



# Riparian Rule Analysis: Methods

Board of Forestry

April 22, 2014

Sunriver, Oregon

# Outline of Agenda Topic



- **Overview: context, background, discussions with RFPCs, CFF, stakeholders**
- **Decision matrix**
- **Methods: model, economic and ecological information**
- **Geographic extent**
- **Reports / comments from advisory committees**
- **Public comment**
- **Board Discussion**
- **Wrap up, next steps**

# Context



- **Rule Analysis for Protecting Cold Water criterion**  
Establish riparian protection measures for small and medium fish-bearing streams that maintain and promote shade conditions that insure, to the maximum extent practicable, the achievement of the Protecting Cold Water criterion
- **Decision timeline on findings, “informal checklist” to be made at each step of the process**
- **April 2015: review methods for supporting June 2015 decision on prescription and geographic extent**

# June 2015 Decisions



- **Prescriptions to move into formal rule making as either regulatory or voluntary measures**
- **Geographic extent of prescription application:**
  - Geographic Regions
  - Stream Extent
- **Remaining 527.714 findings (from checklist):**
  - Restrictions on practices directly relate to, and substantially advance the objective 527.714(5)(d)
  - Must chose least burdensome alternative 527.714(5)(e) and resource benefits achieved by the rule must be proportional to the harm cause by forest practices 527.714(5)(f)



## Stakeholder, Advisory Committee Meetings

**At the September 2014 meeting, the Board directed the department to work in conjunction with Regional Forest Practices Committees and stakeholders to:**

- Develop prescriptions for a new Riparian Protection Rule
- Continue analysis of a) Geographic Regions in western Oregon to which the rule should apply and b) to which stream segments the rule should apply



# Stakeholder, Advisory Committee Meetings

## Met with:

- Combined NW/SW Regional Forest Practices Committees
- Committee for Family Forestlands
- Oregon Stream Protection Coalition
- Oregon Forest Industry Council
- Oregon Small Woodlands Assn., Oregon Assn. of Loggers, Oregon Tree Farm System
- State and Federal Agencies (GNRO, ODF&W, DEQ, and OWEB, EPA, NOAA)
- Fieldtrips with Stewardship Foresters



# Stakeholder, Advisory Committee Meetings

## **With these groups, discussed:**

- Rulemaking timeline, Board meeting dates, and key points for public input
- Model development for prescription and results
- Developing prescriptions, e.g., no-cut buffer, variable retention buffer
- Geography: which geographic regions and which stream reaches
- Economic and ecological information
- Regulatory, non-regulatory, hybrid

# Decision Matrix



## **Purpose:**

- Provide summary tradeoff information
- Focuses on key information requested by the Board

## **Organization:**

- Groups prescriptions by the Board alternatives (columns)

## **Matrix content:**

- Predicted temperature change,
- Change in restriction on forests practices,
- Economic and ecological information, and
- Information on impact by geographic region and stream extent

# Proposed Decision Matrix

	Prescriptions (Rx)									
	No Harvest Buffer			Variable Retention (VR)				Crit. Alt. Plan	Alternate Rx	
	50 ft.	70 ft.	100 ft.	FPA	VR-A	VR-B	FMP			
<b>Rx Description</b>										
<b>Predicted temp. change w/ CI</b>										
<b>Change in Restrictions on Forest Practices by Stream Size</b>										
<b>Medium Streams (acres/mile)</b>										
<b>Small Streams (acres/mile)</b>										
<b>Change in Wood Production Values by Ownership Type (Economic Information)</b>										
<b>Industrial value (\$/acre)</b>										
<b>Non-industrial value (\$/acre)</b>										
<b>Change in Riparian Functions (Ecological Information)</b>										
<b>Large wood recruitment (%)</b>										
<b>Fish response (qualitative)</b>										
<b>Other (litter fall, root strength)</b>										
<b>Forest Practices Act Rules Geographic Region</b>										
<b>Coast Range</b>										
<b>ΔAcres SSBT / Fish – Ind.</b>										
<b>Δ Acres SSBT / Fish – NIPF</b>										
<b>Interior (etc.)</b>										

# Methods Discussion



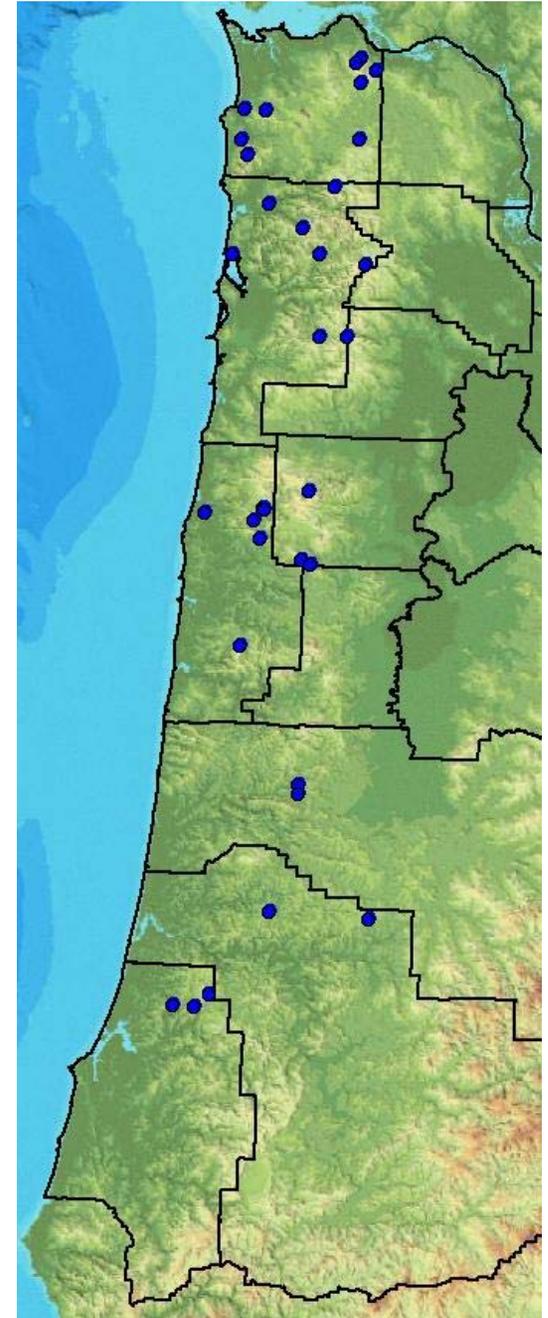
## Will follow the rows in the matrix:

- Predicted Temperature Change: Model Development; Model Assumptions, Limitations and Uncertainty; Use of Model and Other Information for Evaluating Prescription
- Change in Restrictions on Forest Practices
- Change in Wood Production Values (Economic Information)
- Ecological Information: Large Wood Recruitment; Fish Response; Other Functions
- Geographic Extent to Which Prescriptions Apply: Geographic Regions; Stream Reach Extent

# Model Development Background

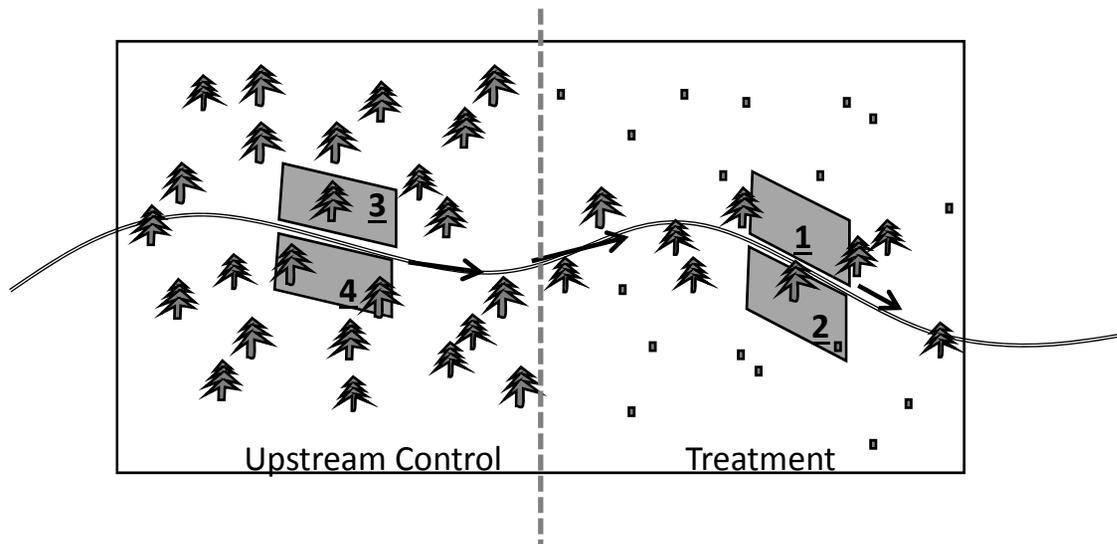
## RipStream Study Design and Data

- Thirty-three (33) Sites (18 on private forests, 15 on State forests, medium and small fish bearing streams).
- Objective: Evaluate effectiveness of forest practices rules and strategies at protecting stream temperature, promoting riparian structure



# RipStream – Data Collection

- Stream temperature
- Shade
- Channel morphology (e.g., gradient, widths, etc.)
- Riparian vegetation (e.g., trees, shrubs)



# Current Modeling For Policy Analysis

- **Predictive Analysis: based on vegetation plots and stream temperature data**
  - Joins Temperature Change Magnitude shade and temperature models
  - Produces estimates of harvest warming
  - Can produce predictions of proposed harvest effects on temperature
  - Measure of confidence in model results

# Model estimation: Predicting Temperatures

**Temperature** = Control reach temp + Treatment Length + % Gradient + Shade

Pre-harvest shade = pre-harvest shade

Post-harvest shade =

Buffer width + density (ba/ac) + composition (% hardwood) + average tree height + number of sides harvested

