?	Wetland Mapping Tools Program	Rule Tool	WETSAG
Are forested wetlands regenerating sufficiently to maintain wetland functions? Does timber harvest in forested wetlands affect water temperature sufficiently to negatively affect temperatures in connected streams? Does timber harvest in forested wetlands alter hydrology sufficiently to affect wetland functions?	Forested Wetlands Effectiveness Program	Effectiveness	WETSAG
Are road construction activities, harvest and harvest methods adequately mitigated to achieve no net-loss of wetland functions?	Wetland Mitigation Program	Effectiveness	WETSAG
Are current WMZs effective in providing adequate levels of LWD, shade, water quality and maintain micro-climates?	WMZ Effectiveness Monitoring Program	Effectiveness	WETSAG
Are current rule-defined wetland functions sufficiently specific to maintain water quality standards, support the long-term viability of covered species, and support the goal of harvestable levels of salmonids?	Wetlands Intensive Monitoring Program	Intensive Monitoring	WETSAG

6.9.1 Wetland Mapping Tools Program (Rule Tools)

Program Strategy

The purpose of the Wetland Mapping Tool Program is to develop mapping tools that will be used to define and locate wetlands throughout the State, to assist in wetland identification and improvement of rules and best management practices, and to facilitate CMER's ability to answer critical questions involving wetlands.

This program consists of three projects. The first project was proposed in phases to develop a GIS layer mapping tool administered by DNR. The first phase of this was initiated by DNR's incorporation of an existing wetland layer (FPWET) to the FPARS GIS layer, which added 165,000 wetland polygons. The second phase of this project was to develop a methodology for updating the GIS data layer from FPA maps. This phase of the project will not be done by WETSAG, as a Policy subgroup of DNR and DOE will address this issue. The second project would involve the analysis and development of a hydro-geomorphic (HGM) classification system for wetlands suitable for implementation on Forest Practices HCP lands to determine which functions should be examined to assure adequate protection. The Wetlands Mitigation Effectiveness Pilot project intends to use the HGM classification system to characterize wetlands and evaluate functions and how well the A/B/F classification system is working. That project will provide a basis for further investigation of an HGM classification system and provide recommendations for improving GIS data layers described above. The third project would focus on the integration of an overlay tool to incorporate WETSAG's research needs with other proposed CMER research in order to increase efficiency.

Table 39. Wetland Mapping Tool Program: Applicable Rule Group Critical Questions with Associate Research Projects

Rule Group Critical Questions	Project Names
How should wetlands be classified and mapped for management purposes?	DNR GIS Wetlands Data Layer Project
	Hydro-geomorphic Wetland Classification System Project
	Overlay Project

DNR GIS Wetlands Data Layer Project

Description:

The first phase of the mapping layer project focused on combining existing wetlands information into one database layer in order to create an adjustable platform that will allow the database to be modified. A subject matter expert (SME) coordinated with DNR’s cartography department to create a state-wide map of all mapped wetlands under a single classification system (NWI) relevant to forest practices. The second phase will recommend how the database will be updated with new information submitted through FPAs. Recommendations could include with a mechanism to incorporate data submitted by landowners using the same process that currently exists for updates to the stream typing layer.

Status:

Phase 1 was scoped and presented to CMER in 2007, but was not approved as a WETSAG research project. It was directed to DNR for incorporation of the FPWET datalayer into FPARS, which was accomplished in December 2007, resulting in the addition of 165,000 wetland polygons originating from a separate DNR data layer. The second phase, updating the layer with new information generated on FPAs, has been delegated to a Policy subgroup, including DNR and DOE.

Hydro-geomorphic Wetland Classification System Project

Description:

The current rating system, Type A, B, or Forested Wetland, characterizes wetlands by size, vegetation, area of open water, and soils; and provides no indication of wetland functions. Each of these WAC 222 wetland classifications are likely to include several hydrogeomorphic (HGM) categories. In order to answer questions regarding no net loss of functions, a functionally-based classification system needs to be developed and applied to the current wetland layer. Scoping of future phases for the data layer (above) may involve gathering information on hydrogeomorphic classification systems and incorporating improved remote sensing to map wetlands. Based on the results of the scoping, this project may be incorporated in the development of the data layer described above or developed independently. The Wetlands Mitigation Effectiveness Study will inform this project.

