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

Steelhead Trout *Oncorhynchus mykiss*

Outline

- Background
  - Board motions
- Science Panel
  - Process
  - Findings
  - Recommendations

Type F Recommendations from Policy to the Board in May 2017

- Adopt items in consensus from Policy, including Maps
- Majority/minority reports for off-channel habitat
- Recommended Board adopt FHAM framework and work on identifying PHB criteria, including:
  - Primary (PNB, gradient, stream width, basin size, channel size, interaction of size and gradient, stream morphology)
  - Secondary (water quantity, substrate, water quality, primary production (food), and temporal considerations

A PHB (potential habitat breaks) is

- Not necessarily F/N break
- “…first point of potentially unfavorable habitat upstream from the last known fish (end of fish or EOF) and the starting point for a protocol survey.”
- **Point to initiate protocol electrofishing survey!!**

Approved Board Motions May 2017

1-Forest Practices Board direct the AMPA to convene and lead a group of internal and external science/technical experts to work under the direction of the Board, in consultation with the TFW Policy Committee caucuses to identify team members.

2-Forest Practices Board direct the group of internal and external science/technical experts to determine those elements that would constitute a barrier and/or potential habitat break (PHB). The group is directed to review the FHAM listed habitat break features for combinations of primary/secondary features to 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 survey

3-Forest Practices Board directed the AMPA to bring the PHB recommendations to the Board for the August 2017 meeting. The recommendations need to include the metrics to identify the PHBs and a plan for validation of the eventual rule.

Science Panel Process Part 1

- Short timeline!
- Call for data on 15 May from all caucuses (following testimony to FPB)
- Formation of science panel (*Motions* **1** *and* **2***; e-mail send to Board on 26 May*)
- Meeting with stakeholder technical group (15 June; *Motions* **1** *and* **2**)
- Data analysis (*Motions* **1** *and* **2**)
- Recommendations shared with stakeholders (21 July; *Motions* **1** *and* **2**)
- Report to the Board (27 July; *Motion* **3**)
- Presentation to the Board (9 August; *Motion* **3**)

Board Motions Approved Aug. 2017

1-Forest Practices Board will delay the approval of Potential Habitat Break (PHB) recommendations until the February 2018 Board meeting. This action will provide time to gather and analyze eastern Washington data, provide transparency by daylighting the data and QA/QC used to provide data to the science panel and to build understanding around the PHB report.

Directed the AMPA to work with the Washington Forest Protection Association to provide documentation of how data were selected and provided to the science panel by September 20, 2017. The AMPA will work with the science panel to add an addendum that includes the documentation from WFPA and others who provided data and publish the data used in the analyses to determine the recommendation for PHBs.

Board Motions Approved Aug. 2017

2-Forest Practices Board directs the AMPA to facilitate the gathering of data for eastern Washington and in those areas of western Washington not represented currently and work with the Science/Technical Expert Panel to incorporate this data into their analyses to determine PHBs. The AMPA must work with the Panel to identify the QA/QC criteria for the data and coordinate the compilation of the data from a random sample of existing approved WTMFs or other appropriate sources of data. All stakeholders are invited to participate in the collation of the data. AMPA and or science Panel will report progress on collecting the data for eastern Washington and those parts in western Washington that need augmenting at the November 2017 meeting.

Board Motions Approved Aug. 2017

3-Forest Practices Board directs the AMPA to validate the original analyses that resulted in the recommendations included in the PHB report to the Board. The AMPA will facilitate the gathering of a random sample of approved western Washington WTMFs and work with the Science/Technical Expert Panel to analyze the data, and compare the results to those of the original analyses. This work is to be completed for inclusion in the PHB recommendations to the Board at the February 2018 meeting.

Board Motions Approved Aug. 2017

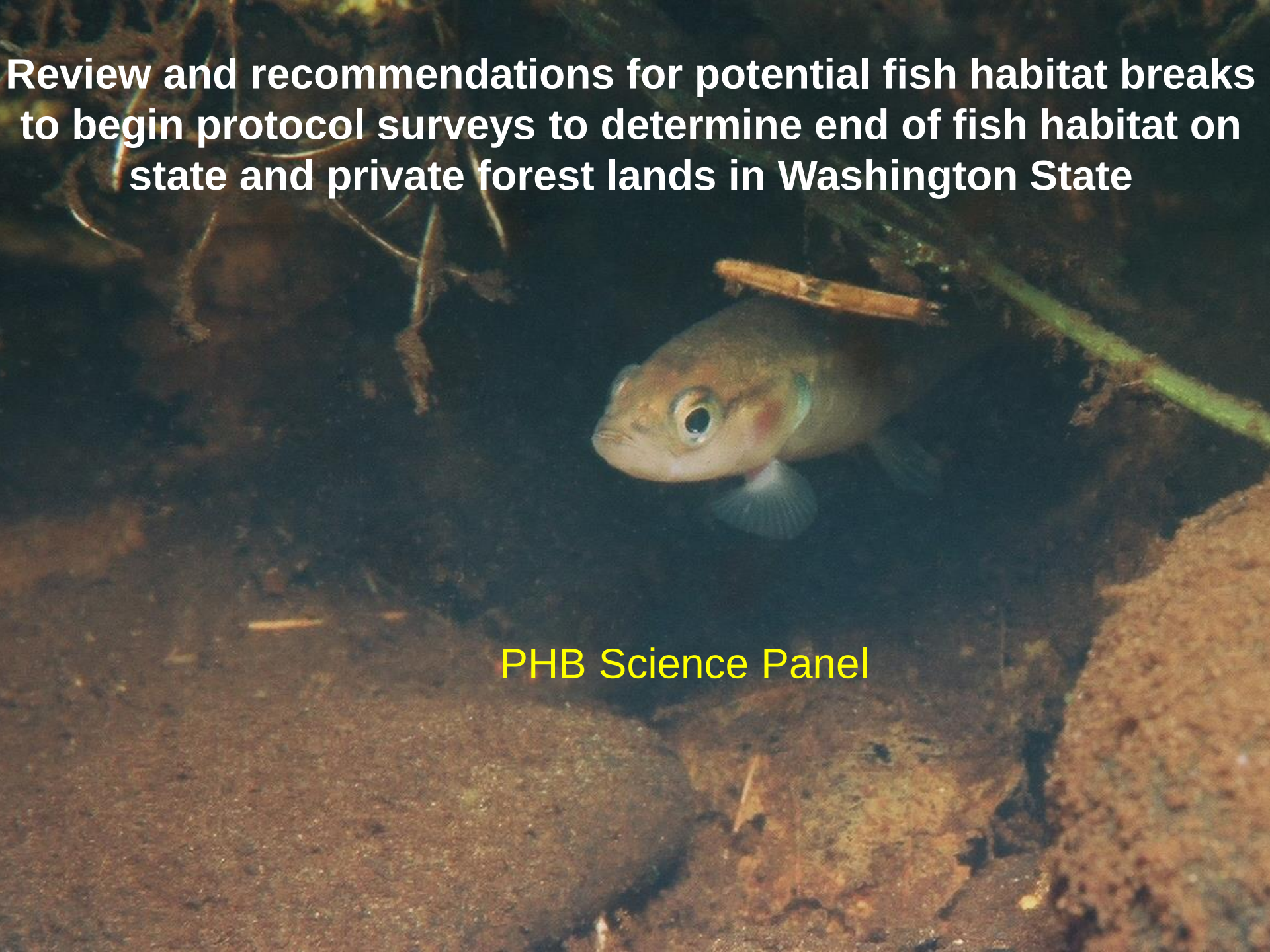
4-Forest Practices Board directs the AMPA to work with the Science/Technical Panel to develop a validation study design and complete ISPR review of the study design to be completed by the February 2018 meeting. The study will be completed within two field seasons and reported to the Board prior to the next field season.

Communication: The Board agreed that the AMPA will work with the Panel to have additional meetings with the stakeholder technical group to invite input and to hear an operational perspective on the analyses and results as the Panel prepares recommendations for the Board.

