Appendix for Completed Projects

1. STREAM TYPING RULE GROUP

1.1. Stream Typing Program (Rule Tool)

1.1.1. Last Fish/Habitat Prediction Model Development Project

Description:

A GIS-based logistic regression model was developed, associating geomorphic parameters (i.e., basin size, gradient, elevation, and other indicators) with last fish points to determine and map the upstream boundary of Type F (fish-habitat) streams. The forest practices rules specified that once the model was developed, with an accuracy of 95%, the resulting map would be used as rule.

Status:

The model was completed in 2006. The model results did not achieve the target accuracy of 95%. In response, DNR developed new water type maps based on the model in March 2006, but the maps are only to be used as a starting point for delineating fish habitat, not as rule. The DNR maps are currently used as part of the forest practices application process in combination with the Interim Water Typing System (WAC 222-16-031). This water typing rule specifies physical criteria for identifying fish-bearing streams (channel width, channel gradient, and contributing basin area), unless overridden by a protocol survey for determining fish use.

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Based on the results of this project, and the CMER recommendation that further efforts to improve the model would likely not increase its level of accuracy, Policy decided that additional CMER work on the model was not necessary at this time. Policy has identified stream typing as a task to be resolved on their Policy work list.

1.1.2. Annual/Seasonal Variability Project

Description:

The Annual/Seasonal Variability Project was conducted to help validate the Last Fish/Habitat Model. The project goal was to assess whether the upstream extent of fish distribution in eastern Washington varies annually and/or by season. The study sampled for changes in the location of the uppermost detected fish at both “terminal” (midstream) and “lateral” (tributary junctions) fish distribution points. Key questions related to this project include the following:

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

Annual variability estimates were obtained from two years of summer data, collected during the

low-flow period (2001–2002). Project results indicated a range of observed annual variability from 943 meters (m) downstream to 400 m upstream of terminal last fish points (n=172). Last fish points did not change from 2001 to 2002 at 51 of 172 locations; and, when movement occurred (in either direction), the last fish point shifted by 25 m or less at 61 of the 172 terminal points. Last fish points shifted by more than 100 m in either direction at 17 of 172 locations, and moved more than 200 m at only 8 locations. Last fish points shifted by more than 500 m at only 3 locations; all of these were downstream movements. For all last fish points in 2002 (terminal and lateral combined), 94% of last fish points shifted by 50 m or less. Of 309 terminal and lateral sites resurveyed in 2002, last fish points did not change at 150 sites.

Seasonal/annual variability estimates were obtained in the summer and fall of 2005; these estimates were compared, to the extent possible, with the annual variability estimates from 2001–2002. Project results showed similar differences in the seasonal variability of fish movement between years, with the majority occurring within 100 m of the original survey. Seasonal variability results included the average upstream/downstream movements, as well as trends in upstream/downstream movement.

The project also assessed the sampling error to help determine the degree to which the field survey protocol (using a single-pass electroshocking survey) was likely to detect the "last fish" at the maximum upstream extent of fish distribution.

Status:

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

1.1.3. Last Fish/Habitat Prediction Model Field Performance Project

Description:

The objective of the Last Fish/Habitat Prediction Model Field Performance Project was to assess the performance of the model predictions in western Washington. ISAG developed a study design, which was approved by CMER, and a pilot field test of the study design was performed. This test primarily included resurveying a randomized sample of last fish points and comparing those points to the predicted model point. If the field-identified last fish point occurred upstream of the model-predicted point, the prediction was considered to be an underestimation of fish habitat; if the field-identified last fish point occurred downstream of the model-predicted point, the prediction was considered to be an overestimation of fish habitat. ISAG compiled existing information related to water typing and presented this, along with the model performance assessment's study design and pilot field effort results, to the Policy Subgroup on Water Typing.

Status:

Because the model did not achieve the level of accuracy specified in the forest practices rules

(95%), and because further work was unlikely to improve upon that level of accuracy, Policy decided that no additional CMER work was necessary at this time.

1.1.4. Fish/Habitat Detection Using Environmental DNA (eDNA

Description:

Genetic material shed by all living organisms and found in the environment is referred to as environmental DNA or eDNA. In the last two decades, noninvasive genetic sampling has been recognized as an effective conservation and management tool for monitoring the presence and distribution of specific species and to assist in quantifying biodiversity within a specific environmental system. Environmental DNA sampling methods are being developed that may contribute to more accurate demarcation between fish- and non-fish-habitat waters.

Guidelines for the application of eDNA sampling methods and assays would need to be established to assure consistent application of this tool for the detection and monitoring of aquatic species across FP HCP lands. Some of the more critical methodology considerations include sampling protocols and study design that prevent contamination in the field and laboratory, choosing the most appropriate sample analysis method (e.g., qPRC probe for specific species or metabarcoding with an array designed for multiple species), minimum reporting guidelines, natural inhibitors for DNA extraction and amplification, and the validation of assays. Also paramount is the consideration of the limitations on inference including temporal and spatial processes, correlation of eDNA with abundance, probability of uncertainty of results, and potential for allochthonous DNA.

Recent and ongoing projects are establishing the empirical and experimental data needed to address these concerns. There is a rapidly growing body of research and methodology reports concerning the application of eDNA analysis that should be consulted as CMER moves forward in the development of projects aimed to test eDNA as a Water Typing tool. Some key questions that can be answered by literature review and collaborative projects include the following:

- How does eDNA sampling compare with electrofishing for overall effectiveness, costs, and accuracy for identifying fish presence?
- What sampling conditions are conducive to accurately and consistently identify fish presence?
- Could eDNA sampling be used to better characterize fish presence as it relates to fish habitat?

Status:

A collaborative pilot field project labeled “Fish/Habitat Detection Using eDNA Project” was approved by CMER in the spring of 2018. In this pilot study, streams were surveyed for fish detection using both electrofishing and eDNA techniques. The fieldwork was completed in 2018, followed by laboratory/data analyses and reporting in 2019. The pilot report was finalized and the report is available online (CMER#2021.05.25).

