A photograph of a river flowing through a forested area. The water is dark and turbulent, with many rocks visible in the stream bed. The surrounding forest is lush and green, with some trees showing signs of autumn. The text is overlaid on the image in white and yellow colors.

Review and recommendations for
potential fish habitat breaks to begin
protocol surveys to determine end
of fish habitat on state and private
forest lands in Washington State

PHB Science Panel

Forest Practices Board Meeting 9 August 2017

WAC 222-16-010

- Type F = Fish habitat: “means habitat, which is used by fish at any life stage at any time of the year including potential habitat likely to be used by fish, which could be recovered by restoration or management and includes off-channel habitat.”



Olympic Mudminnow, *Novumbra hubbsi*

Permanent Water Typing Rule Development over past 2 years

- Started with the water typing matrix (Aug 2015)
- Emphasis on protecting fish habitat (Type F)
- Electrofishing---***reduce it (report)***
- Off-Channel habitat---***protect it (report)***
- Default Physical Criteria (2', 20%; 2', 16%, or?)---***study design***
- Model Evaluation using LiDAR---***study design***
- F/N Break Criteria (***needed***)
 - Fish Habitat Assessment Method (**Board Approved May '17**)
 - PHB Criteria (**report; Proposed today by Science Panel**)

FHAM Development 2016/17

- FHAMs developed by State, WFPA, Eastside Tribes, and Conservation Caucus
- Methodology very similar but criteria/metrics were different and/or undefined
- Policy recommended the Board adopt FHAM framework, but they needed help on PHB criteria
- Forest Practices Board directed AMPA to form a group to recommend criteria to be used in PHBs
- Recommendations for PHBs submitted to the Board (report from Science Panel and this presentation)

Boards Motion May 2017

“...determine those elements that would constitute a barrier and/or PHB...determine those physical, biological, and chemical elements that would individually or in combination constitute a high probability the PHB is coincident with a significant change in habitat including stream size, stream gradient, the interaction of size and gradient and the presence of barriers that limit accessibility, thus the appropriate point to initiate a protocol [electrofishing] survey”

PHB Science Panel Process

GOAL – Develop recommendation for definition of PHBs

- Group of outside experts with expertise
 - Fish biology, geomorphology,
 - Fish-habitat-forestry relationships
 - Water typing, aquatic ecology
 - Statistics and spatial analysis
 - Fish habitat research

Science Panel Members



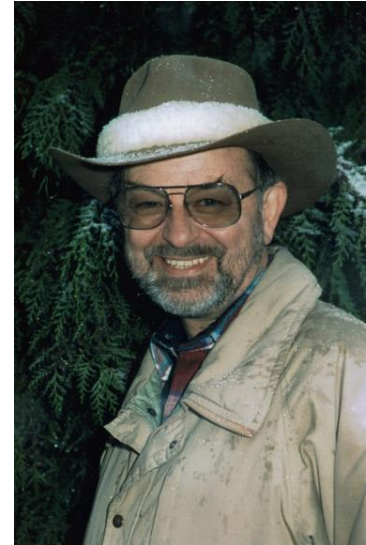
Dr. Phil Roni



Dr. Kai Ross



Dr. Jeff Kershner



Dr. Pat Trotter



Joe Maroney



Brian Fransen



Dr. Pete Bisson



Dr. Ray Timm

PHB Science Panel Process - cont.

GOAL – Develop recommendation for definition of PHBs

- Three key pieces used to develop PHB criteria
 1. Existing literature/science
 2. Available data on end of fish habitat (EFH) and upper most fish (UF)
 3. Professional opinion/experience

PHB Science Panel Process – cont.