Science Panel Process Part 2

- Gather representative sample of WTMFs for F/N Breaks statewide (*Motions* **1**, **2**, *and* **3**)
- Invite stakeholder participation in data mining (*Motion* **2**)
- QA/QC of potential data (*Motion* **1**)
- Published data used in analysis on the Board's website (*Motion* **1**)
- Communicated process to stakeholders (***direct ask of AMPA in August***)
  - Meetings, conference calls, open invitation to ask questions, memos, updates at Policy, solicit written feedback, and draft report review.
- Following analysis came up with different recommendations (see report)
- Compare analysis with original LOD (*Motion* **3**, see tables in report)
- WFPA presented their data QA/QC to the Board in November (*Motion* **1**)
- Validation Study (*Motion* **4**; *report to Board in Nov. that it would be delayed until May following ISPR review*)

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

Reminder of Goal

- Develop recommendations for definition of PHBs

- **PHBs are point to initiate protocol electrofishing survey!!!!**

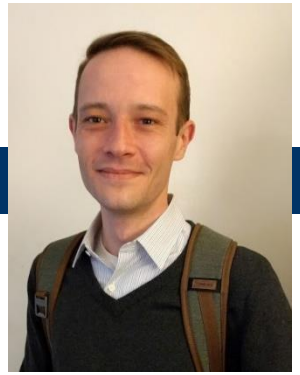
"…first point of potentially unfavorable habitat upstream from the last known fish (end of fish or EOF) and the starting point for a protocol survey."

PHB Science Panel

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

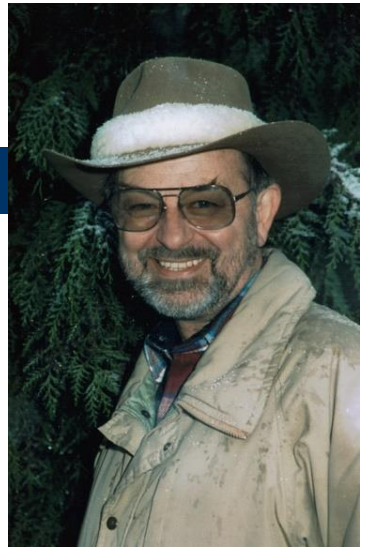
Science Panel Members

Dr. Phil Roni

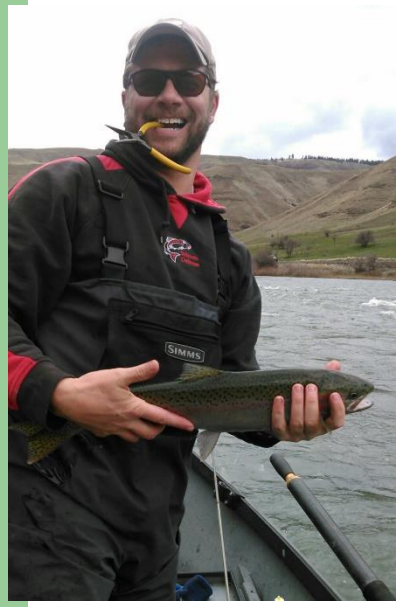


Dr. Kai Ross

Dr. Jeff Kershner



Dr. Pat Trotter



Joe Maroney

Brian Fransen

Dr. Pete Bisson

Dr. Ray Timm

Process for Developing PHB Criteria

1. Literature and science
2. Data and data analysis
3. Professional opinion and experience

Process for Developing PHB Criteria

1. Review existing **literature and science** to define initial criteria
2. Used **data** on end of fish and end of fish habitat from existing water type mod. forms (WTMF) to test criteria
3. **Professional opinion and experience** and results of analysis to provide recommendations

Process for Developing PHB Criteria

- Stakeholder input (perspective and review)
- Produced report for the Board with recommendations

PHB Criteria - Review of Science

- Criteria need to be
  - Useful
  - Simple to understand and measure
  - Objective
  - Repeatable (consistently identified in field)
  - Accurately reflect boundaries to fish-habitat
  - Supported by literature*

- Limited criteria to
  - Gradient
  - Width
  - Permanent natural barriers

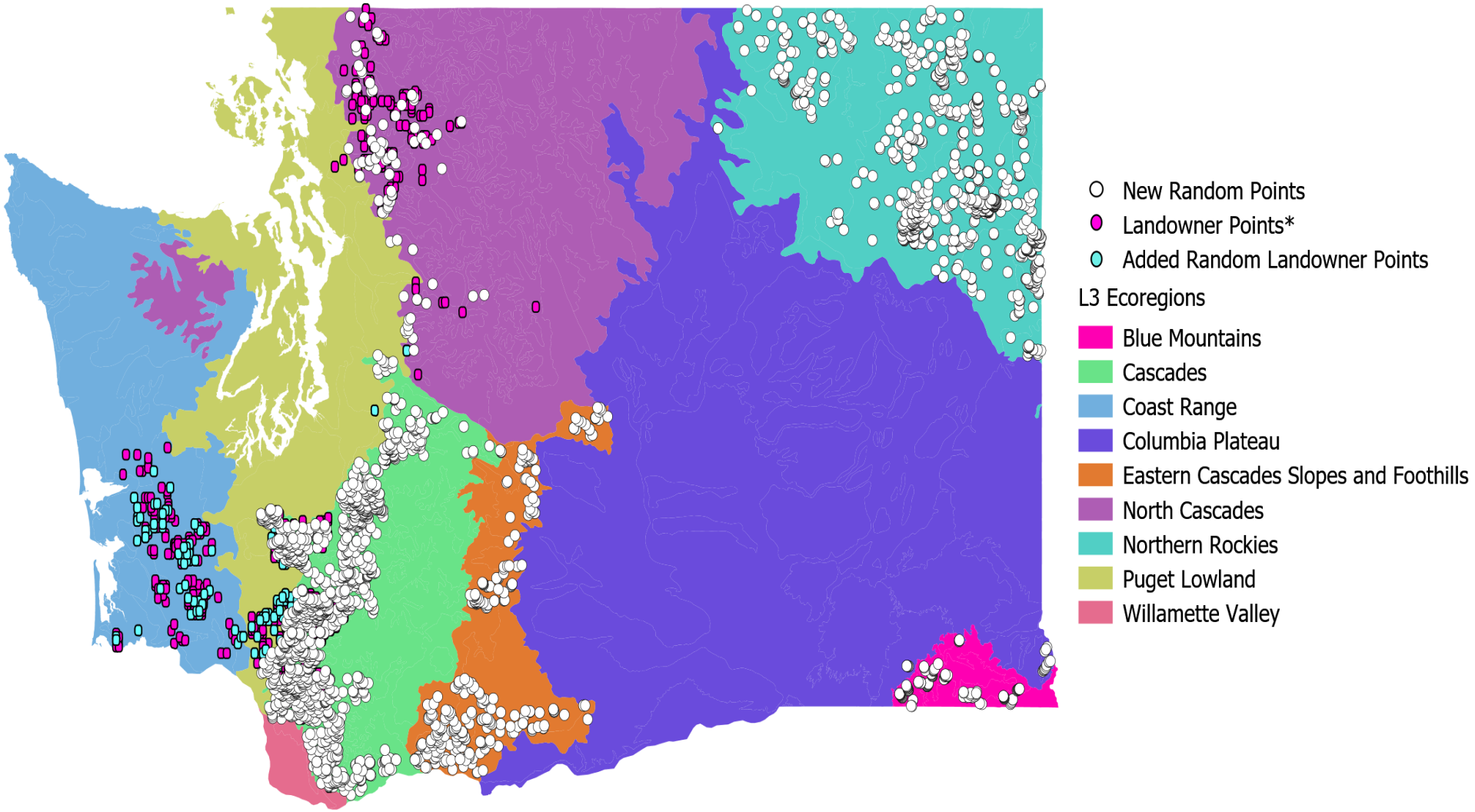
Data Collection

- Water Type Modification Form (WTMF) Data Collection from Protocol Surveys
- Random sample from each of ecoregions (7)
  - 7 ecoregions in WA
  - Target 50-75 per ecoregion per metric
  - Focused on EW first then WW
- Data entry
  - DNR, CFS, and Stakeholders

