H

Appendix H.

H. Cooperative Monitoring, Evaluation, and Research Committee Work Plan

The state Forest Practices Board (the Board) established an adaptive management program in accordance with the requirements of the Forests and Fish Law (Appendix C) for the purpose of:

> "…providing 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. (WAC 222-12-045)"

To provide the science needed to support adaptive management, the Board established the Cooperative Monitoring, Evaluation and Research Committee (CMER). The Board empowered CMER to carry out research and effectiveness and validation monitoring based on priorities contained in the Forests and Fish Report (Appendix B). The CMER Work Plan describes the projects and associated timelines and budgets for addressing research and monitoring needs identified in the Forests and Fish Report.

The goal of the FY2006 CMER Work Plan is to provide an integrated strategy for monitoring the effectiveness of the Forests and Fish forest practices rules to protect and maintain aquatic resources. The work plan is intended to inform CMER participants, policy constituents, and the interested public of CMER's activities.

Adaptive management and CMER's work is an integral part of the Forest Practices Habitat Conversation Plan. Therefore, CMER's Work Plan is important to understanding and predicting present and future areas of research and monitoring.

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CMER FY 2006
WORK PLAN

Prepared by:

COOPERATIVE MONITORING, EVALUATION AND RESEARCH COMMITTEE

July 15, 2005

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1.0 INTRODUCTION

BACKGROUND ON ADAPTIVE MANAGEMENT

The State Forest Practices Board (FPB) adopted an adaptive management program in concurrence with the Forest and Fish Report legislation (State Forest Practices Rules WAC *222-12-045). The purpose of this 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, effectiveness, and validation monitoring per guidelines set by the Forest and Fish Report (FFR). CMER is organized into a series of Scientific Advisory Groups (SAGs) that are responsible for designing and implementing the research and monitoring program. Table 1 provides a brief description of the SAGs.

Table 1. CMER Scientific Advisory Group structure.

Scientific Advisory Group	Acronym	Descriptions
Bull Trout Scientific Advisory Group	BTSAG	Develops and oversees projects related to bull trout biology and the FFR rules designed to maintain bull trout habitat
Instream Scientific Advisory Group	ISAG	Develops and oversees projects related to in-channel issues, including stream typing and fish passage
Landscape-Wildlife Advisory Group	LWAG	Develops and oversees projects related to wildlife include stream-associated amphibians
Riparian Scientific Advisory Group	RSAG	Develops and oversees projects related to the FFR riparian strategy
Scientific Advisory Group-Eastside	SAGE	Develops and oversees projects to address issues specific to the eastside
Upland Processes Scientific Advisory Group	UPSAG	Develops and oversees projects related to roads, mass wasting and channel processes
Wetlands Scientific Advisory Group	WETSAG	Develops and oversees projects related to wetland identification and protection

PURPOSE AND OBJECTIVES OF THE CMER WORK PLAN

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 FFR adaptive management program. The purpose of the work plan is to inform CMER participants, policy constituents, and the interested public about CMER's activities. The plan is a living document that will be revised in response to research findings, changes in policy objectives, and funding. This version supercedes the FY 2005 version of the work plan. Annual revisions to the work plan are anticipated in the future.

ORGANIZATION OF THE WORK PLAN DOCUMENT

The remainder of the document describes the CMER research and monitoring program and CMER recommendations for the FY 2006 work plan. Section 2.0 describes the organization of the CMER research and monitoring activities and the approaches used to address research and monitoring questions relevant to FFR adaptive management. Section 3.0 describes the CMER procedures for prioritization at the program (topic areas) level, and at the project level. Section 4.0 presents the proposed CMER FY 2006 action plan, including recommendations for project prioritization, scheduling and budget allocations. Sections 5.0 and 6.0 provide an overview of CMER's research and monitoring program, with program and project descriptions.

2.0 CMER RESEARCH AND MONITORING STRATEGY

The CMER work plan consists of more than 70 projects covering a range of topics related to the FFR forest practices rules. The work plan is organized in a hierarchical format consisting of rule groups, program types, and projects.

FOREST PRACTICE RULE GROUPS

At the highest level, the CMER work plan is organized by FFR "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 eight 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
Type F riparian rules	Prescriptions for identification fish bearing streams and management of adjacent riparian areas	FFR Appendix B; WAC 222-30
Type N riparian rules	Prescriptions for identification of non-fish-bearing streams and management of adjacent riparian areas	FFR Appendix B WAC 222-30
Unstable Slopes	Prescriptions for identification and management of areas potentially susceptible to mass wasting/erosion processes	FFR Appendix C WAC 222-24,30
Forest Roads	Prescriptions for identification and management of erosion and runoff from forest roads	FFR Appendix D WAC 222-24
Fish Passage	Prescriptions for identification and prevention of fish-passage barriers	FFR Appendix D WAC 222-24
Pesticides	Prescriptions for application of forest chemicals	FFR Appendix E WAC 222-38
Wetland Protection	Prescriptions for the identification and management of wetlands	FFR Appendix F WAC 222-30
Wildlife	Prescriptions for protection of wildlife	

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 the 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. Twenty-eight programs containing more than 70 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); including effectiveness monitoring to evaluate prescription effectiveness at the site or landscape scale; extensive status and trend monitoring to evaluate status and trends in resource condition indicators across FFR lands; and intensive monitoring to identify causal relationships and document cumulative effects at the watershed scale. CMER also conducts rule implementation tool projects to develop, refine or validate scientific tools necessary for implementing the rule(s) or for establishing performance standards. These approaches are summarized below:

Effectiveness Monitoring. Effectiveness monitoring programs consist primarily of effectiveness monitoring projects 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. These programs also may include related projects to develop research methodologies or to validate relationships between forest practices activities, input processes and resource response.

Extensive Status and Trend Monitoring. Extensive monitoring programs evaluate the current status of key watershed input processes and habitat condition indicators across FFR lands and document trends in these indicators over time as the FFR prescriptions are applied across the landscape. Extensive monitoring provides a statewide assessment of the effectiveness of FFR rules to attain specific performance targets across FFR lands. Extensive monitoring is designed to provide report-card-type measures of rule effectiveness (i.e., are FFR 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. Intensive monitoring is designed to evaluate the cumulative effects of multiple forest practices at the watershed scale. Analysis of these effects improves our understanding of causal relationships and of the effects of FFR rules on aquatic resources. Intensive monitoring integrates the effects of multiple management actions over space and through time within the water shed. Evaluation of the 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 how various management actions interact to affect habitat conditions and how aquatic resources respond to these habitat changes. This sophisticated level of understanding of the physical and biologic systems can only be achieved with an intensive, integrated, monitoring effort. CMER has identified several potential intensive monitoring topics and is currently scoping and prioritizing critical questions to be addressed by an intensive monitoring program.

<u>Rule Implementation Tool Development</u>. The development of rule implementation tools includes efforts to develop, refine or validate methods, guidelines, protocols, models or targets required to implement forest practices rules. Typical projects include the development, testing, and refinement of field protocols or models to identify or delineate landscape features requiring FFR prescriptions. One example is a project to develop a stream typing model to predict the upper limit of fish habitat in streams for purposes of determining the appropriate riparian buffering prescriptions for harvest units. Other projects consist of studies to verify performance targets developed during FFR negotiations, such as the DFC performance targets.

3.0 CMER PRIORITIES

CMER's long-term goal is to address the full range of critical questions identified in the CMER work plan, the 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 FFR 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.

PROGRAM PRIORITIZATION AND RANKING

The first step CMER's prioritization process was to rank the relative importance of the proposed programs in meeting FFR goals and objectives. 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 action plan until further scoping and coordination with other efforts occurs.

Effectiveness Monitoring and Extensive Status and Trend Monitoring Programs

Effectiveness monitoring and extensive status and trend monitoring programs were ranked by CMER members in attendance at the December 19, 2002 CMER meeting who 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.

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 FFR Policy Group 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/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 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/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

The 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 project scoping and development.

PROJECT PRIORITIZATION AND RANKING

The second stage of prioritization occurred at the project level in order for CMER to make recommendations to the FFR policy committee concerning scheduling and allocation of funding among the projects developed by the SAGs. Projects were prioritized based on the extent to which projects were deemed essential to inform FFR adaptive management, input from DNR on their importance in improving implementation of forest practice rules, the status of projects relative to policy decisions on adaptive management, and need to follow through and complete work already underway. Individual projects were assigned to categories. The projects rankings were initially assigned by the CMER co-chairs and the AMPA, and were subsequently reviewed and modified by CMER. The system for categorizing projects is as follows:

- Urgent Projects. Urgent projects are effectiveness and extensive monitoring projects that received the highest priority ranking because they are critical elements of a credible FFR adaptive management program and immediate implementation is desirable. The urgent projects address the key scientific uncertainties in the underlying assumptions of the FFR agreement. These projects are typically components of high priority effectiveness/validation or extensive monitoring programs.

- Second Priority Projects. Projects in this category are considered to be important elements of the FFR adaptive management program, but are less critical than projects in the urgent category. These projects should be initiated as soon as funding and human resources are available, but should not impede implementation of urgent projects. Some second priority projects are part of high priority programs, but are a lower priority than other projects in the high priority program. Other projects received this ranking because they are components of moderate priority programs.

- Implement Projects. This ranking identifies high priority rule implementation tool projects.

- Delay Projects. Funding for project implementation in FY 2006 is not recommended for delay projects. Projects received this rating because: 1) project scoping and study design is not complete and they are not ready for implementation; 2) they are elements of low priority programs, or 3) policy decision on direction or relevance to adaptive management is needed.

- Finish Projects. These projects are underway and scheduled for completion in FY 2006.

- Completed Projects. Projects in this category have been completed.

4.0 FY 2006 Action Plan Recommendations

Table 4 summarizes CMER's recommendation for the FY 2006 action plan by program and project. It consists of a list of proposed CMER projects that are organized by program. The table presents project rankings (as described above), status (current stage of development and implementation) and budget projection by fiscal year. Note that Table 4 represents CMER recommendations to the FFR policy committee; the actual budget allocation decisions are ultimately made by the State Forest Practices Board.

FY 2006 CMER Work Plan

Table 4. CMER recommendation for the FY 2006 work plan.

	Effectiveness/Validation Monitoring Programs	Priority Ranking	Stat-us*	FY 01 – FY 05	FY 2006 7/05-6/06	FY 2007 7/06-6/07	FY 2008 7/07-6/08	FY 2009 7/08-6/09	FY 2010 7/09-6/10	FY 2011 7/10-6/11	FY 2012 7/11-6/12	Total FY06-12	Grand Total
1													
2	**Type N Buffer Characteristics, Integrity, Function Prog.**			**323,000**	**571,657**	**884,631**	**902,267**	**834,500**	**791,295**	**550,828**	**119,132**	**4,654,310**	**4.977.310**
3	Type N Buffer Characteristics, Integrity, Function Project	Urgent	6	225,000	250,000	250,000	250,000	250,000	250,000			1,250,000	1,475,000
4	Type N Experimental Buffer Treatment Feasibility Project	Complete	6	98,000									98,000
5	Type N Experimental Buffer Treatment Project	**Decision Pending**	3		321,657	634,631	652,267	584,500	541,295	550,828	119,132	3,404,310	3,404,310
6	Type N WQ/Downstream Effects Project	Delay	0										
7	Type N Performance Target Validation Project	Delay	0										
8	Type N Classification Project	Delay	0										
9	**Eastside Riparian Type F Program**			**220,000**	**200,000**	**200,000**						**400,000**	**620,000**
10	LWD Literature Review Project	Second	8	80,000	40,000							40,000	120,000
11	Disturbance Regime Literature Review Project	Second	8	80,000	20,000							20,000	100,000
12	Eastside Riparian Current Condition Assessment Project	Urgent	2	60,000	140,000	200,000						340,000	400,000
13	**Type N Amphibian Response Program**			**649,723**	**118,000**	**162,000**	**147,000**	**70,000**				**497,000**	**1,146,723**
14	SAA Detection/Relative Abundance Methodology Project	Finish	6	345,600	11,000							11,000	356,600
15	Tailed Frog Literature Review & Meta-analysis Project	Finish	6	93,123									93,123
16	Dunns & van Dykes Salamander Project	Finish	6	104,000									104,000
17	Tailed Frogs & Parent Geology Project	Second	1			70,000	70,000	70,000				210,000	210,000
18	Buffer Integrity-Shade Effectiveness Project	Second	6	80,000	77,000	77,000	77,000					231,000	311,000
19	Amphibian Recovery Project	Complete	10	27,000									27,000
20	Amphibians in Intermittent Streams Project	Second	1		30,000	15,000						45,000	45,000
21	**Roads sub-basin scale Effectiveness Monitoring Prog.**			**79,542**									**79,542**
22	Road Surface Erosion (RSE) Model Update Project	Complete	10	79,542									79,542
23	Road Surface Erosion Model Validation/Refinement Project	Delay	0										
24	**Type F Statewide Prescription Monitoring Program**			**75,000**	**30,000**	**330,000**	**330,000**	**330,000**	**330,000**			**1,350,000**	**1,425,000**
25	Type F Riparian Prescription Monitoring Project (Westside)	Second	3	75,000		300,000	300,000	300,000	300,000			1,200,000	1,275,000
26	Type F Riparian Prescription Monitoring Project (Eastside)	Urgent	1		30,000	30,000	30,000	30,000	30,000			150,000	150,000
27	Type F Experimental Buffer Treatment Project	Delay	0										
28	Type F Performance Target Validation Project	Delay	0										
29	**Mass Wasting Effectiveness Monitoring Program**					**97,000**	**250,000**	**350,000**	**100,000**			**797,000**	**797,000**
30	Effectiveness of Unstable Landform Identification Project	Urgent	1			20,000	150,000	150,000				320,000	320,000
31	Mass Wasting Prescription-scale Effectiveness Mon Project	Urgent	1			77,000	100,000	200,000	100,000			477,000	477,000
32	Mass Wasting Buffer Integrity & Windthrow Assess Project	Delay	0										
33	Mass Wasting Landscape-Scale Effectiveness Mon Project	Delay	0										
34	**Bull Trout Overlay Temperature Program**			**1,212,600**	**310,600**	**107,650**	**107,650**					**525,900**	**1,738,500**
35	Bull Trout Overlay Temperature Project	Urgent	6	825,820	224,920	78,730	78,730					382,380	1,208,200
36	Solar Radiation/Effective Shade Project	Finish	6	386,780	85,680	28,920	28,920					143,520	530,300
37	Groundwater Conceptual Model Project	Delay	0										
38	Groundwater Research Studies Project	Delay	0										
39	**Forested Wetlands Revegetation Effectiveness Prog**			**104,913**									**104,913**
40	Forested Wetlands Literature Review & Workshop Project	Complete	10	54,913									54,913
41	Statewide Forested Wetland Regeneration Project	Complete	10	50,000									50,000
42	Wetland/Stream Water Temperature Interactions Project	Delay	0										
43	Wetland Hydrology Connectivity Project	Delay	0										
44	**Road Site-scale Effectiveness Monitoring Program**					**50,000**	**100,000**	**150,000**	**100,000**			**400,000**	**400,000**
45	Effectiveness of Identifying RMAP Priority Fixes Project	Second	0										
46	Road Site-Scale Effectiveness Monitoring Project	Second	0			50,000	100,000	150,000	100,000			400,000	400,000
47	**Hardwood Conversion Program**			**392,169**	**130,055**	**177,942**						**307,997**	**700,166**
48	Hardwood Conversion Project	Finish	6	387,169	80,055	177,942						257,997	645,166
49	WDOE Temperature Modeling Project	Finish	1	5,000	50,000							50,000	55,000

July 15, 2005

Table 4. CMER recommendation for the FY 2006 work plan.