Status:

This has not been scoped, but WETSAG is discussing the value of this project as it relates to evaluating “no-net loss of function” for the other studies in the rule group. Preliminary scoping is intended to be initiated in FY2010. Estimated completion date is FY2011.

Overlay Project

Description:

This project will develop a system that will facilitate cooperation between WETSAG and other SAGs when wetlands are encountered while conducting other research, to increase efficiencies among SAGs and projects. The other purpose of this project is to develop technical guidelines to add to the Board Manual for identifying HGM classification of wetlands for foresters and other SAGs. This project may also involve a workshop for DNR, CMER, foresters and landowners to detail the products developed.

Status:

This project has not been scoped or scheduled.

6.9.2 Forested Wetlands Effectiveness Program

Program Strategy

This program addresses uncertainty concerning the net loss of hydrologic function, water quality, and recovery capacity of forested wetlands following timber harvest.

This program consists of four projects (Table 40). Schedule L-1 of the FFR states a key performance target for wetlands is “no net loss in the hydrologic functions of wetlands.” Among the list of issues is the evaluation of the regeneration and recovery capacity of forested wetlands. A literature review and synthesis of forested wetlands was performed to identify current understanding of forested wetland functions and regeneration capabilities in the Pacific Northwest; concluding that little research has been performed in forested wetlands, but that functions can be extrapolated from other studies and from research in floodplain wetlands. The review and synthesis also identified informational gaps that will be used to identify further research considerations. A pilot project to evaluate methods for determining whether regeneration in forested wetlands is meeting the goal of replacing function at the mid-point of a timber rotation cycle has been completed. A full scale study is not planned at this time, but was recommended by WETSAG. Future studies of wetland and stream temperature interactions and hydrologic connectivity will further explore wetland functions and impacts associated with timber harvest. The Wetlands Mitigation Effectiveness Project will provide information that will enable scoping for the Wetland/Stream Water Temperature Interactions Project and the Wetland Hydrology Connectivity Project. This program is ranked eighth among the 16 CMER programs.

Table 40. Forested Wetlands Effectiveness Program: Applicable Rule Group Critical Questions with Associated Research Projects

Rule Group Critical Questions		Project Names
Are forested wetlands regenerating sufficiently to maintain wetland functions?		
Program Research Questions	<i>What is currently known about regeneration in forested wetlands in the Pacific Northwest?</i>	Forested Wetlands Literature Review and Workshop Project
	<i>What are the information gaps?</i>	
	<i>What is currently known about affects of timber harvest on forested wetland functions?</i>	
	<i>What are the current methods of evaluating regeneration in forested wetlands?</i>	Statewide Forested Wetland Regeneration Pilot and Project
	<i>How successfully are they being implemented?</i>	
	<i>What results are landowners experiencing?</i>	
	<i>What kind of guidance can be given to landowners to best ensure regeneration of forested wetlands?</i>	
<i>How does the post-harvest stand composition compare to pre-harvest condition?</i>		
<i>How are forested wetland functions affected by timber harvest?</i>		
Does timber harvest in forested wetlands affect water temperature sufficiently to negatively affect stream temperatures in connected streams?		Wetland/Stream Water Temperature Interactions Project
Does timber harvest in forested wetlands alter hydrology sufficiently to affect wetland functions?		Wetland Hydrology Connectivity Project

Forested Wetlands Literature Review and Workshop Project

Description:

The project included three elements: 1) to perform a literature review and create an annotated bibliography; 2) to hold a 1-day workshop for involved forest and wetland professionals as part of the collection and dissemination of experiential information; and 3) to develop a synthesis paper that includes the literature and workshop information. The results from the literature search indicate that there are substantial information gaps regarding the characterization of forested wetlands, including but not limited to studies of water quality, hydrology, and fish and wildlife use.

Status:

This project has been completed and has undergone CMER and SRC review. The paper and workshop proceedings are available on-line and through CMER. Workshops occurred in November of 2002 and the “Pacific Northwest Forested Wetland Literature Survey Synthesis Paper” was completed in April of 2005.

Statewide Forested Wetland Regeneration Pilot and Project

Description:

The pilot project has been completed; the report has been reviewed by CMER and is available on-line and through CMER. This pilot study was initiated to characterize regeneration in forested wetlands, develop research methodologies, examine current methodologies of forested wetland regeneration, and determine the success of their implementation. The two primary objectives were: 1) to develop a process for identifying suitable sites to sample. This included working with landowners who manage forested wetlands to identify forested wetlands that have been harvested and; 2) to develop and test methods for site selection, develop and test sampling protocol, develop measures of regeneration success, develop methods for data analysis, and collect some preliminary information about regeneration in forested wetlands to guide study design for a full scale study. Based on the pilot study, it was concluded that the full-scale project should not be pursued at this time.