# Predicting Temperature Change From Harvest

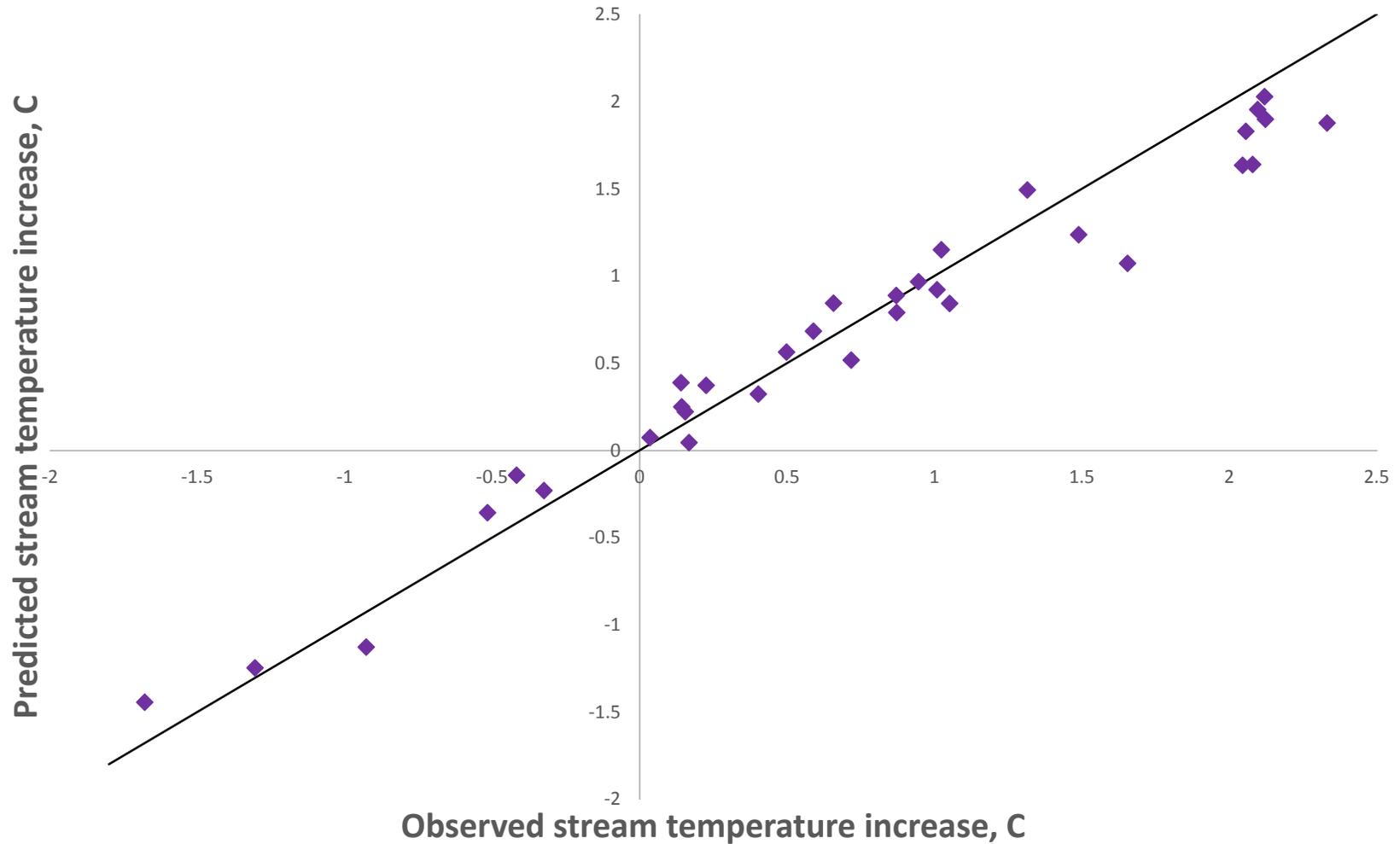
**Temperature<sub>1</sub>** = Control reach temperature + Reach Length + % Gradient + No-harvest shade

