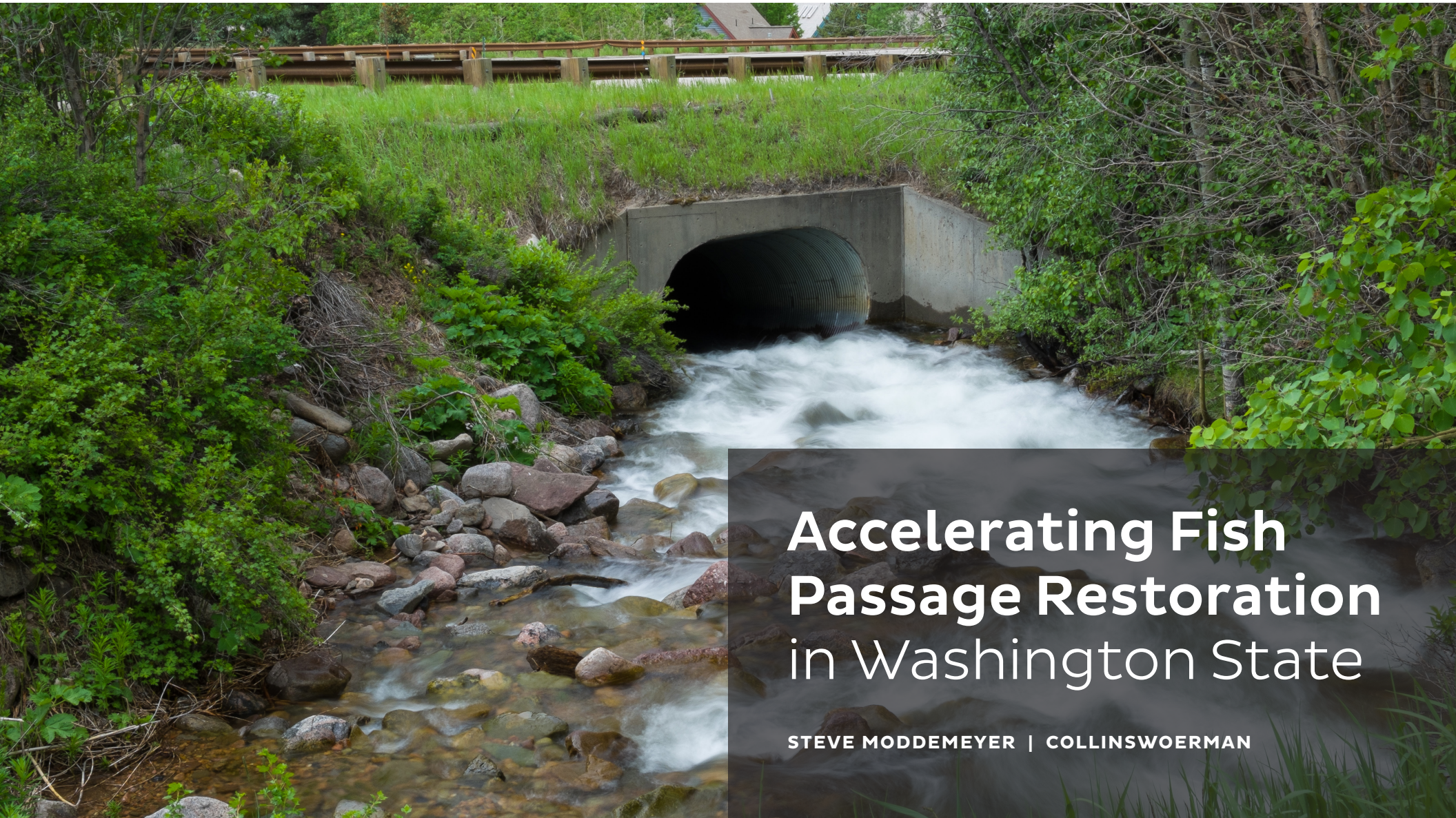
BRIAN ABBOTT
FISH BARRIER
REMOVAL BOARD

Meeting Handouts

April 16, 2019

1. Presentation: Smart Culverts and Modular Bridges
2. Presentation: 2019 Fish Passage Inventory, Assessment, and Prioritization Manual
3. Presentation: Hoko Focus Watershed
4. FBRB Work Plan

WASHINGTON STATE
FISH PASSAGE
RESTORATION PROGRAM



Accelerating Fish Passage Restoration in Washington State

STEVE MODDEMEYER | COLLINSWOERMAN

I. SMART CULVERTS

A range of new low-cost sensor techniques, coupled with computer vision and artificial intelligence algorithms opens up the possibility to adopt a sensing/rapid response technique for fish passage, possibly extending the life of existing culverts. This could accelerate overall fish passage improvements and reduce the long-term cost for fish passage programs. Use of the data from the sensors has the potential to add significant real-time awareness of flows, sediment movement, and fish presence. These measurements would facilitate a shift in assessment from "modeled" to "measured," wherein real-time information accumulates rapidly to provide finer resolution and insight on actual stream and fish passage conditions. The data can also provide hydrologic and hydraulic model verification, potentially allowing for fish passage design based on actual measurements.

These new sensor technologies also make a "Rapid Response" approach to fish passage feasible where recorded changes in stream dynamics can be identified and addressed rapidly before the failure affects fish or human passage.

Both the **Sensors Systems Lab** at the University of Washington Seattle and the **Sensing, Monitoring, and Robotics Technology (SMaRT) Lab** at Columbia University in New York City are eager to collaborate. **Professor Joshua R Smith** is the Milton and Delia Zeutschel Professor at UW's Allen School of Computer Science and Engineering. He runs the Sensors Systems Lab and has created the open-source Wireless Identification and Sensing Platform (WISP) program that allows radio frequency sensors to be placed in the environment without an energy source. They are designed to be powered by the radio waves sent by mobile RFID readers. In 10 milliseconds, the WISP system can tag a number of sensors in and around a culvert, pull instant readings from them, and transmit those data back to the RFID tag reader. Results are the sent out via cellphone or online download.

The sensors powered by the WISP system can determine water depth and sediment depth. Acoustic sensors can also apply Professor Smith's "sea shell" effect to measure the changes in culvert harmonics. More or less water and sediment affects the acoustic signature of the culvert. Fish presence and water temperature readings may also be possible with this acoustic technique.

These systems are proven in other uses. To apply them to fish passage would require a sensor(s) array design, lab and field testing coupled with traditional monitoring information to correlate sensor readings with conditions in the field. Once ground-truthed, the artificial intelligence algorithms are applied to determine patterns that could signal changes in conditions and functionality of the fish passage culvert.

Professor Maria Feng, the Renwick Professor of Civil Engineering who runs Columbia's SMaRT robotics lab, is also committed to help. She has developed a computer vision bridge-monitoring system using small smartphone cameras and artificial intelligence algorithms. She believes this low-cost computer vision approach may be cost-effectively applied to culvert monitoring throughout Washington State.

The cost of sensors is dropping rapidly. New technologies in pattern recognition coupled with computer vision are on the near-term horizon.

MARIA FENG, COLUMBIA'S ROBOTICS LAB BRIDGE MONITORING

- Computer vision measures deflection in edges, while AI pattern recognition software learns the normal variance in changes. When the changes exceed the normal pattern, a message is sent for inspection.
- Microphones can also be installed to monitor changes in sound quality, to capture the sounds of passing salmon, and to correlate audio levels with flow.

JOSHUA SMITH, SENSOR SYSTEMS LABORATORY, UNIVERSITY OF WASHINGTON

- "WISP ISP, the Wireless Identification and Sensing Platform, is a family of sensors that are powered and read by UHF RFID readers. WISPs do not require batteries since they harvest their power from the RF signal generated by the reader. The WISP is an open source, open architecture EPC Class 1 Generation 2 RFID tag that includes a fully programmable 16 bit microcontroller, as well as arbitrary sensors. Unlike the WISP, conventional RFID tags are black boxes that cannot execute arbitrary computer programs, and do not support sensors. We have given WISPs to collaborators around the world.

"Many of the applications have been sensing related, but we were also surprised to find many applications in the areas of cryptography and security, enabled by WISPs programmability." – from UW Sensor Systems Laboratory.

COMPUTER VISION EDGES FOR MONITORING CULVERT FUNCTION FOR FISH PASSAGE

TOP: Computer vision monitoring edges
BOTTOM: WISP sensors do not require batteries

SEASHELL EFFECT SENSING

Seashells sound like the ocean because the cavity of the shell differentially resonates amplifying some frequencies over others. This changes with the shape of the shell. Using microphones and short digital audio recordings, the resonance of the culvert will change based on the presence or absence of water. Patterns of frequency and resonance changes can be monitored using WISP systems and used to determine water depth and flow in the culvert.

