

Agenda Item No.:	4
Work Plan Title & #:	Strategic Planning, Implementation & Monitoring Work Plan 1
IBI # & Title:	IBI 5 Strengthen Links to Forestry Work Outcomes
Presentation Title:	Update on Private Forests Riparian Function and Stream Temperature (RipStream) Project
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**SUMMARY**

This report provides an update on and presents findings from the ongoing long-term Riparian Function and Stream Temperature (RipStream) monitoring project. This monitoring project supports the Forest Practices Act’s (FPA) purpose of ensuring that forest operations meet state water quality standards. This report and attachments summarize the effectiveness of riparian protection measures at minimizing increases in summer stream temperature associated with timber harvest, discuss preliminary results of the 5-year post-harvest analysis, and discuss implications of the most recent research results.

**CONTEXT**

The Board’s 2011 *Forestry Program for Oregon* states that the Board supports an effective, science-based, and adaptive Oregon Forest Practices Act and a strong, but flexible, Land Use Planning Program as the cornerstones of forest resource protection on private lands in Oregon (Objective A.2). The discussion of Goal A recognizes that the FPA includes a set of best management practices to ensure that forest operations are conducted to meet state water quality standards adopted under the federal Clean Water Act. The Board’s guiding principles and philosophies includes a commitment to continuous learning, evaluating and appropriately adjusting forest management policies and programs based upon ongoing monitoring, assessment, and research (Value Statement 11).

With the adoption of the 1994 Water Protection Rules, the Board of Forestry and the Department of Forestry adopted a formal commitment to resource monitoring. Monitoring and evaluation of the water protection rules are necessary because of the innovative approach taken in the rules. Pursuant to OAR 629-635-0110(3)(d), the Department makes annual reports to the Board about current monitoring efforts, and, if applicable, presents findings and recommendations for changes to forest practices.

This report summarizes Private Forests monitoring projects for calendar years 2010 and 2011. During this period, the Private Forests effectiveness monitoring program operated

with no staff due to budget reductions. The program continued the RipStream analysis in partnership with Oregon State University, State Forests and the RipStream external review committee. Funds were provided by ODF State and Private Forest Divisions, Department of Environmental Quality (DEQ), the Environmental Protection Agency (EPA) and the Headwaters Research Cooperative.

## **BACKGROUND**

The Riparian Function and Stream Temperature (RipStream) project is designed to monitor the effectiveness of stream protection rules as prescribed for State Forests and private forestlands. RipStream study sites are located throughout the Coast Range geographic region on small and medium sized fish-bearing streams. Currently, all 33 sites (18 Private and 15 State) have at least three years of post-harvest data and most sites have complete data sets for stream temperature, shade and channel data. A key gap exists in final riparian vegetation cruise and in-channel downed wood data in the fifth year post-harvest (12 sites complete).

The first effectiveness analysis (presented September 2009 and 2010 Board meetings) focused on a strict regulatory perspective of stream temperature and evaluated RipStream sites for effectiveness in meeting stream temperature standards. The analysis evaluated two DEQ temperature standards, the Biologically-Based Numeric Criteria (Numeric Criteria) and the Protecting Cold Water Standard (PCW).

The analysis indicated that both State and Private sites performed well in regard to the maximum temperature thresholds established by the Numeric Criteria standard. For the second standard, timber harvests on state lands did not exceed the PCW more frequently than expected under natural background conditions (5%). Timber harvests designed to the minimum FPA riparian protection standards for Medium and Small Type F streams exceeded the PCW at a greater frequency than would be expected by chance (40 % vs. 5 % for all other stream reaches).

The Department indicated that the findings were consistent with previous department studies on small and medium fish-bearing stream requirements. The ODF/DEQ Sufficiency Analysis reported that about 35% of the harvested sites analyzed exhibited shade reductions in excess of 10 percent relative to unharvested stands. Observed temperature responses to shade level reductions in excess of 10% would not be unexpected.

The first analysis' focus on a strict regulatory perspective of stream temperature, did not allow the results to address functional questions of what site or other environmental variables specifically influence stream temperature. The current analysis examines the magnitude of stream warming or cooling attributable to timber harvest and stream temperature behavior in relation to treatment reach length, changes in shading, stream gradient, and other factors.