2. TYPE N RIPARIAN PRESCRIPTIONS RULE GROUP

2.1. Type N Delineation Program (Rule Tool)

2.1.1. Perennial Initiation Point Survey: Pilot Study

Description:

The Perennial Initiation Point (PIP) pilot study was initiated in 2001 to evaluate field methods and inform sampling needs for a subsequent statewide field study. The field portion of the study was done by Forests and Fish cooperators (tribes, timber companies, and the Washington Department of Fish and Wildlife [WDFW]) on a voluntary basis. CMER staff performed data analysis and reporting under the direction of the Np technical subgroup and UPSAG.

Completion of the pilot study in 2004 was followed by independent scientific peer review (ISPR), and revisions and the preliminary scoping of a coordinated statewide study.

Status:

The pilot study was completed in 2004. The default basin size was eliminated by rule change as a result of the pilot study. A coordinated statewide study has not been scoped or initiated based on direction from Policy.

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2.2. Sensitive Site Program (Rule Tool)

2.2.1. Stream-Associated Amphibians (SAA) Sensitive Sites Identification Methods Project

Description:

The purpose of this project was to develop a practical methodology for identifying SAA sensitive sites, such as headwall seeps, side-slope seeps, and headwater springs. This project is intended to inform the Type N riparian rule by providing a standard methodology (field guide) for field managers to identify SAA sensitive sites when designing harvest units.

Status:

This project was completed in 2007. One manuscript was published in a peer-reviewed journal. This project was administered by the Landscape and Wildlife Advisory Group (LWAG).

SAA Sensitive Sites Characterization Project

Description:

The purpose of this project was to document the distribution and characteristics of sensitive sites as described by the forest practices rules and to verify their use and habitat value for SAAs. The project generated information on the characteristics of sensitive sites, validated the extent to which they are used by amphibians, and determined if other sensitive sites exist. Information from this project could result in changes to the sensitive site criteria in the rules to better focus buffer protection on areas important to SAAs.

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Status:

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This project was completed in 2006. One manuscript was approved by CMER and published. This project was~~is~~ administered by LWAG.

2.3 Type N Riparian Effectiveness Program

Westside

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

Description:

The Westside Type N Buffer Characteristics, Integrity, and Function Project was designed to evaluate the effectiveness of the westside Type N riparian prescriptions, including survival of buffer leave trees, stand condition and trajectory over time, and changes in riparian functions, including shade, LWD recruitment, and soil disturbance/stream-bank protection. A random sample of 15 Type Np treatment sites in the western hemlock zone strata of western Washington were selected from forest practices applications (FPAs). Treatment sites were paired with unharvested reference sites to provide an unbiased estimate of the magnitude of change following application of the clear-cut and 50-ft. buffer prescriptions. Data were also collected on the PIP buffer prescription.

Status:

Initial post-harvest sampling at 15 treatment/reference pairs were initiated in the fall of 2003. Low-altitude photography and field measurements of canopy conditions were collected post- harvest in 2004. After a pilot project to evaluate feasibility of aerial photography, the Riparian Scientific Advisory Group (RSAG) determined that field data were needed to accomplish the project objectives. Field data were collected on riparian stand conditions, fallen trees, LWD recruitment, shade, channel wood loading, and soil disturbance from windthrown trees. Field data were collected three and five years after timber harvest in the summer/fall of 2006 and 2008. A draft report was submitted for ISPR in October 2010. The report was revised to address ISPR comments and the final report was approved by RSAG and CMER in December 2011. The ten-year, post-harvest data collection effort was completed in the summer of 2013. The final report was approved by CMER October 2019. TFW Policy and the FP Board approved no further action or recommendations were needed at this time based on the results of this study.

Type N Experimental Buffer Treatment Project in Soft Rock Lithologies (Soft Rock Project)

Description:

This study was a field experiment analogous to the Hard Rock project but implemented on more erodible (soft rock, largely marine sedimentary) lithologies. This project differs from the Hard Rock project in that it:

- employs a Multiple Before-After/Control-Impact design (e.g., multiple control sites);
- tests only the forest practices rule buffer treatment (no alternative buffers are tested);
- does not include any amphibian, fish, litterfall, or drift measurements; and
- includes benthic macroinvertebrate sampling rather than macroinvertebrate drift.

This project evaluated the effects of timber harvest in headwater basins on water temperature, streamflow, exports of suspended sediment and nutrients from the Type N basin, and benthic macroinvertebrate communities. Site selection was similar to the Hard Rock study except that sites were selected in lithologies that are likely to produce a fine-grained stream substrate. This project began in 2012 and data collection ended in summer 2017, except for stream temperature, which extended through fall 2020. Study sites included ten Type N stream basins (seven treatment sites and three control sites) located in southwestern Washington.

Status:

A grant from the Environmental Protection Agency (EPA) was awarded to the Washington State Department of Ecology (Ecology) in October 2010 that partially funded the design and first two years implementation of the Soft Rock project. The Quality Assurance Project Plan was published in September 2011.

Site selection was completed in August 2012 and temperature monitors were installed. Montana flumes were installed in four basins by Oct 9, 2012 and instrumented by January 2013 to measure stage height and turbidity.

The final report covering the period from 2012-2017 was approved by ISPR and was approved by CMER on July 27, 2021. Extended data collection occurred through October 2020 to track the longer-term trajectory of water temperature. Harvest in the reference sites began in 2020, which necessitated the end of the study~~, marking the end of monitoring in this study~~. The analysis of the 2017-20 temperature data was included as an addendum to the Extended Monitoring Report. The report is available online (CMER #2021.08.24).

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Eastside

2.4.1 Eastside Type N Forest Hydrology Project (FHS)

Description:

The Eastside Type N Forest Hydrology Project was designed to determine the spatial characteristics of late summer surface-water discharge across eastern Washington FP HCP lands. The project explored whether there was a set of readily identified external characteristics that could be used to group and/or remotely identify stream reaches that exhibit similar hydrologic characteristics.

Status:

The study design for the FHS project was approved by CMER in December 2009. Field work was completed in 2012. The FHS report was completed in 2014, and sent to ISPR for review in late 2014. The report was updated and approved by SAGE and CMER in 2015 and was received by Policy in 2016.

2.3.4 Literature Review and Synthesis Related to the Salvage of Fire Damaged Timber

Description:

This project was intended to provide current peer-reviewed science related to the practice of salvaging fire damaged timber on Washington forests. The focus was on literature evaluating timber salvage after fire damage and its effects in and near riparian areas located in Eastern Washington and other regions throughout the country, and also studied what helps identify the best available science as it relates to various methods of timber salvage and the resulting regeneration of upland sites.