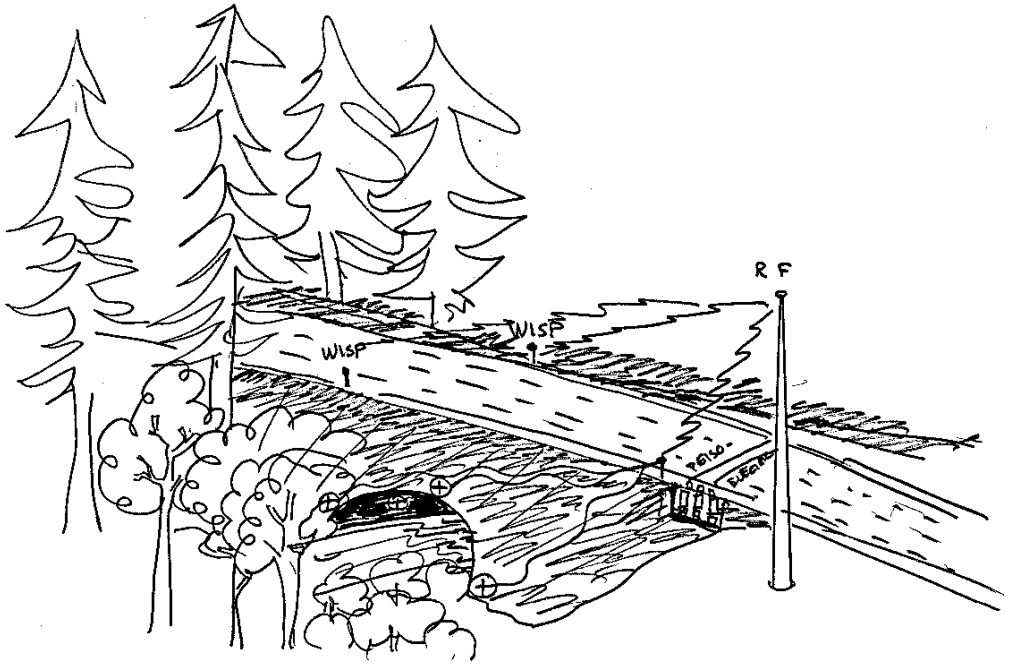
CAPACITANCE SENSING

A sensor can measure changes in capacitance based on water volume and chemistry. The information can be collected with WISP used to generate the data collection.

CROWD SOURCE DATA COLLECTION

RFID readers can be attached to vehicle fleets to gather data as the drive.

RFID readers can also be loaned to citizen volunteers and dog walkers who can collect and download data every day a dog goes for a walk.



Pulse from passing vehicles can feed battery or WISP sensor directly which then powers passive sensor to gather and store data

II. MODULAR BRIDGES

A “Standardized Modular Bridge” concept builds on the success of Thurston County’s modular bridge approach. Thurston County found they could cost-effectively use prefabricated bridge pieces to replace culverts with bridges for a similar price. Their experience was faster permitting (as the bridge exceeds the capacity of the culvert they were replacing). The steel bridge sections offer a longer life as they are guaranteed for 75 years. The current limitation is these bridges are only suitable for low-traffic rural roads as the railing systems are not sufficient for higher traffic situations.

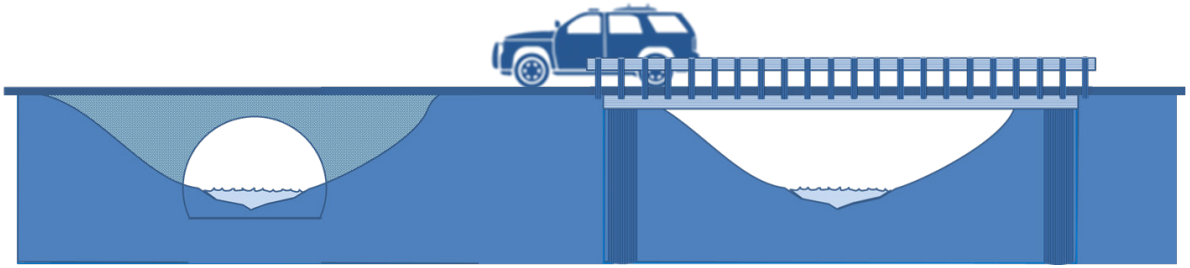
The proposal is to create a standard modular bridge package with repeatable elements to lower costs and increase environmental performance, and where needed to develop a new guard rail system to allow broader use of bridge components for larger volume roadways.

For example, at present any stream with a bankfull width of 15-feet or more requires a bridge (no culvert allowed). Current best practice is each bridge is custom designed for that location. A standardized modular bridge approach may be able to lower costs, not only for the over-15-feet crossings but also for cost-effective application to even smaller stream crossings, perhaps as small as 5-feet thus extending the benefits of increased capacity and increased service life for more of stream crossings. A life cycle cost basis should be used to evaluate the cost effectiveness of this approach.

A standardized package of modular bridge solutions would lower initial design costs, reduce costs through volume buying , thus accelerating replacement rates for fish passages that are currently failing. This would also provide enhanced capacity for climate induced future flows.

- Thurston County is using modular bridge section to accelerate speed of construction and reduce cost for stream crossings.
- Bridges designed to Thurston County specifications
- Span length tie d to state criteria for culverts (bankfull width + 2')
- Best used on low traffic rural roads
- Limitation for busier roads is railing design
- Allows faster permitting
- Allows faster construction time
- Reduces cost
- 75-year guarantee

Photo provided by Jose Carrasuquero



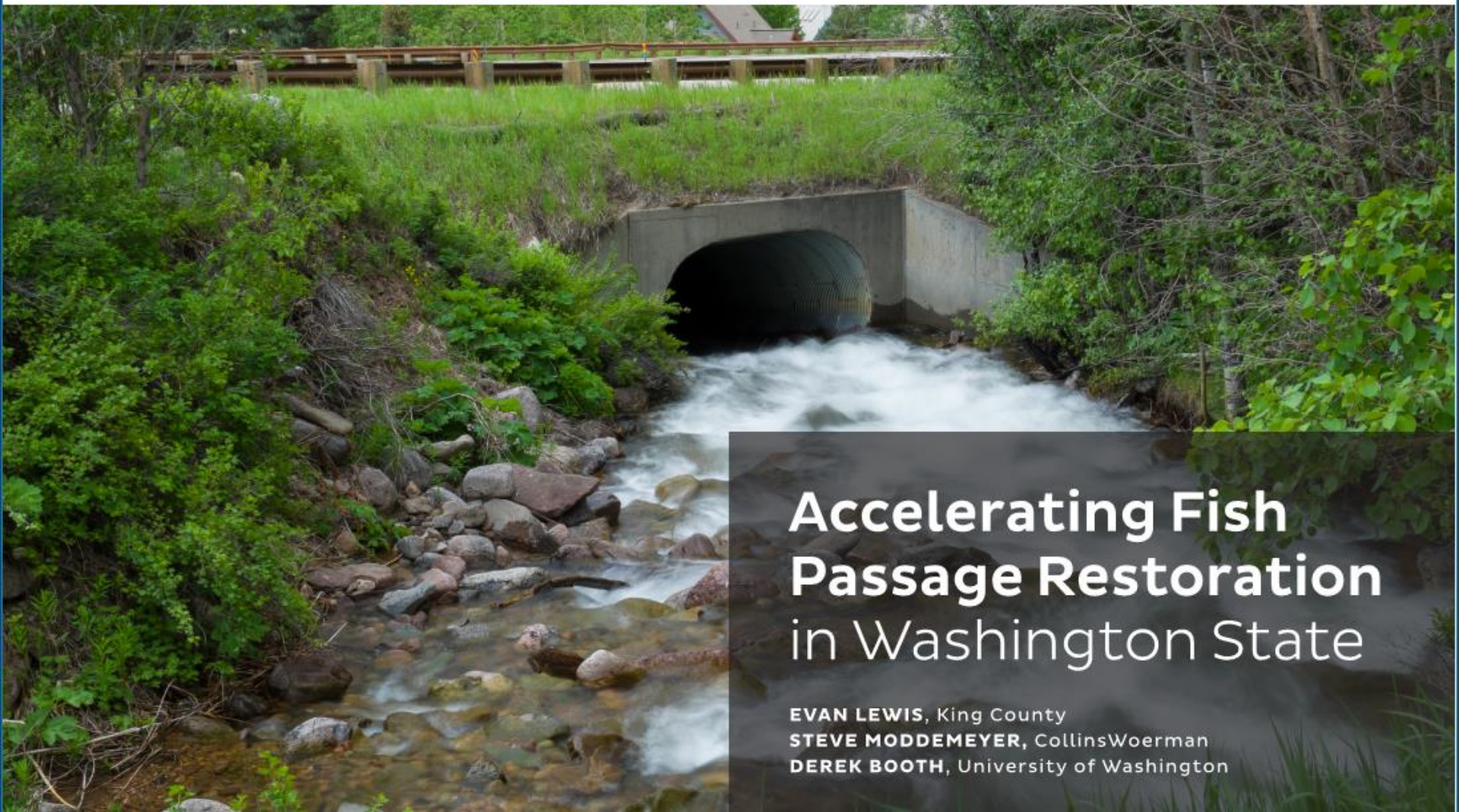
CULVERT	VS	MODULAR BRIDGES
Guard rail often not required		Requires guard railing system improvements
Bankful width + 2-feet		Bankful width + natural channel morphology
Less capacity for high water and debris flows		More capacity for high water and debris flow
Direct impacts on channel during construction		Low impact on channel during construction
Often have impacts on downstream (scour, bedload characteristics)		Virtually zero impacts downstream
50-year service life		75-year service life
Backfill after pipe installation required		Modest backfill requirements
		Faster installation
		Faster permitting
		Similar cost at up to spans of to-be-determine threshold
		More room for ecological connectivity up and downstream

To prepare for implementation of modular bridges, a pilot project should be selected to test the modular bridge concept. The recommendation is to select projects more than 2 years out so that shifts in approach can be accommodated without impacting project costs or timing. A rule of thumb: if a project already has an assigned project manager, then it's too late.