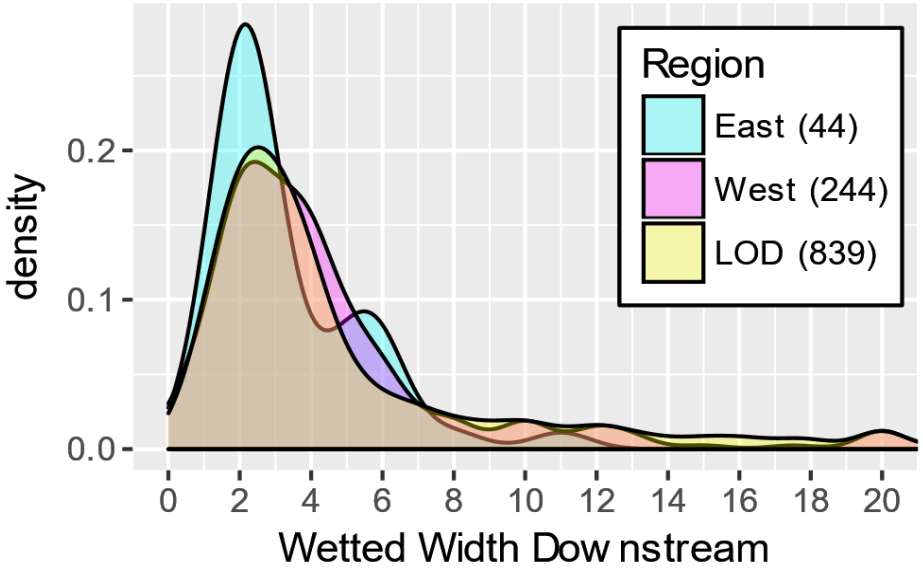
WTMF Data Point Data Entry

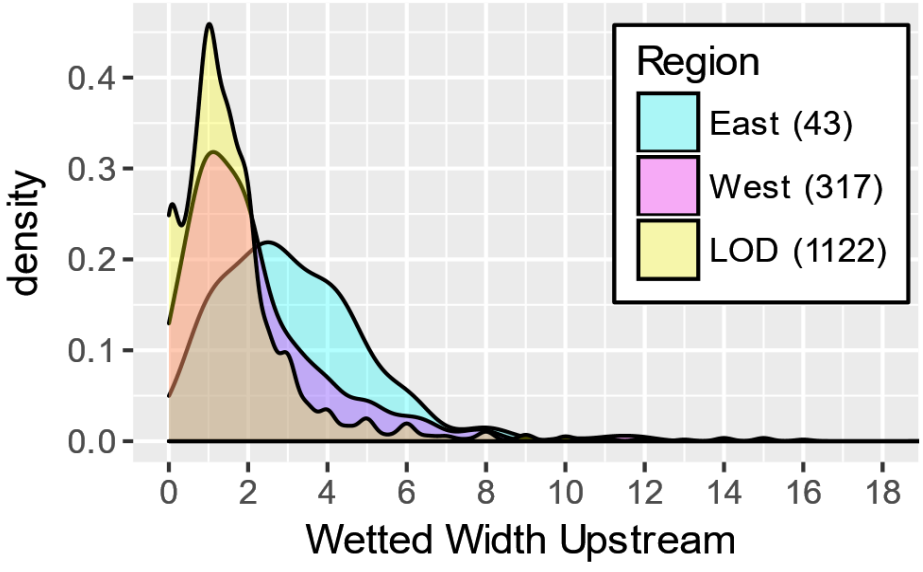
Data labeled Useable?	*Blue Mts.	*Eastern Cascades Slopes & Foothills	*Northern Rockies	North Cascades	Cascades	Total
Yes	**1**	**43**	**192**	**47**	**420**	**703**
No	152	302	684	34	987	2,159
Total	153	345	876	81	1407	2,862