The pilot study indicates that seedlings and saplings are able to establish in forested wetlands that have been harvested. All but one site met the State Board Manual for acceptable stocking level. However, the data did not answer the long term question whether a functional forest is recovered at the mid-point of a timber rotation cycle as stated in WAC 222 timber harvest policy. The pilot study did not address the role of hydrology in forested wetlands or what potentially affects the hydrology. Future studies may include investigations as to how the moisture gradient correlates with or affects the biodiversity of a site and how timber harvesting within a forested wetland affects the hydrologic functions of the wetland. The study objective to determine methodologies to assess the regeneration of forested wetlands was not sufficiently answered by the pilot. Improved mapping and tracking of forest practices operations would better support a full study in the future.

Status:

This project was completed in July of 2004. CMER approved the Forested Wetland Regeneration Pilot Summary Report.

Wetland/Stream Water Temperature Interactions Project

Description:

This project would assess the change in water temperature in wetlands and associated streams as a result of timber harvest in forested wetlands.

Status:

WETSAG will provide a more detailed project description followed by a scoping document in FY 2011-2012.

Wetland Hydrologic Connectivity Project

Description:

This project would assess the impact of harvesting in forested wetlands on hydrology and determine if that impact results in no net loss of hydrologic function.

Status:

WETSAG will review the results of the Wetlands Mitigation Effectiveness Project which will likely provide information relevant to this project, and provide a more detailed project description followed by a scoping document in FY 2011-2012.

6.9.3 Wetlands Mitigation Program

Program Strategy

In order to achieve ‘no net loss of wetland function’ when filling or draining more than 0.10 acre of wetland during road construction, forest practice rules require implementation of a mitigation sequence including avoidance and minimization (WAC 222-24); and replacement or restoration for filling of more than 0.5 acres of wetland. Information on the effectiveness of these mitigation requirements is not currently available.

To address the performance target of “no net loss of hydrologic functions of wetlands (Schedule L-1) this program will evaluate several critical questions, including whether mitigation activities are successful in achieving stated goals and objectives by replacing lost wetland functions caused by wetland filling or draining (see Table 41). This information can then be used to recommend any changes to the current process of wetland mitigation. This program is currently being developed for implementation. It is ranked eleventh among the 16 CMER programs.

Table 41. Wetlands Mitigation Program: Applicable Rule Group Critical Questions with Associated Research Projects

Rule Group Critical Questions		Project Names
Are road construction activities, harvest and harvest methods adequately mitigated to achieve no net-loss of wetland functions?		
Program Research Questions	<i>What sizes and types of wetlands are being impacted by road and landing construction and maintenance activities on the FP HCP landscape?</i>	Wetland Mitigation Effectiveness Project
	<i>Is implementation of the wetland mitigation sequence ensuring no net loss of wetland functions?</i>	
	<i>What are the cumulative effects to wetland functions of impacts to multiple small wetland areas?</i>	
	<i>What wetland functions are assumed critical to achieve the goal of no net loss?</i>	
	<i>What functions are not being mitigated or replaced?</i>	

Wetland Mitigation Effectiveness Project

Description:

The Wetland Mitigation Effectiveness Project will answer the question of whether the current forest practices road construction rules are effective at preventing net losses to wetland functions. Documentation of how often and what types of wetlands are being impacted by road construction is not readily available and currently there is no information available on how road construction under the current rules is affecting wetland functions across the FP HCP landscape.

To effectively design and implement the Wetland Mitigation Effectiveness Project, the Wetland Scientific Advisory Group (WETSAG) decided to implement the study in phases, including a pilot study. The pilot study will test and refine the site selection and data collection methods in a few selected geographical regions. The primary objective of the pilot study is to inform the final site selection procedures and data collection protocols for the main study (i.e., Phase 1 and Phase 2). At the conclusion of the pilot study, WETSAG also intends to include data collected in the pilot study with data collected in Phase 1 of the study. Phase 1 will use the methods finalized in the pilot study and apply them across a larger geographical area and will address questions about the effects of road and landing construction and maintenance activities on the physical characteristics of wetlands. The results of Phase 1 will be used to finish scoping and designing data collection methods for Phase 2, which will address questions about the effects of road and landing construction and maintenance on wetland functions.