Selecting an early pilot modular bridge approach has several advantages. It creates focus and a timeline; it reveals the details in execution that might otherwise be missed; it helps to train regulators so they are comfortable with a larger rollout at a future date; and it allows for targeted monitoring in advance of the project itself.

This early monitoring for the future pilot becomes a baseline to compare the impacts of a modular bridge versus a more traditional culvert in terms of timing, costs, and impact of fish and other upstream or downstream ecosystem processes.

WASHINGTON STATE
FISH PASSAGE
RESTORATION PROGRAM



Accelerating Fish Passage Restoration in Washington State

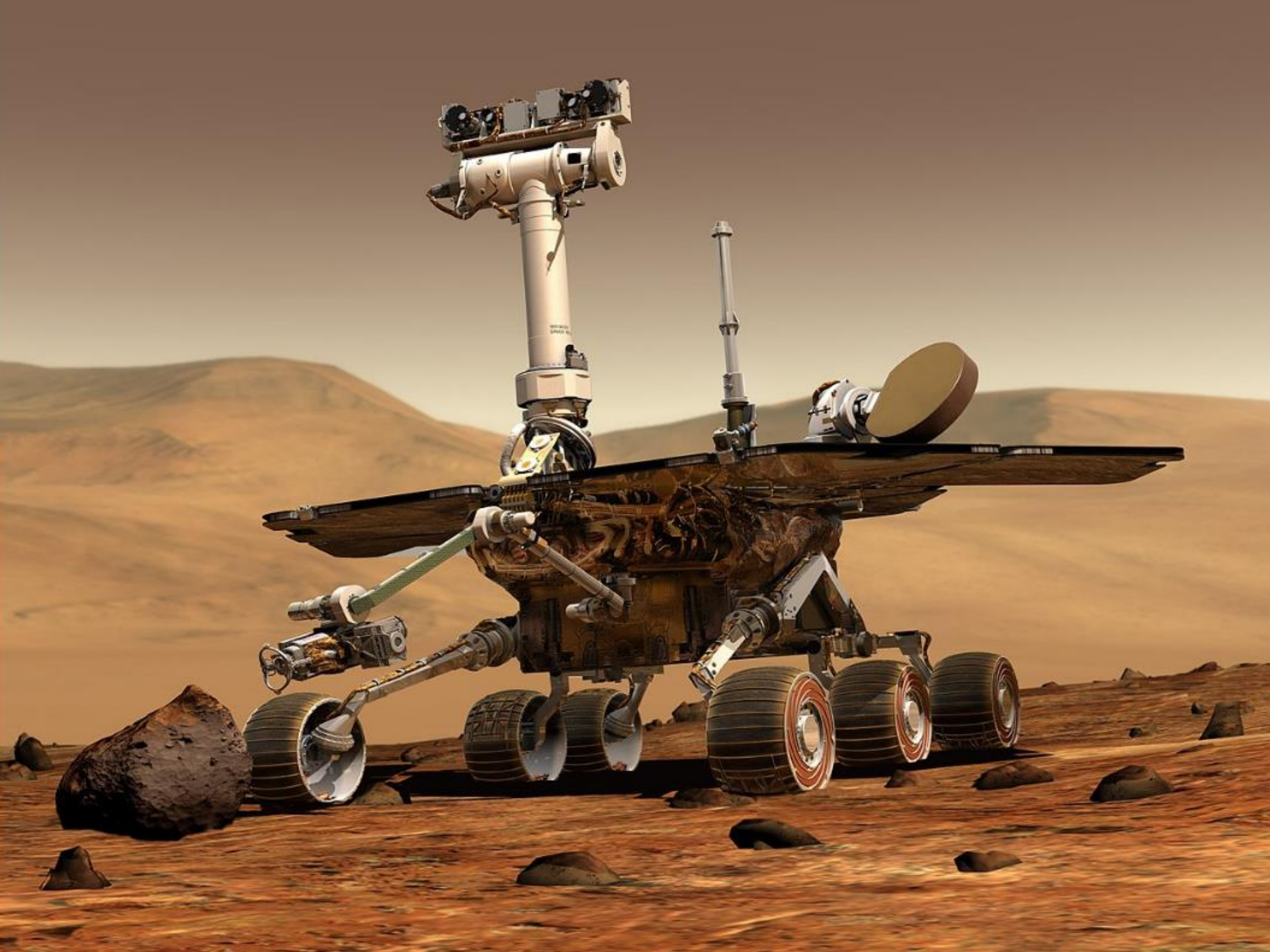
EVAN LEWIS, King County
STEVE MODDEMEYER, CollinsWoerman
DEREK BOOTH, University of Washington

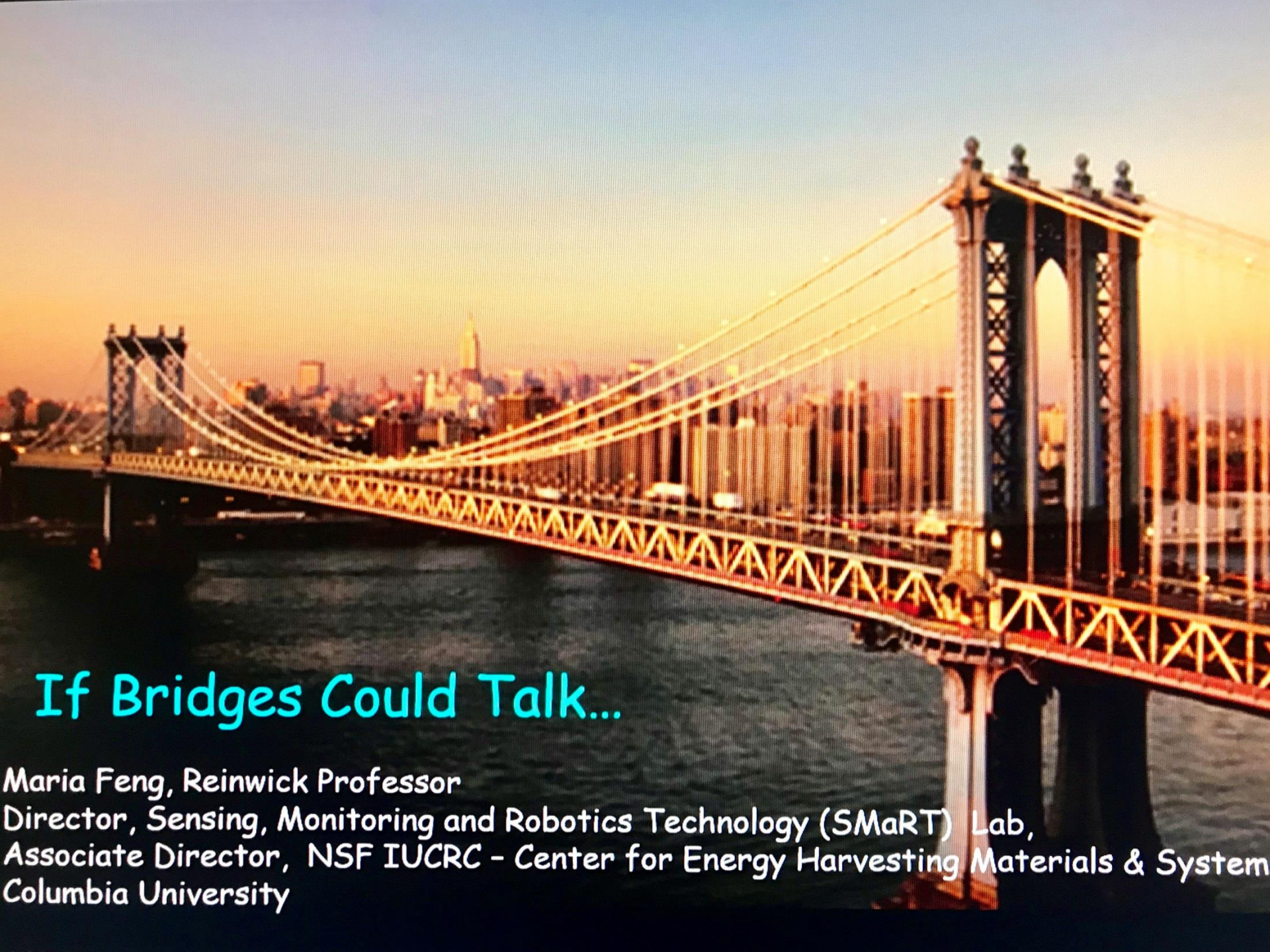
King County Workshops: Strategies for Embracing Non-Stationarity

- Shared values as success criteria
- Briefing book
  - death of stationarity
  - emerging technologies
- Idea generation
- Concept(s)
  - Instrumentation
  - Rapid response
  - Permitting
  - Modular bridges
  - Story and Crowd-sourcing

Which of these is a robot?