With the increased severity of wildfires, insect damage, and high wind events there is an associated increase in salvage FPAs. There is a need to understand if these approved salvaged harvests are adequate at maintaining water quality and performance targets. As required under WAC, approved salvage permits must meet or exceed the protections and functions provided by existing rules.

This summary will serve as the basis for discussion within the AMP about the need and ability to identify and test best management practices for salvage logging.

Project Critical Questions:

The literature synthesis seeks to answer the following critical questions:

- What are the effects of salvage logging on riparian forest stands and how can ecological damage to riparian functions from salvage logging be reduced?
    1. Are there any significant differences between harvest methods in burned areas that potentially pose a greater risk to aquatic resources?
        a. To what extend does application of logging slash on skid trails affect sediment delivery to streams?
        b. Is there a difference in sediment delivery between salvage logging on snow covered versus non-snow covered land?
    2. Does soil disturbance from logging in burned areas increase erosion and delivery of sediment to streams?
        a. Do different logging methods change these impacts?
        b. What effects does hydrophobic soil have on erosion and sediment delivery?
- How can riparian forest stands and associated riparian functions be restored after fire?
    1. To what extent does leaving standing and dead trees within the RMZ contribute to riparian function?
        a. To what extent does down wood reduce erosion and sediment delivery to streams and wetlands? To what extent does the risk of sediment delivery change with stream and side slope gradients, different soil types, or with the intensity of the burn?
        b. To what extent do live standing trees and dead standing trees immediately adjacent to or over the stream bank contribute to bank stability? Are there any differences in the benefits provided by standing trees vs. stumps?
        c. To what extent does standing trees provide levels of shade that will mitigate the warming of streams or wetlands? Is buffer width critical and does this vary by stream size?

d. To what extent are there differences between the rates of large woody delivery over time to streams where the burned RMZ is left in place, compared with one that is harvested and then replanted or allowed to reseed naturally after fire? Are there biogeographic areas that require or do not require replanting after salvage harvest?

e. To what extent does excessive dead standing and/or down wood post fire affect the reforestation of the upland forest stand and the riparian area?

f. To what extent do standing dead or down trees help promote the establishment of new seedlings post fire (whether planted or naturally re-seeded)?

Status:

The literature review proposal was approved by SAGE in December 2016. CMER and Policy approved this project and funding for the project in January 2017. A contractor was selected and the operating contract completed in March 2017. The project was completed and CMER approved in March 2018.

2.4 Type N Amphibian Response Program (Effectiveness)

2.4.1 SAA Detection/Relative Abundance Methodology Project

Description:

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

Status:

This project was completed in 2006, and details have been published in Journal of Wildlife Management.

2.4.2 Tailed Frog Literature Review Project

Description:

Of the seven SAAs addressed in the FP HCP, the two tailed frog species are the most extensively studied due to their wide distribution in the coastal Pacific Northwest. There are enough published studies on this species that a synthesis of those results will be useful in helping LWAG develop a research and monitoring program. A draft literature review was completed in 2011. The recent reclassification of the tailed frog into two species required the review to be restructured while in progress, to reflect that taxonomic revision.

Status:

The draft review was completed in 2011. It was submitted to LWAG for review in December 2011 and it went to CMER in March 2012. It was approved to go to ISPR in October 2012. It was returned from ISPR review in June 2013. The final report was finalized in 2015.

2.4.3 Tailed Frog Meta-Analysis Project

Description:

Published and unpublished data are being subjected to a meta-analysis that will relate tailed frog abundance with habitat conditions created by timber harvest. This analysis may or may not support the conclusions of the tailed frog literature review described above, and will likely identify other factors related to tailed frog distribution and response to timber harvest that will be useful in developing the Type N Amphibian Response Program. The recent reclassification of the tailed frog into two species required the meta-analysis to be restructured while in progress, to reflect that taxonomic revision.

Status:

The six data sets were formatted, checked for quality assurance / quality control (QA/QC), and analyzed in a pilot study that was published as a CMER report in 2002. LWAG decided not to continue development of a potentially larger project because of issues with non-conforming datasets, and inability to integrate corrections addressing detectability, both of which prevented rigorous analysis.

2.4.4 Dunn's Salamander Project

Description:

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

Status:

Analysis of data from both phases has been completed and a final report was approved by CMER in 2011.

2.4.5 Buffer Integrity – Shade Effectiveness (Amphibians) Project

Description:

Timber harvests result in two important, immediate physical changes: reduction in shade levels and increased sedimentation. During harvests these changes are coupled, so it is typically not possible to partition their respective contributions. Understanding their individual effects is important because sediment is suspected of having largely negative effects, whereas shade reduction has potentially positive effects. The Buffer Integrity – Shade Effectiveness Project examined the effects of reducing shade on a scale that minimizes sedimentation effects. This project examined the effects of three levels of shade reduction on SAA density, body condition, and spatial distribution, as well as water temperature, primary productivity, litterfall and macroinvertebrates. This is a cooperative project between Longview Timberlands LLC and CMER. Longview Timberlands LLC completed a pilot study in 2003 and initiated a broader study

in 2004. The study area was increased with CMER approval to include WDFW-monitored sites on the Olympic Peninsula. Though the original study was intended to address all major groups of SAAs (i.e., tailed frogs, torrent salamanders, and giant salamanders), the available SAA-occupied sites on the eastern Olympia Peninsula lacked the giant salamander species— Cope's giant salamander—present on much of the peninsula. Hence, the Olympic portion of the study addressed only tailed frogs and torrent salamanders.

Status:

The first two years of pre-treatment sampling occurred in 2006 and 2007. Treatments were implemented during the winter of 2007–2008, and two years of post-treatment sampling were completed in 2008 and 2009. A draft report was completed in 2012, underwent CMER review, and went to ISPR in mid-2013. The report was revised several times, approved by ISPR in August 2018, and final approval by CMER occurred in October 2018.

2.4.6 Amphibian Recovery Project

Description:

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

Status:

This project was completed in 2003, and four journal articles have been published. One of the publications addresses amphibian response and contains information pertinent to the Type N Amphibian Response Program.