#	Program	Status	Pri										
50	**Wetland Mitigation Program**	Delay	0										
51	**Fish Passage Effectiveness Mon Program/Project**	Second	0		100,000	200,000	200,000	200,000	200,000			900,000	900,000
52	**Wildlife Program (State General Fund)**			758,076	124,890							124,890	882,966
53	RMZ Resample Project	Finish	6	758,076	124,890							124,890	882,966
54	**Wetland Mngt Zone Effectiveness Monitoring Program**	Delay	0										
55	**CMZ Effectiveness Monitoring Program**												
56	CMZ Function Assessment Project	Delay	0										
57	CMZ Integrity Monitoring Project	Delay	0										
58	Alternate-Plan Assessment Project	Delay	0										
59	**Forest Chemicals Program**												
60	*Chemical Application Monitoring Project*	Delay	0										
61	*Sub-Total for Effectiveness & Validation Programs*			3,815,023	1,585,202	2,209,223	2,036,917	1,934,500	1,521,295	550,828	119,132	9,957,097	13,772,120
62	**Extensive Status & Trends Monitoring Programs**												
63	Extensive Riparian Status and Trend Monitoring Program	Urgent	2		231,000	249,000	231,000	249,000				960,000	960,000
64	Extensive Fish Passage Trend Monitoring Program	Delay	2	24,300									24,300
65	Road Sub-Basin Scale Effectiveness Monitoring Program	Urgent	4		356,230	362,185				300,000	300,000	1,318,415	1,318,415
66	Extensive Wetlands Trend Monitoring Program	Delay	0										
67	*Sub-Total for Extensive Monitoring Programs*			24,300	587,230	611,185	231,000	249,000		300,000	300,000	2,278,415	2,302,715
68	**Intensive Watershed-Scale/Cumulative Monitoring Prog**												
69	Cooperative Statewide Intensive Monitoring Program												
70	CMER Contribution to Cooperative Effort	Urgent	1		100,000	400,000	375,000	375,000	375,000			1,625,000	1,625,000
71	*Sub-Total for Intensive Monitoring*				100,000	400,000	375,000	375,000	375,000			1,625,000	1,625,000
72	**Compliance Monitoring Programs**												
73	Compliance Monitoring Program Development												
74	DNR/CMER Cooperative Effort (Protocol Development)	Complete	6	60,000									60,000
75	*Sub-Total for Compliance Monitoring*			60,000									60,000
76	**Rule Tool Programs**												
77	**Type N Delineation Program ("PIP" studies)**			70,666									**70,666**
78	Perennial Stream Survey Pilot Project	Complete	10	70,666									70,666
79	Perennial Stream Survey (Full Statewide Project)	Delay	0										
80	**Sensitive Site Program (Stream Associated Amphibian)**			328,800									**328,800**
81	SAA Sensitive Site Id Methods/Site Characterization	Complete	10	328,800									328,800
82	**Stream Typing ("Water Typing") Program**			1,396,403	450,000	450,000	200,000					1,100,000	2,496,403
83	Last Fish/Habitat Prediction Model Development Project	Implemnt	6	1,116,403	50,000	50,000						100,000	1,216,403
84	Last Fish/Habitat Prediction Model Field Performance Proj	Implemnt	3	80,000	200,000	200,000						400,000	480,000
85	Annual/Seasonal Variability Project	Implemnt	2	200,000	200,000	200,000	200,000					600,000	800,000
86	Guidelines Field Protocol to Locate Mapped Divisions Proj	Delay											
87	**Type F DFC Validation Program**			150,000									**150,000**
88	DFC Target Validation Project	Complete	10	150,000									150,000
89	DFC Trajectory Model Validation Project	Delay	0										
90	DFC-Aquatic Habitat Project	Delay	0										
91	**Eastside Temperature Nomograph Program/Project**	Finish	8	85,000									**85,000**
92	**Bull Trout Habitat Identification Program** [1]												
93	Bull Trout Presence/Absence Protocols Project	Delay											

FY 2006 CMER Work Plan

Table 4. CMER recommendation for the FY 2006 work plan.

#	Project	Status	Code										
94	Bull Trout Habitat Prediction Models Project	Delay											
95	**Unstable Landform Identification Program**			853,750	500,000	650,000						1,300,000	2,153,750
96	Shallow Rapid Landslide Screen for GIS Project	Delay											
97	Technical Guidelines for Geotechnical Reports Project	Delay											
98	Regional Unstable Landforms Identification Project	Complete	10	20,000									20,000
99	Landform Hazard Class System & Mapping Protocols Proj	Complete	10	33,750									33,750
100	Landslide Hazard Zonation Project (completed to date)	Complete	10	800,000									800,000
101	Landslide Hazard Zonation Project	Implemnt	6		500,000	500,000	300,000					1,300,000	1,300,000
102	**Glacial Deep-Seated Landslide Program**			22,000									22,000
103	Model Evapo-Transpiration in DSL Recharge Areas Project	Complete	10	22,000									22,000
104	Vulnerability DS Landslides to Timber Harvest Project	Delay	0										
105	**Wetland Tool Program**			30,000	125,000	125,000	125,000	125,000				530,000	530,000
106	Hydrogeomorphic Wetland Classification System Project	Delay	0										
107	DNR GIS Wetlands Data Layer Project	Implemnt	1		30,000	125,000	125,000	125,000	125,000			530,000	530,000
108	**CMZ Delineation Program**												
109	CMZ Screen & Aerial Photograph Catalog Project	Delay	0										
110	CMZ Boundary Identification Criteria Project	Delay	0										
111	*Sub-Total for Rule Tool Development*			2,906,619	980,000	1,075,000	625,000	125,000	125,000			2,930,000	5,836,619
112	**Miscellaneous Projects and Expenses**												
113	Atterbury Landowner Data Purchase	Complete		10,800									10,800
114	Thermograph Purchases	Complete		1,628									1,628
115	Stream Temperature Workshop	Complete		22,002									22,002
116	*Digital Orthophoto and Aerial Photo Purchases*												
117	*Sub-Total for Misc Projects and Expenses*			34,430									34,430
118	**Program Administration & Project Management**												
119	DNR Indirect Cost (General Fund State only)	Urgent		119,323									119,323
120	AM Program Administrator (Geoff McNaughton, DNR)	Urgent		475,085	87,056	87,056	87,056	87,056	87,056	87,056	87,056	609,389	1,084,474
121	Contract Specialist (Dawn Hitchins, DNR)	Urgent		193,902	58,265	58,265	58,265					174,795	368,697
122	CMER Facilitation	Urgent		28,800	9,600	9,600	9,600	9,600	9,600	9,600	9,600	67,200	96,000
123	CMER Staff (NWIFC)	Urgent		1,748,017	410,416	410,416	410,416	410,416	410,416	410,416	410,416	2,872,912	4,620,929
124	CMER Website (Jeff Schieber, DNR)	Urgent		23,120	11,656	11,656	11,656	11,656	11,656	11,656	11,656	81,592	104,712
125	Scientific Review Committee (Univ. Wash)	Urgent		236,762	87,434	87,434	87,434	87,434	87,434	87,434	87,434	612,038	848,800
126	Coop Fish & Wildlife Research Unit Dues (Univ. Wash)	Urgent		30,609	10,203	10,203	10,203	10,203	10,203	10,203	10,203	71,421	102,030
127	Project Development Support (CMER Discretionary Fund)	Urgent		370,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	700,000	1,070,000
128	*Subtotal for Program Administration*			3,225,618	774,630	774,630	774,630	716,365	716,365	716,365	716,365	5,189,347	8,414,965
129	Total for Completed projects			1,829,101									1,829,101
130	Total for new starts (doesn't include LHZ line 116)				1,288,887	897,000						2,185,887	2,185,887
131	Total for "Urgent" projects			4,336,438	2,106,780	2,441,545	1,989,360	1,970,365	1,471,365	1,016,365	1,016,365	12,012,142	16,348,580
132	Total for "Finish" projects			2,164,748	351,625	206,862	28,920					587,407	2,752,155
133	Total for "Second" projects			315,000	588,657	1,346,631	1,399,267	1,304,500	1,141,295	550,828	119,132	6,450,310	6,765,310
134	Total for "Implement" (Rule Implementation Tools)			1,396,403	980,000	1,075,000	625,000	125,000	125,000			2,930,000	4,326,403
135	Total for "Delay" with funds allocated			24,300									24,300
136	**Total Expenditures (Minus Delay Projects)**			10,041,690	4,027,062	5,070,038	4,042,547	3,399,865	2,737,660	1,567,193	1,135,497	21,979,859	32,021,549

* Project Status Codes: 0=Pre-scoping; 1=Scoping complete; 2=Study Design Phase; 3=Study Design Complete; 4=in Contracting Process; 5=Contract Signed; 6=Project Underway; 7=Interim Report Available; 8=Draft Report Submitted to CMER; 9=Final Report thru SRC; 10=Report Accepted and Published

5.0 RULE GROUP DESCRIPTIONS AND MONITORING STRATEGIES

This section provides a summary, rationale, strategy, and list of programs for each rule group. The rule summary briefly describes the intent of the rule, the rationale identifies scientific questions related to those rules, and the strategy organizes those questions into programs and task categories.

RIPARIAN STRATEGY

Because of the complexity of the riparian strategy, it is divided into five rule groups: the Stream Typing rule group (Type F/N delineation), the Type N rule group (non-fish-bearing streams), the Type F rule group, the Bull Trout rule group, and the Channel Migration Zone Rule Group. Each group is discussed separately below.

STREAM TYPING RULE GROUP

The FFR recommends adoption of rules by the forest practices board delineating waters of the state into three categories, Type S Waters, Type F waters and Type N waters. Distinguishing the upper limits of Type F (or S) waters is particularly important, because the presence or absence of fish habitat in the streams creates differences in the aquatic resources of concern, the management strategies and the prescriptions applied.

Rule Summary

Currently, stream typing is based on a complicated set of physical and beneficial use criteria according to guidance in the forest practice rules. Due to questions about the accuracy of this system, the FFR report recommends 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.

Strategy and Rationale

The FFR report provides a clear rationale and guidance for a strategy related to the stream typing system. The FFR report indicates that the current approach to stream typing is not adequately precise, defines a modeling approach for developing a new map, and sets specifications for the accuracy of the model. It also calls for development of a field protocol for inclusion in the forest practices board manual.

The Instream Scientific Advisory Group (ISAG) has developed a single program (the stream typing program) to develop and validate a GIS based model to predict the upstream extent of fish or fish habitat (Table 5).

Table 5. Stream typing rule group critical question and program.

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

TYPE N RIPARIAN PRESCRIPTIONS RULE GROUP

Type N streams are non-fish-habitat streams that 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 FFR 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.

The Type N riparian prescriptions are designed to accomplish the following FFR resource objectives:
1. Provide cool water by maintaining shade, groundwater temperature, flow, and other watershed processes controlling stream temperature,
2. Provide complex in- and near-stream habitat by recruiting large woody debris and litter,
3. Prevent the delivery of excessive sediment to streams by protecting stream-bank integrity, providing vegetative filtering, protecting unstable slopes, and preventing the routing of sediment to streams, and
4. Provide conditions that sustain SAA population viability within occupied sub basins.

Rule Summary

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 west side, whereas landowners on the eastside have the flexibility to use either clear-cut or partial-cut strategies. The clear-cut strategy involves a patch buffering system where portions of the riparian stand can be clear-cut to the stream and other 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 upstream 300-500 ft from the Type F/Type Np boundary. 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 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, providing 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) 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.

Strategy and Rationale

The Type N rules are based on the assumption that the riparian buffering strategies will result in aquatic conditions that meet the resource objectives and consequently achieve the three FFR performance goals. However, great uncertainty exists about 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.

The Type N riparian strategy is designed to address critical questions related to the effectiveness of the rules in achieving FFR goals and resource objectives. The critical questions, programs, task types and responsible scientific advisory group (SAG) are listed in Table 6.

Table 6. Critical questions and programs for the Type N riparian prescriptions rule group.