- Developed PHB criteria from literature, experience, & data analysis
- Stakeholder input (perspective and review)
- Produced report for the Board



PHB Criteria

- Criteria need to be
 - Useful
 - Simple to understand and measure
 - Objective
 - Repeatable (can be consistently identified in field)
 - Accurately reflect boundaries to fish-habitat
 - Supported by literature*
- Limited criteria to
 - Gradient
 - Width
 - Permanent natural barriers

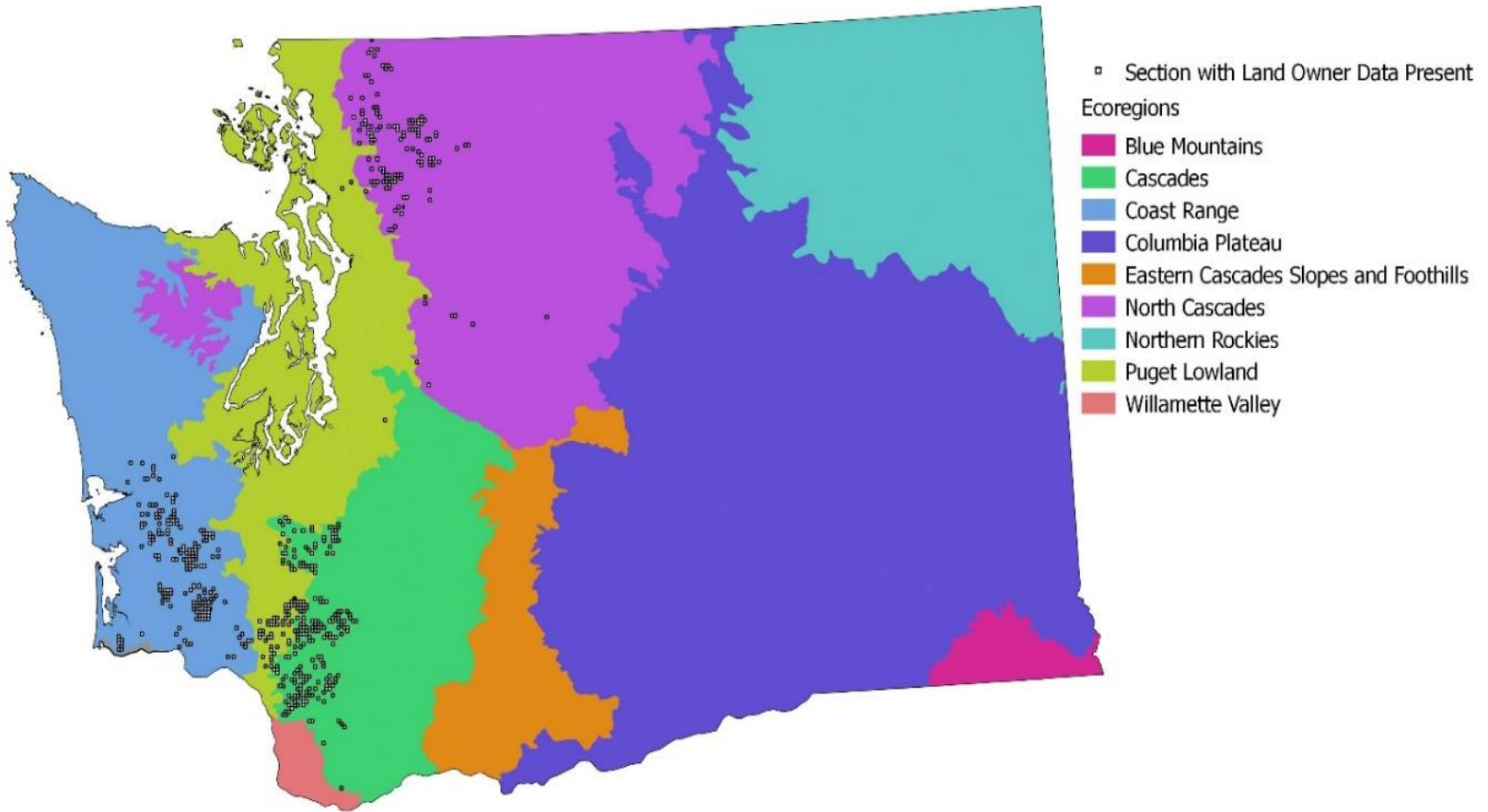


Data collation, screening and analysis

- Collated and mined existing data
 - Reviewed data from multiple sources
 - Most of data sets were inconsistent
 - Selected “high quality” data for analysis
- Used data to
 - Test various PHB criteria
 - Refine criteria based on examination of data