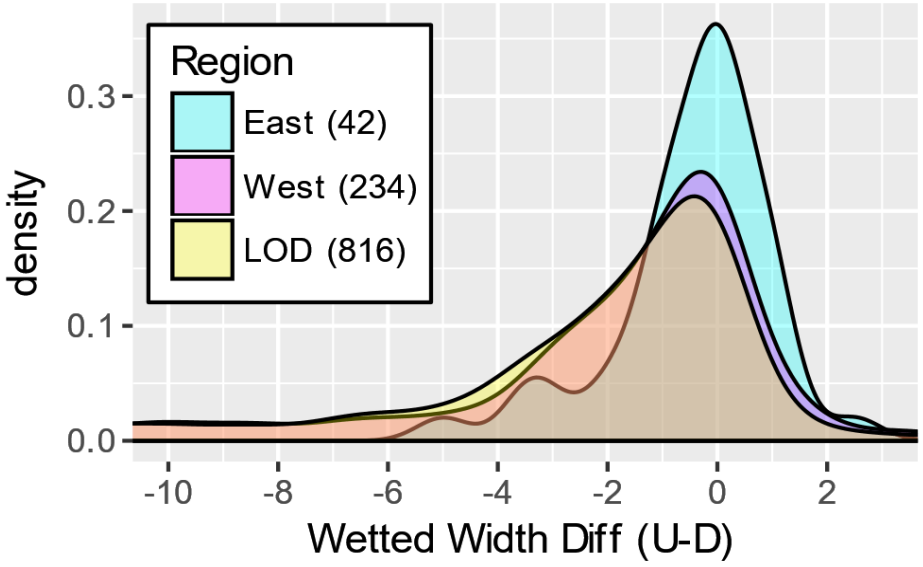
WTMF Data Points Location

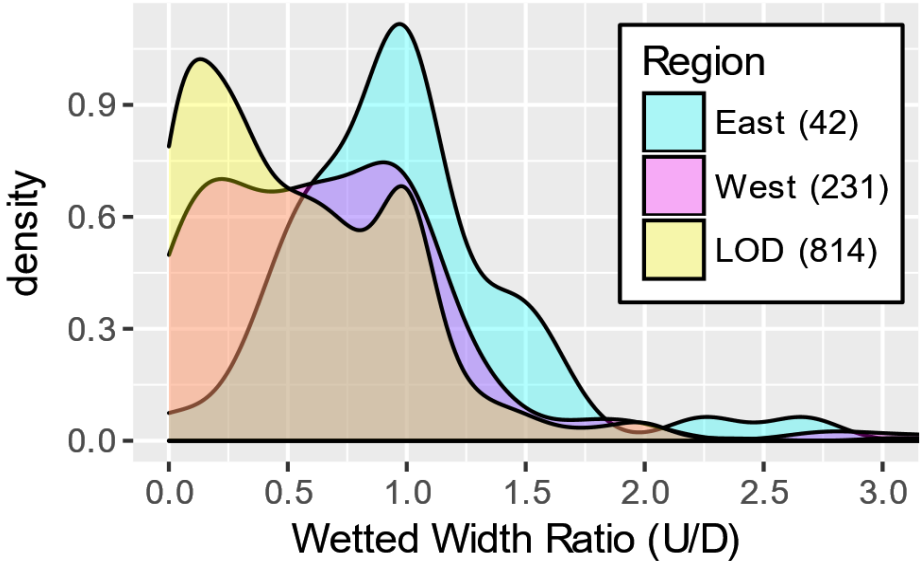


Data Comparison

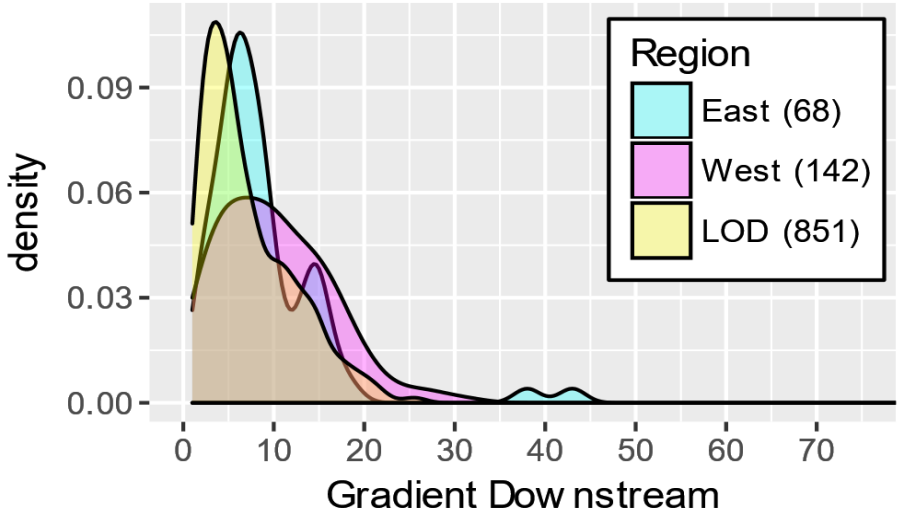


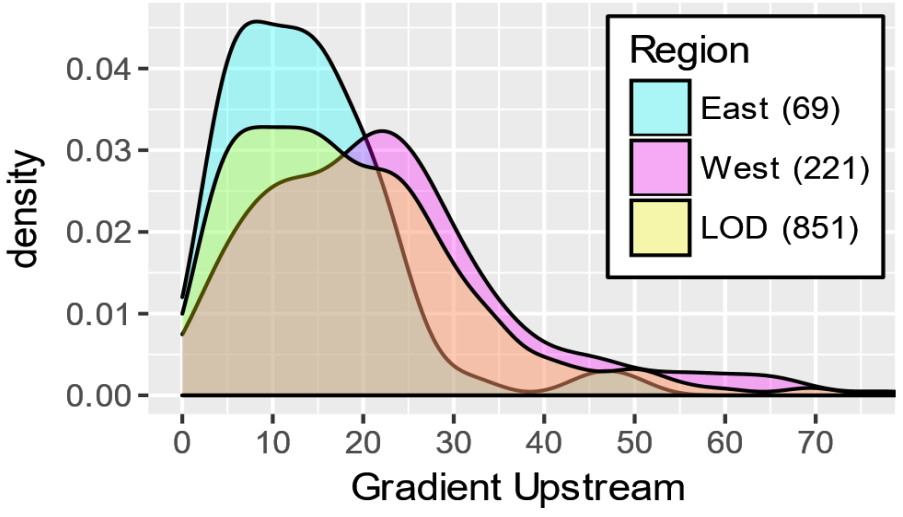


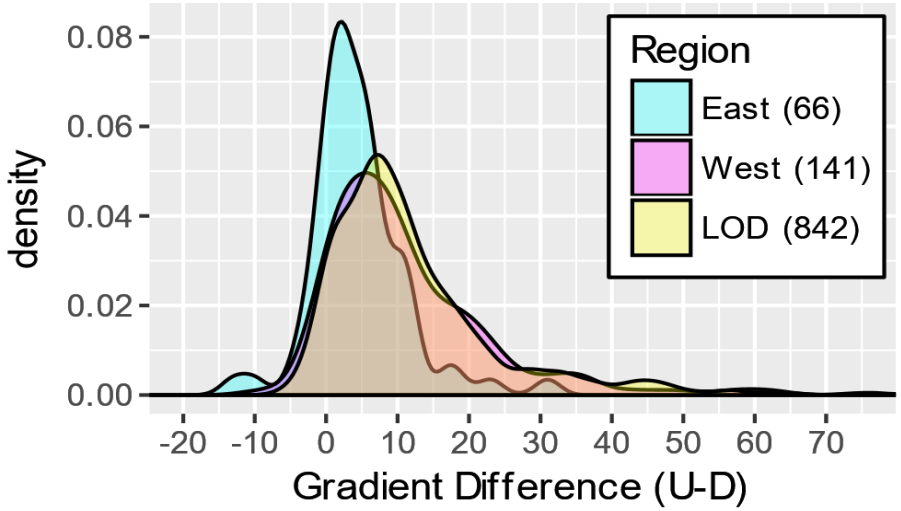


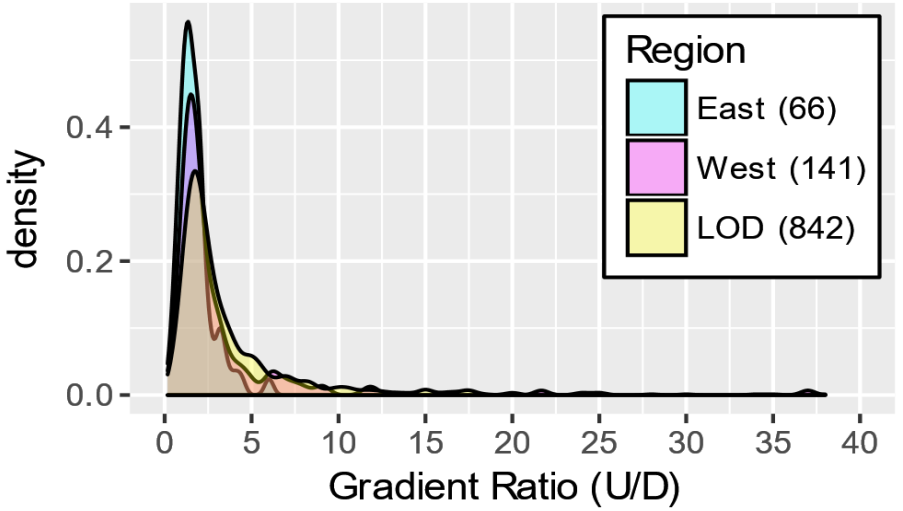


Data Comparison

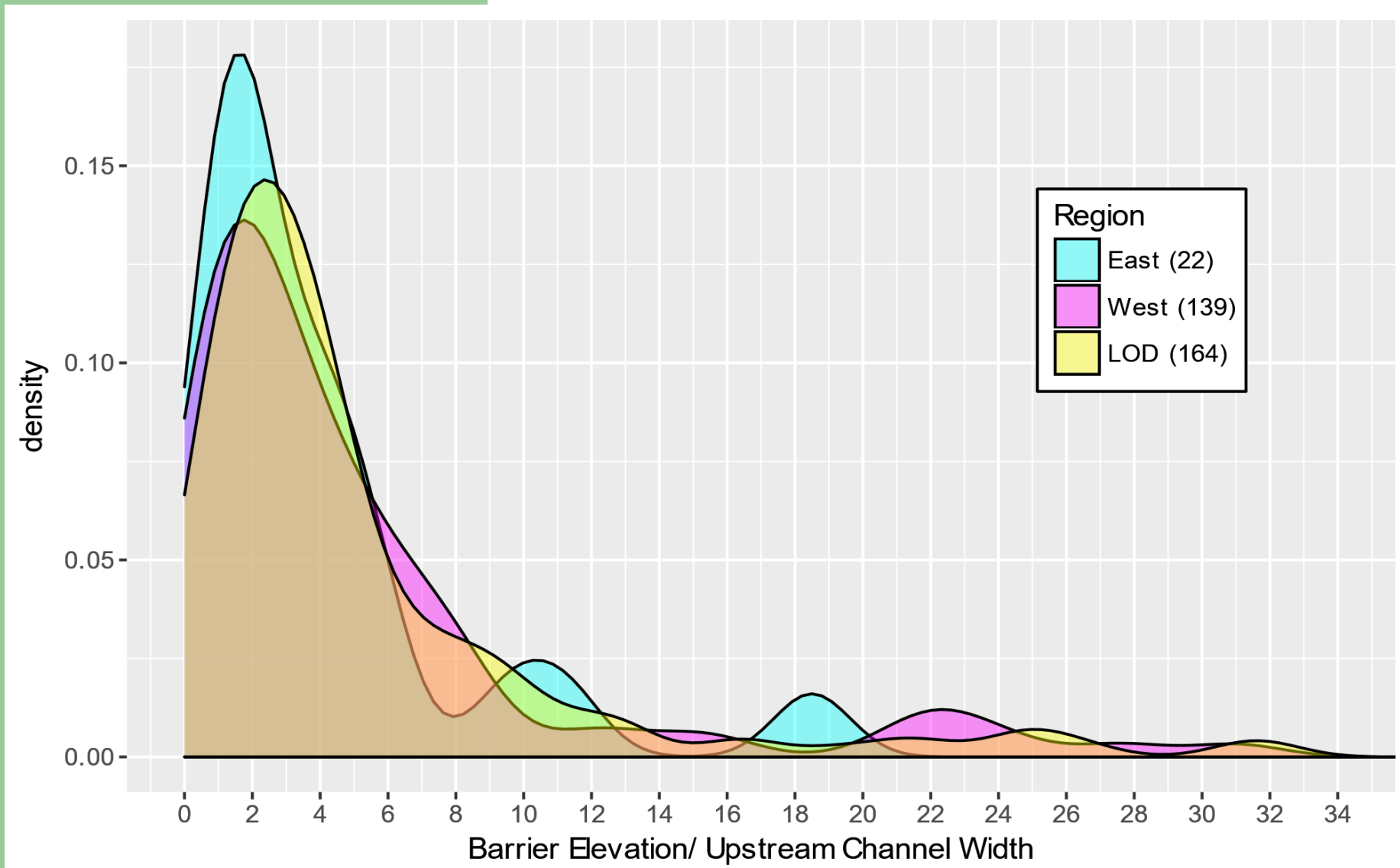








Data Comparison

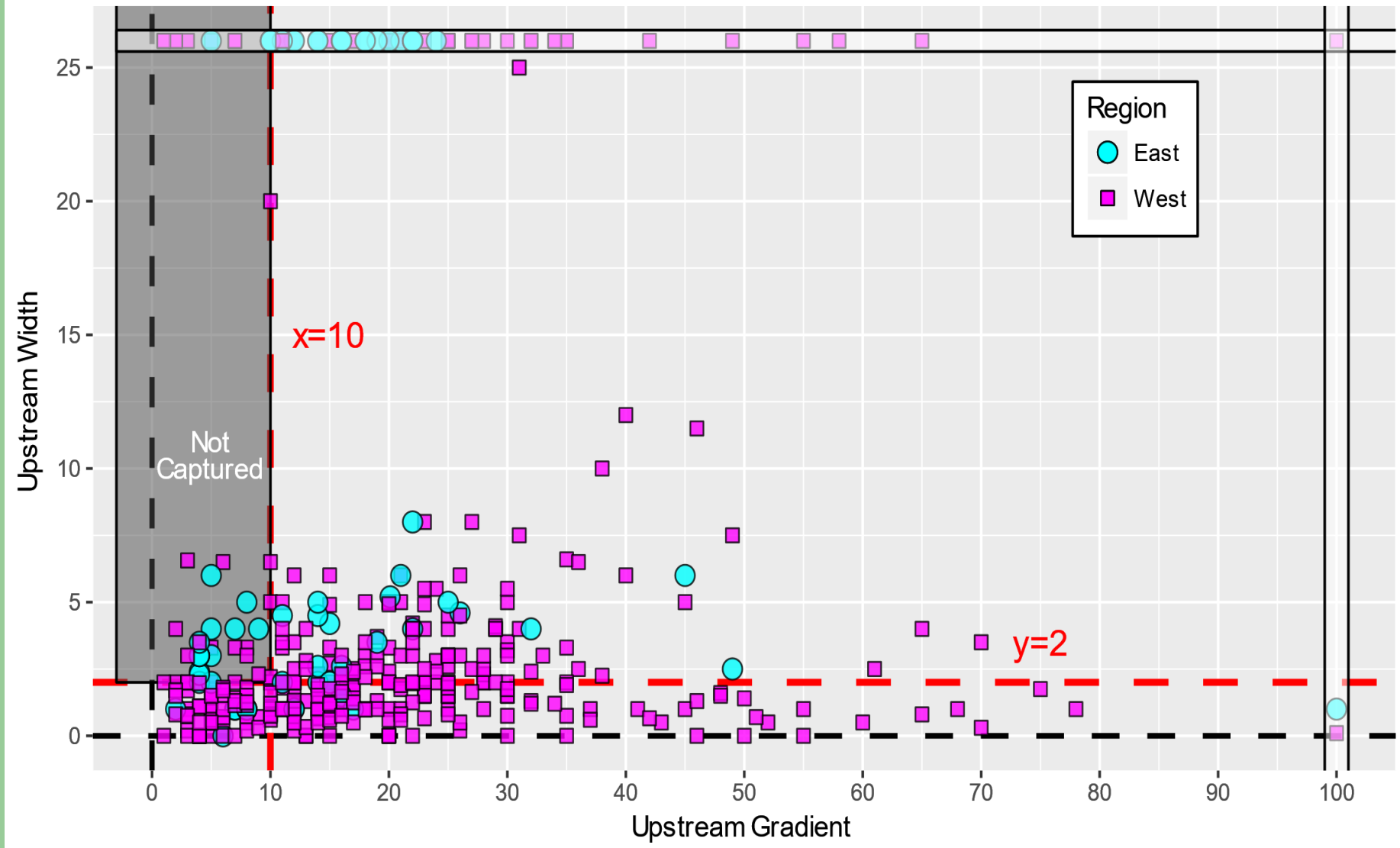


Data Analysis: Examination of PHB Alternatives

- Examined 15 potential PHB definitions for gradient and width
- 7 Different criteria for non-vertical barriers



Example of data analysis



PHB Criteria for Gradient and Size Western Washington

Test	Gradient Metric	Gradient Threshold	Width Metric	Width Threshold (ft)	LOD (n)	Western Washington (n)
4	**Upstream Threshold**	**10%**	**Upstream Threshold**	**2**	**88%**	**96% (335)**
5	**Upstream Threshold**	**15%**	**Upstream Threshold**	**3**	**92%**	**92% (335)**
2	**Upstream Threshold**	**15%**	**Upstream Threshold**	**2**	**80%**	**91% (335)**