**Temperature<sub>2</sub>** = Control reach temperature + Reach Length + % Gradient + Post-harvest shade

Temperature<sub>2</sub> – Temperature<sub>1</sub> = HARVEST EFFECT

# Model Performance

## Observed vs. Predicted Change in Stream Temperature



# Model Results: As harvested

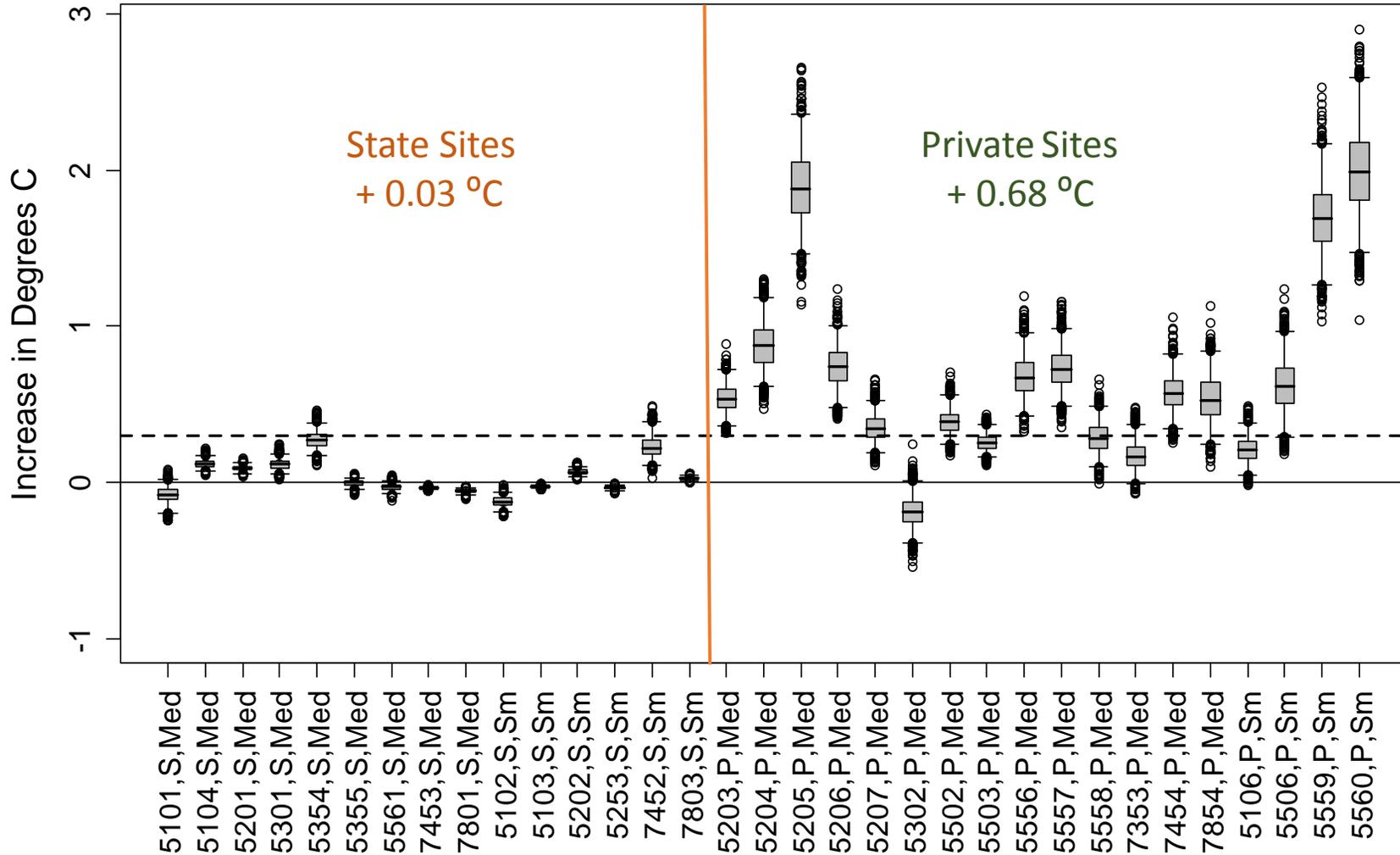


Figure 4 from Attachment 3

# Model Results: FMP Harvest

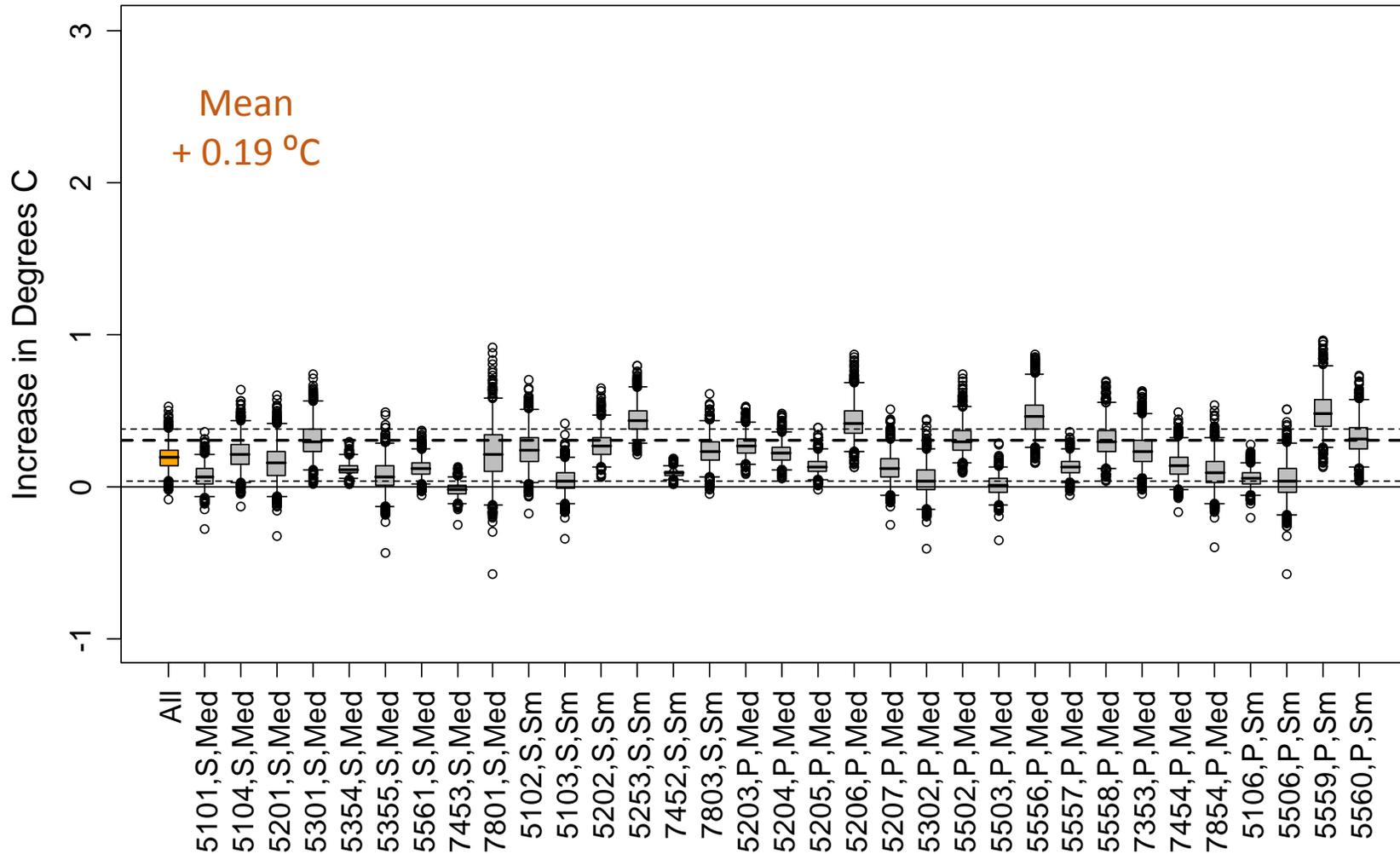


Figure 5 from Attachment 3

# Model Results: FPA harvest

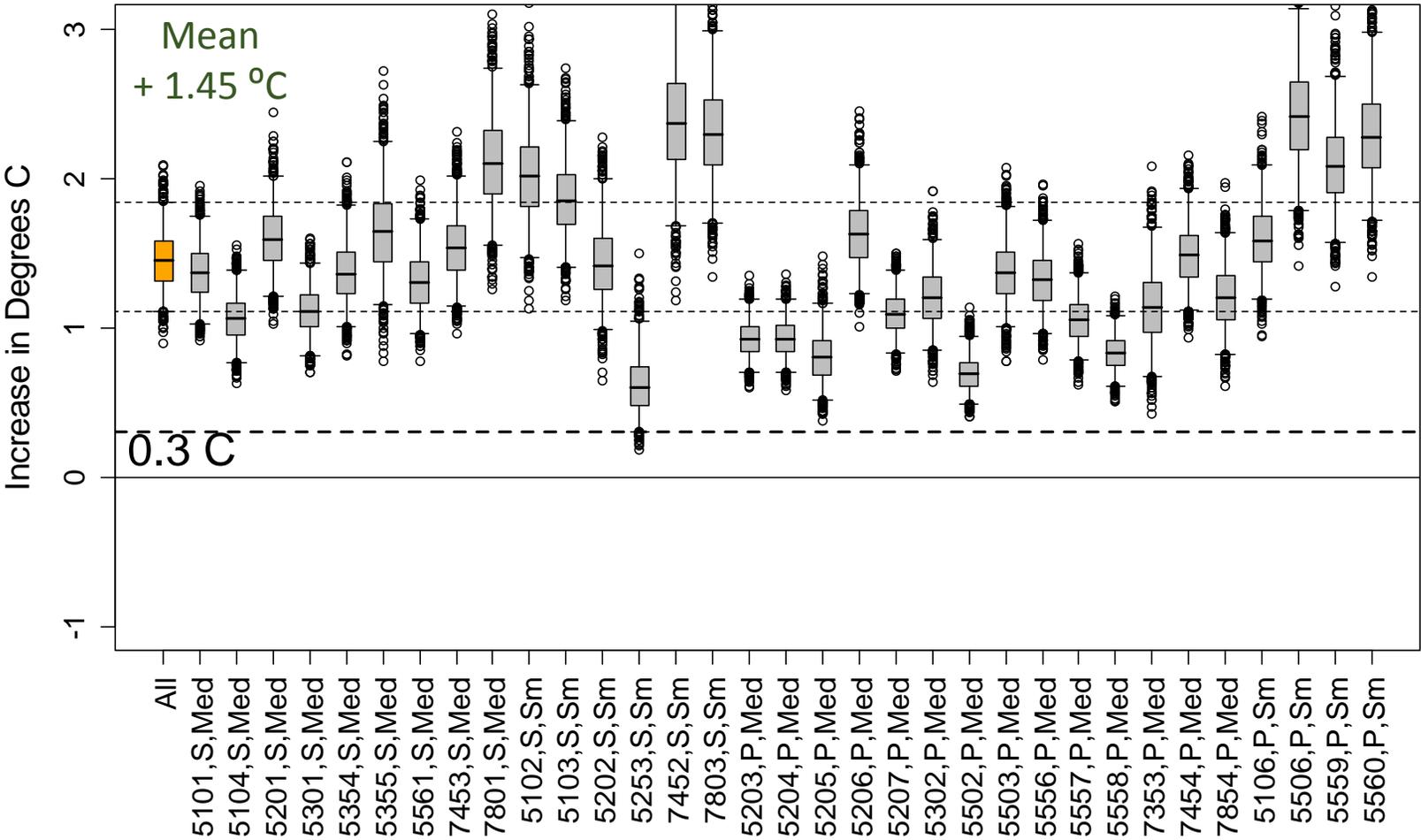
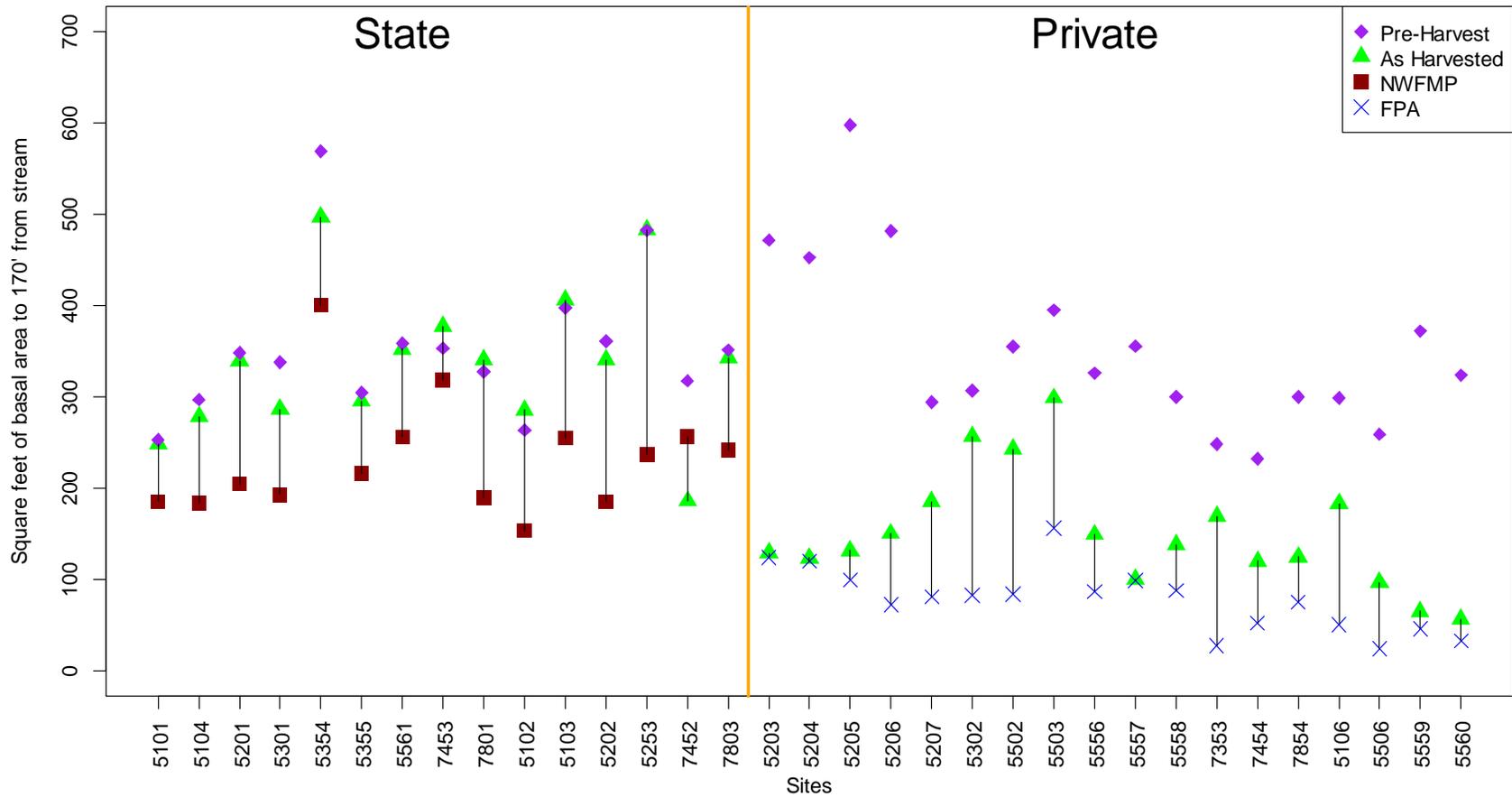


Figure 6 from Attachment 3

# Comparison of Simulated Harvest to as Harvested

## Harvest Comparison



*Note: not in Attachment 3*

# Model Results: No-cut buffer scenario

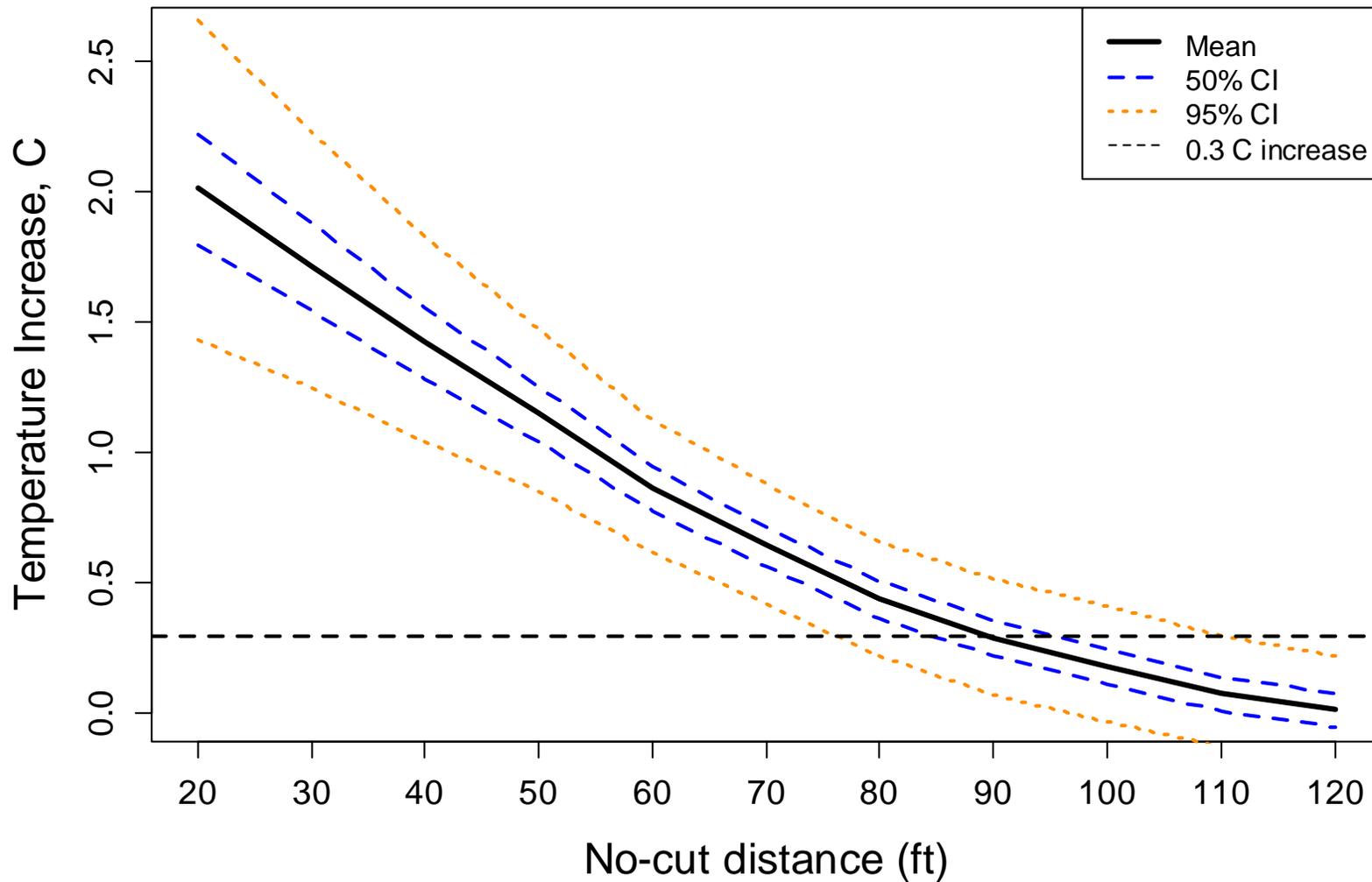


Figure 7 from Attachment 3

# Model Assumptions, Limitations and Uncertainty

- Limitation: Temperature increases are informed by hard-edged clear cuts, not thins
- Assumption: Sites are representative
- Limitation: Pre-harvest shade and inference
- Assumption: Study design and causality
  
- Limitation: model selection.