Data & Caveats



Data Caveats

- Incomplete geographic coverage
- Few points in Eastern Washington
- Potential differences in climate, stream flow, geology, elevation etc. in areas with and without data
- Differences in ownership
- Data used were not collected for our purpose
- Only high quality data available at time of our analysis with necessary components
- Lack of spatial data within the data set
- However, they do represent “concurrent” Type F/N breaks using the current water typing system

PHB Criteria for Gradient and Size

Test	Gradient Metric	Gradient Threshold	Width Metric	Width Threshold	Percent of Surveyed EFH points captured	Percent of non-habitat-break points captured
2	Upstream Threshold	15%	Upstream Threshold	2 ft.	79.7%	24.7%
3*	Upstream Threshold	20%	Upstream Threshold	2 ft.	71.8%	13.6%
5	Upstream Threshold	15%	Upstream Threshold	3 ft.	91.8%	43.4%
6	Upstream Threshold	15%	Ratio up/down	0.7	89.4%	20.4%
7	Difference up-down	5%	Ratio up/down	0.7	92.0%	15.6%
8	Difference up-down. with DS grad. >5%	5%	Ratio up/down	0.7	87.1%	11.6%
10	Difference	5%	Upstream Threshold	2 ft.	87.0%	18.6%
11	Difference up-down	5%	Ratio up/down	0.5	86.2%	11.6%
12	Upstream Threshold	15%	Ratio up/down	0.5	81.8%	16.8%
13	Difference up-down	5%	Ratio up/down	0.25	80.3%	10.7%
14	Upstream Threshold	15%	Ratio up/down	0.25	70.2%	14.9%

Barrier Recommendation

Test	PHB Definition for Non-Vertical Barriers	Percent of barriers captured
G20E2*W	Barrier gradient over 20% and elevation change over barrier length is greater than twice the upstream channel width.	59.5%
G20E1*W	Barrier gradient over 20% and elevation change over barrier length is greater than upstream channel width.	80.7%
G20EL20	Barrier gradient over 20% and elevation change over barrier length is greater than 20ft.	24.2%
G20EL10	Barrier gradient over 20% and elevation change over barrier length is greater than 10ft.	57.3%
G20EL5	Barrier gradient over 20% and elevation change over barrier length is greater than 5ft.	84.8%