2.5 Extensive Riparian Status and Trends Monitoring Program

2.5.1 Extensive Riparian Status and Trends Monitoring – Temperature, Type F/N Westside (Initial Status Effort)

Description:

This project is intended to develop unbiased estimates of the frequency distribution of Type F/N stream temperatures across FP HCP lands in western Washington. Stream temperatures are monitored upstream and downstream from each study reach. Along with stream temperature measurements, air temperature, shade, riparian vegetation type, LWD, and several channel measurements are collected.

Status:

Sampling has been completed. The final report was initially reviewed by RSAG and CMER then revised again based on comments received during ISPR of the Eastside Type F report. The revised report was reviewed by RSAG, CMER, and ISPR. The final report was approved by CMER on April 23, 2019.

2.5.2 Extensive Riparian Status and Trends Monitoring – Temperature, Type F/N Eastside (Initial Status Effort)

Description:

This project is intended to develop unbiased estimates of the frequency distribution of Type F/N stream temperatures across FP HCP lands in eastern Washington. Stream temperatures are monitored upstream and downstream from each study reach. Along with stream temperature measurements, air temperature, shade, riparian vegetation type, LWD, and several channel measurements are also collected.

Status:

Approximately 50 sites were sampled in Type F streams over the 2007 and 2008 summer seasons. The revised report was completed and approved by Policy in June 2013.

Initial site screening occurred in the summer of 2008 in Type N streams. Only 10% of the sites inspected had flow during the summer monitoring season (site requirement), when peak temperatures occur. The Policy committee decided to deprioritize the Eastside N strata as part of a negotiated settlement of the Master Project Schedule in 2014.

3. TYPE F RIPARIAN PRESCRIPTIONS RULE GROUP

3.1. Desired Future Condition (DFC) Validation Program (Rule Tool)

3.1.1. DFC Target Validation Project

Description:

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

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Status:

This project has been completed. Work on the DFC Target Validation Project began in 2000, and the project results were transmitted to Policy in March 2005. The results are available in a CMER document titled "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." In response to the DFC report, Policy requested that CMER undertake three additional tasks: (1) conduct scoping for a project to standardize the width of the plots used in the DFC study to address concerns raised in the ISPR (DFC Plot Width Standardization Project); (2) prepare a scoping document to identify and evaluate potential approaches for validating the accuracy of the DNR site class maps in riparian areas (DFC Site Class Map Validation Project); and (3) complete a study, originated by the Northwest Indian Fisheries Commission (NWIFC) staff, to determine how the westside Type F riparian prescriptions are being applied by landowners and to evaluate how the different prescription options and constraints influence the amount of timber available for harvest and projected future basal area

(the FPA Desktop Analysis Project). In 2009, the Board adopted rule changes based on the results of the DFC Target Validation Project and findings from the FPA Desktop Analysis, but decided not to pursue the first two additional tasks Policy had requested.

3.1.2. FPA Desktop Analysis Project

Description:

This project was intended to determine how westside Type F prescriptions are being applied by landowners and to evaluate the effect of various riparian prescription options and constraints on timber available for current clear cut harvest and on projected future basal area. Although originated by NWIFC staff outside of the adaptive management program, Policy requested that CMER complete a desktop analysis of a random set of forest practices applications (FPAs) that had active management of the inner zone, and to conduct a field-verification project on a subsample of those FPAs. From FPAs approved for harvest in 2003 and 2004, 75 were randomly selected in each year for a total of 150 sites, and the associated stand inventory data were entered in the concurrent DFC model. As part of the quality assurance process, data from 15 randomly selected FPAs were compared to field data collected by CMER staff (i.e., FPA Field Check Report).

Status:

A draft report on the desktop analysis was presented to RSAG in December 2005. Data collection for the field-verification project occurred in the winter of 2006, and a draft report was submitted to RSAG in the spring of 2006. Later in 2006, CMER approved a contract to finalize the desktop analysis, field check, and model and manual reports, along with a document that synthesized findings from each of the reports. This work was completed in 2007 and the desktop analysis and field check reports underwent ISPR in 2009. In 2009, the Board adopted rule changes based on the results of the DFC Target Validation Project and findings from the FPA Desktop Analysis. A final report was submitted to Policy and the Board in 2010.

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3.1.3. Red Alder Growth and Yield Model Project

Description:

The purpose of this project is to develop a growth and yield model for red alder. Existing models either dide not include red alder among the species simulated or used equations that werecare based on too few field data. In this project, cooperators from across the Pacific Northwest have contributed data that were compiled and edited at the Oregon State University (OSU) Hardwood Silviculture Cooperative. A growth and yield model for red alder will be developed from these data in a second phase of the project. Red alder is a dominant component of many riparian forests, and although the model is not specific to riparian areas, it will provide better information on the growth dynamics of this species in riparian stands than is currently available.

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Status:

CMER contributed project development funds to this cooperative effort in the past, and in the fall of 2006 received a request from the Washington Hardwood Commission to fund additional sampling at some existing sites. This request was approved and the work occurred in the winter of 2007. The model was completed by the Hardwood Commission (or OSU) in 2010.

3.2. Eastside Type F Riparian Rule Tool Program

3.2.1. Eastside Disturbance Regime Literature Review Project

Description:

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. The information from this review will help determine whether we can apply these past conditions to present riparian stands and meet the desired future conditions for riparian function.

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

Status:

This document was approved by CMER in June 2002.

3.2.2. Eastside LWD Literature Review Project

Description:

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

SAGE's literature review consisted of 41 questions concerning channel wood issues in eastern Washington. Ten of the 41 questions were answered at least in part by studies in eastern Washington, but these were usually limited to a few specific regions of eastern Washington. The other questions could not be answered by literature currently available for eastern Washington.

Status:

This document was approved by CMER in 2004.

3.2.3. Eastern Washington Riparian Assessment Project (EWRAP)

Description:

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

Due to the perceived variability of forest stand attributes being high in eastside Type F streams, Phase 1 of this study was designed to test proposed methodologies; determine appropriate sample size with current riparian data; provide a data set that could be used for future studies, such as extensive monitoring and an in-stream characterization study; and to provide a baseline for future monitoring.