# Model Variations

## Early Model (February 2014)

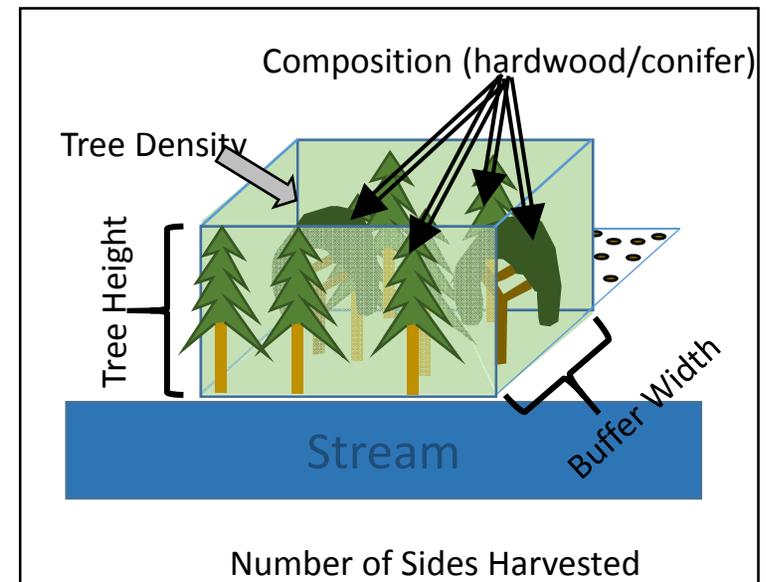
- Shade prediction, inputs: Change in basal area; % HWD BA (pre), tree height