Critical Questions	Program Name	Task Type	SAG
How should the initiation point of Type Np streams be identified for management purposes?	Type N Delineation Program	Rule Tool	UPSAG
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 FFR resource objectives and performance targets for shade, stream temperature, LWD recruitment, litter fall and amphibians? How do other buffers compare with the FFR 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?	Type N Buffer Characteristics, Integrity and Function	Effective-ness	RSAG
Is Stream Associated Amphibian (SAAs) population viability maintained by the Type N prescriptions?	Type N Amphibian Response	Effective-ness	LWAG
Can the methods used to identify and characterize sensitive sites be improved?	Sensitive Site Program	Rule Tool	LWAG
Is the Type N riparian strategy effective in maintaining downstream fish habitat and harvestable fish populations?	Downstream Water Quality/ Fish Response	Intensive	
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 Trend Monitoring	Extensive	RSAG

TYPE F RIPARIAN PRESCRIPTIONS RULE GROUP

The FFR report recognizes differences in riparian systems and processes between eastern (Eastside) and western (Westside) Washington. It describes 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."

The eastern Washington riparian rules for Type F streams 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 FFR assumes that riparian forests managed in accord with these strategies will provide adequate levels of key riparian functions (providing large woody debris, shade, and nutrients and preventing sediment input) necessary to meet FFR resource objectives for harvestable levels of salmonids, long term viability of amphibian populations and protection of water quality while maintaining a viable timber industry. These key functions are the focus of the resource objectives and performance targets established for this rule group.

Rule Summary

The Type F riparian rules prescribe riparian management zones (RMZs) that differ between the Eastside and Westside but share common characteristics. The common characteristics are a RMZs equal in width to a site-potential tree height and divided into three zones: core, inner and outer. The core zone is adjacent to the stream and generally is a no harvest zone. The core is intended to protect bank stability and maintain the majority of shade and wood recruitment. The inner and outer zones extend outward from it and allow prescribed harvesting to under specific conditions.

Westside Type F Prescriptions

Western Washington RMZs consist of three zones, including:
1. A core zone 50 feet wide that is generally a no-harvest 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 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 contribute to the overall riparian functions provided by the RMZ.

A variety of measures in the Westside Type-F riparian rules address site-specific situations, operational concerns of landowners, conversion of hardwood-dominated sites to conifer, placement of large wood, catastrophic loss from fire or wind, and alternate plans.

Eastside Type F Prescriptions

The eastern Washington Type-F riparian rules require:
1. A core 30-foot wide that is generally a no harvest zone.
2. An inner zone that is 45 to 70 feet wide (depending site class and stream size).
3. An outer zone is between 0 to 55 feet wide.

The sum of the core, inner and outer zones approximates the length 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 temperature rules overlay the Eastside Type F riparian rule package. The first defines the amount of shade needed to meet state water-quality standards. The second (the bull trout overlay) is intended to provide the additional temperature protection required by bull trout (see Bull Trout Rule Group, below).

Strategy and Rationale

The western Washington Type F riparian rules are based upon the assumptions that:
1. The DFC basal area targets adequately describe mature riparian forest conditions.
2. The growth model used for DFC adequately projects riparian growth and mortality.
3. Some hardwood-dominated riparian stands need to be converted to conifer in order to achieve DFC.
4. Stands that meet the DFC target will provide the aquatic habitat conditions needed to provide the functions to meet the overall performance goals and resource objectives.

The eastern Washington Type F riparian rules are based upon the following assumptions:
1. 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.
2. The defined elevation bands are reasonably accurate reflections of the spatial distribution of historical disturbance regimes and species compositions
3. The management strategies will minimize risk of catastrophic events within the RMZs.
4. The management strategies will put stands on a trajectory that will provide the riparian functions needed to support harvestable populations of fish.
5. The temperature overlays are necessary to provide stream temperatures that meet the state water quality standards and the needs of bull trout.

Uncertainties about the validity of the assumptions and the effectiveness of the rule lead to a series of critical questions and programs to address them (Table 7). The effectiveness programs include:

1. The Type F Statewide Effectiveness Monitoring Program, which addresses effectiveness of the Type F riparian rules in meeting performance targets and achieving resource objectives;
2. The Hardwood Conversion Program, which addresses uncertainty regarding strategies and prescriptions for managing hardwood dominated stands;
3. The Extensive Riparian Trend Monitoring Program, which documents status and trends of riparian conditions on Type F streams on a regional scale; and,
4. The DFC Validation Program, a rule tool program that addresses uncertainties regarding the validity of the west side DFC performance targets and the accuracy of DFC model that is used to project stand trajectory to age 140.
5. The Eastside Riparian Type F Program, which assesses current riparian stand and stream conditions on Type F streams across the eastside, and evaluate the likelihood that the prescriptions will move stands towards desired future conditions (forest health, riparian function, and within historic disturbance regimes). It also will develop eastside LWD performance targets and validate the shade-temperature relationships for eastern Washington in the forest practices rules.
6. The Eastside Temperature Nomograph Program that validates the shade-temperature relationships for eastern Washington in the forest practices rules.
7. The Bull Trout overlay temperature program addresses effectiveness of the eastside Type F shade requirements. This program is discussed in the Bull Trout rule group.

Table 7. Critical questions and programs for the Type F riparian prescriptions rule group.

Type F Riparian Prescriptions Rule Group Critical Questions	Program Name	Task Type	SAG
Does the DFC model, including basal area targets, adequately describe mature riparian forests?	DFC Validation Program	Rule Tool	RSAG
Are the Type F riparian rules effective in meeting the performance targets, resource objectives, and overall performance goals of FFR?	Type F Statewide Effectiveness Monitoring Program BTO Temperature Program	Effective-ness	RSAG BTSAG
Where and how should hardwood conversion projects be conducted, and what are the ecological outcomes?	Hardwood Conversion Program	Effective-ness	RSAG
What is the current range of conditions for eastside riparian stands and streams? Will application of the prescriptions result in stands that achieve eastside FFR objectives (forest health, riparian function and historic disturbance regimes)? What are appropriate LWD performance targets?	Eastside Type F Riparian Program	Rule Tool	SAGE
Can the shade/temperature relationships in the eastside temperature nomograph be refined?	Eastside Type F Riparian Program	Rule Tool	SAGE
What is the current status of riparian conditions and functions in Type F streams on a regional scale, and how are conditions changing over time?	Extensive Riparian Trend Monitoring Program (Type F)	Extensive	RSAG
How do aquatic organisms respond to changes in habitat and water quality associated with changes in riparian inputs and functions?	Aquatic Habitat Biotic Response	Intensive	RSAG

BULL TROUT RULE GROUP

Bull Trout are listed under ESA as threatened throughout their range in Washington. A factor contributing to their "threatened" status is the degradation of habitat, especially increasing stream temperatures. Bull Trout temperature requirements are cooler than those of other salmonids. The bull trout habitat overlay (BTO, a map showing the distribution of potentially suitable habitat) was developed to identify streams containing potential bull trout habitat.

Rule Summary

Specific riparian timber harvest prescriptions apply to Type F streams located within the bull trout habitat overlay area. When a timber harvest unit is located within the overlay, "all available shade" must be retained within 75 feet of the bankfull width or channel migration zone, whichever is greater. When outside of the overlay, 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 canopy cover existing prior to harvest. The standard shade rule, which was designed to meet earlier state water quality temperature standards, is believed to be inadequate to meet the optimal bull trout water temperatures.

Strategy and Rationale

Problems arise during implementation of the bull trout overlay. Because knowledge of the current and potential distribution of the species is imprecise, large areas of forest land in eastern Washington are currently included within the bull trout overlay. Some included areas may never have been occupied by bull trout and may not have the potential to support bull trout in the future. The riparian zones bordering these streams are placed under inappropriate restrictions that may result in riparian conditions that do not meet the intent of the Eastside riparian strategy.

The Bull Trout "All Available Shade" Rule is based on the following assumptions:
1. Shade and water temperature are more at risk in eastern Washington than in western Washington because of the potential for more shade removal within the Eastside RMZ prescriptions and warmer Eastside air temperatures.
2. The water temperature criteria within the current (prior to 2004) water quality standards (and nomograph) are too warm to meet the optimal cold water temperature needs of bull trout.
3. A primary factor contributing to bull trout decline is habitat degradation, especially as it relates to stream temperature. Past forest practices, including shade removal, have been a contributing factor. Therefore with restoration of habitat and the consequential reduction in stream temperatures, bull trout should rebound in those habitats.
4. Historically when habitats were more optimal, watersheds were more extensively occupied by bull trout, including all life history strategies such as resident and migratory (i.e. fluvial and adfluvial).
5. The bull trout habitat overlay includes areas that never have and never will have the potential to support bull trout. Where this occurs, forestlands may be placed under inappropriate harvest restrictions.
6. The "all available shade" rule should provide more shade and water temperature protection than the standard eastside prescriptions.
7. The densiometer methodology can adequately measure and determine "all available shade".
8. All shade affecting stream temperature comes from within 75 feet of the stream.

The following list of uncertainties apply to the bull trout "all available shade rule"

1. Lack of agreement on bull trout temperature requirements.
2. Different perspectives exist regarding the accuracy of the bull trout habitat overlay in identifying habitat potentially suitable for bull trout.
3. The characteristics of "unsuitable" bull trout habitat are poorly defined.
4. The effectiveness of the densiometer methodology for determining effective shade, especially "all available shade" is not fully accepted.
5. The meaning of "all available shade" is unclear.

The strategy for the bull trout rule group is intended to answer a set of critical questions that address these uncertainties (Table 8).

Table 8. Critical questions and programs for the Bull Trout rule group. All programs are administered by BTSAG.

Bull Trout Rule Group Critical Questions	Program Name	Task Type
Are both the standard eastside prescriptions and the "all available shade" rule effective in protecting shade and stream temperature and in meeting the 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 FFR riparian prescriptions effective at protecting groundwater flow and temperature?	BTO Temperature Program	Effective-ness
How can habitat suitable for bull trout be identified?	Bull Trout Habitat Identification Program	Rule Tool

Two programs are proposed to address these questions. The Bull Trout Overlay Temperature Program is designed to address the effectiveness of FFR rules on shade and stream temperatures in bull trout habitat, as well as other eastside fish habitat. The Bull Trout Habitat Identification Program is intended to help in identifying bull trout habitat for management purposes.

CHANNEL MIGRATION ZONE RULE GROUP

Rule Summary

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. 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 effectiveness of public resources as described in the rules and the Forest Practices Act.

Strategy and Rationale

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 9). The overall strategy is to assess the delineation methods for CMZs while cooperating with the riparian rule group to develop and implement a long-term riparian/CMZ effectiveness-monitoring program. The CMZ rule group is divided into three programs addressing the critical questions.

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.

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).

The third question addresses the effectiveness of the CMZ rule in maintaining RMZ integrity and riparian functions. The rule assumes that riparian functions can be maintained by protecting forests in the CMZ and RMZ to provide riparian functions despite the effects of rapidly migrating channels. However, alternative plans may not be equally successful because of a lack of information and experience on the part of landowners and regulators. Moreover, changing forest practices increase the uncertainty because past migration patterns may not predict future migration and fluvial disturbance of the RMZ.

Table 9. Critical questions and programs for the CMZ Rule Group. All effectiveness tasks are administered by UPSAG; rule tools are administered by DNR in collaboration with UPSAG.

Channel Migration Zone Rule Group Critical Questions	Program Name	Task Type
What field/map criteria allow consistent, repeatable delineation of the CMZ lateral boundaries ("edge")?	CMZ Delineation Program	Rule Tool
Will the physical processes that drive channel migration change appreciably due to the application of FFR rules?	CMZ Validation Program	Intensive
Does the CMZ rule meet FFR performance goals and resource objectives?	CMZ Effectiveness Monitoring Program	Effective- ness

UNSTABLE SLOPES RULE GROUP

Rule Summary

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

The FFR default protective measure for unstable slopes is avoidance. The rule strategy begins with identification of unstable slopes and then the strategy is either to avoid the area or conduct a risk evaluation through the SEPA process. The rule strategy relies on the ability of forest managers to recognize and mitigate for unstable slopes within a 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 FFR rule relates to timber harvest on the groundwater recharge areas of deep-seated landslides in glacial sediments.

Strategy and Rationale

Table 10 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 design and implement mass wasting effectiveness monitoring and validation programs to assess the effectiveness of landform recognition and mitigation at various scales. All effectiveness and intensive tasks are administered by UPSAG; rule tools are administered by DNR in collaboration with UPSAG.

Table 10. Critical questions and programs for the Unstable Slopes Rule Group.

Unstable Slopes Rule Group Critical Questions	Program Name	Task Type
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
Are deep-seated landslides in glacial sediments along with their recharge area being correctly and uniformly identified, and does harvesting of the recharge area promote their instability?	Glacial Deep-Seated Landslides Program	Rule Tool
Are unstable landforms being correctly and uniformly identified and evaluated for potential hazard?	Mass Wasting Effectiveness Monitoring Program	Effective-ness
What is the natural (background) rate of landsliding on managed forest lands?		
Are the FFR 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?		
What levels of cumulative sediment inputs are harmful to the resource at the basin scale?	Mass Wasting Validation Program	Intensive

ROADS RULE GROUP

Rule Summary

The intent of the rules for roads is to protect water quality and riparian/aquatic habitat by minimizing sediment delivery to Type 1-5 waters and 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. 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 require RMAPs for all forest roads to be developed by 2006 for large forest landowners, and timed with timber harvest activity for small forest landowners.

Strategy and Rationale

The basic assumptions of the road rules are
1. Implementation of road prescriptions will result in achieving FFR performance goals and resource objectives, including:
    a. Meeting water quality standards,
    b. Providing clean water and substrate and maintain 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. Maintaining 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 we can identify and prioritize roadwork based on these differences.
4. Appropriately identified standard BMPs are effective at achieving functional objectives.

Assessment of the rules leads to five critical questions. Three monitoring and validation programs are proposed to address these critical questions (Table 11). The monitoring strategy is based on CMER's experience with road sediment problems and BMPs and on the data from numerous Watershed Analyses used to develop the FFR 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 FFR targets. If BMPs are ineffective, validation monitoring is unwarranted. If BMPs are proving to be effective, then validating the performance targets should begin (do we have the right target?).

Table 11. Critical questions and programs for the Roads Rule Group. All effectiveness, extensive, and intensive tasks are administered by UPSAG.