Variability was lower between sites than expected; thus, Phase 2 of this study is entirely a desktop project, which analyzes data from the 103 Phase 1 sites. This work characterized the accuracy of forest practices rules and habitat types, and included an assessment of how much harvest can occur on each site given stand densities and tree size.

Status:

The report for the Phase 1 was approved by CMER in 2007. The Phase 2 final report was completed in late 2015; it was approved by both SAGE and CMER and was approved with no action taken by Policy in 2016.

3.2.4. Eastside Modeling Evaluation Project (EMEP)

Description:

This project was initially part of Phase 2 of the EWRAP. Due to multiple contracting issues this component was never completed and was submitted to the Adaptive Management Program as a separate project from SAGE.

The EMEP modeling uses the riparian stand data collected from Phase 1 of the EWRAP project to assign fire and disease risk ratings (current and projected), under current rule or alternate plan, between eco-regions and within the 240-foot transect length from which riparian stand data were collected. Growth and yield models were used to extrapolate future stand conditions and provide detailed data about present and future stand structure and composition.

In summary, the EMEP was designed to model future riparian stand conditions based on current riparian stand conditions to estimate the extent to which current riparian stands might achieve the three FFR eastside riparian objectives (provide necessary riparian functions, are within the range of historic stand conditions, and to reduce risk of catastrophic damage due to disease or insect

outbreaks).

Status:

ISPR approved the final report in July 2020. CMER approved the final report in November 2020. CMER findings report (answers to 6-questions) was approved and sent to Policy in February 2021. No further action was taken by Policy on this project.

3.3. Bull Trout Habitat Identification Program (Rule Tool)

3.3.1. Bull Trout Presence/Absence Protocols

Description:

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

Status:

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

3.3.2. Bull Trout Habitat Prediction Models

Description:

This project was designed to develop habitat suitability models for bull trout, which would help in identifying those areas on the BTO that might actually be "unsuitable" for supporting the species. According to the forest practices rules, if areas were found to be unsuitable for potentially supporting bull trout, those areas could be exempt from the requirements of the all available shade rule. This project focused on bull trout juveniles; it did not include adult bull trout. The model's preliminary results showed that the primary habitat predictor of suitable habitat for juvenile bull trout was stream temperature.

Status:

To date, preliminary draft models have been found to be too coarse for forest practices purposes. One report from this project was finalized and approved by CMER: "Models to Predict Suitable

Habitat for Juvenile Bull Trout in Washington State," by Dunham and Chandler, July 2001. This report provided valuable information pertaining to habitat suitability for juvenile bull trout. However, the study only resulted in a preliminary model, which was too coarse of a screen for determining what would represent unsuitable bull trout habitat within forested lands. Predictive models tend to be more appropriate for determining "suitable" habitat rather than "unsuitable" habitat. Additional work is needed to incorporate additional variables, resulting in a finer screen for determining what might be suitable or unsuitable habitat. It is likely, however, that a model would not be adequate by itself to determine habitat suitability; additional field surveys would probably be needed on a site-by-site basis. The CMER report has been forwarded to Policy, who accepted the report and decided that no further action was needed at the time.

3.3.3. Yakima River Radiotelemetry

Description:

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

Status:

This project was contracted through the US Fish and Wildlife Service (USFWS) and was only partially funded with CMER funds. The final report, "An Investigation into the Migratory Behavior, Habitat Use and Genetic Composition of Fluvial and Resident Bull Trout (*Salvelinus confluentus*) in the Yakima River Basin" was completed in December 2015. The report was delivered to the AMP in late 2017 and added to the IMS system even though there is not an official CMER report number.

3.4. Eastside Type F Riparian Effectiveness Program

3.4.1. Bull Trout Overlay Temperature (Eastside Riparian Shade/Temperature) Project

Description:

The Eastside Riparian Shade/Temperature Project was designed to evaluate the effectiveness of both the all-available shade rule and the standard eastside riparian prescriptions in meeting FP HCP resource objectives. The project aimed at determining if a difference exists between shade and stream temperature provided by the BTO all available shade prescriptions and the standard shade requirements. The field study was originally implemented by BTSAG but is currently administered by RSAG. The study design specified a two-year, pre-harvest data collection period, a year for harvesting, and a two-year, post-harvest data collection period. This study was combined with the Solar Radiation/Effective Shade Project.

Status:

Post-harvest data collection was completed during the 2010 field season. The draft report has been through CMER and ISPR review. RSAG approved sending the post ISPR draft to CMER for approval in March 2014. The final CMER report #02-214.

3.4.2 Solar Radiation/Effective Shade Project

Description:

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

Status:

This project is complete. CMER report #02-212.

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

Description:

The original RSAG study design for eastside Type F riparian prescription effectiveness monitoring called for random sampling of Type F forest practices applications (FPAs) paired with untreated control sites to determine the effectiveness of the prescriptions as applied operationally across the range of conditions on FP HCP lands. The eastside was to be sampled as a separate stratum. However, the Eastside Riparian Shade/Temperature Project demonstrated the great expense and difficulty in finding suitable treatment and control sites in eastern Washington. Consequently, the decision was made to utilize the BTO temperature study sites for the eastside riparian prescription monitoring component, even though they were not randomly selected, in order to save money, expedite implementation of the project, and provide an integrated package of results for the adaptive management process. This was accomplished by collecting additional data on changes in vegetation, buffer integrity, and LWD recruitment at the BTO temperature study sites. (Consequently, the Eastside Type F Riparian Effectiveness Monitoring Project is sometimes referred to as the BTO add-on project.)

Status:

Changes in stand structure, tree mortality, ingrowth, and wood recruitment from fallen trees were compared one-two years and five years after harvest in response to the standard rule and the all-available shade riparian prescriptions. The final report was approved by CMER October 2019. The FP Board recommended no further action be taken at this time.

3.5 Hardwood Conversion Program (Effectiveness)

3.5.1 Riparian Hardwood Conversion Project

Description:

The Riparian Hardwood Conversion Project is a series of case studies at eight sites. Each site consists of landowner-designed and implemented site-specific harvests of hardwood trees in riparian buffers. In each case, harvest is followed by reforesting with conifers. Data about tree regeneration and residual stand condition are collected at each site. Data collection also includes annually asking participating landowners to document their silvicultural ~~strategies~~ treatments and the costs and benefits associated with each conversion.