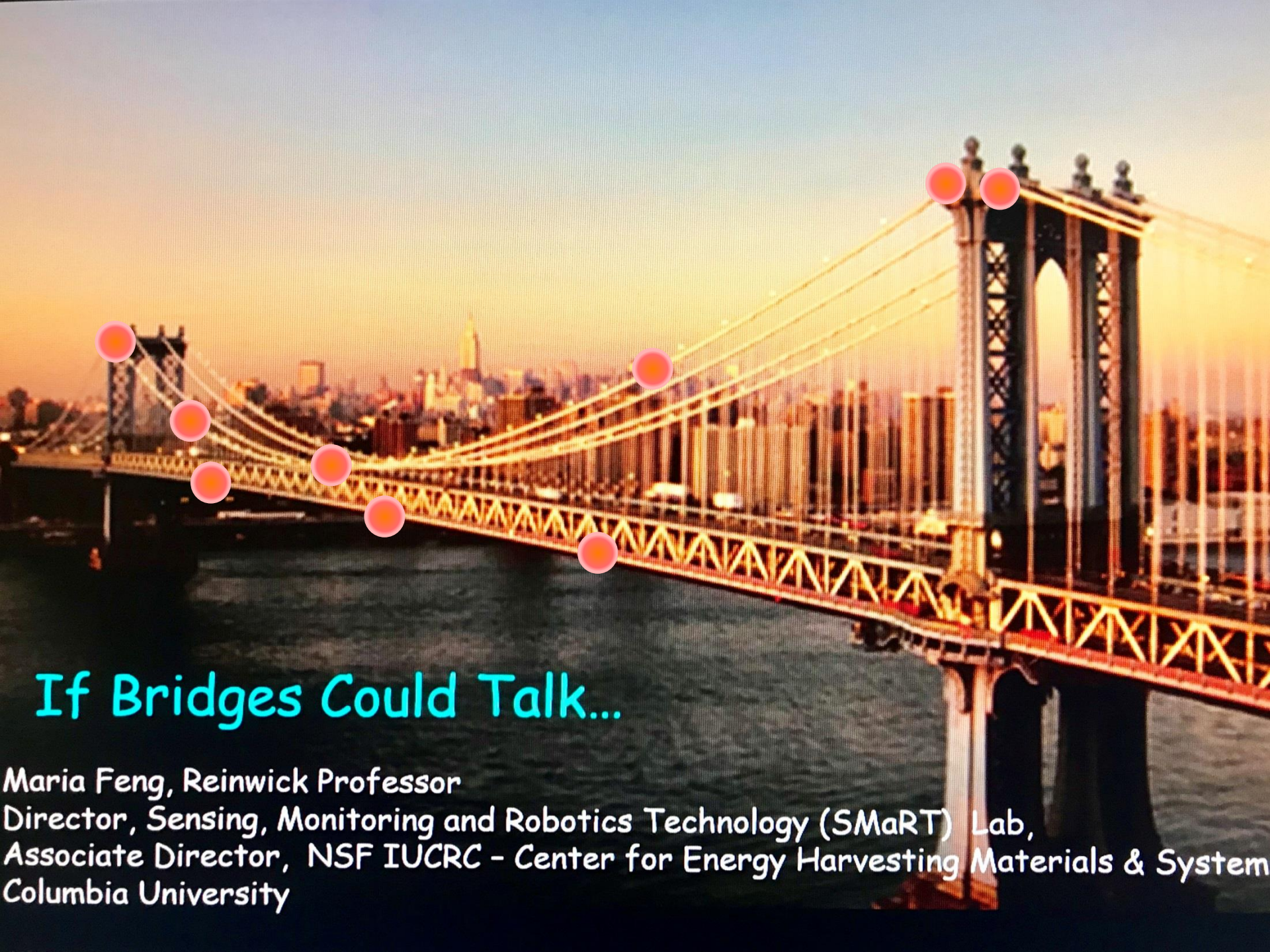
Which of these senses barriers and has a suite of strategies to navigate around them?





If Bridges Could Talk…

Maria Feng, Reinwick Professor
Director, Sensing, Monitoring and Robotics Technology (SMaRT) Lab,
Associate Director, NSF IUCRC – Center for Energy Harvesting Materials & System
Columbia University



If Bridges Could Talk…

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Associate Director, NSF IUCRC – Center for Energy Harvesting Materials & System
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COLUMBIA | ENGINEERING

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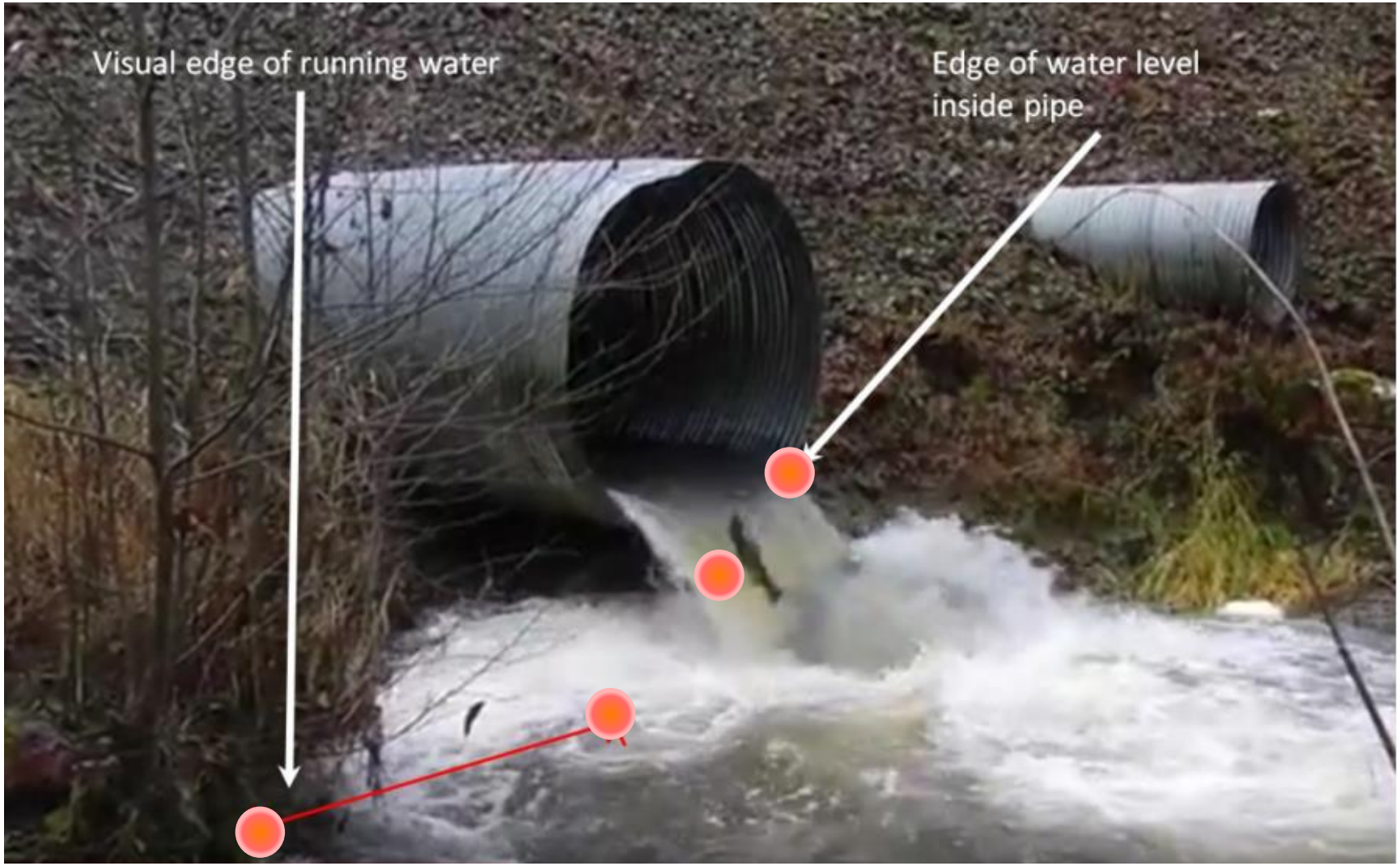
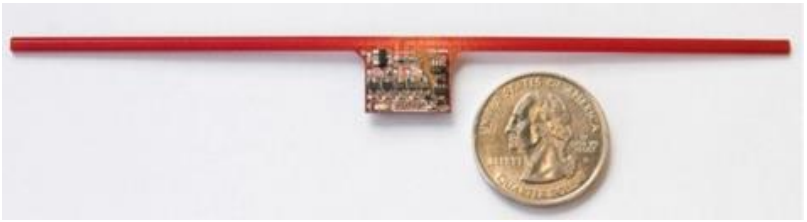
Instrumentation

Instrumentation



Wireless Identification and Sensing Platform (WISP)



Joshua R. Smith, Ph.D.