Roads Rule Group Critical Questions	Program Name	Task Type
Are road prescriptions effective at meeting sub-basin scale performance targets for sediment and water? (Exclusive of mass wasting prescriptions that are covered under the Mass Wasting Rule Group).	Road Basin-Scale Effectiveness Monitoring Program	Effective-ness
Does the RMAP process correctly identify priority fixes (see Section 2.9)?	Roads Prescription (Site-Scale) Effectiveness Monitoring Program	
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).		
Have the correct performance targets for sediment delivery and connectivity been identified?	Roads Validation Program and Cumulative Sediment Effects.	Intensive
What levels of cumulative sediment inputs are harmful to the resource at the basin scale? (Validation of road sediment targets).		

FISH PASSAGE RULE GROUP

The intent (objective) of the fish passage rule is to install, upgrade and/or maintain stream crossings by 2016 that provide fish passage at all life stages.

Rule Summary

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 acting as fish barriers are to be prioritized as to amount of potential fish-bearing stream affected. 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.

Strategy and Rationale

Critical questions were developed through an analysis of the FFR rules during which the assumptions and uncertainties underlying the rule were identified. From these uncertainties, two critical questions were derived (Table 12). The fish passage rule is based on the following assumptions:

1. Achieving the objective of no fish barriers is critical for recovery of depressed stocks and the health of fish at all life stages.
2. Implementation of the rules will result in achieving the objective to maintain or provide passage for fish in all life stages and to provide for the passage of woody debris likely to be encountered.

3. Assessment, prioritization, and implementation of RMAPs will achieve the objectives in a timely manner.
4. Current stream crossing replacement standards are adequate to address fish and all life history stages.
5. Hydraulic code criteria are effective at achieving resource objectives.
6. Fish species and all life history stage distributions can be characterized statewide.
7. Performance targets can be developed for fish at all life history stages.
8. Stream simulation methods provide passage for fish (definition WAC 222-16-010) and all life history stages.

Table 12. Critical questions and programs for the Fish Passage Rule Group. All effectiveness and extensive tasks are administered by ISAG.

Fish Passage Rule Group Critical Questions	Program Name	Task Type
Are the corrective measures effective in restoring fish passage for fish at all life history stages?	Fish Passage Effectiveness Monitoring Program	Effective-ness
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

PESTICIDES RULE GROUP

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."

Rule Summary

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. A single critical question has been developed, with a corresponding effectiveness program (Table 13).

Table 13. Critical questions and programs for the Pesticides Rule Group.

Pesticides Rule Group Critical Questions	Program Name	Task Type
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	Effective-ness

WETLAND PROTECTION RULE GROUP

Wetland adaptive management goals are 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."

The intent of the 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. The main strategy is to use forest and fish rules and watershed analyses as the primary vehicle for implementing wetland BMPs.

Rule Summary

The forest practices rules classify wetlands into two categories. Type A wetlands include non-forested wetlands with an area greater than 0.5 acres or forested wetlands and non-forested bogs with an area greater than 0.25 acres. Type B wetlands included non-forest wetlands with an area greater than 0.25 acres. Landowners are required to inventory and map wetlands as part of their FPA for timber harvest or road construction. Wetland management zones (WMZ) are prescribed for all Type A and Type B wetlands greater than 0.5 acres. The WMZs have variable widths based on the wetland type and area. 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. Additional rules apply to road construction to assure that there is no net loss of wetland function. The preferred option is to prevent impacts by locating roads outside of wetlands, however where this is not possible, the guidelines seek to minimize and mitigate impacts.

Strategy and Rationale

The wetland rules are based on the following assumptions:

1. Implementation of the wetland prescriptions will result in achieving 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.
2. Assessment and planning in watershed analysis and implementation of forest practices rules will achieve the stated resource objectives.
3. Appropriately identified, standard BMPs are effective at achieving the resource objectives.
4. Forested wetlands will successfully regenerate following timber harvest.

Several uncertainties exist about the validity of these assumptions. The wetland functions listed in the rules are limited and significant uncertainty exists regarding their adequacy to meet the resource objectives of the FFR report. The degree to which current rules for wetland mitigation will achieve the "no net loss of wetland function" policy is unclear because no objective performance measures are available for determining the:

1. Range of wetland functions affected by road construction, harvest and harvest methods or
2. Net loss or gain of these functions over time.

These assumptions and uncertainties guided development of critical questions and research and monitoring programs to address them (Table 14).

Table 14. Critical questions and programs for the Wetlands Rule Group.

Wetlands Rule Group Critical Questions	Program Name	Task Type
Are forested wetlands regenerating sufficiently to maintain wetland functions?	Wetlands Revegetation Effectiveness Program	Effective-ness
Are road construction activities, harvest and harvest methods adequately mitigated to achieve no net-loss of wetland functions?	Wetland Mitigation Program	Effective-ness
Are current WMZs effective in providing adequate levels of LWD? Are current rule-defined wetland functions adequate to meet or exceed water quality standards, support the long-term viability of covered species, and support harvestable levels of salmonids? 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?	WMZ Effectiveness Monitoring Program	Effective-ness
How should wetlands be classified and mapped for management purposes?	Wetland Tools Program	Rule Tool

The approach of the wetlands rule strategy is to establish through a comprehensive literature review the current scientific basis for evaluating wetland functional relationships for salmonids, covered species and water quality and quantity. The literature review will be followed by development of tools to map wetland locations (GIS Layer) and describe wetland functions (Hydro-geomorphic HGM classification system). Specific effectiveness/validation studies will be developed to answer specific questions about the effects of rule implementation at the landscape and site scales. All effectiveness tasks are administered by WETSAG; rule tools are administered by DNR in collaboration with WETSAG.

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 FFR agreement is focused on water quality, fish, and SAAs, both the Policy Committee 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 FFR priorities, the only funding available for additional wildlife projects is from the State general fund.

Rule Summary

Forest practice rules directed at wildlife conservation take two approaches: 1) general statewide requirements, and 2) species-specific strategies. In addition, FFR rules may benefit wildlife through the retention or enhancement of habitat, such as riparian buffers, upland management areas, landslide hazard zonation, 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*).

A species-specific approach that avoids direct rule making has been endorsed by the Forest Practices Board. This approach is 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.

Strategy and Rationale

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 those associated with FFR were delayed until the FFR 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 15). This rule group is administered by the Landscape and Wildlife Advisory Group (LWAG).

Table 15. Wildlife issues (in order of priority) and critical questions.

Wildlife Rule Group Critical Questions	Program Name	Task Type
What are the values of snags retained in upland management units and RMZs? Is there a threshold response by wildlife to snag density? What are the fates of wildlife reserve trees (WRT) and green recruitment trees (GRT) in managed forests? What are the most-effective ways of retaining and replacing snags?	Effectiveness of snags for wildlife	Effectiveness Validation
What are the effects of variation in stand establishment practices, herbicides, thinning, fertilization, and rotation lengths on vegetation and wildlife? Does the concept of the steady-state shifting mosaic apply and how does that process effect wildlife?	Conifer management effects on wildlife	Validation Effectiveness
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? What are the functions of large legacy trees (snags, down wood, high stumps) as compared to the smaller complements produced in intensively managed forests? What are the roles and fates of special sites (e.g., rock outcrops, cliffs, talus slopes, isolated small wetlands, etc.) in managed forests?	Legacy features and their effect on wildlife	Effectiveness Validation
What are the movement patterns, processes, and distances of amphibians in managed forests? Do amphibians persist in refugia following timber harvest or is subsequent occupancy related to movements from other areas? How quickly do amphibians re-colonize areas, particularly habitat outside the stream network? 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?	Amphibian movement and distribution effectiveness monitoring	Effectiveness
What is the status and trends of bats in managed forests?	Forest Bats	Extensive
What is the role of WRTs and GRTs in bat ecology? What are the relationships between forest management and bat foraging and roosting?	Forest Bats	Effectiveness
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	Effectiveness
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? What are the appropriate management approaches to maintaining and restoring oak woodlands at stand and landscape levels?	Oak woodland Habitat	Effectiveness

6.0 PROGRAM DESCRIPTIONS

This section describes the purpose and research strategy for each CMER program. The program descriptions are organized by task category, beginning with effectiveness monitoring programs, followed by extensive monitoring programs, rule tool programs and the intensive monitoring program. The program description includes the identification of specific projects that will be implemented to address critical questions. Low priority projects (see Section 4), may or may not be fully scoped and developed at this time. Eventually, over time, all projects and the rationale for conducting them will be included in the program descriptions.

EFFECTIVENESS MONITORING PROGRAMS

Type N Buffer Characteristics, Integrity and Function Program

Purpose

The purpose of this program is to evaluate the FFR Type N riparian management prescriptions, including the response of riparian vegetation, growth and mortality of buffer trees, the level of riparian functions provided, the biotic and water quality responses to the 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.

Strategy

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, the 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 will answer critical questions about the effectiveness of both the FFR Type N riparian prescriptions and alternative riparian management prescriptions (Table 16) through a series of projects that include both effectiveness monitoring and validation studies. The effectiveness monitoring projects will utilize two complementary approaches to inform CMER on the Type N riparian prescriptions. The Type N Buffer Characteristics, Integrity and Function project uses a passive approach that randomly samples Type N forest practice application to evaluate the performance of Type N prescriptions as they are applied operationally over the range of conditions occurring in the FFR landscape. The Type N experimental Buffer Treatment study utilizes a manipulative experimental design to compare the effectiveness of a range of potential Type N prescriptions relative to untreated control sites. This study will focus on quantifying resource responses to different buffer strategies that require intensive sampling and a controlled experimental design (e.g. amphibian response, litterfall, temperature and downstream nutrient export and fish response) in competent lithologies in western Washington. The DNR Type 5 experimental buffer treatment project uses a similar manipulative experimental approach to study headwater basins which are typically smaller in size than those in the Type N

experimental Buffer Treatment Study. The role of the Type N Water Quality/Downstream Effects Project is to focus on the downstream resource effects of Type N streams that do not typically support amphibian populations, including eastern Washington and those portions of western Washington with incompetent lithologies.

Implementation of these three projects will provide a substantial amount of useful information for adaptive management in Type N riparian prescriptions, including an assessment of the variability in the performance of the FFR Type N prescriptions across the FFR landscape, and intensive comparison of instream and downstream aquatic resource response to varying Type N buffering strategies. Once these projects are underway, it is envisioned that the Type N performance target validation project will be designed to test and refine FFR performance targets for Type N riparian prescriptions. Data on the response of buffers, the level of riparian functions provided and aquatic resource response gained from the three buffer effectiveness projects will be used to define the approach taken by this project. Finally, the Type N classification project is currently a concept that remains to be scoped and developed.

Table 16. Type N Buffer Characteristics, Integrity and Function Program.

Critical Questions	Project
How do the survival and growth rates of riparian leave trees change following the FFR partial cut and patch cut Type Np buffer treatments?	Type N FFR Buffer Integrity, Characteristics and Function Project
Are riparian processes and functions provided by Type N buffers maintained at levels that meet FFR resource objectives and performance targets for shade, stream temperature, LWD recruitment, litter fall and amphibians?	Type N Buffer Integrity, Characteristics and Function Project Type N Experimental Buffer Treatments Project
How do different buffering strategies compare with the FFR Type N prescriptions in meeting resource objectives?	Type N Experimental Buffer Treatments Project
How do the Type N riparian prescriptions affect downstream water quality and fish populations?	Type N Experimental Buffer Treatments Project Type N Water Quality/Downstream Effects Project
Are the Type N performance targets valid and meaningful measures of success in meeting resource objectives for Type N streams?	Type N Performance Target Validation Project
Do different types of Type N channels explain the variability in the response of Type N channels to forest practices?	Type N Classification Project

Project Descriptions

Type N Buffer Integrity, Characteristics and Function Project (Table 4, line 3)

The Type-N FFR buffer integrity, characteristics, and function project will evaluate the effectiveness of the FFR 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. The study design calls for selecting a random sample Type N forest practices and pairing the "treatment" sites with un-harvested control sites to provide an unbiased estimate of variability for the performance of the buffers relative to the

Type N performance targets. The design for this project has been approved and funded by CMER. A pilot effort is underway. Initial post-harvest sampling at a 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. Preliminary data analysis is underway. RSAG intends to bring recommendations to CMER based on the pilot study in the fall 2005. This project is ranked as Urgent.

Type N Experimental Buffer Treatment Project in Selected Lithologies in Western Washington (Table 4, lines 4 and 5)

As currently envisioned, this study is designed to compare the effect of three different Type N buffer treatments with an untreated control. The study design involves establishing several blocks, consisting of adjacent type N basins where the various treatments and control are applied. 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 will be collected and compared to document change. Downstream effects on water quality and fish populations will be assessed. In order to include amphibians, the study sites are confined to basins with basaltic geology in the southwestern part of the state. A draft study plan for this project has been reviewed by SRC and is being finalized under the supervision of LWAG and RSAG with assistance from BTSAG and UPSAG. In addition, an effort is currently underway to determine the feasibility of finding blocks of study sites meeting the site selection criteria. CMER ranked this project is as Second. The FFR Policy Committee has not made a decision on whether to begin project implementation in FY 2006 at the time this document was finalized (July 13, 2005).

DNR Type 5 Experimental Buffer Treatment Project (not included in Table 4)

This is a cooperative project with DNR and USFS that compares the 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. This is a manipulative study with a BACI design. Each block of paired sites consists of three riparian treatments and an unharvested control site. This experimental design provides the high level of control needed to distinguish differences in response to variations in buffer treatments. This information will help assess the response of headwater streams to different riparian management strategies. Baseline data collection is completer, and post-harvest data collection is underway. CMER provided funding to assist with baseline data collection in the summer of 2003. No additional CMER funding is anticipated.

Type N Water Quality/Downstream Effects Project (Table 4, line 6)

The Type N Water Quality/Downstream Effects Project has been neither scoped nor designed. The intent of this project is to evaluate the resource effects of the Type N riparian prescriptions in areas excluded from the design of the Type N Experimental Buffer Treatment project, (i.e. eastern Washington and portions of western Washington with non-competent geologies). The study will focus on the changes in water quality, exports of nutrients and sediment, and response of downstream fish populations. This project is ranked as Delay.