Status:

The Scoping document was approved by CMER June, 2008. The Study Design for the Pilot Project is currently being developed and is expected to be implemented in FY 2010.

6.9.4 Wetland Management Zone Effectiveness Monitoring Program

Program Strategy

This program will be designed to assess the effectiveness of Wetland Management Zones in meeting FP HCP resource objectives and performance targets. The wetland management zone rules are based on a number of assumptions, including:

- Meeting the wetland performance targets will achieve the functional objectives.
- Certain BMPs work better than others.
- We can determine how effective BMPs are (to a generalized degree). We can standardize how we measure and document this effectiveness.
- Reaching BMP objectives at the site scale (i.e., avoiding road fill in wetlands) will aggregate to meeting sub-basin and watershed scale functional objectives.

These uncertainties form the basis for the critical questions (Table 42) that the program will be designed to address. This project is envisioned to follow the Wetlands Mitigation Effectiveness Project.

Table 42. Wetland Management Zone Effectiveness Monitoring Program: Applicable Rule Group Critical Questions with Associated Research Projects

Rule Group Critical Questions	Project Names
Are current WMZs effective in providing adequate levels of LWD, shade, water quality and maintain micro-climates?	Wetland Management Zone Effectiveness Monitoring Project

Wetland Management Zone Effectiveness Monitoring Project

Description:

This project will evaluate those indicators of wetland functions to determine if the target of no net loss of hydrologic function and hydrologic connectivity are being achieved.

Status:

To be scoped in FY2010.

6.9.5 Wetlands Intensive Trend Monitoring Program

Program Strategy

The wetlands intensive monitoring program will assess the status of forested wetlands harvested under Forest Practices Rules. If they are available, WETSAG will utilize the updated mapping and data layer tools and a Hydro-geomorphic Wetland Classification System to assess functional integrity. The project will be informed by the Wetlands Mitigation Effectiveness Study data collection methodologies and the baseline data metrics produced.

Table 43. Wetlands Intensive Monitoring Program: Applicable Rule Group Critical Questions with Associated Research Projects

Rule Group Critical Questions	Project Names
Are current rule-defined wetland functions sufficiently specific to maintain water quality standards, support the long-term viability of covered species, and support the goal of harvestable levels of salmonids?	Wetlands Intensive Monitoring Project

Wetlands Intensive Monitoring Project

Description:

This project will look at wetlands on both the eastside and the westside. It will stratify based on HGM type, Forest Practices rating, and size. The critical question will be reviewed in the scoping process.

Status:

To be scoped in the future. As this project would be informed by the Wetland Management Zone and Hydrology projects, it is not considered a high priority at this time.

6.10 WILDLIFE RULE GROUP

CMER has funded a number of wildlife research projects since the late 1980s. These projects have addressed general multi-species and statewide issues, as well as species-specific concerns about the effects of forest practices. Although the FP HCP is focused on water quality, fish, and stream associated amphibians (SAAs), both Policy and CMER acknowledge that wildlife issues are important and need attention. Consequently CMER is currently funding additional sampling and analyses of a study that examines wildlife use of two streamside buffer designs. However, because CMER's focus is currently on FP HCP priorities, the only funding available for additional wildlife projects is from the State general fund.

Rule Overview and Intent

Forest practice rules directed at wildlife conservation take two approaches: 1) general statewide requirements, and 2) species-specific strategies. In addition, Forest Practices Rules may benefit wildlife through the retention or enhancement of habitat, such as riparian buffers, upland management areas, mass wasting sites, channel migration zones, etc. The only general statewide rule specifically directed at wildlife conservation is the provisions for wildlife reserve tree management (WAC 222-30-020[11]). Specifications for the retention of wildlife reserve trees, green recruitment trees, and down logs are provided for both eastern and western Washington. Species-specific forest practice rules are closely tied to state and federal endangered and threatened species programs. Habitat of listed species is defined as critical habitat (state) and any proposed forest practice activity in critical habitat becomes a Class-IV special forest practice under SEPA (WAC 222-10-040), requiring consultation, evaluation, an environmental impact statement, and mitigation. There are currently 10 species for which these rules apply, (e.g., the bald eagle [*Haliaeetus leucocephalus*], grizzly bear [*Ursus arctos*], northern spotted owl [*Strix occidentalis*], and marbled murrelet [*Brachyramphus marmoratus*]).