Sensor Systems Laboratory

Principal Investigator

Milton and Delia Zeutschel Professor

Allen School of Computer Science and Engineering, University of Washington

Department of Electrical Engineering, University of Washington

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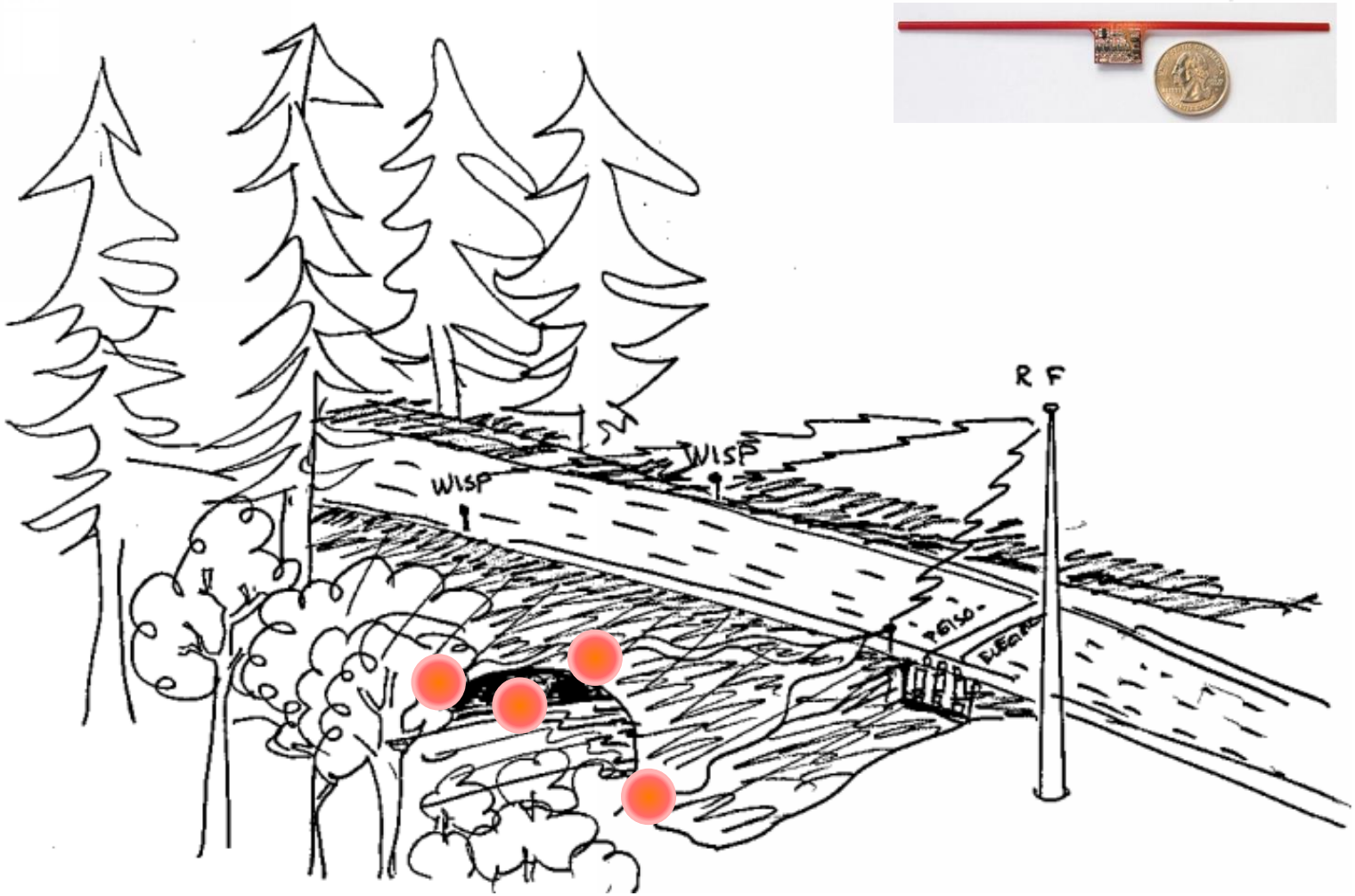
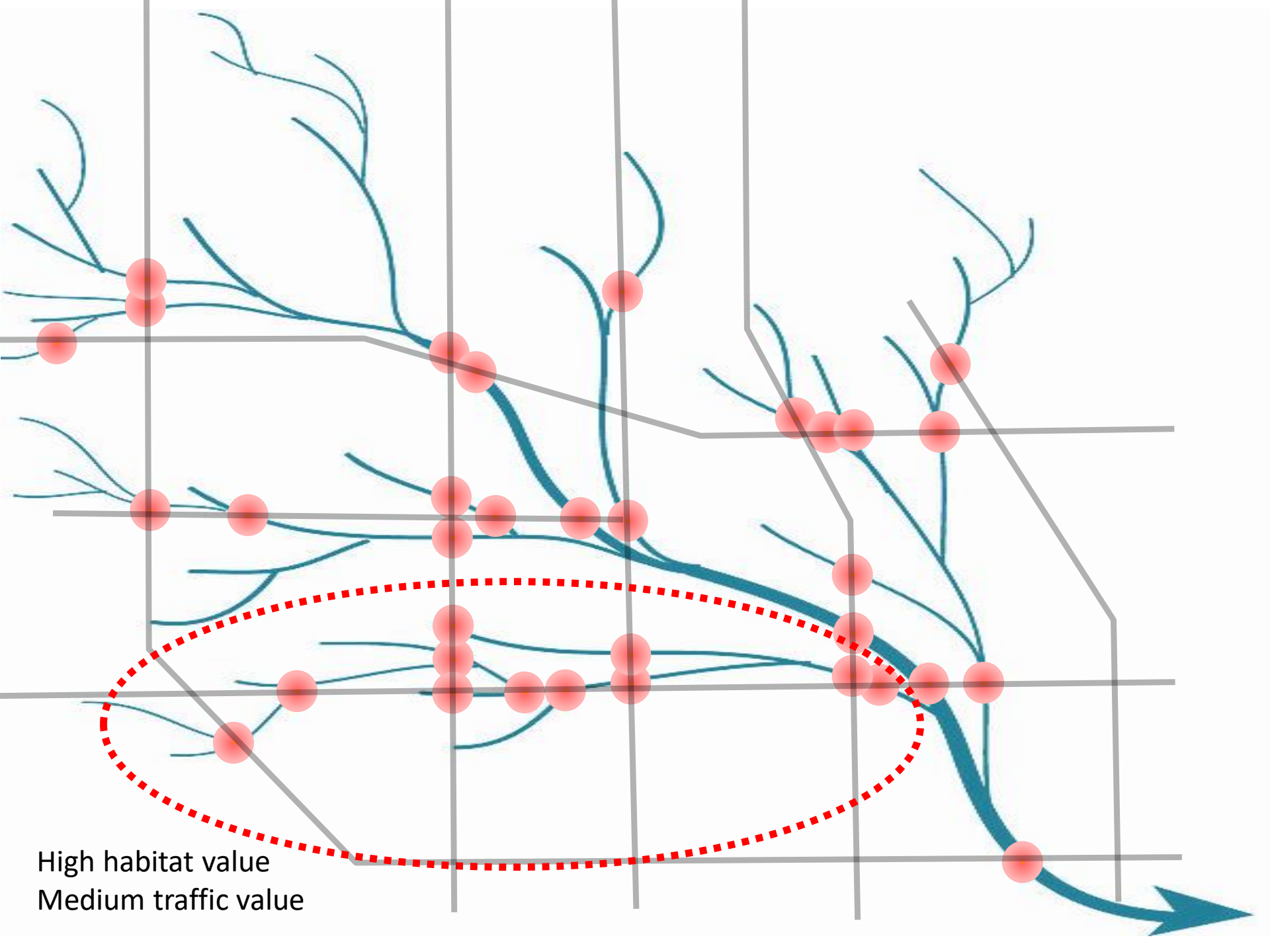
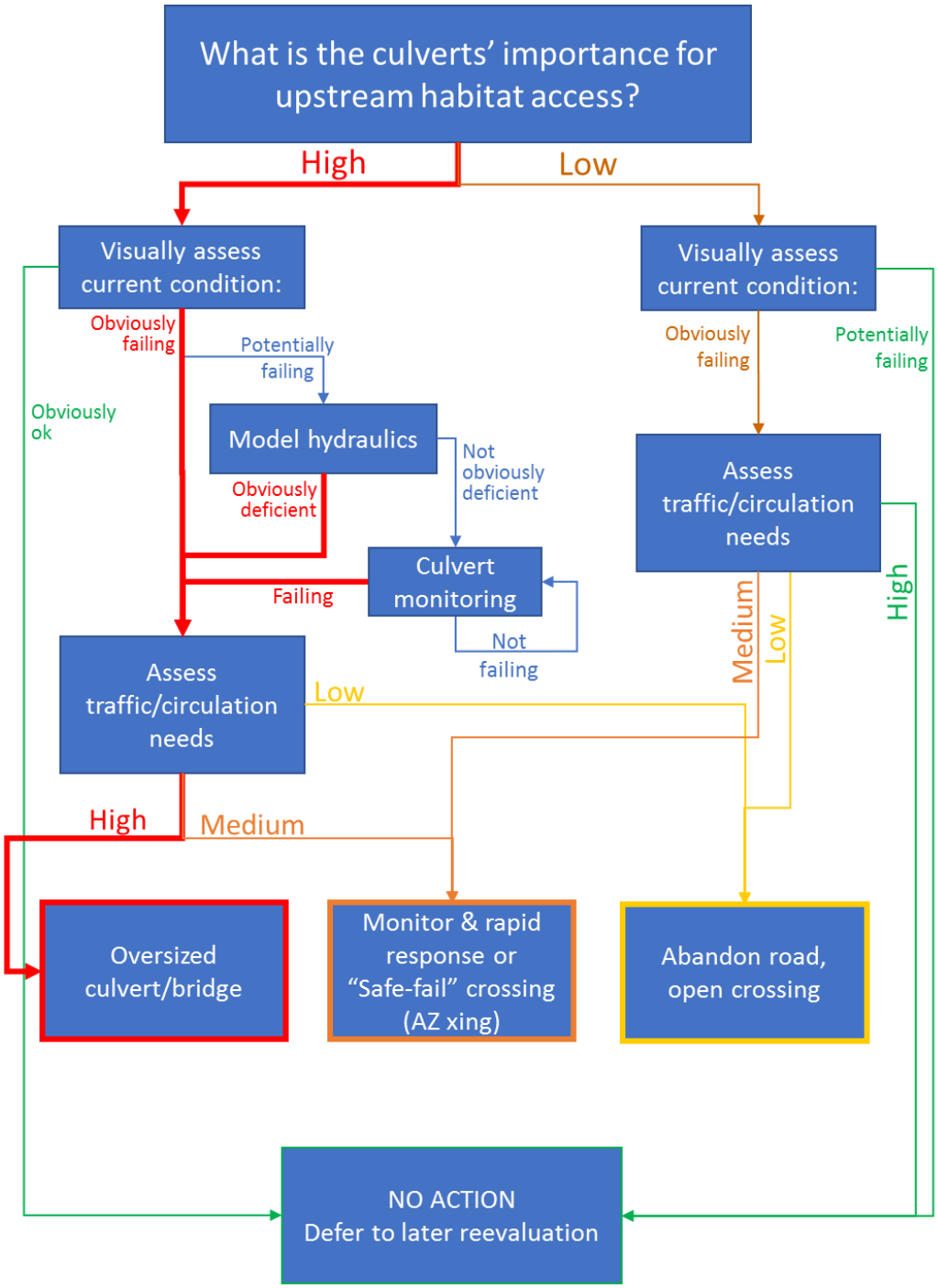