Type N Performance Target Validation Project (Table 4, line 7)

The Type N Performance Target Validation Project has been neither scoped nor designed. It will probably consist of one or more studies designed to validate the relationships between Type N

performance targets and aquatic resource response. This comparison will ensure that the performance targets provide a meaningful indication that FFR resource objectives are being achieved. This project is ranked as Delay.

Type N Classification Project (Table 4, line 8)

The Type N Classification Project has been neither scoped nor designed. It will explore potential methods of classifying Type N streams to provide a context for interpreting channel response to management practices. The project will identify important physical processes that affect the results of the above projects, the findings of the N Amphibian Response programs and contribute to the integration of Type N functions and processes. This project is ranked as Delay.

Type N Amphibian Response Program

Purpose

The purpose of this program is to addresses critical questions concerning the response of SAAs to forest practices, particularly the Type N riparian prescriptions. Many uncertainties exist regarding 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 17).

Strategy

The restricted distribution of SAAs and the lack of information about them required the development of an amphibian response strategy that differs from that of many other rule groups. This program began with the 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 answer species-specific L-1 questions were undertaken (i.e., Dunn's and Van Dyke's salamanders). Following the 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 SAA 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 FFR 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 described in Section 3.1.1).

Table 17. Type N Amphibian Response Program.

Critical Questions	Project

Is SAA population viability maintained by the Type N prescriptions?
 	
   Do SAAs continue to occupy and reproduce in the patch buffers?
 	
   Do SAAs continue to occupy and reproduce in the ELZ only reaches?
	SAA Detection/ Relative Abundance Methodology Project

If SAAs do not continue to occupy the ELZ only reaches, do they re-occupy those reaches before the next harvest?
 	
   How does SAA habitat respond to the sensitive site buffers?
 	
   How does SAA habitat respond to variation in inputs, e.g. sediment, litter fall, wood?
 	
   How do SAA populations respond to the Type N prescriptions over time?
	Type N Experimental Buffer Treatment

What are the common findings and inconsistencies in published studies on the effects of timber harvest on tailed frogs? What can be learned from a meta-analysis of published data and unpublished data on tailed frogs in managed forests? design and implement mass wasting effectiveness monitoring and validation programs to assess the effectiveness of landform recognition and mitigation at various scales Are published generalizations on the relationship between parent geology and tailed frog abundance correct and consistent?	Tailed Frog Literature Review & Meta-analysis Project Tailed Frog and Parent Geology Project
What are the common findings and inconsistencies in published studies on the habitat associations of Dunn's & Van Dyke's Salamanders?	Dunn's & Van Dyke's Salamander Project
What are the effects of various levels of shade retention on the stream-breeding SAAs? Is there an optimum level of shade retention? Does territoriality in high quality habitat confound interpretation of SAA relative abundance estimates?	Buffer Integrity-Shade Effectiveness Project
What are the effects of 3 buffer treatments on SAAs, 2 years post-harvest?	Amphibian Recovery Project

Project Descriptions

SAA Detection/Relative Abundance Methodology Project (Table 4, line 14)

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. Two project reports have been completed, two peer-reviewed manuscripts are near completion and two additional peer-review manuscripts are planned. Fieldwork for this project will be completed in fiscal FY 2006. The remaining planned

peer-reviewed products await the completion of the genetic species identification (scheduled for FY 2006). The project should be completed in FY 2007.

Tailed Frog Literature Review & Meta-analysis Project (Table 4, line 15)

Of the 6 FFR SAAs, the tailed frog may be the most extensively studied due to an inclusive distribution in the coastal Pacific Northwest. There are enough published studies on this species that a synthesis of those results is useful in helping LWAG develop a research and monitoring program. In addition, the published data sets, as well as several that are not published, will be the subject of a meta-analysis. That analysis may or may not support the literature review synthesis 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. A draft literature review was completed in 2003. The partitioning of the two species of tailed frog required the review to be restructured along species lines. The restructured review is planned for completion in 2006. The meta-analysis is underway and planned for completion in 2006. LWAG administers this project.

Tailed Frog and Parent Geology Project (Table 4, line 17)

Recent studies in managed forests have emphasized the relationship between parent geology, stream substrate composition, and tailed frog abundance. The general hypothesis has emerged that tailed frogs are most abundant in streams on geologies the produce hard or competent rock (volcanic basalt) vs. those that do not (marine sandstones). However, a study in Olympic National Park found that tailed frogs were abundant on both marine and volcanic parent material. However, these studies were largely observational and the distinction between geologies was an extrapolated finding of the results. This project will test the parent geology hypothesis throughout Washington. This project is currently being scoped and the design of the study is currently under development. This is a new project proposed to begin in 2007. LWAG administers this project. This project is ranked as Second.

Dunn's & Van Dyke's Salamander Project (Table 4, line 16)

The FFR 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 in the FFR was done external to CMER in 2000. The initial field phase of this project, done in cooperation with the Forest Service in 2001, was a study designed to provide additional information on the role of LWD in these species habitats. The initial field phase collected data across to few sites to complete and effective analysis, so a second phased of field data were collected in 2003. Analysis of data from both phases is being completed and an initial peer-reviewed submittal ready product will be available in 2006.

Buffer Integrity-Shade Effectiveness Project (Table 4, line 18)

The effects of blow down on SAAs in Type N patch buffers are largely unknown. However, blow down is unpredictable in time and space, precluding a passive monitoring approach. One of the primary effects of blow down is a reduction in shade. 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 Fibre Company and Washington Department of Fish and Wildlife. Longview Fibre completed a pilot study in 2003, and initiated a broader study in 2004. The latitudinal breadth of this study was increased with a CMER-approved segment to include sites on the Olympic Peninsula. Site selection for this added

segment has been completed and sampling will begin in 2006. As sampling is projected for two-years pre- and two years post-treatment, this project will extend to fiscal 2010. This project is ranked as Second.

<u>Amphibian Recovery Project (Table 4, line 19)</u>

In 1998, the National Council for Air and Stream Improvement (NCASI) funded a study by Dr. Rhett Jackson on the effects of 3 buffer treatments on headwater streams in the Willapa Hills and Olympic Peninsula. Many of the FFR SAAs occurred on these sites. The NCASI funding covered a year of pre-treatment data and immediate post-harvest sampling. This project collected additional data, 2 years post-harvest. This project was completed in 2003.

<u>Amphibians in Intermittent Streams Project (Table 4, line 20)</u>

This is a small project that seeks to provide a preliminary understanding of amphibian use of the intermittent segments that often occur at or near the origins of headwater streams. This project will provide information that will directly inform the placement of the required 50 ft buffer on headwater springs, which is part of current rule. This project has been scoped, the critical questions have been developed and defined, and a fully developed study proposal that has been approved by LWAG exists. Completion of this project requires no new data; analysis will be developed from existing data. This project was awaiting completion of the CMER work plan to be advanced to CMER. The project is ranked second. LWAG would administer this project.

Type F Statewide Prescription Monitoring Program

Purpose

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

1. The survival of buffer trees and rates of buffer tree mortality from wind-throw, 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. Post-harvest changes in conifer-dominated eastside RMZs, and whether eastside riparian stands will remain within desired ranges and
4. Uncertainty about the level of riparian functions provided by riparian stands produced by FFR Type F prescriptions, and whether or not FFR resource objectives and performance targets will be achieved.
5. The efficacy of alternative buffer designs in providing riparian functions and meeting resource objectives and performance targets.
6. The validity of various performance targets.

Strategy

Implementation of the Type F statewide prescription-monitoring program was identified as a priority by CMER in the January 2003 program ranking process. The program is designed to answer a series of critical questions that will reduce scientific uncertainty concerning the effectiveness of the Type F prescriptions and the response of riparian stands, functions and

aquatic resources to riparian management practices. Table 18 lists the critical questions and the projects that address them. This program is ranked fifth among the 16 CMER programs.

Table 18. Type F Statewide Prescription Monitoring Program critical questions and projects.

Critical Questions	Project
How do the survival and growth rates of riparian leave trees change following the FFR Type F buffer treatments?	Type F Riparian Prescription Monitoring Projects (Eastside and Westside)
Do stands in Type F RMZs remain on trajectory to DFC (west side) or within desired ranges (east side)?	
Do riparian functions meet FFR resource objectives and performance targets for shade, stream temperature, LWD recruitment, and litter fall following application of the riparian Type F prescriptions?	
Would alternative approaches to the FFR Type F prescriptions be more effective in meeting FFR resource objectives and performance targets, while reducing costs or increasing flexibility for landowners?	Type F Experimental Buffer Treatment Project
Are the Type F performance targets valid and meaningful measures of success in meeting resource objectives?	Type F Performance Target Validation Project

The program is being implemented in stages. The Type F riparian prescription monitoring projects will be the first to be implemented, because the greatest uncertainties concern the effectiveness of the current FFR Type F prescriptions. The original study design for Type F riparian prescription called for a passive design that involved random sampling of Type F Forest Practice Applications to determine the effectiveness of the prescriptions as they are applied operationally across the range of conditions on FFR lands with untreated control sites. The proposal was to sample the east and west sides as separate strata. 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 sites and study design for additional eastside riparian prescription monitoring 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. Westside Type F riparian prescription effectiveness monitoring will be implemented as in the original study design. Depending on the results of these projects, experiment buffer treatment projects may be implemented to test the effectiveness of alternative buffer designs. Finally, the response of aquatic organisms and resources to different levels of riparian inputs and functions needs to be examined to determine if the Type F performance targets are valid and meaningful measures (Type F Performance Target Validation Project).

Project Descriptions

Type F Riparian Prescription Monitoring Project- westside (Table 4, line 25)

In January of 2003, CMER approved the N/F Riparian Prescription Monitoring study design, which included a study design for monitoring the effectiveness of the Type F riparian prescriptions. RSAG is planning to begin implementing the westside Type F prescription effectiveness component in FY 2007. This project is ranked as Second.

Type F Riparian Prescription Monitoring Project- eastside (Table 4, line 26)

RSAG, in conjunction with BTSAG and SAGE, is currently developing a proposal to conduct eastside Type F effectiveness monitoring at the paired treatment-control sites used for the Bull Trout Overlay temperature study. This project involves collecting additional information on buffer tree integrity/survival and changes in stand conditions and LWD recruitment to augment the BTO project data on temperature and canopy closure. Work is currently underway on a study design for this project. This project is ranked as Delay.

Type F Experimental Buffer Treatment Project (Table 4, line 27)

The Experimental Type F Buffer Treatment Project has been neither scoped nor designed. This project design, particularly the identification of appropriate alternative prescriptions for testing, will be based on the results of the Type F riparian prescription-monitoring project. This project is ranked as Delay.

Type F Performance Target Validation Project (Table 4, line 28)

This project has been neither scoped nor designed. This project is ranked as Delay.

Hardwood Conversion Program

Purpose

The purpose of this program is to inform the FFR strategy for addressing hardwood riparian stands that 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. These hardwood stands probably will not achieve DFC without active intervention. Large uncertainties are associated with the identification of sites where conversion is an appropriate management strategy, the cost and effectiveness of different silvicultural techniques, and the trade-offs between short-term effects and long-term benefits.

Strategy

Table 19 presents the critical questions and projects of the Hardwood Conversion Program. The program began by implementing an initial project (the Hardwood Conversion Project) to provide information for FFR policy committee on the effectiveness of hardwood conversion treatments, the economic costs and benefits of hardwood conversion, and potential resource effects through a series of case studies.

In the spring of 2005, a second project was initiated in response to a request from a FFR policy committee working on a small landowner hardwood conversion template. 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. This program is ranked tenth among the 16 CMER programs.

Table 19. Hardwood Conversion Program critical questions and projects.

Critical Questions	Project
How effective are different hardwood conversion treatments in re-establishing conifers in hardwood-dominated riparian stands?	Hardwood Conversion Project
Is hardwood conversion in riparian stands operationally feasible and what are the economic costs and benefits of the hardwood conversion treatments?	
What effects do hardwood conversion treatments in riparian stands have on shade, stream temperature and LWD recruitment?	
What is the effect of hardwood conversion practices on stream temperature as a function of buffer width and length of stream treated?	WDOE Water Temperature Modeling Project

Project Descriptions

Hardwood Conversion Project (Table 4, line 48)

The Hardwood Conversion Project is a series of case studies. They consist of landowner designed and implemented site-specific harvests of hardwood trees in riparian buffers. In each case, harvest is followed by replanting of conifers. Pre-harvest vegetation and temperature monitoring is completed and post-harvest monitoring will be implemented as the units are harvested. The economic component of the study is currently being designed. This project is ranked as Finish.

WDOE Temperature Modeling Project (Table 4, line 49)

This study will use existing stream temperature models to explore the relative effect on stream temperature of different hardwood conversion strategies. The management strategy to be evaluated is a one-sided harvest with a continuous 30 ft buffer with treated stream lengths ranging from 500-1500 feet. A sensitivity analysis will be performed on a range of stream conditions (width, flow, gradient, groundwater, and hyporheic flow). Study design is currently underway and the project is schedule to be completed by December 2005. This project is ranked as Finish.

In addition to these two projects, RSAG is contemplating other projects to address specific aspects of hardwood conversion, such as studies to determine how to identify sites where hardwood conversion is an appropriate management strategy, and to assess the distribution and characteristics of hardwood-dominated riparian stands on FFR lands.

Bull Trout Overlay Temperature Program

Purpose

This program addresses the effectiveness of Eastside FFR rules in meeting shade and temperature requirements for bull trout habitat.

Strategy

The Bull Trout Temperature Overlay (BTO) Program consists of three projects that address the critical questions in Table 20. The projects are designed to compliment and build upon each other by first determining the effectiveness of both eastside riparian prescriptions ("all available shade" [BTO]; and standard shade rules) on shade, solar energy, and stream temperature. Conceptual models are also being developed to determine potential forest practices effects on groundwater and stream temperature. This program is ranked seventh among the 16 CMER programs.

Table 20. BTO Temperature Program.