Status:

Harvest has occurred at all sites, and four to five years after harvest, monitoring of regeneration is complete. CMER reviewed a draft interim report describing the pre-harvest, harvest, silviculture, and costs and benefits of the harvests at six of the eight sites. This report is titled "The Draft Case Study Reports: Hardwood Conversion Study," and the principal investigator was Frank Brown of Pacific Rim Forestry. Final drafts of the eight case study reports were received in spring of 2012 and were reviewed and approved by CMER. An interim summary report synthesizing the results and findings from the eight case studies was reviewed and approved by RSAG and CMER in 2014.

Commented [JM19]: Four to five years after harvest depending on the time of harvest.

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RSAG requested and received Policy approval to revisit the eight sites in FY 2016 to collect year ten regeneration and general buffer condition data. The ten-year resample is in response to concerns that four-year post-harvest stocking data do not reliably determine the likely future conifer stocking levels at these sites. RSAG approved the case study reports and the synthesis report. The reports went to CMER for review and approval and was sent to ISPR in early 2018.

In 2017 Cramer Fish Sciences completed and CMER accepted a final report on the first two Hardwood Conversion Project critical questions. In early 2020 CMER completed answers to the standard six questions characterizing the findings of the Cramer Fish Sciences report. Both the report and answers to the six questions were sent to TFW Policy without recommendations for additional research.

In Summer 2020, RSAG completed an informal analysis of approved forest practice application (FPAs), both standard rules and alternate plans, for hardwood conversions. This analysis indicated that hardwood conversions peaked between 2009 and 2015. For the 2015 to 2019 period only 30 hardwood conversion FPAs were approved. Consequently, RSAG recommended that public resource risk was not sufficient to warrant a long-term study.

3.5.3 Riparian Hardwood Conversion Project – Temperature Component

Description:

The hardwood conversion temperature study was contracted through an interagency agreement with the Washington Department of Fish and Wildlife (WDFW) in June 2003. The objective of this study was to collect data that may help understand what effect hardwood conversion rules and alternate plans may have on water temperature. Specifically, this was designed to collect temperature and canopy data in association with hardwood conversion activities. The study evaluated changes in canopy cover and air and stream temperature 2 years before and 2 years after timber harvest.

Stream temperatures were measured upstream and downstream and at 25-m intervals along stream reaches at the same eight study sites used in the Riparian Hardwood Conversion Project. These temperature measurements occurred before and after harvests. Pre-harvest data collection began in 2003, with the final post-harvest data collected in 2006. The minimum buffer width was 25 ft., but ranged from 25 ft. to more than 100 ft. This project was contracted with WDFW.

Commented [JM22]: As I remember the results were rejected because there was ground water entering the streams and influencing the water temperature. What are the conditions today? Ground water is a natural condition.

Commented [TA(23R22]: Move to RSAG parking lot

Status:

A data collection report has been reviewed and approved by CMER. This report did not undergo

ISPR since it provided the data and site descriptions only and did not include a statistical evaluation of harvest effects on stream temperature. High inter- and intra-site variability in both the treatment and control sites before and after harvest prevented CMER from using the data in a statistical analysis of treatment effects. CMER therefore agreed to finalize the study as a data collection report and archive all of the supporting documentation for potential future use. The data collected and reported in "Water Temperature Evaluation of Hardwood Conversion Treatment Sites Data Collection Report" (CMER #05-513, June 1, 2010) can be useful to scope and develop a study plan for a more comprehensive and long-term study addressing the water temperature and shade impacts of this once-common forest practice.

3.5.3 Ecology Water Temperature Modeling Project

Description:

This study used an existing stream temperature and shade model to explore the relative effect on stream temperature of different hardwood conversion strategies. The management strategies that were evaluated include a one-sided harvest with continuous 30-ft. and 50-ft.-wide buffers with treated stream lengths ranging from 500 to 1,500 ft. A sensitivity analysis was performed on a range of modeled stream conditions (width, flow, gradient, groundwater, and hyporheic flow).

Status:

A draft report was completed in 2006 and was reviewed and approved by CMER. The report was completed in 2007 and submitted to the Small Forest Landowners Advisory Committee, who forwarded the report on to Policy with a recommendation of no further action warranted at this time. The report from this study was Modeling the Effects of Riparian Buffer Width on Effective Shade and Stream Temperature, available at https://apps.ecology.wa.gov/publications/SummaryPages/0703028.html

4. UNSTABLE SLOPES RULE GROUP

4.1 Unstable Landform Identification Program

4.1.3 Shallow Rapid Landslide Screen for GIS Project

Description:

This project has three phases. The first phase compared different slope stability models. Based on the results of Phase 1, Policy directed DNR to develop a GIS-based screen of modeled slope stability based on digital elevation model (DEM) topography for the westside. This first phase was completed in 2001 and was released as Timber, Fish and Wildlife (TFW) Report 118 titled, "Comparison of GIS-Based Models of Shallow Landsliding for Application to Watershed Management." The second phase produced a modeled slope stability screen, which is available on the DNR forest practices website (SLPSTAB). A third phase has been proposed to identify topographic model(s) appropriate for similar mapping on the eastside, but it was never initiated.

Status:

- Phase 1 — Complete

Commented [JM24]: When will this happen?

Commented [TA(25R24]: Move to RSAG parking lot

Commented [JM26]: This will grow less common because it is legacy of second growth forests that have been mostly converted to third growth

Commented [TA(27R26]: RSAG recommends referring to this as "once common"

Commented [H(28R26]: Included suggested change

Commented [T(29]: Suggestion to add the report title and link. It might be helpful to add report titles and links for all completed studies that have one.

Commented [H(30R29]: Good idea. Will leave this one here and try to populate in the future.

- Phase 2 — Complete
- Phase 3 — ~~On hold~~Withdrawn

Commented [MM31]: Should this Phase be retired or moved to an active project?

Commented [H(32R31]: Changed to withdrawn.

4.1.2 Technical Guidelines for Geotechnical Reports Project

Description:

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

Status:

Complete.