Crowd-source:
“Kids and Culverts?”

“Fish, Flow, Gotta Go”?

“Fish and Flow package?”


High habitat value
Medium traffic value


What is the culverts' importance for upstream habitat access?
High
Low
Visually assess current condition:
Visually assess current condition:
Obviously failing
Potentially failing
Obviously ok
Model hydraulics
Not obviously deficient
Obviously deficient
Culvert monitoring
Failing
Not failing
Assess traffic/circulation needs
Assess traffic/circulation needs
Obviously failing
Potentially failing
High
Medium
Low
Low
High
Medium
Oversized culvert/bridge
Monitor & rapid response or "Safe-fail" crossing (AZ xing)
Abandon road, open crossing
NO ACTION
Defer to later reevaluation

Modular Bridges

Photo provided by Jose Carrasuquero

- Faster permitting
- Faster construction time
- Reduces cost
- 75-year lifespan
- Accounts for increased variability from climate change
- Requires guard rail improvements

CULVERT	VS	MODULAR BRIDGES
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		Modest backfill requirements
		Faster installation
		Faster permitting
		Similar cost at up to spans of to-be-determine threshold

Can we use manufacturing strategies to drive down bridge costs?

Can we make culverts as smart as vacuum cleaners?

Next Steps

If so, then do 1% for research and development

1) Instrumentation for Smart Culverts

- Apply new sensor arrays in demonstration sub-basins
- Calibrate field monitoring with digital results
- Test crowd sourcing strategies
- Develop rapid response capabilities

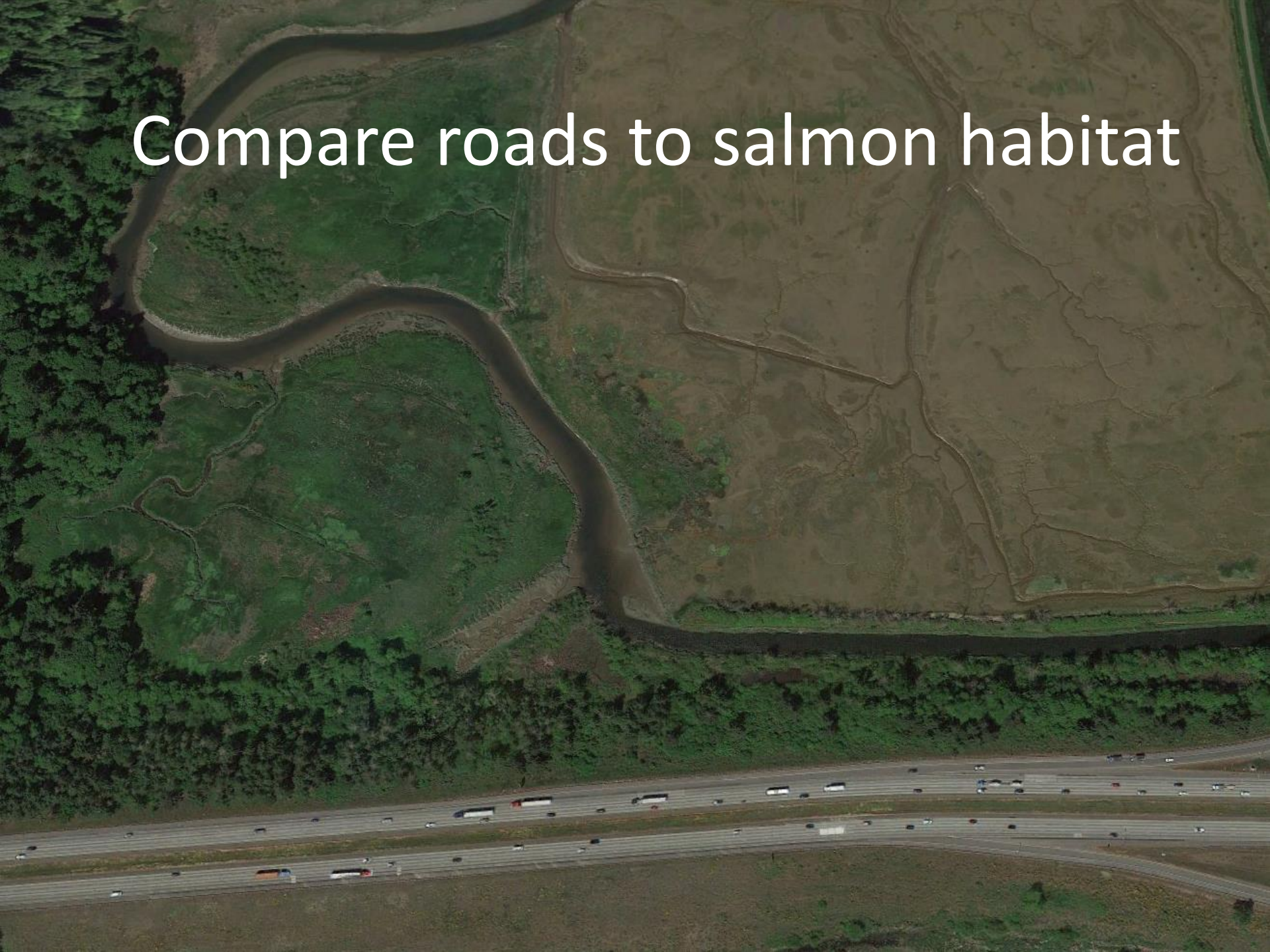
2) Modular Bridges

- Develop standardized mini-bridge packages
- Drive down costs
- Accelerate permitting