Critical Questions	Projects
Are both the standard eastside shade rules and the "all available shade" rule effective in protecting shade and stream temperature and in meeting the 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?	BTO Temperature (Eastside Riparian Shade/Temperature Effectiveness) Project
Is "all available shade" actually achieved with the densiometer methodology under the BTO shade rule?	Solar Radiation/Effective Shade Project
Does timber harvest affect the temperature of groundwater entering streams?	Groundwater Conceptual Model Project

Project Descriptions

BTO Temperature (Eastside Riparian Shade/Temp. Effectiveness) Project (Table 4, line 35)

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 FFR 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 FFR shade requirements. This field study is administered by BTSAG and is currently in the site-selection and pre-harvest data collection stages. It is combined with the Solar Radiation /Effective Shade Project. This project is ranked as Urgent.

Solar Radiation/Effective Shade Project (Table 4, line 36)

The Solar Radiation/Effective Shade Project is designed to evaluate whether "all available shade" is actually achieved under the BTO shade rule. This study, which is being done in conjunction with the BTO Temperature (Eastside Riparian Shade/Temperature Effectiveness Study), is in the site selection and pre-harvest data collection stages. This project is ranked as Finish.

Groundwater Conceptual Model Project (Table 4, line 37)

The on-going Groundwater Conceptual Model Project is designed to investigate the potential impacts of timber harvest on groundwater temperatures, which subsequently can discharge to streams and thereby affect the temperature regime of fish habitat. A literature review is completed and a conceptual model is being developed to identify areas that are highly susceptible to groundwater heating after timber harvest. This project is ranked as Delay.

Groundwater Research Studies (Table 4, line 38)

These projects have been neither scoped nor designed. This project is ranked as Delay.

CMZ Effectiveness Monitoring Program

Purpose

The purpose of the channel migration zone (CMZ) effectiveness monitoring program is to determine the degree to which CMZs protect riparian management zones from migrating channels and protect migration zone functions.

Strategy

The CMZ effectiveness monitoring program is ranked fifteenth among the 16 CMER programs. It addresses two critical questions:

1. Does the CMZ rule meet FFR resource and functional objectives by:
    a. Protecting trees subject to recruitment as a result of channel migration?
    b. Protecting off-channel aquatic resources?
    c. Providing adequate LWD and shade to the channel?
    d. Maintaining natural rate of sediment input from banks?

2. Are riparian processes and functions being maintained in alternate plans for CMZ protection?
    a. What are the riparian processes and functions provided by the CMZ that must be maintained in alternate plans?
    b. Do riparian functions and processes vary regionally?
    c. What short- and long-term changes in riparian processes should be considered acceptable in the development/approval of alternate plans?

Effectiveness monitoring of CMZ functions (first question) has a low uncertainty because the rule provides full protection of the CMZ. The uncertainty is greater for the effectiveness of alternate plans in maintaining CMZ riparian functions (second question). The effectiveness-monitoring program addresses these uncertainties through three projects.

Project Descriptions

CMZ Function Assessment Project (Table 4, line 56)

A literature review of off-channel and riparian functions and physical processes provided by CMZs. This project is ranked Delay. The project has been neither scoped nor designed.

CMZ Integrity Monitoring Project (Table 4, line 57)

This project is a retrospective study of existing CMZs to assess their integrity and the degree to which the CMZ and RMZ have been impacted by lateral migration. This project is ranked Delay. The project has been neither scoped nor designed.

Alternate Plan Assessment Project (Table 4, line 58)

Monitoring CMZs with alternate plans to assess the degree to which off-channel and riparian functions have been preserved. This project is ranked Delay. The project has been neither scoped nor designed.

Mass Wasting Effectiveness Monitoring Program

Purpose

The purpose of this program is to assess the degree to which implementation of the FFR rules is preventing or avoiding an increase landsliding beyond natural background levels. The rules assume that:
1. The administrative process of identifying, reviewing, and regulating forest practices on potentially unstable slopes will prevent exceeding a naturally occurring rate of mass wasting due to 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.
3. Implementation of the unstable slopes prescriptions will meet FFR landscape-scale targets (there are no site-scale targets).

Strategy

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 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 monitoring). This program is ranked sixth among the 16 CMER programs.

Landscape-scale monitoring will 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. Site-scale or prescription level monitoring will use a sample of recent landslides on forestlands or prescriptions to determine if and how management actions were responsible for triggering the landslide. This will include landslides associated with roads, harvest, and/or leave areas (e.g., windthrow-triggered). UPSAG will coordinate the two scales of monitoring by conducting prescription -scale evaluations within watersheds evaluated in the landscape-scale monitoring. This will allow for interpretation of results across multiple scales; i.e., how does the effectiveness (or ineffectiveness) of specific prescriptions contribute to the total effect of landslides at the landscape scale? There are currently two competing and/or complimentary monitoring designs for extensive monitoring for mass wasting under consideration by UPSAG. Evaluation of these designs from current and planned pilot projects is expected to be completed by the end of 2004. Table 21 (below) lists critical questions identified for mass wasting effectiveness monitoring and the associated projects.

Project Descriptions

Effectiveness of Unstable Landform Identification Project (Table 4, line 30)

Considerable variability and bias exists between investigators when determining hazard areas associated with unstable (e.g., high-risk) landforms. The extent of this variability and/or bias, and the degree of influence it has on 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?

Table 21. Mass Wasting Effectiveness Monitoring Program.

Critical Questions	Project
Are unstable landforms being accurately and consistently identified in the field?	Effectiveness of Unstable Landform Identification Project
Are forest practices preventing or avoiding an increase in landsliding beyond natural rates of mass wasting?	Mass Wasting Landscape-Scale Effectiveness Monitoring Project
What field protocols will be used for assessing the causal mechanism of landslides at the site scale? Are unstable slope rule strategies failing to prevent landslides, and if so, how?	Mass Wasting Prescription-scale Effectiveness Monitoring Project
Does wind-throw on mass-wasting buffers (leave areas) increase mass wasting?	Mass Wasting Buffer Integrity and Wind-throw Assessment Project

This study will provide recommended improvements to reduce variability related to proper hazard identification and assessment. This project is ranked as Urgent.

Mass Wasting Landscape-Scale Effectiveness Monitoring Project (Table 4, line 33)

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 FFR-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 will consist of an inventory of landslides using aerial photography, terrain, topographic, forest cover, and road network maps. The current status will be assessed using existing data, monitoring for trends will require collection of additional data over time for each site. This project is ranked Delay.

Mass Wasting Prescription-Scale Effectiveness Monitoring Project (Table 4, line 31)

This project will be designed to conduct prescription-scale monitoring of landslides in FFR-compliant units to determine the degree to which management actions were responsible for triggering the landslide. This study will include landslides associated with roads, harvest, and leave areas, to determine the effectiveness of the current management strategies (typically avoidance) on preventing landslides. This project will help validate the effectiveness-monitoring project (and vice versa). This project is ranked as Urgent.

Mass Wasting Buffer Integrity and Windthrow Assessment Project (Table 4, line 32)

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. This project is ranked as Delay.

Roads Sub-basin Scale Effectiveness Monitoring Program

Purpose

The purpose of the roads sub-basin scale effectiveness-monitoring program is to determine the degree to which road prescriptions are effective at meeting performance targets for sediment and water established at the sub-basin scale.

Strategy

The roads program assumes that performance targets are correct, which allows the testing of effectiveness against those targets. 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. FFR established performance targets at the sub-basin scale. At the sub-basin scale, road monitoring assesses the effectiveness of the rules at meeting the FFR performance targets for sediment and hydrologic connectivity across ownerships and regions of the state. Because the rules provide a 15-year implementation 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. 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 22. 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.

Table 22. Road Sub-basin Scale Effectiveness Monitoring Program.

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

Project Descriptions

Road Surface Erosion Model Update Project (Table 4, line 22)

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 is 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 includes 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. This project was completed in 2003 and produced the Washington State road surface erosion model (WARSEM).

Road Sub-Basin-Scale Effectiveness Monitoring Project (Table 4, line 65)

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 will also characterize 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 and 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 FFR rules, independent of ownership will be monitored. Data will be 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 is expected to extend to through 15-year road rule implementation period, this piece will be put in place before model validation and performance target validation. The first sampling event is underway with completion anticipated in 2007.

Road Surface Erosion Model Validation/Refinement Project (Table 4, line 23)

WARSEM is based on a range of empirically derived data available in 2003. This project will provide an opportunity to add to and update the model relationships from additional data when a significant amount becomes available. This project is ranked as Delay and scoping and design are not anticipated before 2010.

Roads Site-Scale Effectiveness Monitoring Program

Site-scale effectiveness monitoring provides more immediate insights into the effectiveness of road prescriptions than does sub-basin-scale monitoring program. Because the FFR prescriptions are tied to implementation of RMAPs, monitoring must also occur within this context. The site-scale subprogram requires the development of site-specific road performance measures (based on prescription objectives), the testing of site-level effectiveness using RMAP 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.

Purpose

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

Strategy

As described in Table 23, an important issue related to road effectiveness monitoring is the degree to which maintenance activities targeted in the RMAPs 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 production or delivery or disconnecting roads from surface water. These two issues are best approached by concurrent projects. This program is ranked ninth among the 16 CMER programs.

We anticipate that the results of these studies will inform the FFR adaptive management process about the effectiveness of RMAP rules in achieving the FFR goals. Should RMAPs prove to be ineffective, Policy may have to revisit the rule to refine its requirements and application.

Table 23. Road Site-scale Prescription Effectiveness Monitoring Program.

Critical Program Questions	Projects
Are RMAP scheduled activities identified and prioritized appropriately?	Effectiveness of Identifying RMAP Priority Fixes Project
Are road prescriptions effective at meeting site-scale performance targets for sediment and water?	Road Site-Scale Effectiveness Monitoring Project

Project Descriptions

Effectiveness of Identifying RMAP Priority Fixes Project (Table 4, line 45)

The primary purpose of this project is to evaluate the degree to which RMAP priorities have been appropriately identified and scheduled. The project will audit a random sample of RMAPs state wide, and audit results will be used to inform the rules and guidelines related to RMAP scheduling. The development of the study design will begin once sub-basin scale monitoring begins. This project is ranked as Second.

Road Site-Scale Effectiveness Monitoring Project (Table 4, line 46)

The objectives of monitoring of forest roads at the prescription scale are to: (1) evaluate the effectiveness of road prescriptions in meeting site-scale sediment performance targets, and (2) identify sensitive situations where prescriptions are not effective. Site-scale effectiveness monitoring utilizes the information and landowner intentions presented in the RMAP, both individual and collectively. Treatments that do not meet site-specific performance targets will be analyzed using site data to determine the cause, the need for further evaluation, and a more appropriate alternative treatment. These sites may be candidates for BMP investigations, testing or refinement assuming no compliance or installation problems. Results from site-scale monitoring are anticipated within the short time frame of 2-4 years. UPSAG anticipates conducting this project in parallel with the sub-basin scale road-monitoring project.   This project is ranked as Second. A draft monitoring plan is in progress.

Fish Passage Effectiveness Monitoring Program

Purpose

The focus and development of the Fish Passage Effectiveness Monitoring Program is pending Policy direction. In general, the program is intended to address 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 (Table 24).

Table 24. Fish Passage Effectiveness Monitoring Program.

Critical Questions	Project
Are the corrective measures effective in restoring fish passage for fish at all life history stages?	Fish Passage Effectiveness Monitoring Project

Strategy

ISAG has developed and sent questions to Policy to better focus the intent of FFR regarding fish passage monitoring. This program is ranked twelfth among the 16 CMER programs.

Project Description

Fish Passage Effectiveness Monitoring Project (Table 4, line 51)

This project has been neither scoped nor designed. This project is ranked as Second.

Forest Chemicals Program

Purpose

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. Alterative strategies with lower costs will also be considered.

Strategy

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

Forested Wetlands Re-vegetation Effectiveness Program

Purpose

This program addresses uncertainty concerning the re-vegetation of forested wetlands following timber harvest.

Strategy

This program consists of four projects (Table 25). Schedule L-1 of the FFR states a key performance target for wetlands is "no net loss in the hydrologic functions of wetlands". Schedule L-2 H.9 directs the testing of the performance target from L-1 through research to "assess the hydrologic functions of forested wetlands, the effects of harvesting on stream flows and the effectiveness of prescriptions in meeting wetland targets." 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. 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 reforestation in forested wetlands was recently completed and the report is being finalized. A full scale study will not be conducted at this time based on the results of the pilot. Future studies of wetland and stream temperature interactions and hydrologic connectivity will further explore wetland functions and impacts associated with timber harvest. This program is ranked eighth among the 16 CMER programs.

Table 25. Forested Wetlands Re-vegetation Effectiveness Program

Critical Questions	Project
What is currently known about regeneration in forested wetlands in the Pacific Northwest? What are the information gaps? What is currently known about affects of timber harvest on forested wetland functions?	Forested Wetlands Literature Review & Workshop project
What are the current methods of evaluating regeneration in forested wetlands? How successfully are they being implemented? What results are landowners experiencing? What kind of guidance can be given to landowners to best ensure regeneration of forested wetlands? How does the stand compare in composition post harvest to pre-harvest conditions? How are forested wetland functions affected by timber harvest?	Statewide Forested Wetland Regeneration Pilot & Project
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

Project Descriptions

Forested Wetlands Literature Review and Workshop Project (Table 4, line 40)

This project is nearly completed. It has undergone CMER and SRC review. The comments received are now being reviewed and edited by WSAG. The project is scheduled to be completed by July 2005.

Statewide Forested Wetland Regeneration Pilot and Project (Table 4, line 41)

The pilot project is being finalized. The report has been reviewed by CMER. The comment response plan is currently being drafted and the report will revised. The report will be completed by May 2005. Based on the pilot study, it was concluded that the full scale project will not be pursued at this time. The study objective to determine whether forested wetlands regenerate was not answered by the pilot. However, there currently is a lack of data infrastructure that prevents a full scale study being conducted. This project is ranked as Delay.

Wetland/Stream Water Temperature Interactions Project (Table 4, line 42)

This project has been neither scoped nor designed. This project is not scheduled to begin until 2008. This project is ranked as Delay.