4.2.1 Regional Unstable Landforms Identification Project (RLIP)

Description:

This project provided a coordinator to work with TFW cooperators within each DNR region in order to identify unstable landforms that do not meet the statewide landform descriptions. Its results also serve as an interim screen for deep-seated landslides by identifying lithologies that promote this type of slide; however, the project did not actually map individual deep-seated landslides but rather the areas where they occur in abundance. CMER and UPSAG recommended that the information created by the RLIP be incorporated into the Landslide Hazard Zonation (LHZ) Project. In 2005, data from this project were distributed to DNR regions.

Status:

Complete.

4.1.4 Landform Hazard Classification System and Mapping Protocols Project

Description:

This project developed a detailed protocol for mapping landslides and potentially unstable landforms in a consistent manner, leading to the assignment of hazard level to unstable slopes in the forested environment. This project was completed in 2004; the protocol has subsequently been used to implement the LHZ Project (described below). State lands geologists have also applied the protocols to analysis of large blocks of land under state ownership.

Status:

This project was completed in 2004 and ~~has been~~was utilized in the LHZ Project.

4.2 Mass Wasting Effectiveness Monitoring Program

4.2.1 Mass Wasting Effectiveness Monitoring Project

Description:

This project was designed to statistically compare landslide rates among five harvest treatments and five road treatments. The treatments were sets of prescriptions associated with the period in

which different forest practices rules were in effect. In late 2007, a storm produced a significant population of landslides. Landslide data were collected within 4-square-mile blocks, and all area encompassed by the blocks was classified into one of the five harvest and five road treatments. Harvest and road landslides were analyzed separately, and primary statistical analyses were made relative to the block response to account for differences in geomorphology and rainfall intensity. Tests were conducted to determine whether there are differences in the density of landslides associated with each of the harvest and road treatments. The statistical design aimed to answer two critical questions in Table 27: "Are the forest practices unstable slopes rules reducing the rate of management-induced landsliding at the landscape scale?" and, "Are the mass wasting prescriptions and mitigation measures effective in preventing landslides from roads and harvest units?" The detailed data collection at individual landslides was used to help evaluate the effectiveness of specific best management practices. This project is a CMER Clean Water Act Milestone.

Status:

The final report was submitted to CMER and Policy in May 2013 as CMER Publication 08-802. The report was submitted to Policy as a non-consensus report, which includes minority reports.

4.3 Deep-Seated Landslides Program

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

Description:

This project developed an analytical model for assessing changes in evapo-transpiration resulting from timber harvest. The model was intended to be applied to timber harvest within the groundwater recharge area of deep-seated landslides in glacial sediments. The model has been developed but was not directly validated and refined because of insufficient field data to verify model parameters. As such, UPSAG and CMER did not recommend a policy change, even though the results of the model suggest that there is likely a significant, detectible change in water availability when converting an entire groundwater recharge area from mature forest to a clear-cut (Sias 2003). A follow-up validation/refinement study could be pursued as a second phase, as described below.

Status:

Complete, but there has been no use of the model due to a general lack of available data required to run the model in the forested environment.

4.3.3 Literature Synthesis of the Effects of Forest Practices on Glacial Deep-Seated Landslides and Groundwater Recharge

Description:

This project is a focused literature review to summarize the best available science on the effects of forest practices on deep-seated landslides in glacial materials. The literature review includes an annotated database, a GIS map product, and a synthesis report. UPSAG undertook this project in 2015 to provide updated background information to help address the question: "does harvesting of the groundwater recharge area of a glacial deep-seated landslide promote its instability?" The

synthesis found that the sensitivity of glacial deep-seated landslides to forest practices is poorly understood and that many of the effects of forest practices must be inferred using measurements for different land-cover types (Miller 2016).

Status:

Completed. The Literature Synthesis of the Effects of Forest Practices on Glacial Deep-Seated Landslides and Groundwater Recharge was presented to UPSAG in June 2016 and approved by CMER and delivered to Policy in July 2016.

4.3.3 Literature Synthesis of the Effects of Forest Practices on Non-Glacial Deep-Seated Landslides and Groundwater Recharge

Description:

This project was a companion project to the literature synthesis focused on deep-seated landslides in glacial materials, but focuses on non-glacial materials. UPSAG undertook the project in October 2016 to address questions related to the effects of harvesting of the groundwater recharge area of non-glacial deep-seated landslides on slope stability. An Unstable Slopes Proposal Initiation (PI), generated by the Forest Practices Board led to a memo "Recommendations from TFW Policy Committee to Forest Practices Board", dated August 4, 2016, informing the questions posed for the literature synthesis. This literature review builds on the annotated database and landslide inventory created for the glacial deep-seated literature review and includes a separate synthesis report to address additional questions about slope stability in non-glacial materials.

Status:

Completed.

5. ROADS RULE GROUP

5.1 Road Sub-Basin-Scale Effectiveness Monitoring Program

5.1.1 Road Surface Erosion Model Update Project

Description:

The Surface Erosion Module of the Washington Forest Practices Board Manual on Standard Methodology for Conducting Watershed Analysis (version 4.0, November 1997) contains an empirically derived road erosion model widely used for estimating surface erosion and sediment delivery to streams from forest roads.

The primary purpose of the Road Surface Erosion Model Update Project was to refine and adapt the manual's model for use in forest road monitoring and as an assessment method. Revisions included standardizing input variables and developing repeatable application protocols. This project also included developing, testing, and refining standardized protocols for field application of the revised road surface erosion model for use at the site and road-segment scale.

Status:

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

6. WETLANDS PROTECTION RULE GROUP

6.1 Forested Wetlands Effectiveness Program

6.1.1 Forest Practices and Wetlands Systematic Literature Review

Description:

1. Adamus (2014): The Forest Practices and Wetlands Systematic Literature Review was intended to address the uncertainty about how harvesting wetlands and constructing roads in and adjacent to wetlands affects the capacity of wetlands to contribute to watershed processes that support fish, amphibians, and water quality. This project reviewed and synthesized scientific literature to identify and evaluate effects on wetland functions, with a primary focus on harvesting trees from forested wetlands and on road construction and maintenance activities. This project will allow WetSAG to develop testable hypotheses for future WetSAG projects; to evaluate risk and uncertainty about protecting wetland function; to inform prioritizing, scoping, and designing of future field studies; and to fill data gaps identified in the previous wetland literature review.