## New Shade Model

- Shade prediction, inputs
- Predict pre and post shade

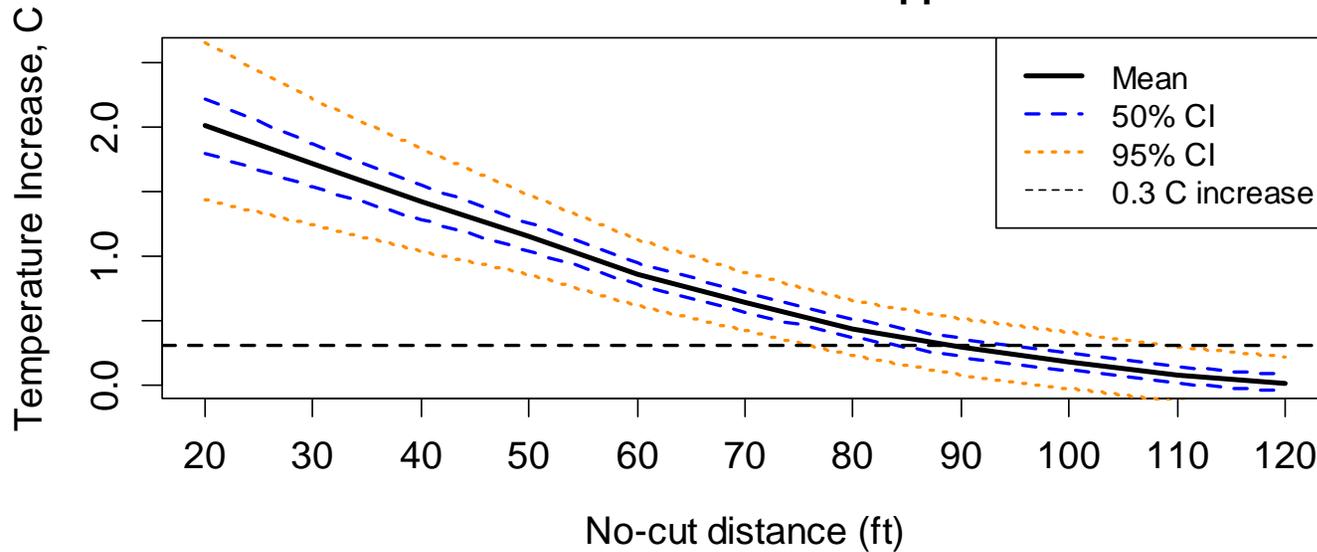
## Current Shade Model

- Pre harvest shade variant
- Predict post shade, use measured pre shade

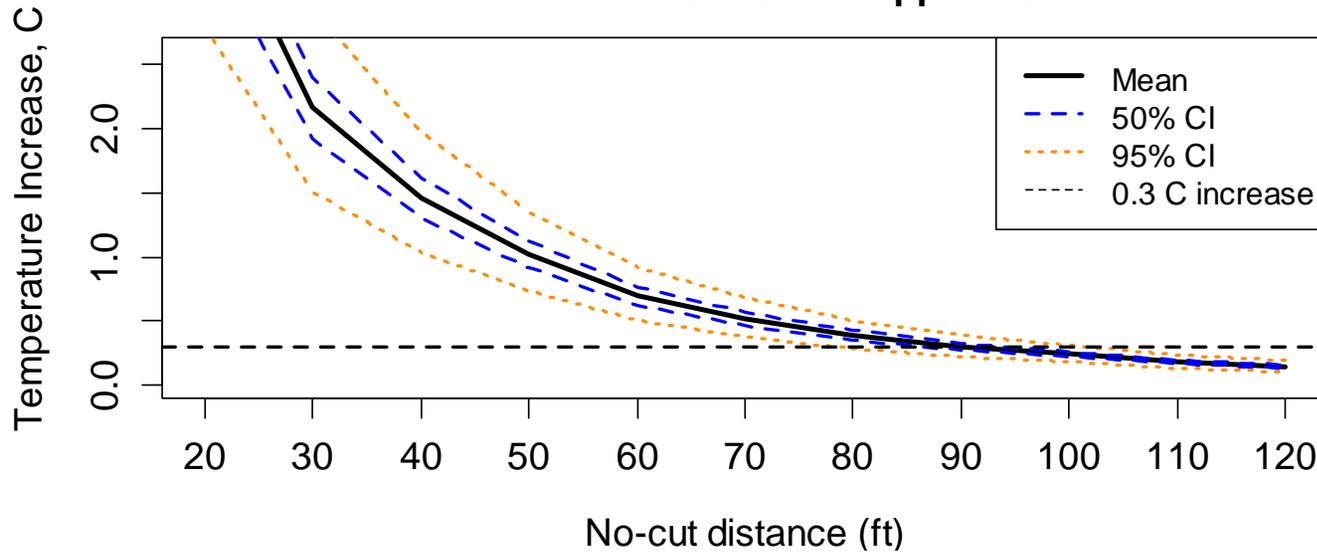


# Predictive Analysis: Temperature increase by slope no-cut distance (Figures 8A & 8B from Attachment 3)

### 8A: Current Simulation Approach

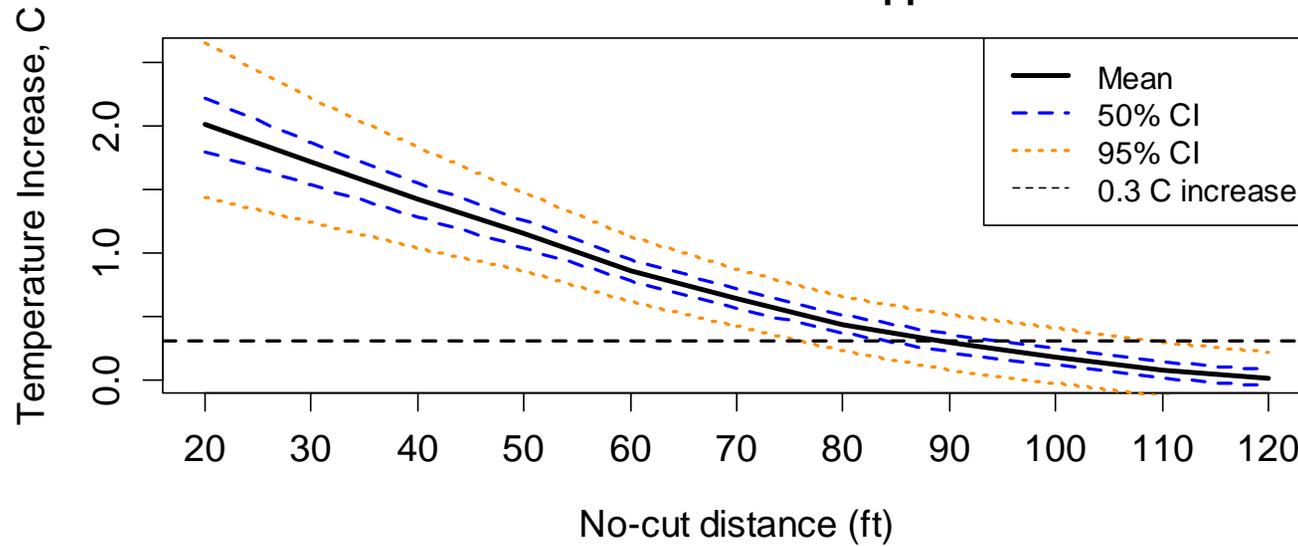


### 8B: Current simulation approach

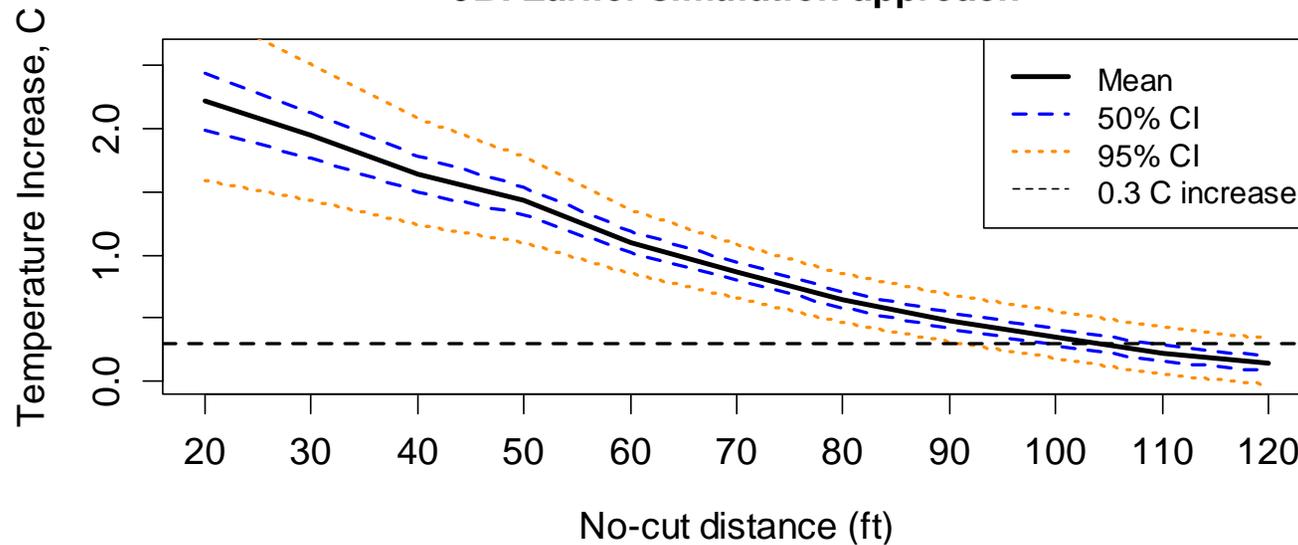


# Predictive Analysis: Temperature increase by slope no-cut distance (Figures 9A & 9B from Attachment 3)

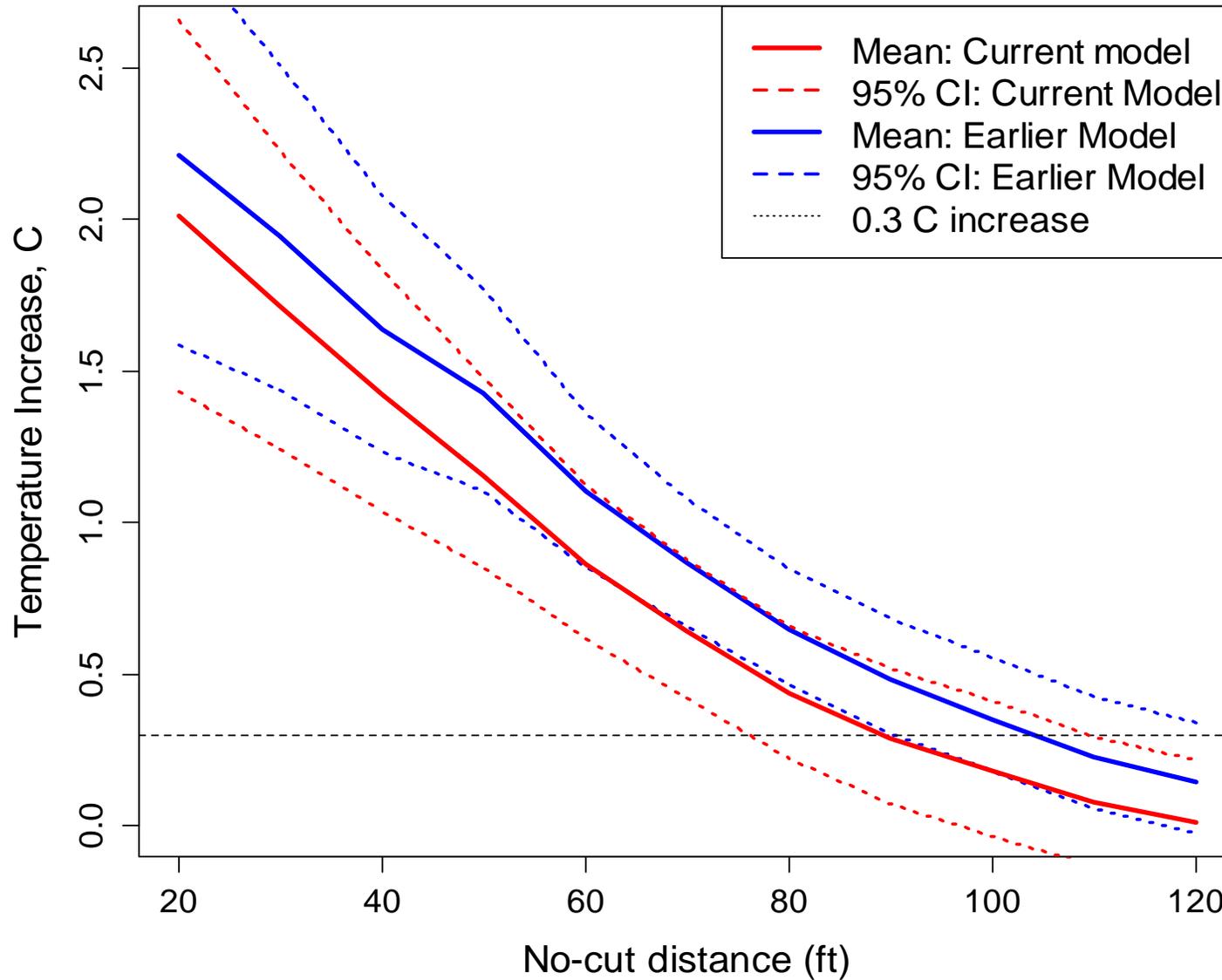
## 9A: Current simulation approach



## 9B: Earlier simulation approach



# Predictive Analysis: Temperature increase by slope no-cut distance (Figure 10 from Attachment 3)



## Comparison of RipStream Temperature Results with Systematic Review Data



## Model Usage and Prescription Evaluation



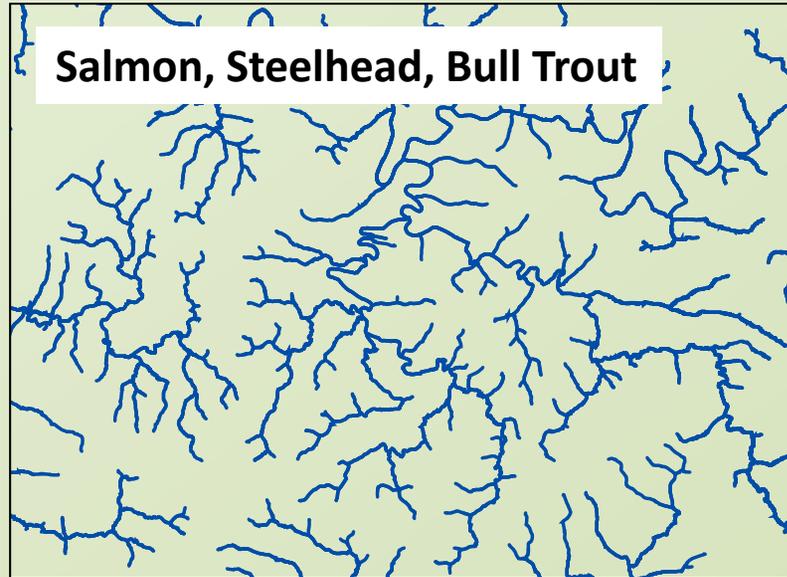
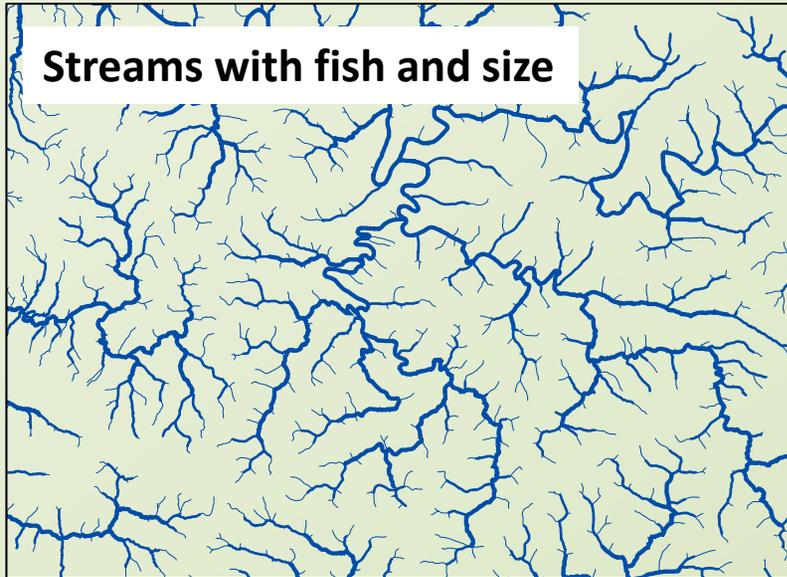
- The State Forest and Private Forest harvest scenarios represent bookends and draft rule prescriptions will describe intermediate harvest types.
- The no-cut buffer scenarios can inform the no-cut buffer prescriptions.
- We will develop a variable-retention scenario to inform a combination of no-cut distances and basal area retention targets.
- We will present results from simulations of temperature effects to inform draft rule prescriptions.
- We may not be able to evaluate some prescription types with the model

## Change in Restrictions on Forest Practices



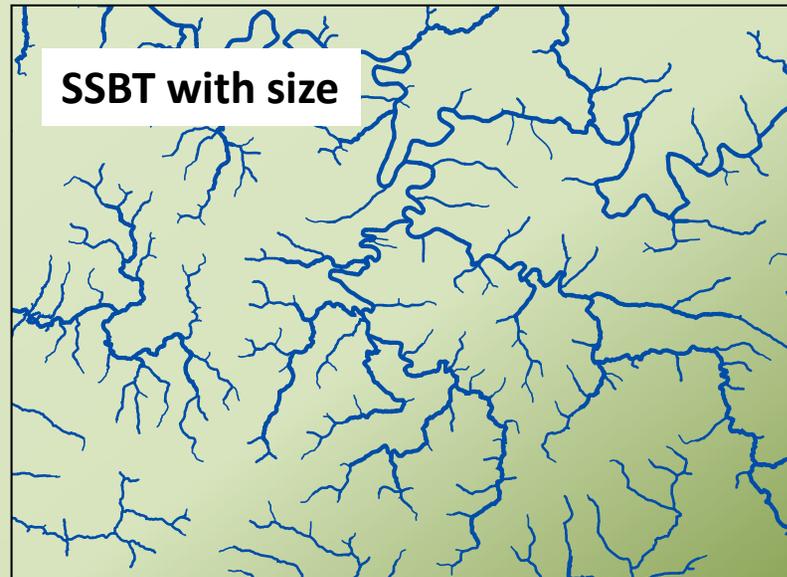
- Board is considering adopting a rule that would provide increased standards or restrictions on forest practices, i.e., limit wood production in riparian management areas
- Want a consistent metric across prescriptions for additional restrictions
- Propose to represent change in restrictions as the acres of riparian areas removed from timber production
- Calculate this value by estimating the width of an equivalent no-cut buffer for each prescription including the current rules

# Geographic Information System Analysis

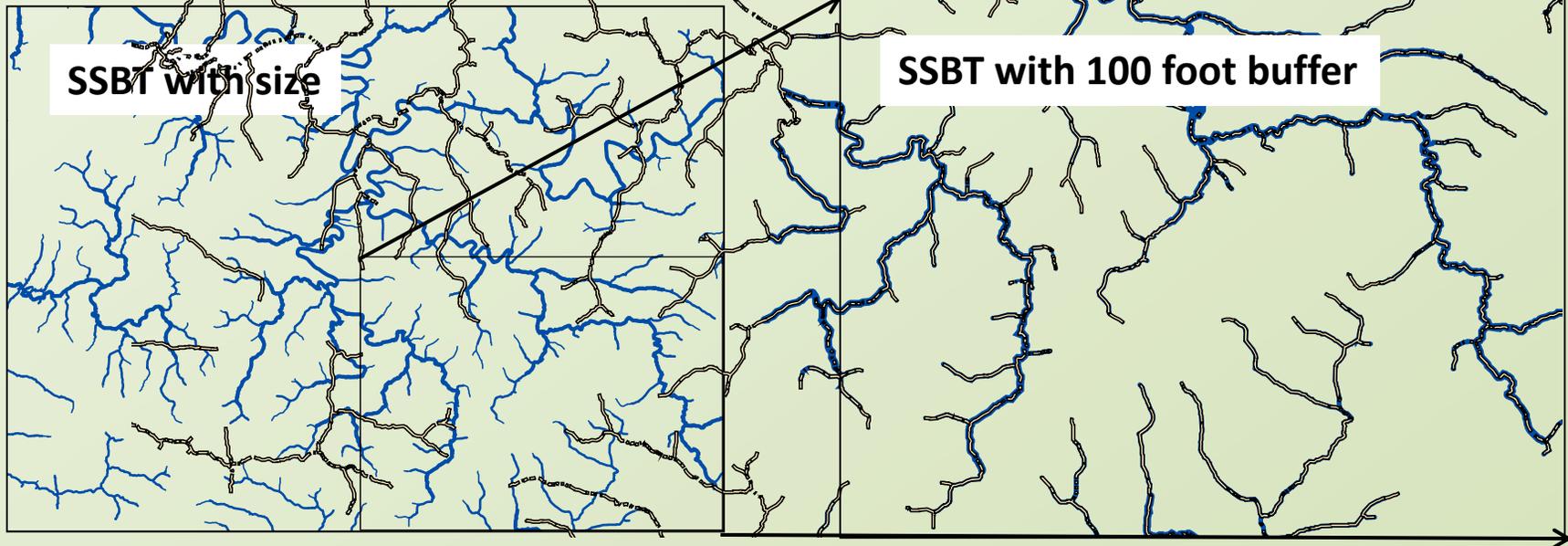


## Combined

- ODF Streams layer (stream size, fish use)
- ODFW's Fish Habitat Distribution layer (Salmon, Steelhead, Bull Trout)

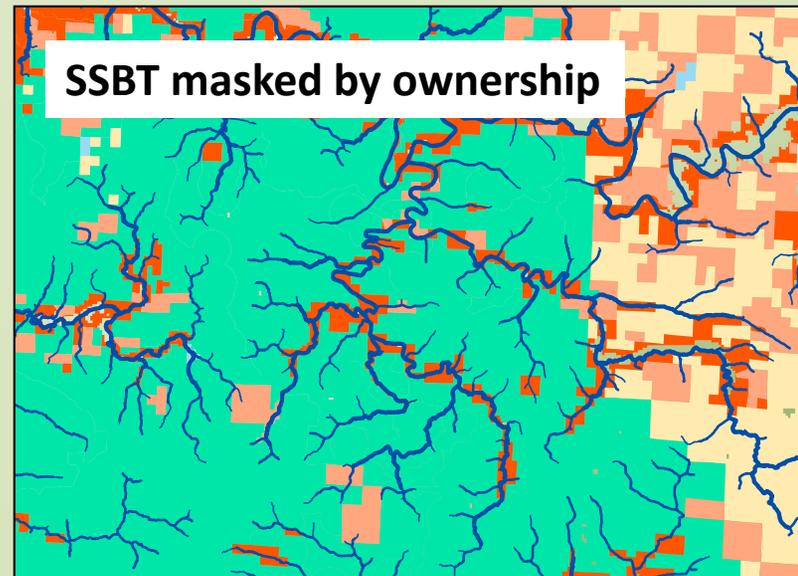


# Geographic Information System Analysis



## Calculated:

- Acres in fixed-width buffers from 20'-100' in 20' increments (horizontal distance)





## Change in Restrictions on Forest Practices

- Change in Acres/mile =  
 $(\text{Acres/mile})_{\text{Rx}} - (\text{Acres/mile})_{\text{FPA}}$
- Calculated separately for small, medium streams

Miles of Small and Medium SSBT and Fish Streams by Ownership in Western Oregon

	Salmon, Steelhead, Bull Trout		All Fish	
<u>Ownership</u>	<u>Small</u>	<u>Medium</u>	<u>Small</u>	<u>Medium</u>
Private Industrial	476	1261	2517	2188
Private Non-Industrial	446	1507	2561	2028
<b>Total</b>	<b>922</b>	<b>2769</b>	<b>5078</b>	<b>4216</b>

# Change in Wood Production Values (Economic Information)



- Provide estimates of the economic costs of prescriptions to forestland owners
- Given that each prescription will have an estimate of acres removed from timber production:
  - Calculate the land and timber values (LTV) of those acres using a capitalized net income value approach
  - Present value of the net cash flow that can be produced over time (in this case in perpetuity)
- Different for Industrial, Non-Industrial owners due to stand volume, rotation ages, etc.