3) Tell the resilience story

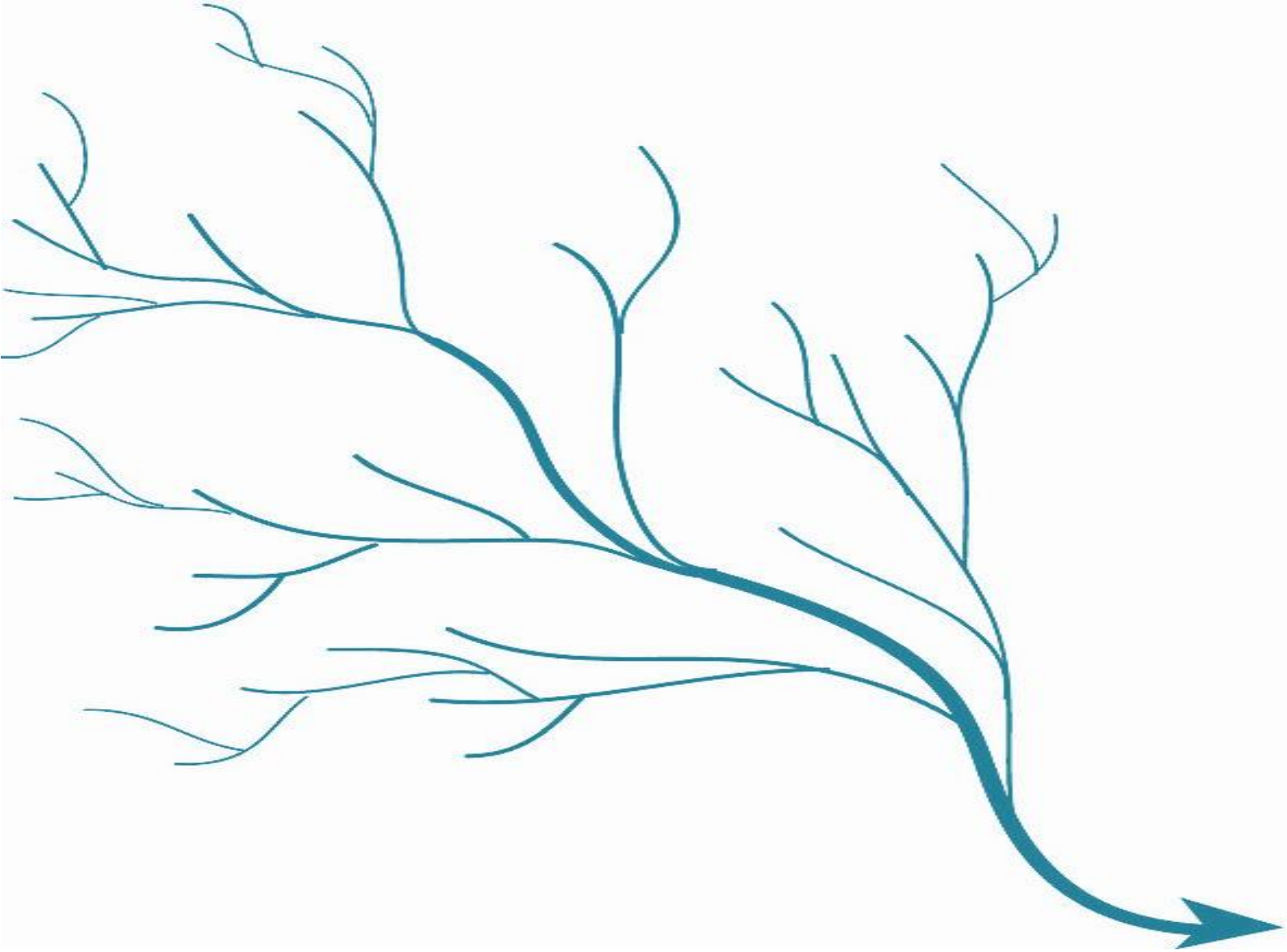
- Fish passage for a changing future

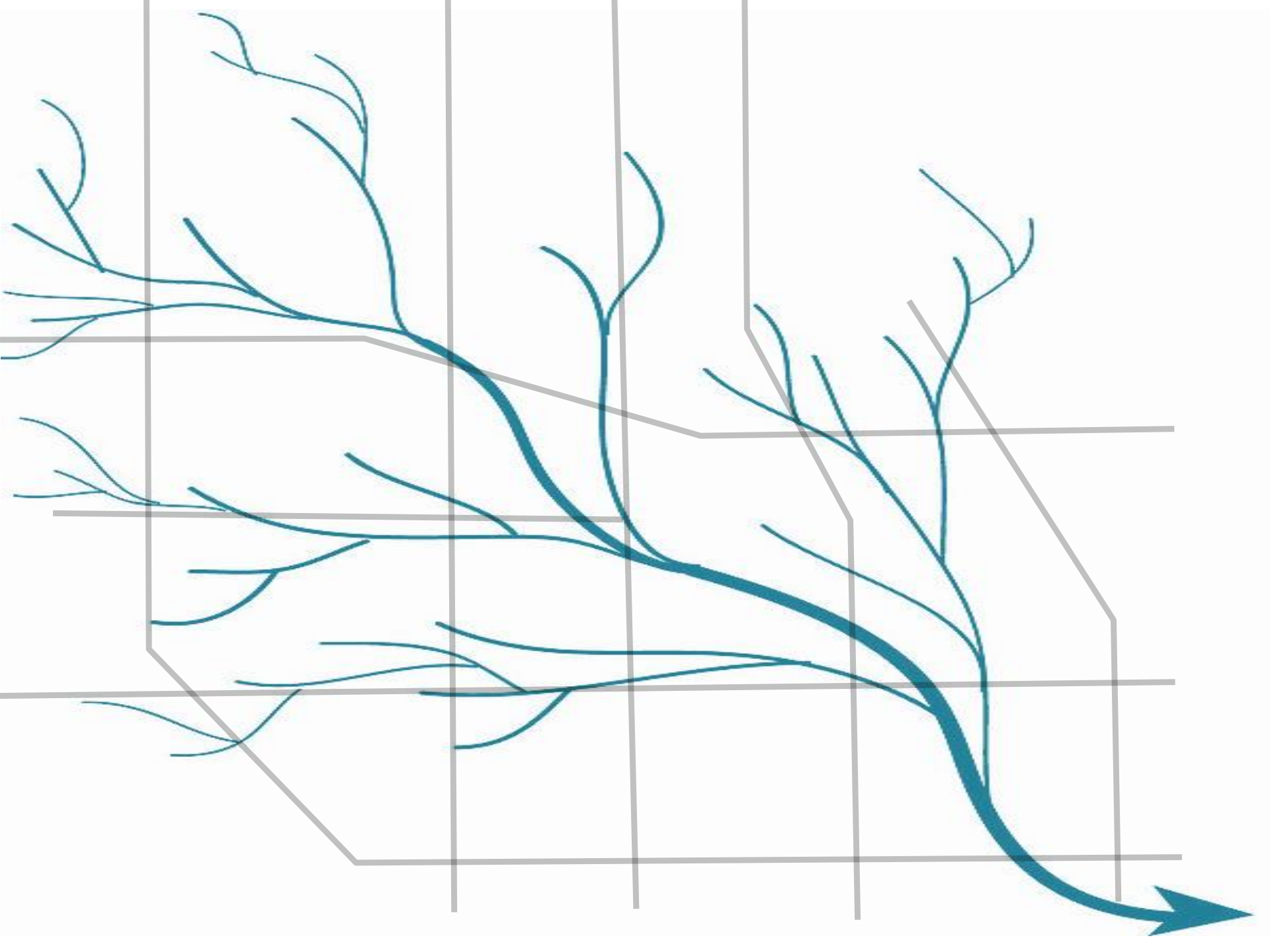
Compare roads to salmon habitat

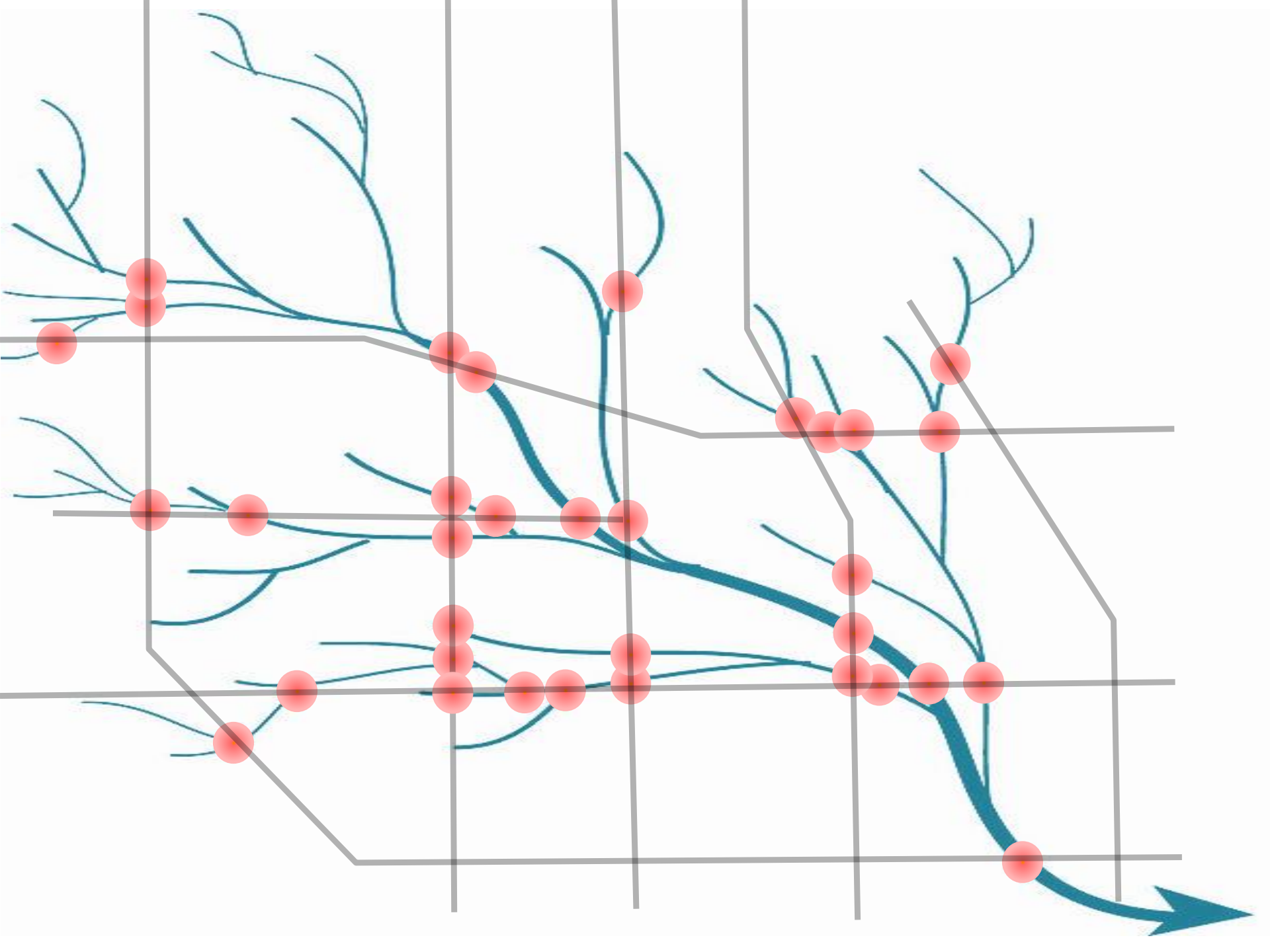


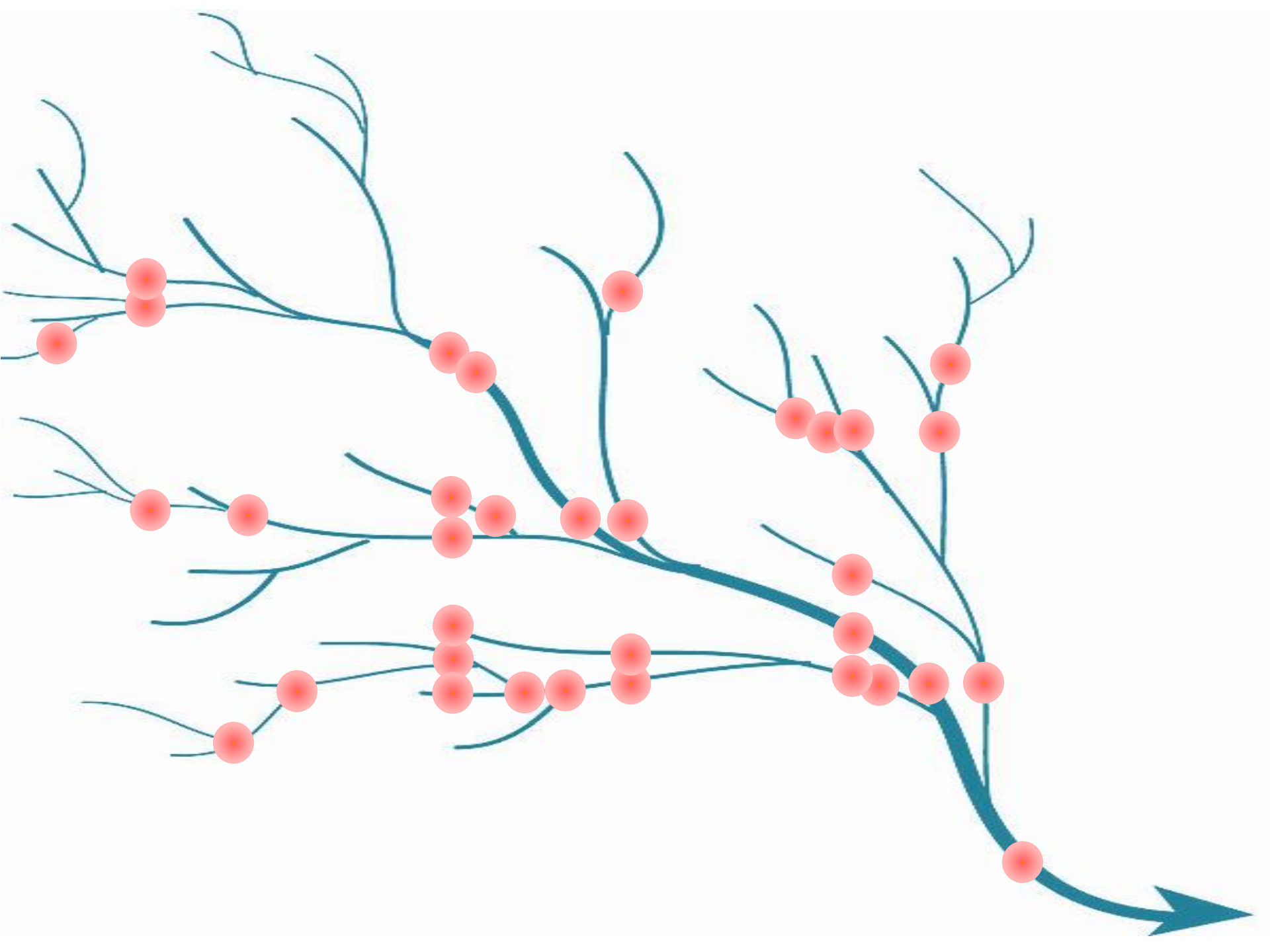

Compare roads to salmon habitat
Hard
Dry
Rigid
Resist
Fixed


Compare roads to salmon habitat
Soft *Wet* *Flexible* *Adapt* *Mobile*
Hard Dry Rigid Resist Fixed









Fish Passage Inventory, Assessment, and Prioritization Manual

WASHINGTON DEPARTMENT OF FISH & WILDLIFE

ACKNOWLEDGEMENTS

This document was produced with the assistance of numerous experts in the fields of fish passage, hydraulics, screening, and habitat assessment. Many thanks to the numerous people who took the time to review this document and to the authors of earlier versions.

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Christy Rains (App. D, Recommended Survey Equipment; App. F, Photo Tips)

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This document was submitted to numerous entities for review, including the tribes (NWIFC), Washington State Department of Transportation (WSDOT), the Aquatic Habitat Guidelines group (AHG) and authors of earlier versions of this manual.

Updates, Feedback, Questions

The *Fish Passage Inventory, Assessment, and Prioritization Manual* is a work in progress. It has been updated three times since first published in 1998. We welcome feedback that would make the content more useful. Questions or comments regarding the manual can be e-mailed to:

FishPassageInventory@dfw.wa.gov

Or mailed to:

Habitat Program - Fish Passage
Washington Department of Fish and Wildlife
PO Box 43200
Olympia, WA 98504-3200

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APPENDIX B

Summary of Major Changes

from the 2009 Fish Passage Barrier and Surface Water
Diversion Screening Assessment and Prioritization Manual

This appendix provides a summary of significant updates to the 2009 version of this manual.

Cover:

- Shortened the manual title.
- Redesigned the cover.

Chapter 1: Introduction/Welcome to Fish Passage