In some cases, a species-specific approach that avoids rule making has been endorsed by the Forest Practices Board. This approach usually involves the development and adoption of management plans or the specification of "voluntary" guidelines. The federal listing of the lynx (*Lynx canadensis*) prompted the state and a few large private landowners in northeastern Washington to develop and adopt a lynx management plan. The state listing of the western gray squirrel (*Sciurus griseus*) resulted in landowners agreeing to apply forest practice guidelines developed by the Washington Department of Fish and Wildlife in areas known to contain the species. These rules and associated guidelines are very complex. Each species generates specific definitions of habitats, specific monitoring methods, and specific provisions for protection of sites that vary with the species needs. In addition, the Forest Practices Board often adopts rule options that allow landowners to develop species-specific management plans.

Rule Group Resource Objectives and Performance Targets

No resource objectives or performance targets exist for wildlife rules.

Rule Group Strategy

The Landscape and Wildlife Advisory Group (LWAG) has been developing an overall wildlife work plan for several years. However, focused plan development for wildlife issues other than

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those associated with the FP HCP were delayed until the CMER Work Plan is completed. Nonetheless, LWAG continues to work on the broader work plan as time allows. To date, LWAG has identified a number of programs that contain several issues, each with critical questions (Table 44). This rule group is administered by LWAG.

Table 44. Wildlife Rule Group Critical Questions (in Order of Priority) and Programs

Rule Group Critical Questions	Program	Task Type	Project Name	SAG
<p>What are the values of snags retained in upland management units and RMZs?</p> <p>Is there a threshold response by wildlife to snag density?</p> <p>What are the fates of wildlife reserve trees (WRT) and green recruitment trees (GRT) in managed forests?</p> <p>What are the most-effective ways of retaining and replacing snags?</p>	Effectiveness of snags for wildlife	Effectiveness Validation		LWAG
<p>What are the effects of variation in stand establishment practices, herbicides, thinning, fertilization, and rotation lengths on vegetation and wildlife?</p> <p>Does the concept of the steady-state shifting mosaic apply and how does that process effect wildlife?</p>	Conifer management effects on wildlife	Effectiveness Validation		
<p>What role do RMZs, UMAs, and other forest patches play in maintaining species and providing structural and vegetative characteristics thought to be important to wildlife?</p> <p>What are the functions of large legacy trees (snags, down wood, high stumps) as compared to the smaller complements produced in intensively managed forests?</p> <p>What are the roles and fates of special sites (e.g., rock outcrops, cliffs, talus slopes, isolated small wetlands, etc.) in managed forests?</p>	Legacy features and their effect on wildlife	Effectiveness Validation	RMZ Resample Project	
<p>What are the movement patterns, processes, and distances of amphibians in managed forests?</p> <p>Do amphibians persist in refugia following timber harvest or is subsequent occupancy related to movements from other areas?</p> <p>How quickly do amphibians re-colonize areas, particularly habitat outside the stream network?</p> <p>What is the role of ponds created by beaver, slumps, rotational failures, road ditches, and sediment traps, and off-channel habitats in the distribution and abundance of still-water breeding amphibians?</p>	Amphibian movement and distribution effectiveness monitoring	Effectiveness	Type N Experimental Buffer Project	
<p>What is the status and trends of bats in managed forests?</p>	Forest Bats	Extensive		
<p>What is the role of WRTs and GRTs in bat ecology?</p> <p>What are the relationships between forest management and bat foraging and roosting?</p>	Forest Bats	Effectiveness		

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(Table 44 cont.)

Rule Group Critical Questions	Program	Task Type	Project Name	SAG
What is the relationship between the abundance and productivity of wildlife and gradients in the composition and structure of ponderosa pine stands?	Ponderosa Pine Habitat	Effective-ness		LWAG
What are the effects of forest practices on the western gray squirrel and oviposition sites of egg-laying reptiles?				
What is the role of isolated oak trees and small patches of oaks?	Oak Woodland Habitat	Effective-ness		
What are the appropriate management approaches to maintaining and restoring oak woodlands at stand and landscape levels?				

6.10.1 Wildlife Program

The purpose of this program is to 1) determine the species of wildlife that use managed forests, 2) estimate habitat conditions associated with wildlife use of managed forests, 3) assess the efficacy of regulations designed to provide habitat for wildlife in managed forests, and 4) identify emerging forestry-wildlife issues and develop research projects that address those issues.