Proposed Interim PHB Criteria

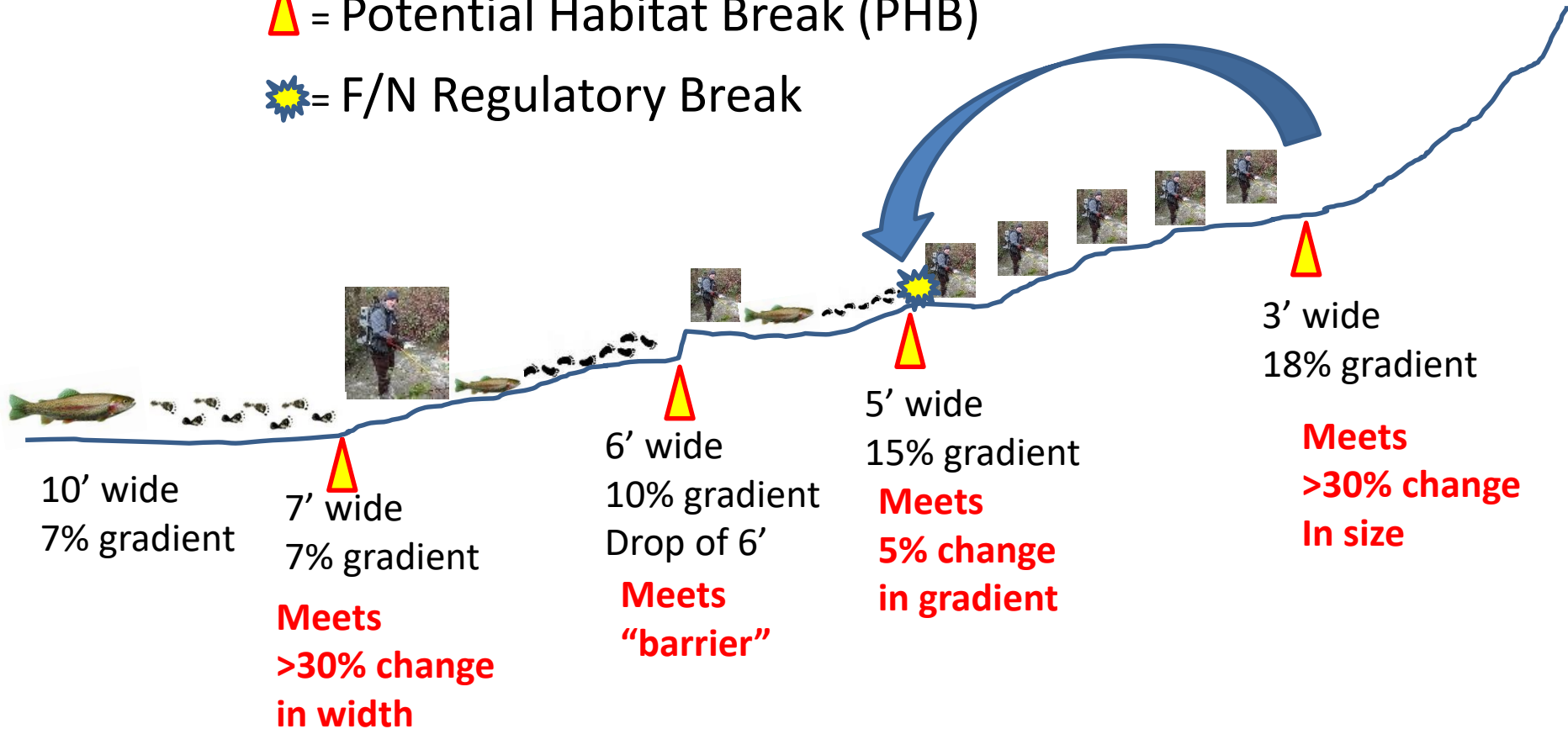
A PHB will be identified at a point along a stream channel where one or more of these changes in stream character is identified:

- a gradient increase $> 5\%$
- bankfull channel width decrease $> 30\%$
- a potential fish passage barrier = an abrupt step in the stream channel with at least 20% slope and minimum elevation change greater than or equal to 1 upstream channel width.

FHAM Framework to Establish the F/N Break

 = Potential Habitat Break (PHB)

 = F/N Regulatory Break



Proposed Interim PHB Criteria where

- Gradient, width, and barriers clearly supported by scientific literature
- Looked at many scenarios including fixed width or gradient criteria but proposed most consistent with literature, our experience, and understanding of how fish react to environment
- Our analysis suggest that proposed perform better against the data set than other options