## ANALYSIS

### *RipStream Effectiveness Results*

The most recent analysis (see attachments 1 and 2) examines the behavior of several stream temperature metrics in relation to study site characteristics: changes in treatment reach daily maximum, minimum, average, and daily range of temperatures pre-harvest and up to two years post-harvest. The site variables included stream shade, gradient, elevation, reach length, valley azimuth, watershed area, and change in the control reach temperatures.

The analysis created multiple statistical models to examine different explanations for changes in stream temperature. The best models for changes in stream temperatures in the treatment reach included the upstream control reach, length of the treatment reach, and treatment reach shade as explanatory variables. Shade was a particularly important variable. At the lowest-encountered levels of shade (51%), holding other factors constant, the maximum stream temperatures were predicted to increase by almost 2 °C. Minimum temperatures were predicted to increase by 0.3 °C. Mean temperatures and the daily range of temperature also increased under low-shade conditions.

Maximum temperatures increased at private sites after harvest by an overall average of 0.7 °C. Sites exhibited variability in responses; some sites increased by up to 2.5 °C while others decline by 0.9 °C. The average change in maximum temperatures for state forest sites was 0.0 °C, and supported temperature models that considered state sites post-harvest years to resemble pre-harvest conditions. In turn, shade overall declined post-harvest at private sites but not at state sites

The analysis included an examination of factors relating to site shade levels. The best-supported model found that shade levels were related to the amount of riparian basal area within 100 feet of a stream and tree height. The greater the basal area, the more shade remained. Shorter trees were associated with more shade.

In summary, stream temperatures on average increased by 0.7 °C on private study sites post-harvest. We did not detect a harvest signal on state forest study sites. Temperature increases were related to shade, which in turn was related to tree height and basal area.

### *Policy Implications*

The results from this analysis and the regulatory analyses (i.e., Numeric Criteria and Protecting Cold Water) described the magnitude and expected frequency of the two year post-harvest temperature change, variability in change among sites, the management-related factors associated with the temperature change, and the degree to which that change appeared to meet regulatory water quality requirements. Together these findings indicate that FPA riparian protection measures for small and medium fish streams do not maintain stream temperatures similar to control conditions, and are inadequate to insure forest operations meet the state water quality standard for protecting cold water. The results inform the Board of Forestry regarding their statutory obligations to “establish best management practices and other rules applying to forest practices as necessary to insure that to the maximum extent practicable nonpoint source discharges of pollutants

resulting from forest operations on forestlands do not impair the achievement and maintenance of water quality standards” (ORS 527.765).

## **RECOMMENDATION**

The Department recommends that the Board consider the implication of these results and the potential need to revise the riparian protection standards to increase the maintenance and promotion of shade on small and medium fish streams.

The Board should also direct the Department to prepare a January agenda topic that reviews the Board’s duties and powers for rules and required consultation with other agencies (ORS 527.710); the types of rules, procedure, necessary findings, and rule analysis (ORS 527.714); the relationship between rules for maintaining water quality (ORS 527.765) and rule analysis (ORS 527.714); and implications for good faith compliance with best management practices or “BMP shield” (ORS 527.770).

## **NEXT STEPS**

In accordance with Board guidance, Staff will develop a January agenda topic to review aspects of rule analysis procedures and to facilitate discussion of the implication of RipStream results and the potential need to revise the riparian protection standards for small and medium fish streams.

Staff will continue analysis of the relationship between vegetation / site characteristics, shade and temperature. The analysis will inform the development of possible options to insure that best management practices and other rules applying to forest practices do not impair the achievement and maintenance of water quality standards.

Staff will continue RipStream data analysis to address the following topics:

- Environmental Quality Commission Water Quality Standards assessment to 5 yrs post-harvest
- Riparian stand conditions relative to State forest management plan and FPA desired conditions
- Maintenance & recruitment of large woody debris pre-harvest and 1-5 yrs post-harvest
- Magnitude of temperature change in downstream reaches pre- v. post 1-5 yrs harvest.

Answers to these questions would address the efficacy of the Forest Practices Act at meeting Future Desired Conditions.

## **ATTACHMENT**

- (1) Riparian Function and Stream Temperature (RipStream) Project: Background, Current Findings, and Future Analyses
- (2) Groom, J.D., L. Dent, L.J. Madsen, J. Fleuret. 2011. Response of western Oregon (USA) stream temperatures to contemporary forest management. *Forest Ecology and Management* 262:1618-1629 (Abstract only).