Program Strategy

With the current emphasis of CMER on the Forest Practices Adaptive Management Program, there is little opportunity to fund projects on other wildlife. LWAG has identified and prioritized several wildlife issues that need attention. The highest priority project (RMZ Resample) had a great deal of overlap with many of FFR Schedule L-1 questions and this is the only wildlife project funded at this time. This program is ranked thirteenth among the 16 CMER programs.

Table 45. Wildlife Program: Applicable Rule Group Critical Questions with Associated Research Projects

Rule Group Critical Questions	Project Names
What role do RMZs, UMAs, and other forest patches play in maintaining species and providing structural and vegetative characteristics thought to be important to wildlife?	RMZ Study Resample Project
What are the movement patterns, processes, and distances of amphibians in managed forests?	Type N Experimental Buffer Treatment Project
Do amphibians persist in refugia following timber harvest or is subsequent occupancy related to movements from other areas?	

RMZ Study Resample Project

Description:

In 1990, CMER funded an experimental study to examine the effects of two buffer configurations (state regulations and “smart buffers”) on birds, small mammals and amphibians. The study produced 2 years of pre- and post-harvest data and a final report that was completed in 2000. The results were species specific and equivocal and raised numerous questions about the long-term response of wildlife to the treatments. Because the smart buffer was similar to the forest practices buffer for Type F streams and more than five years had elapsed since last

sampling the RMZ, another two years of sampling was initiated in 2003 to document changes over time. The study will provide additional data on riparian conditions and some SAAs.

Status:

The final report was completed in 2008, was reviewed by LWAG and CMER, and is currently undergoing revision. The report will be reviewed by ISRP in 2009. A Final report incorporating comments is expected in late 2009.

Type N Experimental Buffer

Description:

The genetic work associated with this project will provide some answers to questions about SAA movements. For example, initial sampling and analysis suggests that the “genetic neighborhood” of tailed frogs is about 32 km². In addition, SAA sampling before and after harvest will directly answer questions about extirpation from harvested areas, persistence in refugia (patch buffers), and recolonization if extirpated.

Status:

Two years of pre-treatment sampling have been completed, and additional pre-treatment sampling occurred in 2008 due to a blow-down event that occurred in December 2007. Harvests are being implemented during fall 2008-spring 2009. However, due to poor economic conditions in 2009 one basin will have a delayed harvest, pushing post-treatment data collection back one year; one basin will not be harvested until markets recover; and a remaining basin may be delayed, but this has not been confirmed. The initial year of post-harvest sampling is to occur as scheduled in the harvested basins. Annual progress reports have been completed.

6.10.2 Ponderosa Pine Habitat

A number of bird species are thought to be closely associated with mature Ponderosa pine forest. Currently, Ponderosa pine forests occur along a gradient from dense stands of Douglas-fir and grand fir with a few large remnant pines to low density open stands composed almost exclusively of large diameter pine. This project would examine the abundance of birds along this gradient on the east slope of the Cascade Mountains. Scoping has not occurred and no activity is planned for this project.

6.10.3 Other Wildlife Programs/Projects

Due to the overriding importance of the Forest Practices Adaptive Management Program, funds for the Wildlife Program from CMER are limited and confined to the State General Fund. Due to these circumstances, none of the other programs in Table 45 have been developed into projects.

6.11 INTENSIVE WATERSHED-SCALE MONITORING TO ASSESS CUMULATIVE EFFECTS

Intensive monitoring is watershed-scale research designed to evaluate the cumulative effects of multiple forest practices and to provide information that will improve our understanding of causal relationships and the biological effects of Forest Practices Rules on aquatic resources. The evaluation of cumulative effects of multiple management actions on a system requires an understanding of how individual actions influence a site and how those responses propagate through the system. This understanding will enable the evaluation of the effectiveness of management practices applied at multiple locations over time. This sophisticated level of understanding can only be achieved with an intensive, integrated, monitoring effort. Evaluating biological responses is similarly complicated, requiring an understanding of how various management actions interact to affect habitat conditions and how system biology responds to these habitat changes. This program was identified in the MDT report as an essential component of an integrated monitoring program. CMER is scoping its intensive monitoring needs. A draft scoping paper that identifies potential objectives and critical questions has been prepared by CMER staff. Cumulative effects of forest practices from changes in fine sediment input and LWD have been tentatively identified as issues meriting further scoping. Contacts with outside programs with similar interests in intensive monitoring (such as the State's Intensively Monitored Watersheds Program) are being pursued to identify opportunities for collaboration. A draft scoping document for a fine sediment cumulative effects study is under review by CMER.