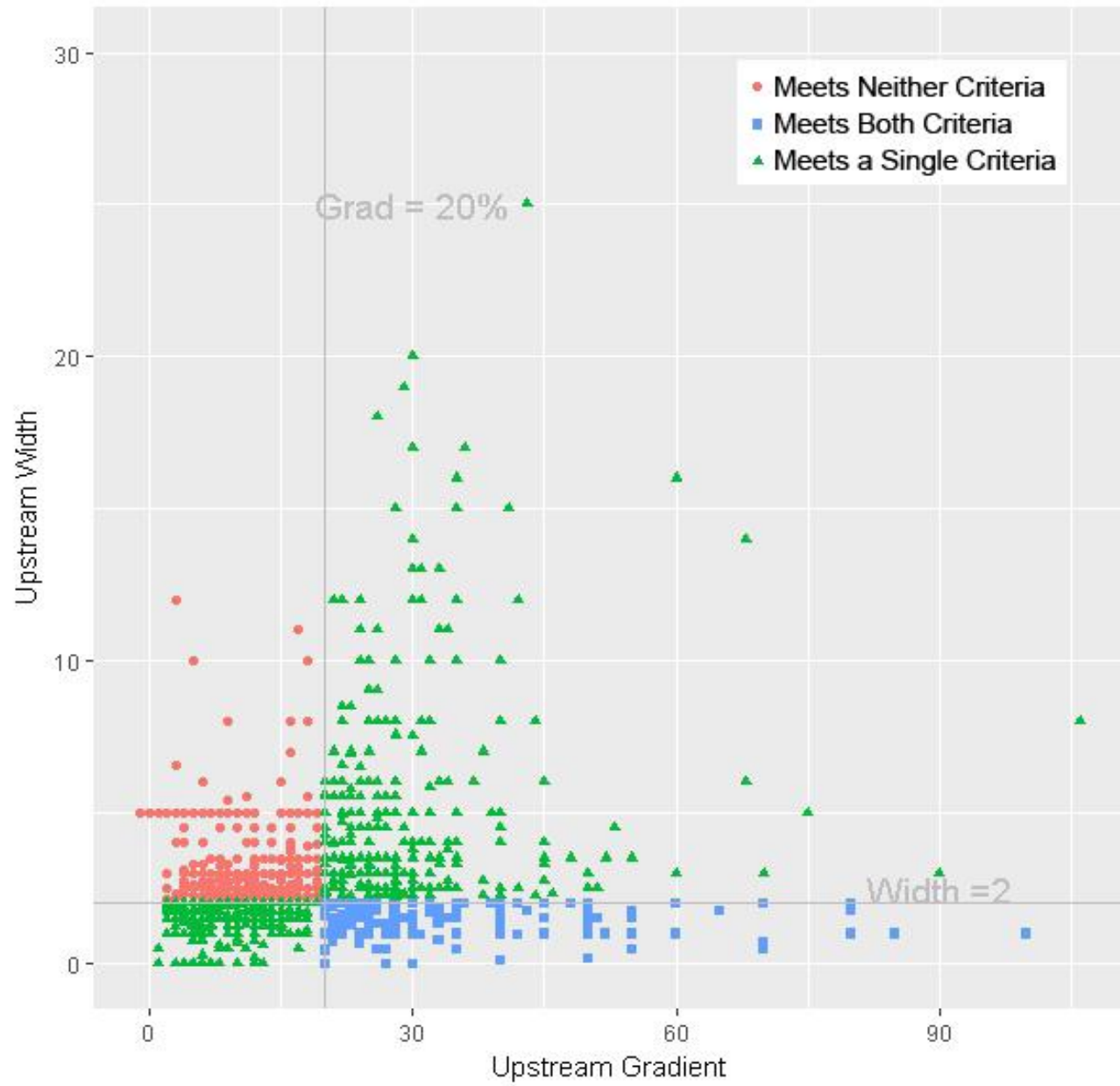
Study to Evaluate Proposed Criteria

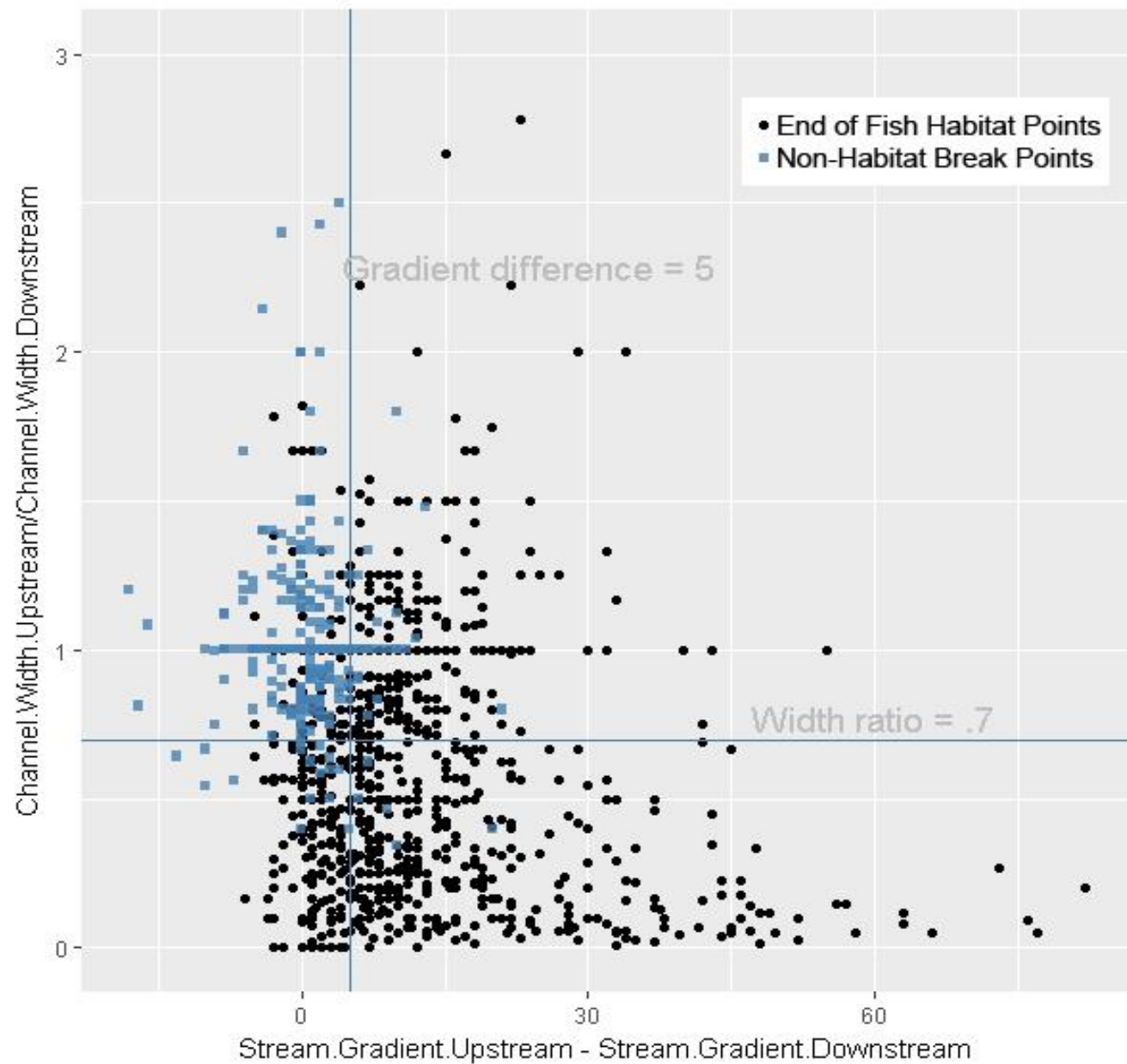
- Do various crews identify similar starting point for electrofishing?
- Does approach lead to consistent application and identification of F/N break across landscape?
- Is it important to stratify PHBs at finer scale than simply Eastside/Westside?
- Would adding gradient and stream size thresholds to criteria improve PHB identification?
- How does accessibility relate to fish use?
- Are there other variables that could be used to help better define PHB either in the field or in the office that should be evaluated?

Additional Questions?



Steelhead Trout *Oncorhynchus mykiss*





Individual Metrics

Barriers	<u>Test</u>	<u>Non-Vertical barriers captured</u>		
20% criteria removed	1xUpstream Width	82.89%		
	1.5xUpstream Width	71.86%		
	.75xUpstream Width	89.35%		
Gradient	<u>Metric</u>	<u>Value</u>	<u>Captured</u>	<u>NHBP Captured</u>
	Difference (up-down)	5	73.97%	10.54%
	Upstream Threshold	15	56.38%	17.33%
	Upstream Threshold	20	42.01%	6.13%
Stream Width				
	ratio (up/down)	0.7	60.07%	6.71%
	ratio (up/down)	0.5	46.96%	2.44%
	ratio (up/down)	0.25	25.51%	0.00%
Latterell et al (2003) Using recommended Criteria				
<u>Value</u>	<u>Width</u>	<u>Value</u>	<u>Captured</u>	<u>NHBP Captured</u>
15%	ratio (up/down)	0.7	65.52%	Unknown
>5% Change	ratio (up/down)	0.7	67.24%	Unknown