<u>Wetland Hydrologic Connectivity Project (Table 4, line 43)</u>

This project has been neither scoped nor designed. This project is not scheduled to begin until 2007. This project is ranked as Delay.

Wetland Mitigation Program

Purpose

Current forest practice rules require mitigation for filling of wetlands and replacement of lost wetland functions. Currently no information on the effectiveness of, or compliance with, these mitigation requirements is available.

Strategy

To address the performance target of "no net loss of hydrologic functions of wetlands", Schedule L-2 H.8 sets a goal to determine "wetland size and function requiring mitigation sequencing to achieve targets". This program will evaluate several critical questions (Table 26), including whether wetland mitigation projects are being conducted as required by the forest practices rules, and where conducted, if they are successful in achieving their stated goals and objectives and replacing lost wetland functions caused by wetland filling. This information can then be used to recommend any needed changes to the current process of wetland mitigation. This program is ranked eleventh among the 16 CMER programs.

Table 26. Wetlands Mitigation Program

Critical Questions	Project
Is wetland mitigation being performed when required by the forest practice rules?	
Are wetland mitigation projects achieving their stated goals and objectives?	Wetland Mitigation Effectiveness Project
Are wetland mitigation projects replacing lost wetland functions?	
What functions are not being replaced?	

Project Description

<u>Wetland Mitigation Effectiveness Project (Table 4, line 50)</u>

It became evident during the early scoping phase of this project that sample sites and background information were going to be difficult to obtain. Before this study begins, a more accurate and comprehensive GIS layer of wetland locations will be created to facilitate site identification, location and delineation. Additionally, a database of situations where mitigation was required on forested lands should be developed. The mitigation effectiveness project will begin scoping by June 2007. This project is ranked as Delay.

Wetland Management Zone Effectiveness Monitoring Program

Purpose

This program will be designed to assess the effectiveness of Wetland Management Zones in meeting FFR resource objectives and performance targets. The wetland management zone rules are based on a number of assumptions, including:
1. Meeting the wetland performance targets will achieve the functional objectives.
2. Certain BMPs work better than others.
3. We can determine how effective BMPs are (to a generalized degree). We can standardize how we measure and document this effectiveness.
4. 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 27) that the program will be designed to address.

Strategy

This program is ranked fourteenth among the 16 CMER programs. A strategy to study WMZ effectiveness will be developed beginning in 2007 or 2008.

Table 27. Wetland Management Zone Effectiveness Monitoring Program.

Critical Questions	Project
Are current WMZs effective in providing adequate levels of LWD? Are current rule-defined wetland functions adequate to meet or exceed water quality standards, support the long-term viability of covered species, and support harvestable levels of salmonids?	Wetland Management Zone Effectiveness Monitoring Project

Project Description

Wetland Management Zone Effectiveness Monitoring Project (Table 4, line 54)

This project has been neither scoped nor designed. This project is not scheduled to begin until 2009. This project is ranked as Delay.

Wildlife Program

Purpose

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.

Strategy

With the current emphasis of CMER on the FFR 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.

Project Descriptions

RMZ Study Resample Project (Table 4, line 53)

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. Since the smart buffer was similar to the FFR buffer for Type F streams and more than five years had elapsed since the last sampling the RMZ, the resample project was initiated in FY 2003 to complete another 2 years of sampling to document changes over time. The study will provide additional data on riparian conditions and some SAAs. . Data collection was completed in 2005 and analyses and reports will be completed in 2006. This project is administered by LWAG. .

Ponderosa Pine Habitat (not in FFR budget)

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. . No activity for this project will take place in 2006.

Other Wildlife Programs/Projects (not in FFR budget)

Due to the overriding importance of the FFR 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 11 have been developed into projects.

EXTENSIVE STATUS AND TREND MONITORING PROGRAMS

Extensive status and trend monitoring evaluates the current statewide status of key watershed input processes and habitat conditions across FFR lands and will document future trends in key indicators as the FFR prescriptions are implemented across lands managed under FFR over time. Extensive monitoring is a landscape-scale assessment of the effectiveness of FFR rules to attain specific performance targets. This is different from prescription-effectiveness monitoring, which evaluates the effect of specific prescriptions at the site scale. Extensive monitoring is designed to provide annual or periodic report-card-type measure of rule effectiveness (i.e., do we meet the performance targets or how much have we improved over time) that can be used to by the regulatory agencies to determine if progress is consistent with expectations. Several extensive monitoring components were identified in the MDT report. CMER has identified several extensive monitoring programs, but further scoping and project design is needed, as well as CMER review and approval.

Extensive Riparian Status and Trend Monitoring Program

Purpose

The purpose of the extensive riparian status and trend monitoring program (ERSTMP) is to provide data needed to evaluate the landscape-scale effects of implementing the FFR forest practices riparian prescriptions and to provide the data needed by the 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 28. This program will obtain an unbiased estimate of the distribution of stream temperature and shade, and riparian stand characteristics across FFR lands and provide statistically valid estimates of two riparian resource indicators, water temperature and riparian stand conditions, for streams across FFR lands and identify trends in these indicators over time.

Strategy

The extensive riparian status and trend monitoring program is organized into four separate projects stratifyied 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 four separate projects creates projects of a manageable size and allows project-specific adjustments in the sampling strategy and effort to address stratum-specific differences in variability. This program ranked first among the three CMER extensive monitoring programs.

Table 28. Extensive Riparian Status & Trend Monitoring Program (ERSTMP) critical questions.

Critical Questions	Project
What is the distribution of maximum summer stream temperature and 7-day mean maximum daily water temperature on FFR lands, and how is the distribution changing over time as the FFR prescriptions are implemented?	All four ERSTM projects
What proportion of stream length on FFR lands meets water quality standards for water temperature, and how is the proportion changing over time as the FFR prescriptions are implemented?	
What are current riparian stand attributes on FFR lands, and how are stand conditions changing over time as the FFR prescriptions are implemented?	
What proportion of westside Type F/S stream length on FFR lands that meet DFC basal area performance targets, and how is the proportion changing over time as the FFR prescriptions are implemented?	Westside Type F/S ERSTM
What the proportion of eastside Type F/S stream length on FFR lands that are within the eastside basal area ranges, and how is the proportion changing over time as the FFR prescriptions are implemented?	Eastside Type F/S ERSTM

Project Description (Table 4, line 63)

A study design for the entire extensive riparian trend-monitoring program was developed by RSAG and is currently approved for submission to SRC for review. An effort is currently underway to integrate the sampling of the eastside Type F streams with the Eastside Riparian current condition assessment project being designed by SAGE. Site selection requires accurate information on the location and typing of streams. The new western Washington stream-type map is expected to be available in 2005, and the revised eastern Washington stream type map should be available in 2006. The order in which the four projects are implemented will depend on funding, availability of accurate stream typing information and coordination with the SAGE riparian current condition assessment project

Extensive Fish Passage Trend Monitoring Program

Purpose

The Monitoring Design Team defines extensive monitoring as a population-scale assessment of the effectiveness of the FFR rules in attaining forest practice related performance targets across FFR lands (Monitoring Design Team, 2002). The implied FFR performance target for fish passage based upon the requirements for Road Maintenance and Abandonment Plans (RMAP's) is to eliminate fish blockages on FFR regulated lands. This program will be designed to evaluate status and trends in fish passage conditions at forest road crossings.

Strategy

The extensive fish passage monitoring program is composed of two projects: the development of the study design, and the subsequent implementation of the study design. Each project will be coordinated by an ISAG project manager and approved by ISAG and CMER. The study design will be developed in 2004. This program is ranked last among the three CMER extensive monitoring programs.

Project Description

Extensive Fish Passage Trend Monitoring Project (Table 4, line 64)

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 presented a recommended study design and methodology to ISAG for review. After modifications were incorporated, ISAG submitted the draft plan to CMER for review and approval.

Extensive Wetlands Trend Monitoring Program

Purpose

The wetlands extensive monitoring program will assess the status and trends of reforestation of forested wetlands harvested under FFR rules.

Strategy

This project requires that the wetland database project be complete. The database is listed under rule tools. The wetlands database project is not scheduled to begin until 2006. This program was not ranked with the three CMER extensive monitoring programs.

Project Description

Extensive Wetlands Trend Monitoring Project (Table 4, line 66)

Scoping to develop a strategy has not occurred. Projects are currently proposed to begin in 2009 or 2010.

INTENSIVE MONITORING PROGRAM (Table 4, Line 68)

Intensive monitoring is a watershed-scale research program that is 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 FFR 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 in the process of 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 Intensivively Monitored Watersheds Program) are being pursued to identify opportunities for collaboration.

RULE IMPLEMENTATION TOOL PROGRAMS

Rule implementation tool programs/projects are designed to develop, refine or validate tools used to implement the forest practices rules. Two types of rule-tool projects are recognized:

1. Methodology Tool Development Projects develop, test or refine protocols, models, and guides that allow the identification and location of FFR specified management features, such as the Last Fish Model, various landslide screens, the Np/Ns break and SAA Sensitive Site Identification.
2. Target Verification Projects consist of studies designed to verify the validity of performance targets developed during FFR negotiations that the authors identified as having a weak scientific foundation, such as the DFC basal area targets.

Rule implementation tools differ from research and monitoring tools, which are required to implement a specific effectiveness-monitoring program, such as Road Surface Erosion Model. Monitoring implementation tools are included with the effectiveness monitoring programs.

CMER identified ten rule tool implementation programs.

Type N Delineation Program

Purpose

The purpose of this program is to validate the default basin areas established by FFR negotiations and refine methodologies for identifying the perennial initiation point (upper extent of perennial flow in Type N streams).

Strategy

The Type N Delineation Program is designed to refine default basin areas and/or to identify potential field criteria for locating the Type Np/Ns break in the field. The program consists of two projects – a pilot project to test field protocol and to obtain a sufficient number of basin areas to establish basin-area variability. The second phase will apply the field protocol to randomly selected stream basins across FFR lands in the state to establish the basin area required to maintain perennial flow in each FFR default region. The pilot project was completed in October, 2003 and submitted to Policy for review in November 2003 as part of the adaptive management process. Policy requested SRC peer review for the pilot project report in 2004. Policy is presently considering the revised report.

Project Descriptions

Perennial Stream Survey Pilot Project (Type N Stream Demarcation Study) (Table 4, line 78)

The pilot project produced a field methodology for identifying the break between seasonal flow (Ns streams) and perennial flow (Np streams), provided an initial assessment of the accuracy of the default basin area numbers, identified alternative default criteria, and developed an estimate of the sample size needed to achieve precision and accuracy objectives based on variability in basin areas above the Np/Ns break. The pilot project was completed in October, 2003 and submitted to Policy for review in November 2003. Policy requested SRC peer review for the pilot project report in 2004. Policy is presently considering the revised report.

Perennial Stream Survey (Type N Stream Demarcation Study): Phase 2 Statewide Project (Table 4, line 79)

A statewide project that will refine/develop default criteria and possible field criteria that can be used to identify the Np/Ns break in the field. This project is ranked as delayed awaiting policy direction.

Sensitive Site Program

This program consists of two rule-tool implementation projects. The program began in 1999 and is managed by LWAG.

Purpose

The purpose of this program is to refine the descriptions of SAA sensitive sites in FFR and to estimate their importance to stream-associated amphibians.

Strategy

The strategy is to first develop a filed methodology to assist forest managers in identify sensitive sites and then characterize sensitive sites that are the most important to the FFR SAAs.

Project Descriptions

SAA Sensitive Sites Identification Methods Project (Table 4, line 81)

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?

It 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. This project is in the final stages of data analysis and report writing and will be completed in 2006. The project is administered by LWAG.

SAA Sensitive Sites Characterization (Table 4, line 81)

The purposes of this project are to document the distribution and characteristics of sensitive sites as described by the FFR rule and to verify their utilization and habitat value for SAA. 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 area criteria in the rules to better focus buffer protection on areas important to SAA. This project is in the final stages of data analysis and report writing and will be completed in 2006. The project is administered by LWAG.

Stream Typing Program

ISAG administers this program.

Purpose

The purpose of this program is to develop a statewide stream typing map, described as follows in the Forest and Fish Report:

> *"The rule to be adopted by the Forest Practices Board will include a statewide map delineating the waters of the state into three categories: Type S waters, Type F waters and Type N waters. The map is to be developed using a multi-parameter, field-verified GIS logistic regression model pursuant to the adaptive management procedures described in Appendix L. The multi-parameter model will be "habitat driven" and will use geomorphic parameters such as basin size, gradient, elevation and other indicators. Electro fishing and day or night snorkeling and other non-lethal methods may be used with appropriate state and federal permits to do*

research and effectiveness monitoring for the purpose of developing and testing a habitat-based model or improving the model at five year intervals."

Strategy

ISAG has been charged with implementation of this project.

Project Descriptions

Last Fish/Habitat Prediction Model Development Project (Table 4, line 83)

The purpose of this project is to develop a GIS-based logistic regression fish habitat model(s) to identify and map the upstream boundary of Type F (fish-habitat) streams. This project will inform the stream-typing rule by providing the consistent, statewide mapping system required by the FFR agreement. This project is currently underway. A preliminary model for western Washington is completed and the modeled end of fish points (MEOFP) have been generated. Preliminary maps will be released for public preview July 1, 2004. Work on eastern Washington began April 2004.

Annual/Seasonal Variability Project (Table 4, line 85)

Seasonal and annual variability will be characterized to understand how modeled points vary with time. Work was begun on Annual Variability 2000-2001 for identifying last fish and also assessing sampling error. With only 2 years of data, results suggested that there may be no difference in annual variability. No work has been done on Seasonal Variability. A seasonal variability study will be drafted in late 2004, and field studies will be conducted by season in 2005.

Last Fish/Habitat Prediction Model Field Performance Project (Table 4, line 84)

This project objective is validation and assessment of model predictions to accurately evaluate model performance and future applicability. The study design will be develop an approach and methodology to investigate the performance of the model in correctly determining fish habitat across watersheds of western Washington. This project has not been ranked and does not appear in Table 4.