15	**Difference up-down**	**5%**	**Ratio Up/Down**	**0.8**	**95%**	**91% (228)**
10	Difference up-down	5%	Upstream Threshold	2	87%	87% (307)
7	Difference up-down	5%	Ratio Up/Down	0.7	92%	87% (228)
3	Upstream Threshold	20%	Upstream Threshold	2	72%	86% (335)

PHB Criteria for Gradient and Size Eastern Washington

Test	Gradient Metric	Gradient Threshold	Width Metric	Width Threshold (ft.)	Eastern Washington (n)
4	**Upstream Threshold**	**10%**	**Upstream Threshold**	**2**	**79% (70)**
5	**Upstream Threshold**	**15%**	**Upstream Threshold**	**3**	**73% (70)**
1	Ratio Up/Down	1.50	Ratio Up/Down	0.75	73% (67)
10	Difference up-down	5%	Upstream Threshold	2	61% (67)
11	Difference up-down	5%	Ratio Up/Down	0.5	61% (67)
15	Difference up-down	5%	Ratio Up/Down	0.8	61% (67)
2	Upstream Threshold	15%	Upstream Threshold	2	60% (70)
7	Difference up-down	5%	Ratio Up/Down	0.7	60% (67)
6	Upstream Threshold	15%	Ratio Up/Down	0.7	59% (70)
8	Difference up-down	5% if dsg>=5%	Ratio Up/Down	0.7	57% (67)

Non-vertical Obstacles to upstream migration (barriers)