\*Note: not economic impact analysis (for ORS 527.714)

# Change in Wood Production Values (Economic Information)



- LTV of bare land is equivalent to soil expectation value (SEV), the present value of a perpetual series of timber harvest starting at age zero.
- Oregon Department of Revenue (DOR) calculates an equivalent value for forestland by site index class for property tax purposes
- LTV calculation also requires an estimate of the distribution of restricted acres by site class and stand age or volume.
- Will work with the RFPCs and stakeholders to review assumptions and estimates.

# Ecological Information

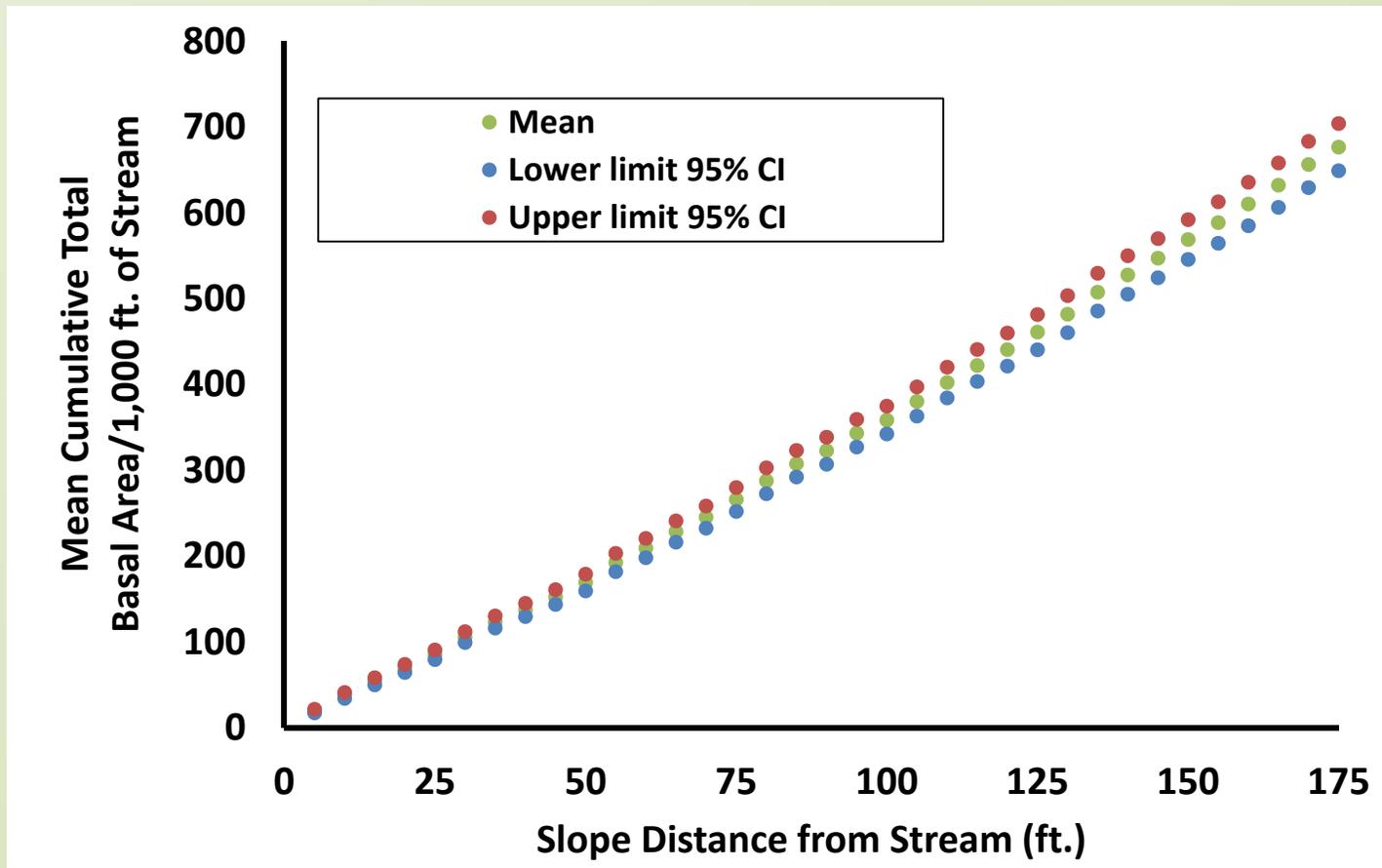


- Develop ecological information related to each prescription, and in particular to look at impacts of proposed prescriptions on large woody debris
- Stakeholders also expressed interest in seeing if the department could provide information on impacts to fish
- Analogous to the approach above, the department will evaluate the ecological effects based on the equivalent buffer width of the prescriptions.

# Ecological Information

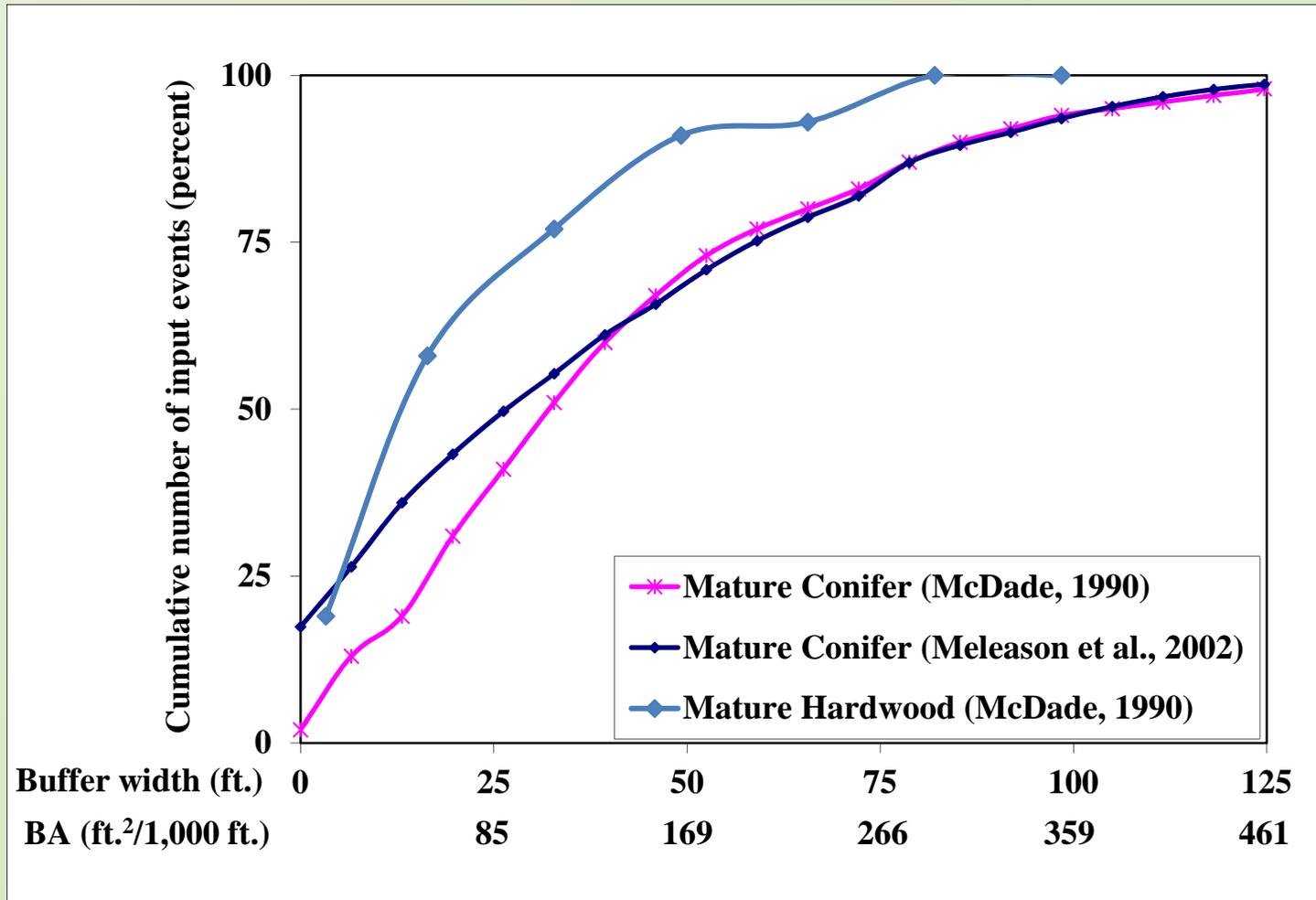


- Ecological Information and large wood assessed with respect to buffer widths
- To Assess information for variable retention Rx, correlate BA and distance (buffer width)



# Large Wood Recruitment

Large wood recruitment with respect to buffer width & mean cumulative total basal area