2. Hough-Snee (2019): Previous literature reviews did not link specific forest practice actions to forested wetlands as they occur in different biological and climatic regions of Washington State and the larger Pacific Northwest. Due to Washington State's diverse climate, ecology, geology, and hydrology, an updated systematic literature review paired studies from across North America with management and application domains by topic. This review synthesized recent, key forested wetlands studies to Washington State Department of Natural Resources administrative regions within which forestry activities occur. This provided a geospatial bibliography from which managers can identify patterns in the literature that describe how forestry activities impact forested wetland ecology and hydrology across Washington State.

Status:
The Adamus review was completed in 2014 and the report is available online (CMER #12-1202). This report was augmented by FWEP TWIG (Beckett et al. 2016) as part of the FWEP scoping process. A Wetland Research and Monitoring Strategy was developed based on findings from the literature review; priority will be placed on scoping projects identified in the Strategy. The Hough-Snee review was completed in 2020 and the report is available online (CMER #2020.02.25).

6.1.2 Forested Wetlands Literature Review and Workshop Project

Description:

The Forested Wetlands Literature Review and Workshop Project was intended to perform a literature review and synthesis of relevant forested wetland research. The project focused on literature with an emphasis on interactions between commercial forest management activities and forested wetland functions, emphasizing topics listed in the WDNR Forests and Fish Report.

Status:

This project was completed in 2005 and the report is available online (CMER #04-406).

6.1.3 Statewide Forested Wetlands Regeneration Pilot Project

Description:

The pilot project was largely conducted in western Washington (with a single eastside site) and finalized in 2004. This pilot study was initiated to characterize regeneration in forested wetlands, develop research methodologies, examine current methodologies of forested wetland regeneration, and determine the success of their implementation. The pilot study had two primary objectives:

1. Develop a process for identifying suitable sites to sample. This included working with landowners to identify forested wetlands that have been harvested.
2. Develop and test methods for site selection, a test sampling protocol, measures of regeneration success, and methods for data analysis; and collect some preliminary information about regeneration in forested wetlands to guide study design for a full-scale study.

Status:

This pilot project was completed in July 2004. CMER approved the "Forested Wetland Regeneration Pilot Summary Report" (CMER #03-303).

This project showed the difficulty in finding forested wetlands in an unbiased manner. A full- scale study was not recommended by WetSAG upon completion of the pilot study and no such study is planned at this time. Future studies of wetland prescription effectiveness, wetland and stream temperature interactions, and hydrologic connectivity will further explore wetland functions and impacts associated with timber harvest.

6.2 Wetland Mapping Program

6.2.1 Wetland Intrinsic Potential Tool (WIP)

Description

- Phase 1 developed a beta wetland intrinsic potential (WIP) identification model that interfaces as a GIS~~n ArcMap~~ tool.
- Phase 2 calibrated the wetland identification model (i.e., using field data) to predict the probability of wetlands (including forested wetlands) on forest lands of western Washington.

Phase I developed the GIS-based wetland identification tool by linking pixel-based and object-based approaches for delineating forested wetlands. Pixel-based approaches utilize topographic attributes inferred from high-resolution elevation data (e.g., LiDAR DEMs) with soils and geologic mapping to identify hydrogeomorphic attributes associated with wetlands. Object- based approaches use a variety of data sources, potentially including the pixel-based results, with eCognition software to delineate visual (from optical imagery) and topographic features associated with forested wetlands. eCognition is a commercial .software program widely used for object-based analyses To apply these tools, the project team built an add-in tool kit for ArcGIS that enables a user to (1) generate the pixel-based attributes, (2) optionally import eCognition-produced

files, and (3) map potential wetlands. The wetland intrinsic potential identification tool works either with or without object-based, eCognition-provided data files, although inclusion of the object-based results provides better wetland identification and more accurate delineation than can be achieved with the pixel-based results alone.

Phase 2 of this project refined the WIP tool through new data collection, inclusion of additional remote sensing methods and statistical analysis, and calibration of the WIP tool in new areas. The tool development included revisions with new datasets and methods, testing the tool on multiple watersheds, comparing the ability to transfer a model to different geographic watersheds, troubleshooting the revised tool, and updating the user manual and report from Phase 1. The importance of local "training" data for each geographic area/watershed was emphasized.

Status:

Phase 1 was approved for funding by Policy in November 2015. Phase 1 was completed in April 2018. Adaptive Management funding for this project enabled CMER to join with a larger wetlands mapping project led by Ecology with funding from EPA and in collaboration with other state and federal agencies. Phase 2 began in July 2018 and was completed in early 2021 (Wetland Mapping Tool Project Phase 2 Report, CMER document # 2021.04.27). The WIP tool has been successfully used in locating study sites for the FWEP Chronosequence study.

7. WILDLIFE RULE GROUP

7.1 Wildlife Program

7.1.1 RMZ Resample Project

Description:

In 1990, CMER funded a BACI-based manipulative study to examine the effects of two buffer configurations (state regulations and “smart buffers”) on birds, small mammals, and amphibians. The study produced two years of pre- and post-harvest data and a final report that was completed in 2000. The results were species-specific and equivocal, and raised numerous questions about the long-term response of wildlife to the treatments. Because the smart buffer was similar to the forest practices buffer for Type F streams, and more than five years had elapsed since last sampling in the RMZ, another two years of sampling was initiated in 2003 to document changes over time. The extension was intended to provide additional data on riparian conditions and some SAAs.

Status:

The final report was completed in 2008 and was reviewed by LWAG, CMER, and ISPR. The contract with the consultant that collected the data and prepared the final report was not renewed; therefore, the final report has not been revised based on ISPR comments. LWAG developed a memorandum that summarized the complex issues surrounding the inability to finalize the RMZ Resample report and its tentative conclusions, and LWAG provided suggestions for addressing any useful information that might be extracted from the project’s results. That memorandum and the ISPR comments were attached as an addendum to the final report and submitted to CMER for final approval. Since that time, LWAG has examined the report and available data, and determined

that only the bird and amphibian data have potential for further analysis and for useful additional products. The bird data have a higher priority for further analysis, due to the methods used for data collection. A report on the bird data was developed in 2013, has gone through LWAG, CMER, and ISPR review, and been finalized and approved by Policy. The product was a peer-reviewed, submittal-ready report that was accepted in PLOS in December 2015.