Test	Description	LOD	East (n)	West (n)
5	Obstacle gradient over 20% and elevation change over obstacle length is greater than 5 feet (1.5 m).	85%	91 % (55)	88 % (139)
2	**Obstacle gradient over 20% and elevation change over obstacle length is greater than the upstream bankfull channel width.**	**81%**	**91% (22)**	**83% (93)**
6	Obstacle gradient over 20% and elevation change over obstacle length is greater than 1.5 times the upstream bankfull channel width.	70%	77 % (22)	71 % (93)
4	Obstacle gradient over 20% and elevation change over obstacle length is greater than 10 feet (3 m).	57%	58 % (55)	68 % (139)
1	Obstacle gradient over 20% and elevation change over obstacle length is greater than twice the upstream bankfull channel width.	59%	50 % (22)	65 % (93)
7	Obstacle gradient over 20% and elevation change over obstacle length is greater than 15 feet (4.6 m).	35%	42 % (55)	50 % (139)
3	Obstacle gradient over 20% and elevation change over obstacle length is greater than 20 feet (6.1 m).	24%	38 % (55)	35 % (139)

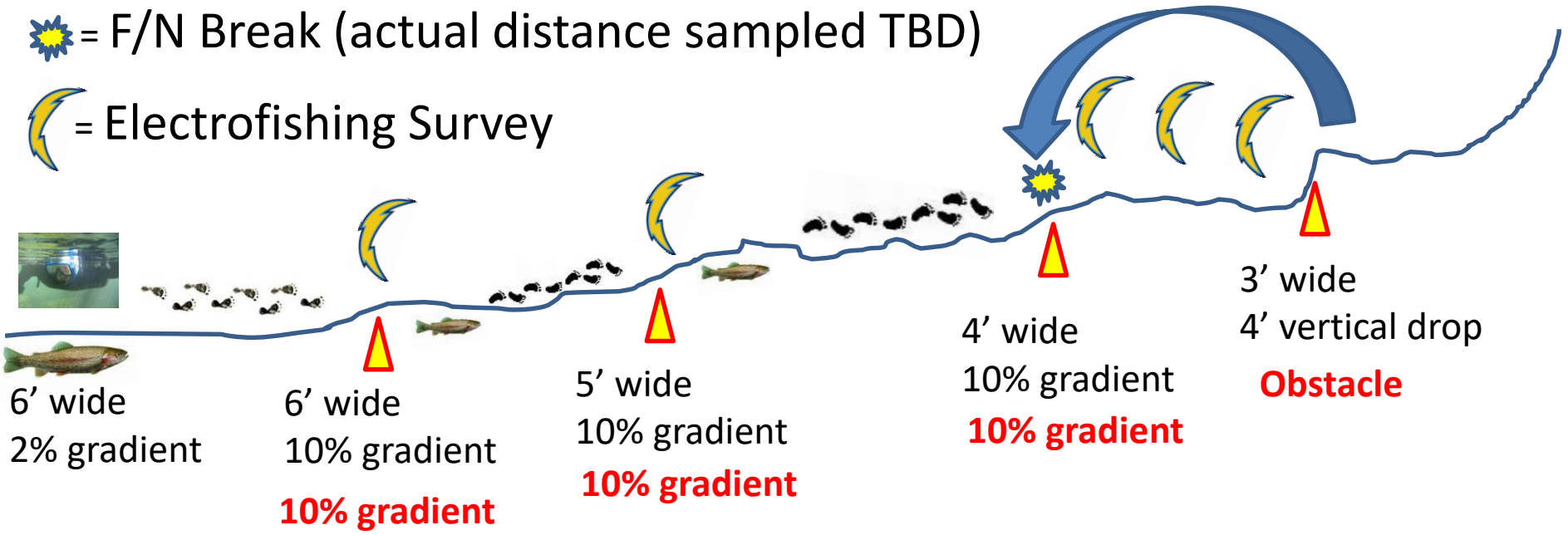
***Recommendation for vertical obstacles: ≥3 feet drop**

Example of FHAM to Establish F/N Break

= Potential Habitat Break (PHB)

= F/N Break (actual distance sampled TBD)

= Electrofishing Survey



Western Washington Recommended Criteria:
10% gradient, 2’ bankfull width, and 3’ vertical **or** >20% over a distance = to upstream BFW

Summary of Findings

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

Recommendations

- Select one of the top four performing set of PHB criteria for gradient and bankfull channel width for WW, and one of the top two set of criteria for EW

- That the Board select the same PHB obstacle (barrier) criteria for eastern and western Washington,
  - Vertical barriers = 3-ft vertical drop
  - Non-vertical 20% slope and minimum elevation change = 1 upstream bankfull channel width

Additional recommendations

- PHB criteria for laterals (tributaries) start at the most downstream end of the tributary and changes or thresholds associated with PHB criteria be measured upstream from that location.
- Consistent and accurate protocols and forms for recording gradient, width, and obstacle information be established.
- That changes in stream gradient and bankfull channel width over at least 20 times the average bankfull width be measured.
- **Validation study needed to confirm proposed criteria**

Common Questions

- Why are there multiple recommendations?
- Why the results are different from August?
- Why was there consensus in August but not with January report?
- Are there flaws with using ratios given the data provided on stream widths?