FY 2010 - 2018 Policy Preferred CMER Budget

First priority									
Second priority									
Third priority									
	2010	2011	2012	2013	2014	2015	2016	2017	2018
Type N Rule Group									
Type N Experimental Buffer Treatment - Basalt Lithologies	811,000	815,000	400,000						
Type N Experimental Buffer Treatment - Incompetent Lithologies		200,000	400,000	400,000	400,000	400,000	200,000		
Easter WA Type N Effectiveness			400,000	400,000	400,000	400,000	200,000		
Eastside Type N Characterization - Forest Hydrology		400,000	400,000						
Buffer Integrity - Shade Effectiveness	120,000	64,000	35,000						
Amphibians in Intermittent Streams			150,000	150,000					
Type F Rule Group									
Eastside Type F Channel Wood Characterization		200,000							
Bull Trout Overlay Temperature	202,000	210,000							
Solar Radiation/Effective Shade	88,000	116,000							
Westside Type F Riparian Prescription Monitoring			50,000	150,000	400,000	400,000	400,000	400,000	200,000
Eastside Type F Riparian Prescription Monitoring (BTO Add-on)	32,000	50,000	50,000	50,000	50,000				
Hardwood Conversion	22,000	15,000	10,000						
Extensive Riparian Status and Trend Monitoring - Temperature Component	320,000	145,000	150,000	150,000					
Unstable Slopes Rule Group									
Testing the Accuracy of Unstable Landform ID		60,000							
Mass Wasting Landscape Scale Effectiveness		30,000							
Roads Rule Group									
Road Sub-Basin Scale Effectiveness							900,000		
Wetlands Rule Group									
Wetland Mitigation Effectiveness		100,000	150,000						
Subtotal Projects	\$1,595,000	\$2,405,000	\$2,195,000	\$1,300,000	\$1,250,000	\$1,200,000	\$1,700,000	\$400,000	\$200,000
CMER PI Staff at NWIFC	363,000	381,000	400,200	420,200	441,200	463,300	486,465	511,000	536,000
Total Project Costs	1,958,000	2,786,000	2,595,200	1,720,200	1,691,200	1,663,300	2,186,465	911,000	736,000
Project Support									
Contingency Fund for Active Projects	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
Policy Information & Analysis Support			75,000	75,000	50,000	75,000	75,000	75,000	75,000
CMER Project Managers (2 at DNR, 1 at NWIFC)	311,000	317,000	330,000	337,000	351,000	359,000	366,000	389,000	397,000
Program Administration									
AMP Administrator	105,000	105,000	108,150	108,150	111,395	111,395	114,737	114,737	118,179
Contract Specialist	68,000	68,000	70,040	70,040	72,141	72,141	74,305	74,305	76,534

FY 2010 - 2018 Policy Preferred CMER Budget

CMER/Policy Coordinator	45,000	45,000	46,350	46,350	47,741	47,741	49,173	49,173	50,648
CMER Website	10,000	10,000	10,300	10,300	10,609	10,609	10,927	10,927	11,255
AMP Data Management	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000
Independent Science Panel	90,000	90,000	94,500	94,500	99,225	99,225	104,186	104,186	110,000
Co-op Fish & Wildlife Research Unit Dues (U of W)	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000
Subtotal Support and Administration	\$765,000	\$771,000	\$870,340	\$877,340	\$878,111	\$911,111	\$930,328	\$953,328	\$974,616
Total Expenditures for Projects/Activities	\$2,723,000	\$3,557,000	\$3,465,540	\$2,597,540	\$2,569,311	\$2,574,411	\$3,116,793	\$1,864,328	\$1,710,616
Assumed Carry Forward From Previous FY + (GF-S & FFSA) Revenue	\$3,300,000	\$1,577,000	-\$780,000	-\$2,945,540	-\$4,143,080	-\$5,212,391	-\$6,186,802	-\$7,703,595	-\$7,967,923
Balance	\$577,000	-\$1,980,000	-\$4,245,540	-\$5,543,080	-\$6,712,391	-\$7,786,802	-\$9,303,595	-\$9,567,923	-\$9,678,539

