Testing the Effectiveness of Riparian Buffers Along Non-Fishbearing Streams: The Type N Experimental Buffer Treatment Study

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Introduction

In the spring of 2000, the Washington Forest Practices Board (WFPB) adopted emergency rules designed to maintain and restore salmonid populations and meet the requirements of the federal Clean Water Act (WFPB 2000). These rules were based on the recommendations of the Forests and Fish Report (FFR), the product of negotiations between federal agencies, timber landowners, state resource agencies, and tribal and local governments (USFWS et al. 1999). Permanent rules were adopted in May 2001 (WPFB 2001).

The resource goals of FFR are to:

- Meet water quality standards,
- Maintain a viable timber industry in Washington,
- Provide harvestable levels of fish, and
- Maintain viable populations of stream-associated amphibians (SAAs).

Riparian buffer prescriptions are a key part of the FFR strategy to achieve these three goals.

Objective

This study will assess the effectiveness of the Forest and Fish Report (FFR) patch buffer prescriptions along non-fishbearing (Type N) streams in western Washington. The FFR riparian prescriptions are designed to achieve the resource goals by maintaining important ecological functions provided by riparian forests, including: large woody debris recruitment, shade to control stream temperature, sediment filtering / bank stability, and litterfall. The purpose of this study is to evaluate the relative effectiveness of alternative prescriptions in meeting FFR resource goals, which includes the response of SAAs to differing buffer strategies.
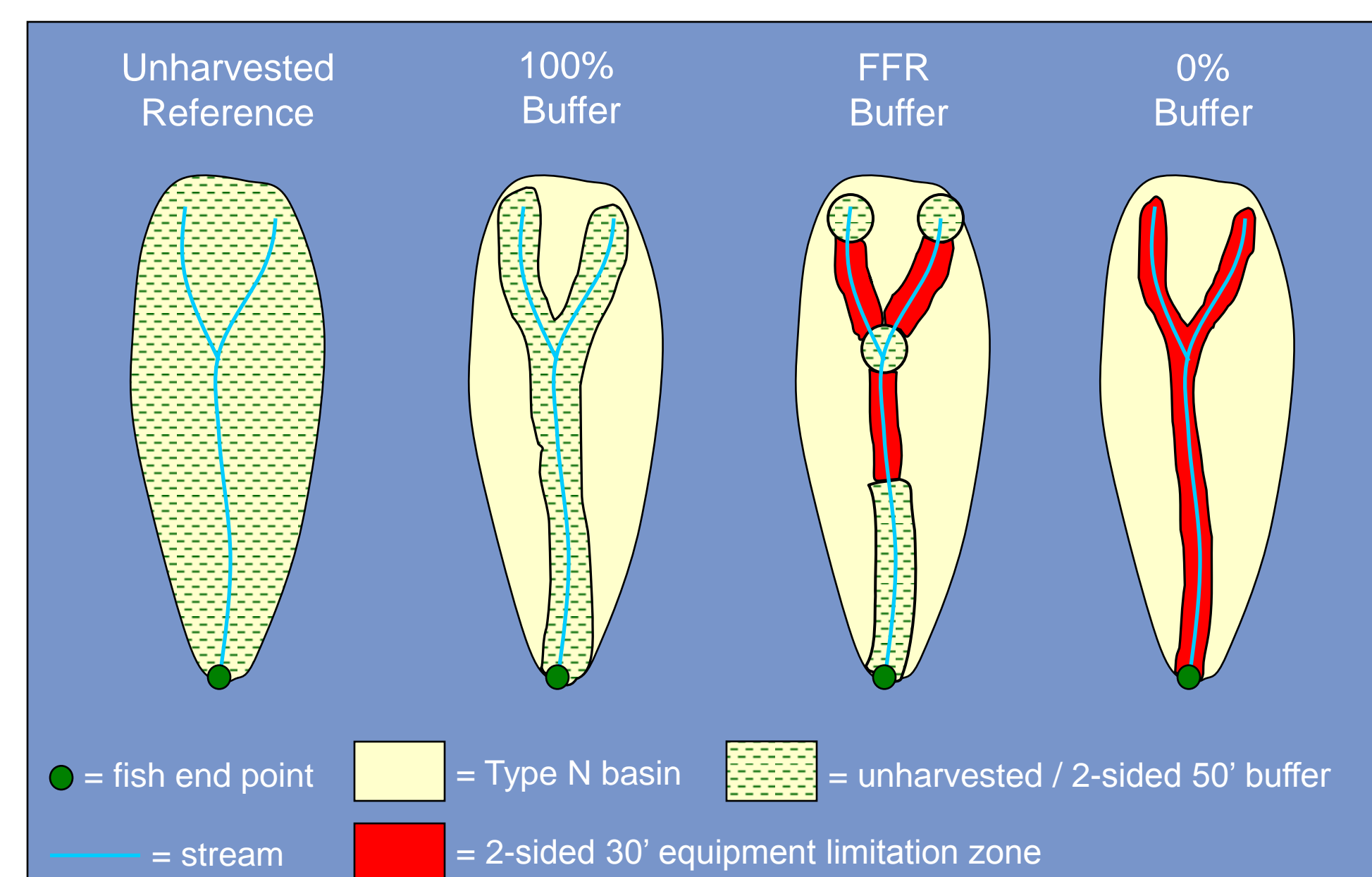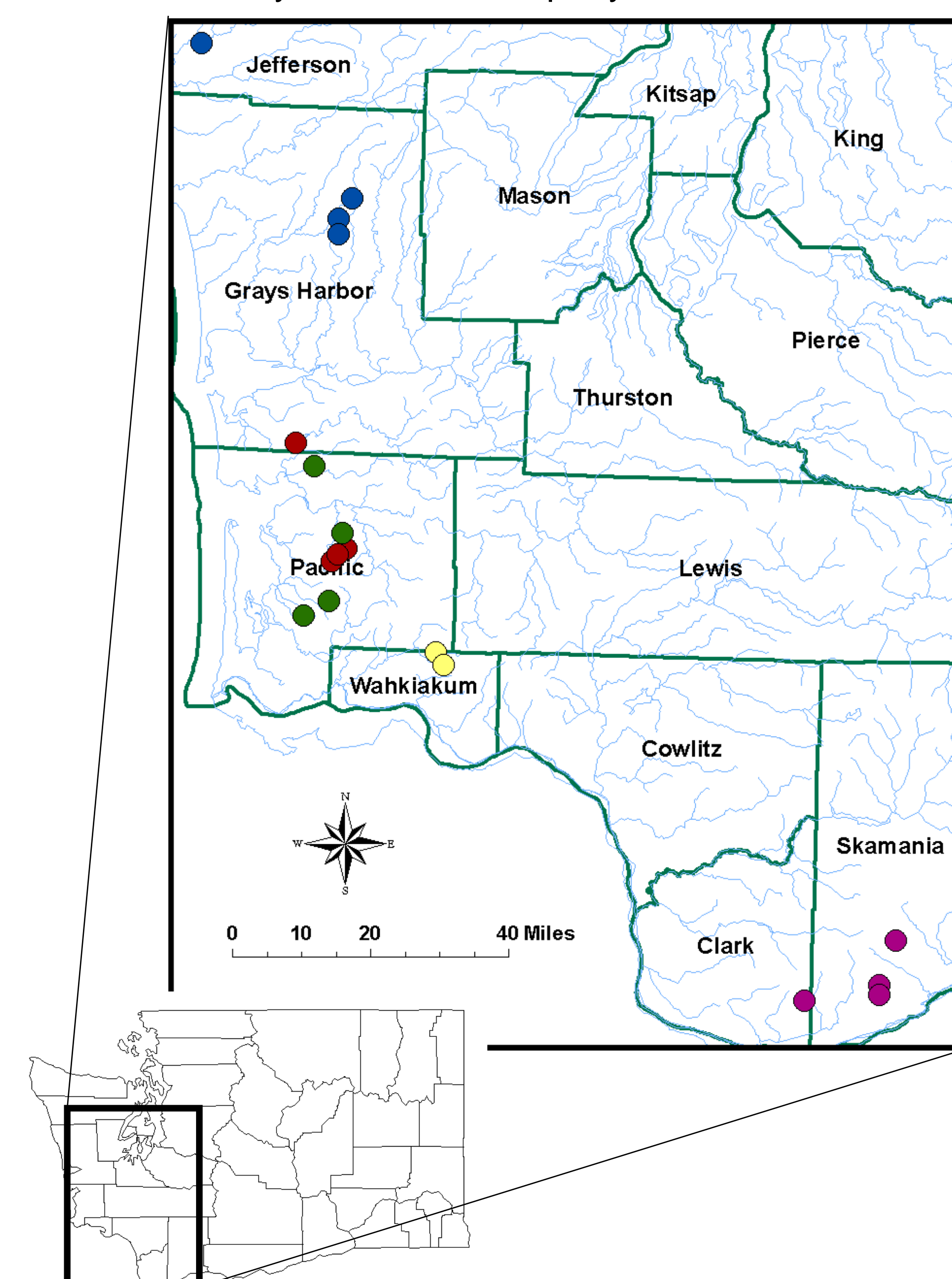