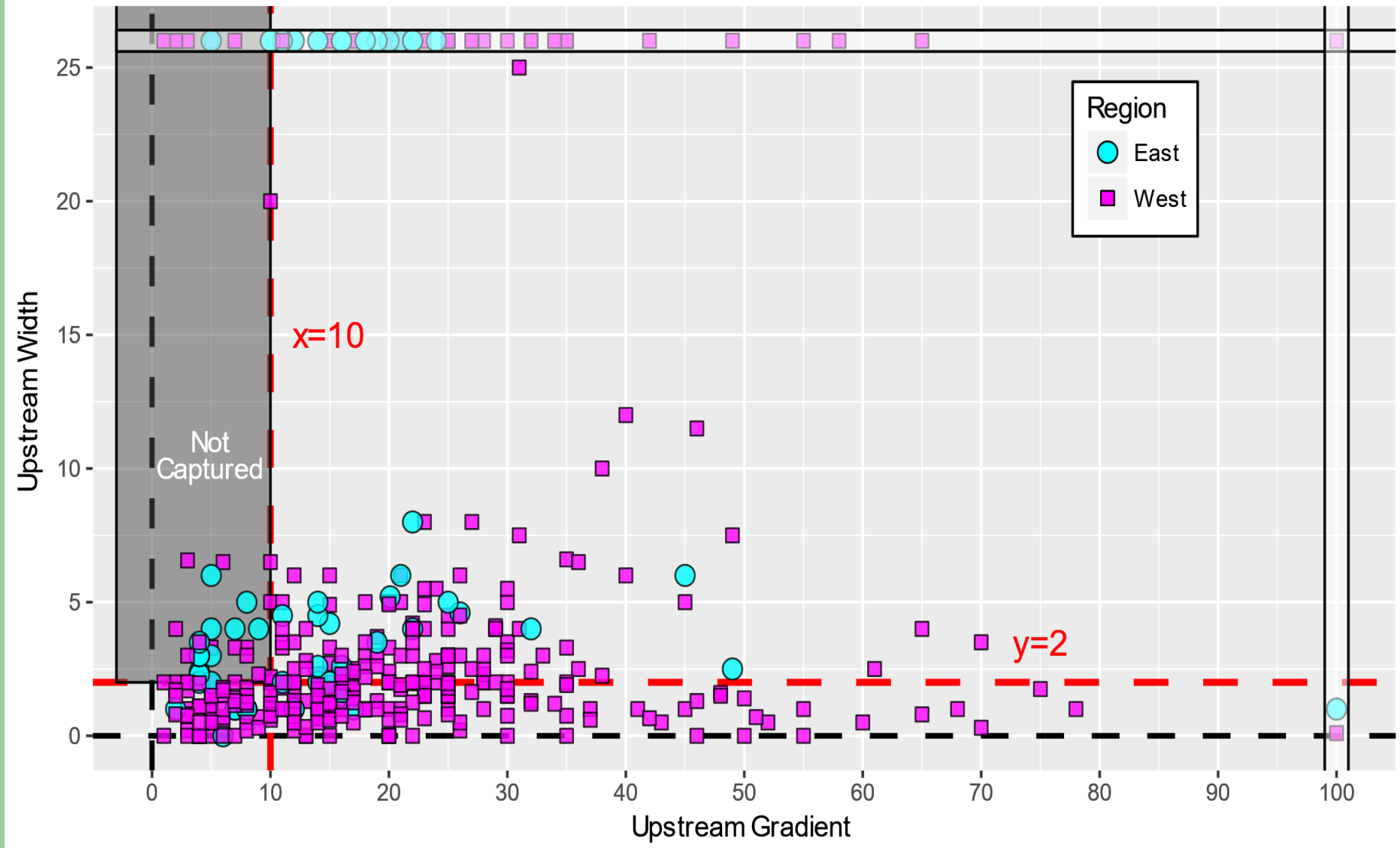
Questions

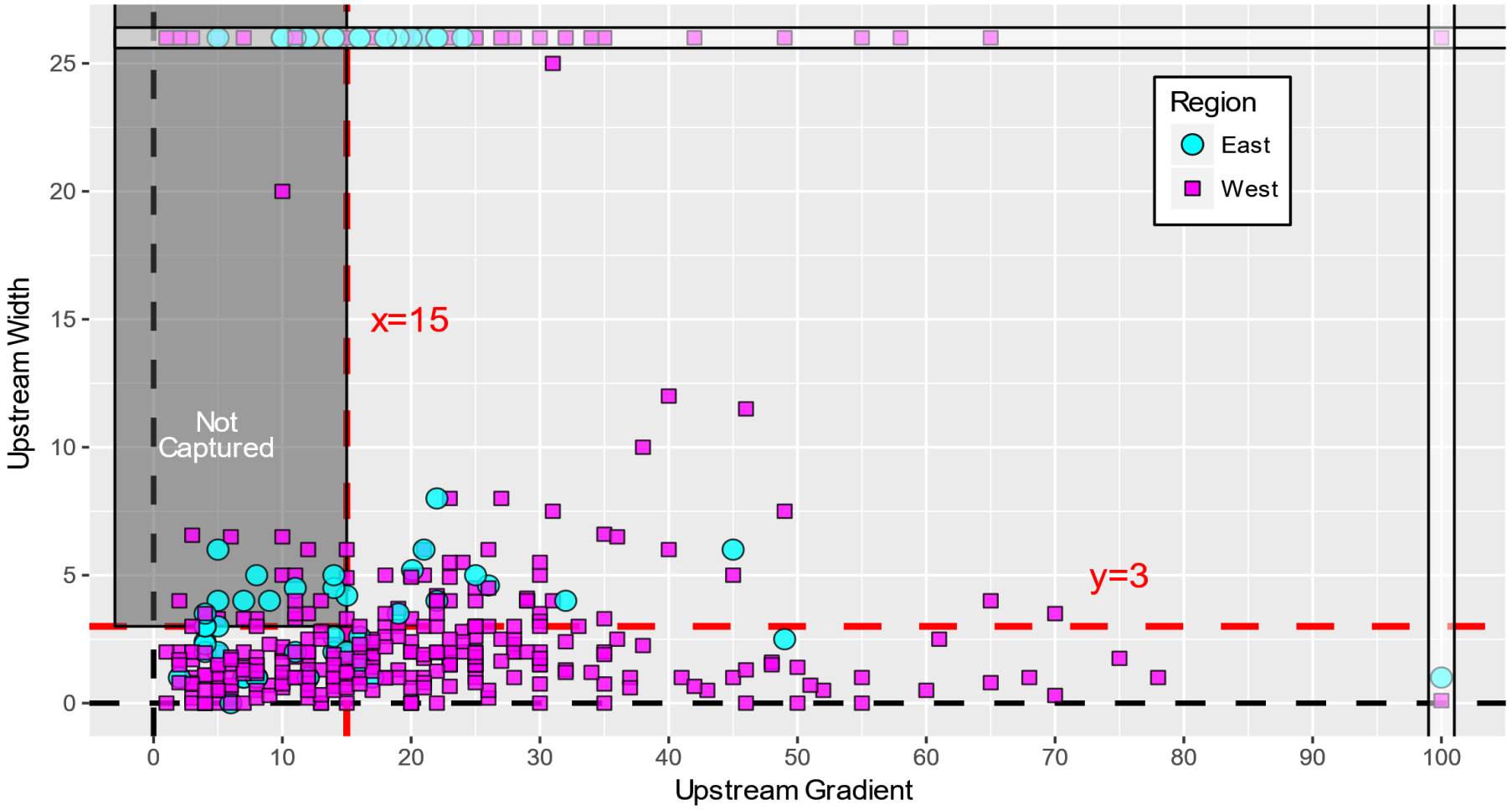
Photo Credit: Weyerhaeuser

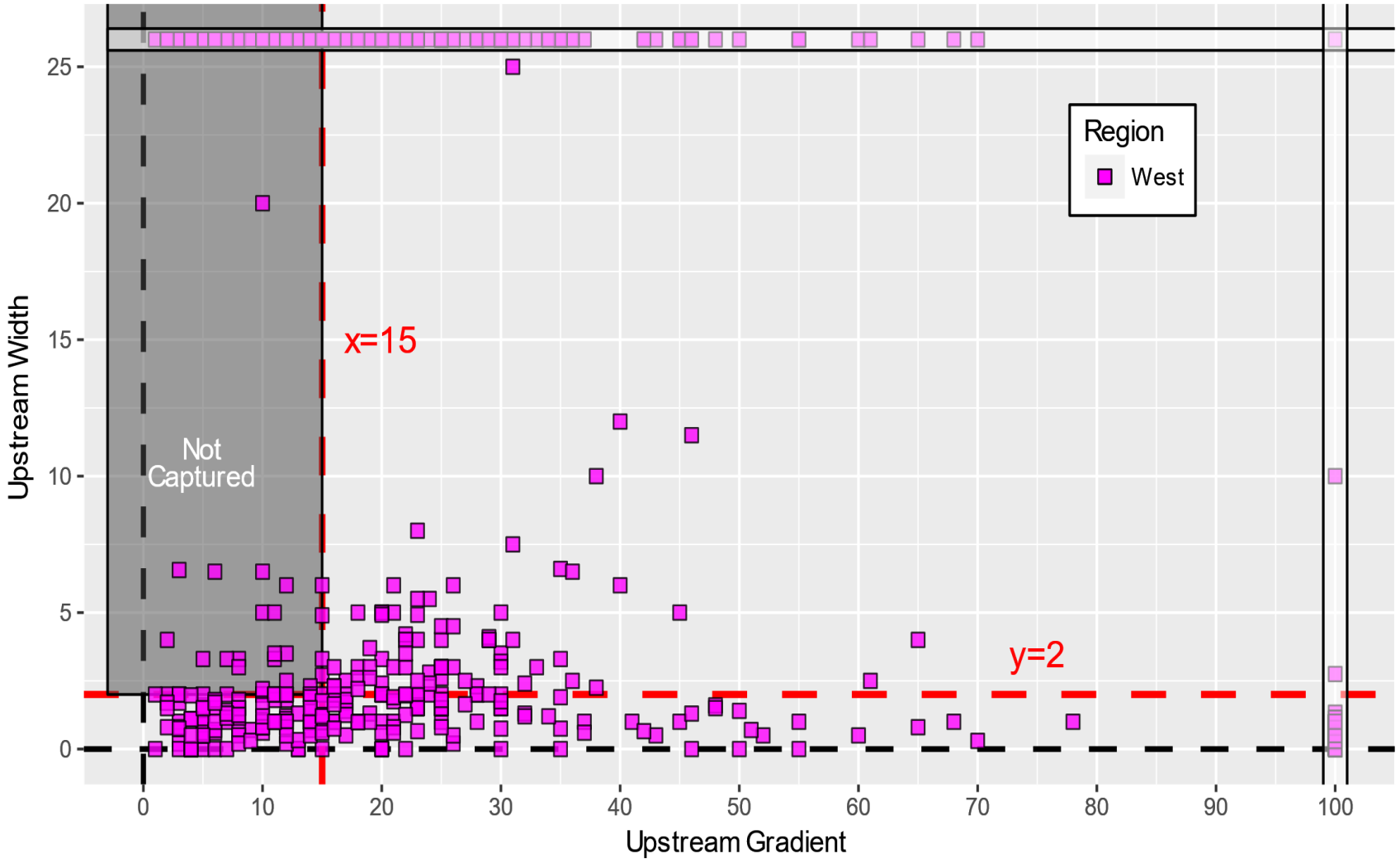
Extra slides

Westside Tribes Proposal

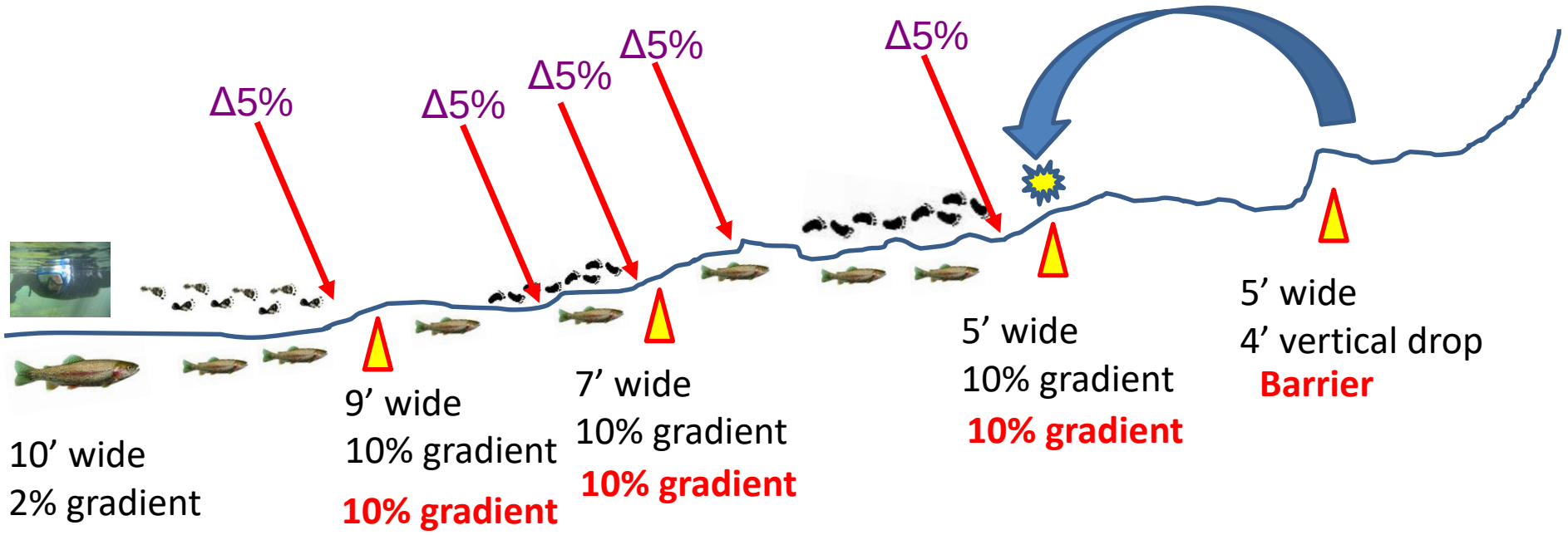
- Westside Tribes Proposal: 10% floor; 5% change in gradient; 2’ bfw
  - East (56%; n=18); West (87%; n=90)
- Eastside: ~73% of F/N with DS Gradient<10% (n=68)
- Westside: ~61% of F/N with DS Grad < 10% (n=228)


Region
East
West
x=10
y=2
Not Captured
Upstream Width
Upstream Gradient
0
5
10
15
20
25
0
10
20
30
40
50
60
70
80
90
100


Region
East
West
x=15
y=3
Not
Captured
Upstream Width
Upstream Gradient