# Fish Response



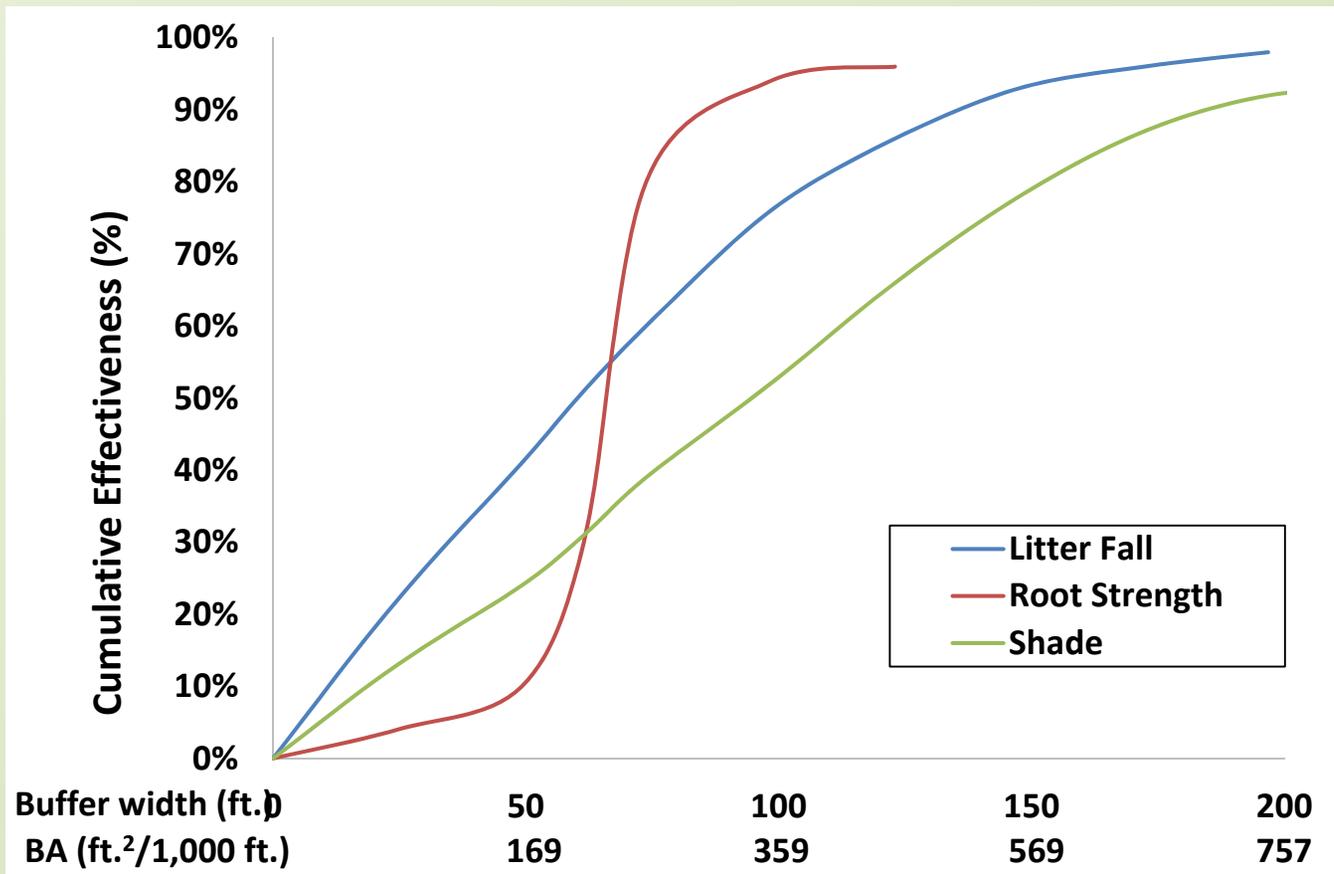
- Qualitative approach using questions (i.e., information from a number of fish biologists)
- Response metrics may include but are not limited to changes in fish size, fish abundance, and fish distribution
- For each prescription, will ask fish biologists from state and federal agencies, landowner, and environmental

Based on your professional experience, what may be likely fish responses from increasing current riparian management prescriptions from current FPA rules to new prescription?