Guidelines for Field Protocol to Locate Mapped Divisions (Table 4, line 86)

Protocols and methods with be developed and proposed for adoption for the Forest Practices Board Manual Section 23. Through the Validation study protocols and methods will be tested and evaluated to establish a recommendation for the Forest Practices Board.

Type F DFC Validation Program

The program is being administered by RSAG. This program 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 accurately the DFC model predicts growth of riparian stands to age 140, 3) what sort of habitat conditions will be provided by mature riparian stands, and 4) how young stands of different composition and density develop as they mature.

Purpose

The purpose of this program is to validate the DFC approach for management of western Washington, conifer-dominated riparian stands on fish bearing streams, including the DFC performance targets and the DFC model.

Strategy

This program consists of several projects designed to answer a series of critical questions (Table 29). DFC target validation has been identified as a high priority issue. 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. Validation of the DFC performance targets is a high priority. Work on the DFC target validation project began in 2000, and the project results were transmitted to FFR policy in March of 2005. Validation of the DFC model is another high priority project. Development of the study design was put on hold while RSAG waited to assess the feasibility of the regional riparian stand growth-mortality cooperative effort proposed by the UW to address this issue in a cost-effective manner. The DFC-Aquatic Habitat Project is a lower priority issue, consequently scoping on this project has not begun. The Pathways of Riparian Stand Development to Maturity Project is an outgrowth of the DFC target validation project, based on the realization that many young low density stands of mixed composition are not likely to achieve DFC without some form of intervention, and that a better understanding of the development of such stands is need to identify appropriate management approaches.

This program is assessing the validity of the DFC targets and the DFC model. We anticipate that the results will require Policy to consider changing the DFC targets and modifying the model used to project stand growth and mortality.

Table 29. Type F DFC Validation Program critical questions and issues.

Critical Questions	Projects
Do the DFC targets accurately reflect stand conditions for mature, unmanaged conifer-dominated west side riparian stands?	DFC Target Validation Project
Does the DFC growth and mortality model accurately predict the trajectory of west side conifer-dominated riparian stands to age 140?	DFC Trajectory Model Validation Project
What aquatic habitat conditions are associated with mature west side riparian stands?	DFC-Aquatic Habitat Project
How do mature stand structures develop from younger stands in a variety of stand compositions and densities?	Pathways of Riparian Stand Development to Maturity Project
What growth trajectories and success ional pathways are characteristic of hardwood-dominated riparian stands?	Red Alder Growth and Yield Model Project

Project Descriptions

DFC Target Validation Project (Table 4, line 88)

The purpose of this project is to collect data on stand characteristics from a random sample of mature unmanaged conifer-dominated riparian stands in western Washington; compare basal area per acre from the sample with the current DFC targets; and evaluate alternative parameters for characterizing DFC. 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 have been transmitted to the FFR Policy Committee for consideration. .

DFC Trajectory Model Validation Project (Table 4, line 89)

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. A study design has not been developed because of the potential for a regional riparian stand cooperative monitoring effort.

DFC-Aquatic Habitat Project (Table 4, line 90)

The purpose of this project is to determine the range of aquatic habitat associated with mature (DFC) riparian forest conditions. This study has been neither scoped nor designed.

Pathways of Riparian Stand Development to Maturity Project (not included in Table 4)

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. This study has been neither scoped nor designed.

Red Alder Growth and Yield Model Project (not included in Table 4)

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 few field data. In this project, cooperators from across the PNW have contributed existing data that will be compiled and cleaned at the UW Stand Management Cooperative. A growth and yield model for red alder will 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 then is currently available. CMER has contributed project development funds to this cooperative effort. This project is currently underway.

Eastside Riparian Type F Program

Purpose

The purpose of the eastside riparian Type F program is to validate the eastside Type F riparian prescriptions. The eastside riparian strategy is designed to achieve three management objectives:
1. To create dynamic riparian stands and riparian processes that emulate those provided by natural riparian disturbance regimes,
2. To create healthy and sustainable riparian stand conditions and,

3. To create riparian stands that provides riparian functions necessary for the protection and recovery of salmon and aquatic amphibian species.

The Forest Practices Rules describe the management strategy as follows:

> *"For eastside forests, riparian management is intended to provide stand conditions that vary over time. It is designed to mimic eastside disturbance regimes within a range that meets functional conditions and maintains general forest health. These desired future conditions are a reference point on the pathway to restoration of riparian functions, not an end of riparian stand development"* (WFPB, 2001).

The Eastern Washington Type F riparian rules are based on the following assumptions:

1) 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.
2) The defined elevation bands are reasonably accurate reflections of the special distribution of historical disturbance regimes and species composition.
3) The management strategies will minimize risk of catastrophic events
4) The management strategies will put stands on a trajectory that will provide rifparian functions needed to support harvestable populations of fish.
5) The temperature overlays are necessary to provide stream temperatures that meet the state water quality standards and the needs for bull trout.

Uncertainties about the validity of the assumptions and the effectiveness of the rule lead to two critical questions and programs to address them. The critical questions to address first are:

1) What is the desired range of conditions for eastside riparian stands and what are the appropriate LWD performance targets?
2) Can the shade/temperature relationships in the eastside temperature nomograph be refined?

SAGE has is developing the following projects to address these critical questions:

Eastside Disturbance Regime Literature Review Project (Table 4, line 11)

A literature review titled *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. This will help determine whether we can apply these past conditions to present riparian stands and meet the Desired Future Conditions for riparian function. This document has been reviewed by SAGE, CMER and SRC. During FY 2006 the document is expected to be revised as needed and accepted as an official CMER document.

Eastside LWD Literature Review Project (Table 4, line 10)

A literature review titled *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 to aquatic habitat to different types or levels of LWD input and loading, and consequently on how much LWD riparian buffers need to

produce. This document has been reviewed by SAGE, CMER and SRC. During FY 2006 the document is expected to be revised as needed and accepted as an official CMER document.

Eastside Temperature Nomograph Project (Table 4, line 91)

The Eastern Washington Nomograph Project developed an Eastern Washington specific nomograph using existing data and identifies gaps for future study. The study identified site characteristic necessary to produce a better predictive model of stream temperatures in eastern Washington. This project is currently undergoing CMER review and is expected to be forwarded to SRC with in several months. In fiscal year 2006 a course of action will be proposed to CMER based on the studies recommendations and review comments. Further studies may be proposed to reduce the uncertainty of a temperature nomograph.

Eastside Riparian Current Condition Assessment Project (Table 4, line 12)

Eastern Washington has a wide range of climatic condition, elevations, forest types, riparian zones, and management history. Riparian health/function information over this range of conditions is limited. An assessment, or baseline study, of current riparian forest stands is needed to determine whether they are meeting required functions for fish habitat and where they fit into the historical disturbance regime and/or current disturbance regime. This will also help to develop targets to accomplish prescription assessment/evaluation. A scoping document was developed by SAGE and adopted by consensus to pursue this project. Subsequently CMER approved budget items, project development and site selection. A contractor to develop the study plan for this project has been hired with an expected completion date of August 2005. Immediately after completion of the study plan SAGE will solicit, by a request for proposals, a contractor to conduct the field portion (phase 1) of the study. This will occur in fiscal year 2006. A second phase is planned for FY 2007.

Eastside Channel Wood Characterization Project (not included in Table 4)

Fish bearing steams in Eastern Washington exhibit a wide range of characteristics and management histories. An assessment, or baseline study, of current stream conditions and characteristics will help determine whether they are meeting required functions for fish habitat. This will also help to develop targets to accomplish prescription assessment/evaluation. This project is underway. The study is on a trajectory for implementation in the latter half of fiscal year 2006 or 2007.

Bull Trout Habitat Identification Program

This program is administered by BTSAG and consists of three projects.

Project Descriptions

Bull Trout Presence/Absence Protocols (Table 4, line 93)

This active project is developing a set of protocols for assessing the presence of Bull Trout. This project has been funded with USFWS bull trout funds to date.

Bull Trout Habitat Prediction Models (Table 4, line 94)

This project will be designed to improve the accuracy of the method used to identify Bull Trout habitat for forest management purposes. This project has been funded with USFWS bull trout funds to date.

This active project is designed to evaluate the migratory patterns of 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. This project has been funded with USFWS bull trout funds to date.

CMZ Delineation Program

Purpose

The purpose of the CMZ program is to develop methods and criteria for accurately identifying and delineating CMZ.

Strategy

This 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 will provide a screening tool to locate areas with potential CMZs and second will 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. Because the program is providing tools, we do not anticipate that program results will require Policy action. The program is being administered by UPSAG.

Project Descriptions

CMZ Screen and Aerial Photograph Catalog Project (Table 4, line 109)

This GIS-based project will be designed to identify potential CMZs based on slope and valley width data and to overlay on this map the historic DNR aerial photographs documenting past migration behavior. This project is ranked as delay because of the low priority of the CMZ program.

CMZ Boundary Identification Criteria Project (Table 4, line 110)

This project will be designed to develop criteria and a consistent and uniform method to define the margins (edges) of the CMZ. This project is ranked as delay because of the low priority of the CMZ program.

Unstable Landform Identification Program

Purpose

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.

Strategy

This program consists of five projects that provide statewide information on the distribution of unstable landforms. 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 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 FFR as necessary for implementing forest practices that meet resource objectives.

Several projects are underway or completed and it is anticipated that the rule tools will be completely developed by 2008. Because the projects are developing screening tools, we do not anticipate that program results will require Policy action.

Project Descriptions

Shallow Rapid Landslide Screen for GIS (Table 4, line 96)

The first phase of this project developed a GIS-based screen of modeled slope stability based on DEM topography for the Westside. This project was completed in 2002 and released as TFW 118. A second phase to identify topographic model(s) appropriate for similar mapping on the Eastside is ranked as delay while the recently approved 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 complete coverage. The Westside screen becomes one component of the LHZ project in areas where the landslide hazard zonation will be completed.

Technical Guidelines for Geotechnical Reports (Table 4, line 97)

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. This project is ranked as delay.

Regional Unstable Landforms Identification (Deep-Seated Landslide Screen) (Table 4, line 98)

This active project provides a coordinator to work with TFW cooperators within each DNR region in order to identify unstable landforms that do not meet the present statewide landform descriptions. The project also serves as an interim screen for deep-seated landslides by identifying lithologies that promote deep-seated landslides; however, it is not intended to map them. This project was completed in 2005 and its results are being incorporated into the LHZ project.

Landform Hazard Classification System and Mapping Protocols Project (Table 4, line 99)

This project developed a statewide standard for assigning hazard to unstable slopes. It was completed in 2004 and was incorporated into the Landslide Hazard Zonation Project.

Landslide Hazard Zonation (Table 26, lines 100 and 101)

This is a multi-phase project. Completed phases have collected and collated data on unstable landforms from previously completed Watershed Analyses and placed this information in a GIS database and finished the mass wasting assessments in Watershed Analyses that were not completed. The currently active phase is mapping and evaluating unstable landforms in high priority areas that are not covered by Watershed Analyses and are within FFR jurisdiction.

Glacial Deep-seated Landslide Program

Purpose

The purpose of the Glacial Deep-seated Landside Program is to develop a tool for assessing the failure potential of deep-seated landslides in glacial sediments resulting from changes in groundwater hydrology during and after timber harvest in the landslide recharge area.

Strategy

This program consists of two projects that are designed to develop and test an analytical model for assessing recharge impacts of timber harvest. The approach is to first undertake a project develop an analytical procedure to estimate the increased recharge that may result from harvest. The second project will expand this procedure into a model that incorporates site specific conditions. The results of these studies will probably lead to a reassessment of the glacial-recharge area rule by Policy. The projects are administered by UPSAG.

Project Descriptions

Model Evapo-Transpiration in Deep-Seated Landslide Recharge Areas (Table 4, line 103)

This completed project developed an analytical model for assessing the evapo-transpiration changes resulting from timber harvest. The model is intended to be applied to timber harvest within the recharge area of deep-seated landslide in glacial sediments. The model has been developed but was not directly validated and refined because of insufficient field data. This project is ranked as delay because of the low priority of the program.

Method to Assess Vulnerability of Deep-Seated Landslides to Timber Harvest (Table 4, line 104)

This multiphase project will integrate the existing analytical model with site-specific slope stability analysis to develop a site-specific assessment methodology that determines the potential for failure of deep-seated landslides subject to harvest in the recharge area. This project is ranked as delay because of the low priority of the program.

Wetland Mapping Tool Program

This program consists of two projects and is administered by WETSAG.

Purpose

The purpose of the Wetland Tool Program is to develop mapping tools that will be used to define and locate wetlands throughout the State to facilitate research in wetlands.

Strategy

This program consists of 3 projects. The first project will develop a GIS layer mapping tool that DNR will administer. This layer will include all types of wetlands under a standardized classification system yet to be identified. The second project involves the development of an integration or overlay tool that will be used to integrate WSAGs research needs with other proposed CMER research in order to increase time management and CMER funds spending efficiency. The first two projects will determine the necessity and timing of the third project which is to develop a hydrogeomorphic classification system for wetlands.

Project Descriptions

DNR GIS Wetlands Data Layer (Table 4, line 107)

A subject matter expert (SME) will coordinate with DNR's cartography department to create an accurate, state-wide map of all wetlands under one classification system. The SME will compile existing wetland location data from a variety of sources and interpret the data for consistency with the classification system to be used. This project may be modeled after the Landslide Mapping Project mapping screens and include the development of locational models and ground verification. When completed, the layer will be frequently updated with data submitted by landowners as required in F.4 (a) of the FFR. Scoping of this project began in early to mid 2005 and will be completed by 2008. This project is ranked as implement.

Hydrogeomorphic Wetland Classification System (Table 4, line 106)

This project will be scoped and or designed beginning in 2008 if necessary. This project is ranked as delay.

Overlay Project (not included in Table 4)

This project will develop a system that to facilitate cooperation between WSAG and other SAGs when conducting research to increase efficiencies. The other purpose of this project is to develop technical guidelines to identify wetlands for foresters and other SAGs. This project may also involve a workshop for DNR, CMER, foresters and landowners to detail the products developed. The scoping of this project will begin in late 2005. This project has not been ranked.