0
5
10
15
20
25
0
10
20
30
40
50
60
70
80
90
100


Upstream Width
Upstream Gradient
Region
West
x=15
y=2
Not
Captured
0
5
10
15
20
25
0
10
20
30
40
50
60
70
80
90
100

10% Threshold vs. 5% Change



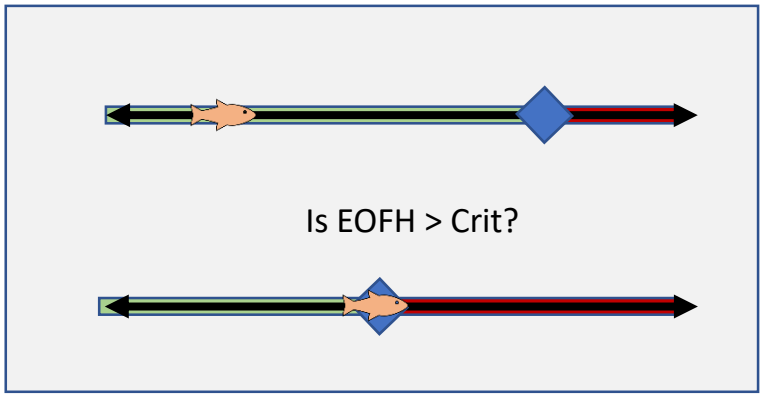
= Potential Habitat Break (PHB)

= Electrofishing Survey

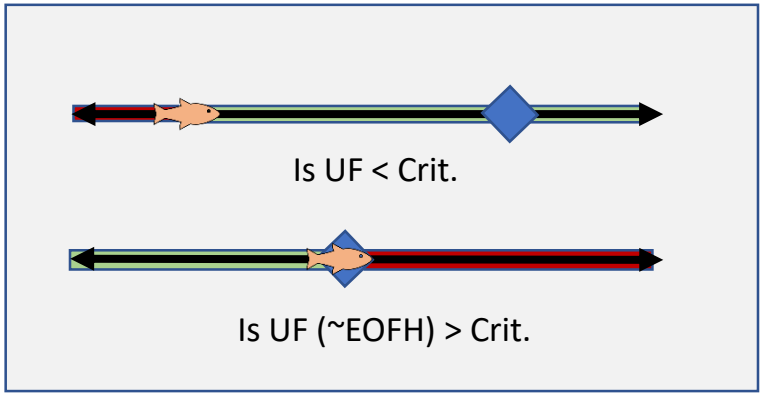
= F/N Regulatory Break

Are end of fish points necessary?

"Captured" EOFH points



Surveyor "agreement"



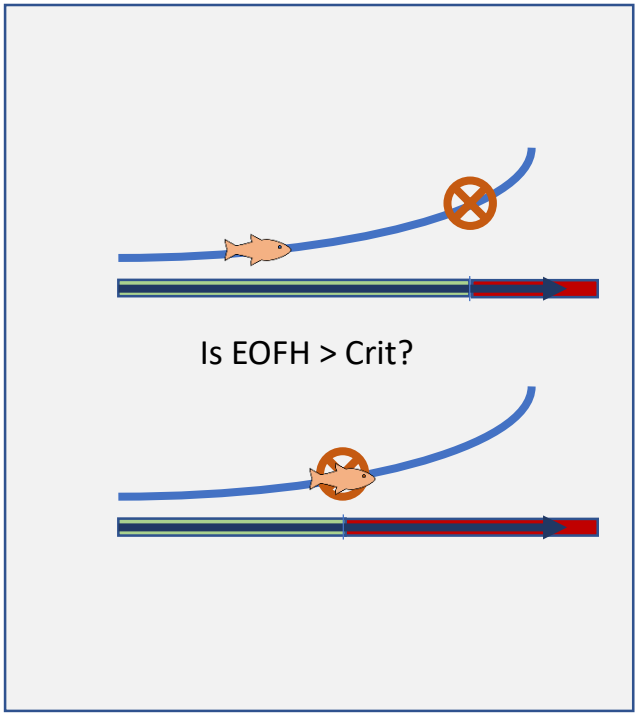
UF Point

EOFH Point

"Pass" Values

"Fail" Values

“Captured” EOFH points



UF Point

EOFH Point

“Pass” Values

“Fail” Values

Surveyor “agreement”