# Other Ecological Functions



Litter fall, root strength, and shade from FEMAT 1993

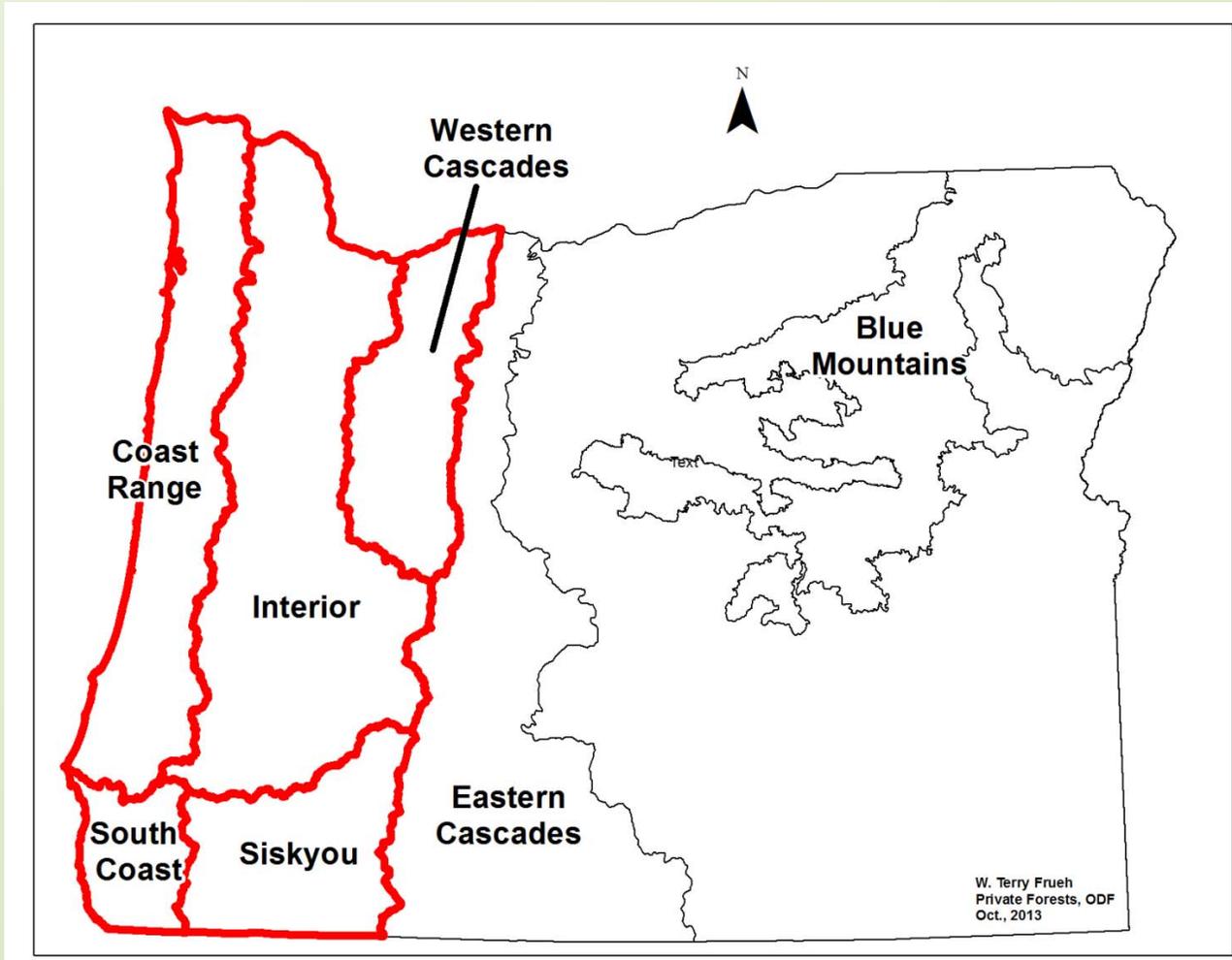


# Geographic Extent

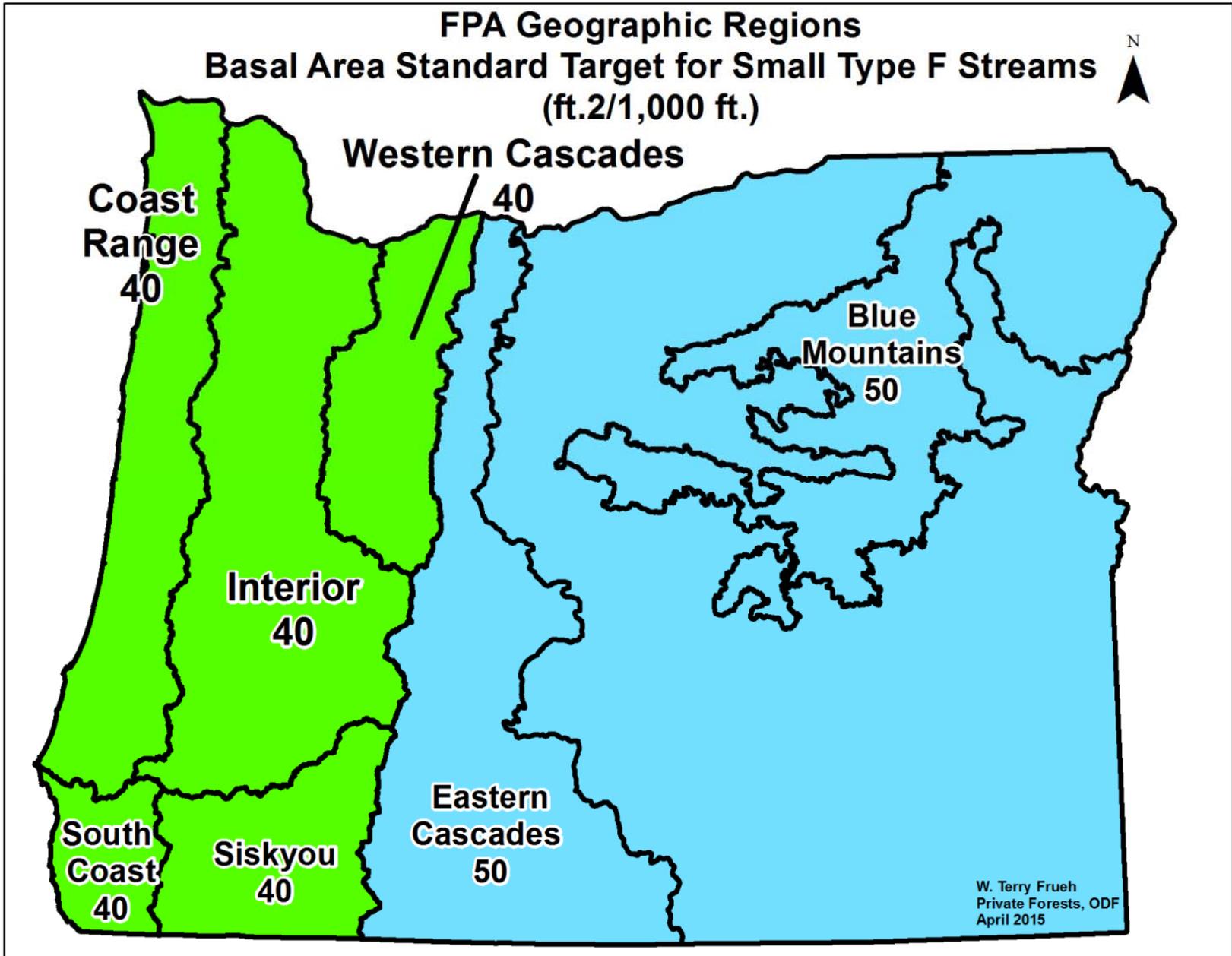


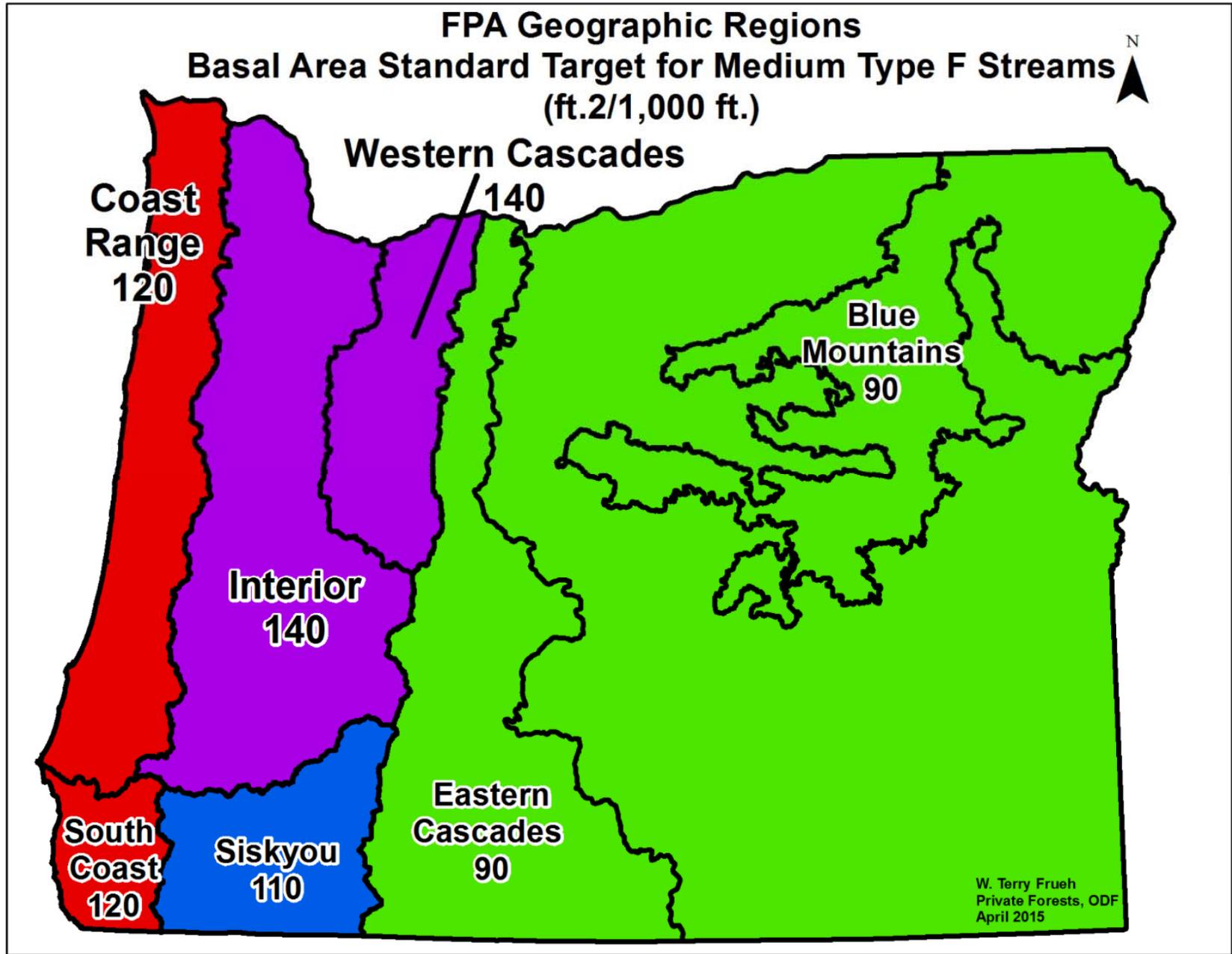
- Two Aspects:
  - To which Geographic Regions in western Oregon the prescriptions should apply
  - Which stream segments (i.e., only those streams with salmon, steelhead, or bull trout present; the entire network of small and medium fish streams; or something in between)
- Largely policy questions, for which science only provides minimal direction
- Two approaches for Geographic Regions:
  - Information from Systematic Review
  - Implications of current policy as identified in rule

# Western Oregon Geographic Regions



Information from Systematic Review was equivocal in terms of differences between Geographic Regions



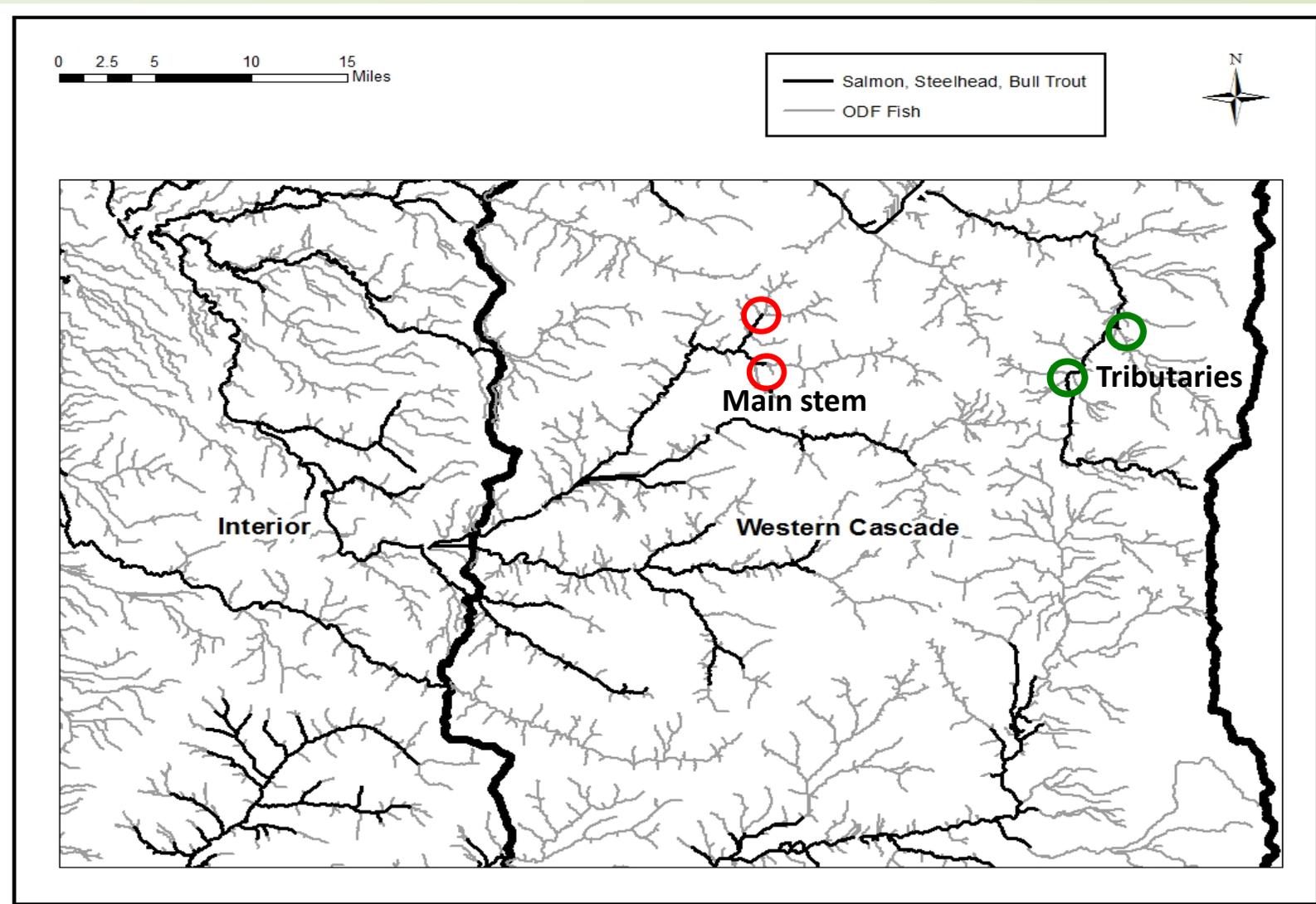


## Stream Extent



- Rule analysis objective:
  - Establish riparian protection measures for small and medium fish-bearing streams
  - insure, to the maximum extent practicable, the achievement of the Protecting Cold Water (PCW) criterion
- PCW language OAR 340-041-0028 (11)(a):
  - “...applies to all sources taken together at the point of maximum impact where salmon, steelhead or bull trout are present.”
  - Indicates need contributing waters (i.e., **upstream**)
- Board bookends of small and medium streams: SSBT to All Fish

# Two types of “upstream”

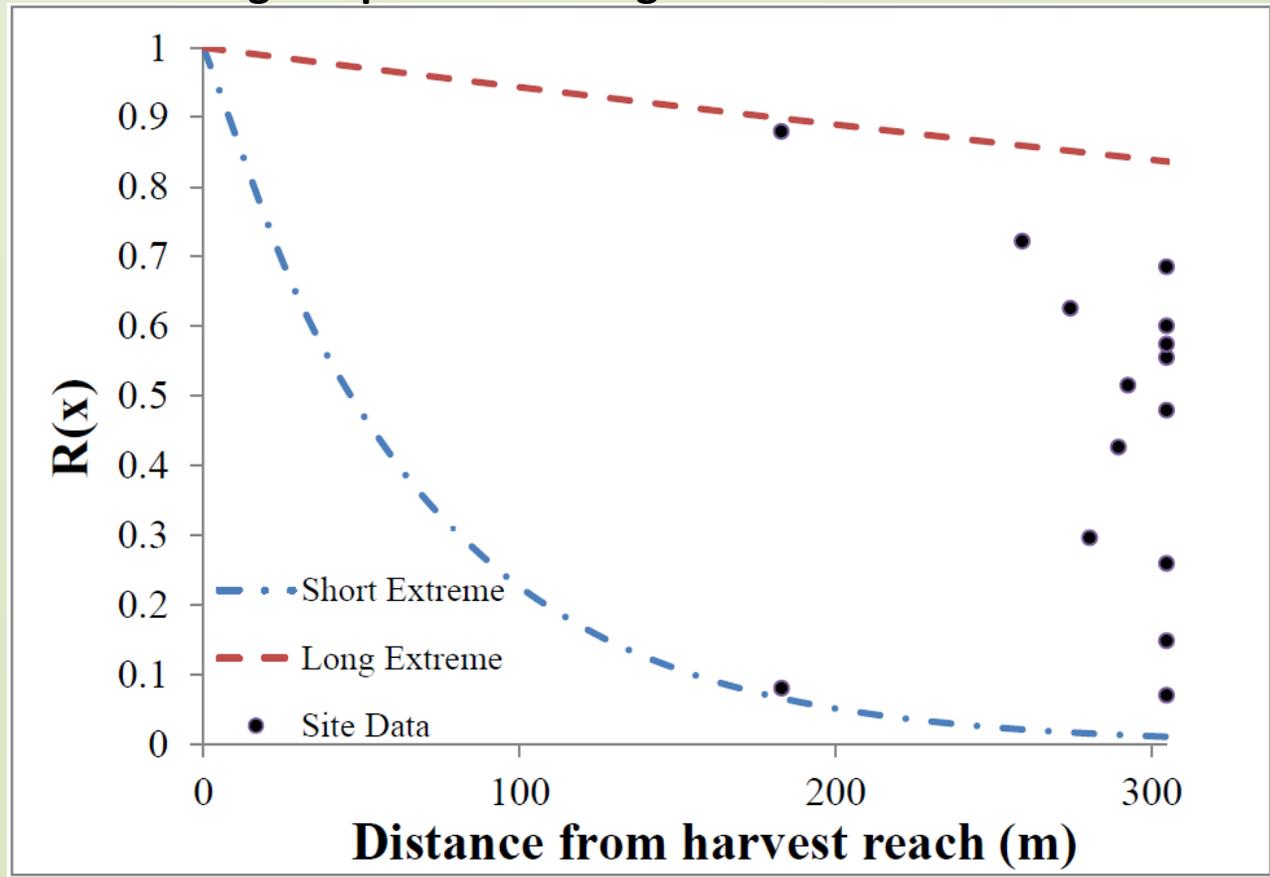




# Delineating upstream extent

1. Distance upstream of main stem: some science with lots of variance

Remaining temperature change downstream of harvest



# Delineating upstream extent



## Challenges:

1. Distance upstream of main stem: some science with lots of variance
2. Tributaries: volume-weighted flow (complicated modeling, much uncertainty) plus challenge #1
3. All sources taken together: timing of heat load arrival from multiple streams at point of maximum impact



## **Reports / comments from advisory committees**

- Northwest Oregon and Southwest Oregon Regional Forest Practices Committees
- Committee for Family Forestlands

## **Public Comment**



## Board Discussion

For example,

- Feedback on decision matrix

## Next Steps



- At June 2015 meeting:
  - Staff presents results from prescriptions and associated information
  - Board decision on prescriptions, geographic regions, stream extent, regulatory nature
  - Board findings on 527.714(5)(d), (e), and (f)
- If decide to enter rule-making, Board decision on rule language in September or November 2015 (followed by Secretary of State process)



**Questions?**