Figure 1. Four alternative buffer treatments: an unharvested basin, 100% stream length buffered, 50% stream length buffered (representing one application of the FFR prescribed buffer), and 0% stream length buffered.

Site Selection

The study is a cooperative effort between state and federal agencies, private landowners, Indian Nations, and conservation groups. A complex 2-year site selection effort began in 2004 and involved a 4-tiered process including:

1) GIS screening of basins meeting specified criteria,

2) Acquisition of landowner information,

3) Field verification of GIS information and target amphibian presence, and

4) Verification of fish end point.

A total of 35,957 non-fishbearing basins were screened. Twenty-seven met criteria all screening criteria. Of these, 18 are included in the study: 4 replicated blocks of 4 treatments, and 2 back-up sites (Figure 2). Basins are located within the following ownerships: Gifford Pinchot National Forest, Green Crow, Longview Fibre Company, Olympic National Forest, Rayonier, Washington State Lands, and Weyerhaeuser Company.

Table 2. Distribution of 18 non-fishbearing basins included in the Type N Study, color of circles represents block groupings.

Methods

We will compare one application of the FFR buffer to 3 alternative treatments (Figure 1). Treatments will be applied to the entire non-fishbearing basin. Differences in treatments will be measured by changes of amphibian occupancy, density, and genetic structure; stream characteristics including large woody debris load, water quality; primary productivity; elements (litter and nutrients) exported to fishbearing streams; and response of fish downstream.

Amphibian	Stream Characters	Water Quality	Primary Productivity	Downstream and Exports
Presence Density Genetics	Morphology Habitat Units Large Woody Debris	Temperature	Periphyton Standing Crop	Fish Nutrients Organic Material Macroinvertebrates Sediment Water Temperature

Table 1. Primary variables that will be measured to compare between treatments. Data collection conducted by **Washington Department of Ecology**, **Washington Department of Fish and Wildlife**, **Washington State University**, and **Weyerhaeuser Company**.

Analysis

Data will be analyzed using a repeated measures analysis of variance (ANOVA). Factors in the analysis will include: 1) before-after treatment, 2) year, 3) reference-treatment comparison, and 4) interaction between before-after and reference-treatment.

Due to the large number of data points recorded, temperature will be analyzed using a regression to examine potential changes before and after treatments as well as between references and treatments. These analyses are expected to distinguish potential differences among treatments and evaluate the relative ability of buffer prescriptions to maintain headwater habitat and system functions.

Time Line

Year 1 & 2 (2004-2005): contact landowners, site selection

Years 3 & 4 (2006-2007): pre-treatment data collection

Year 5 (2008): application of harvest treatments

Years 6 & 7 (2009-2010): post-treatment data collection

Year 12 (2015): post-treatment genetic sampling

The study is designed (pending funding) to include at least one round of post-treatment sampling to occur 10 years after the application of treatments.

Literature Cited

USFWS et al. [US Fish and Wildlife Service and 11 other organizations]. 1999. Forests and Fish Report. Washington Forest Protection Association, Olympia.

WFPB [Washington Forest Practices Board]. 2000. Forest Practices Emergency Rules. Washington Department of Natural Resources, Forest Practices Division, Olympia.

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Acknowledgements

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