- Provided a series of disclaimers and clarifications about the scope of this, and previous versions, of the fish passage manual.
- Outlined services provided by the WDFW Fish Passage program.
- Defined high and low fish passage flows.
- Abbreviated the section on inventory methods, removing the examples of each inventory type. Removed the attached maps.
- Updated links to current online resources.

Chapter 2: Site Information

- Provided detailed descriptions for each field on the Site field form.
- Clarified that the fish use classification "Biological" applies only to native Pacific trout and salmon.
- Established a hierarchy for entering fish use criteria.
- Provided a definition of Scour Line Width, and a map of the dividing line between Eastern and Western Washington.
- Updated links to current online resources for determining potential species use.
- Provided further guidance on how to inventory features without fish use potential.

Chapter 3: Culverts

- Included a section on tidal influence, and link to an "in development" tidal protocol.
- Removed the section on non-culvert crossings and made it a separate chapter. Provided instruction for differentiating between dams, bridges, and culverts.
- Specified where span and rise should be measured for different culvert conditions, including a definition of "soffit".
- Culverts outside of bankfull width, when there are at multiple culverts at a single crossing, were defined as "overflow" regardless of invert elevations.
- Provided additional instructions for measuring span in unstraightforward circumstances (countersunk squash culverts, skewed, different dimensions at inlet/outlet, etc.).
- Specified where to take water surface drop measurements when the culvert does not outlet directly into a resting/launching pool.
- Provided direction for broken back culverts: measuring slope and elevations for Level B analysis.
- Specified where to measure road fill depth.
- Provided instruction for assessing culverts where embedment depth is too great/headroom is too small to allow fish passage.

- Provided additional instruction for assessing gates. Linked to the in-development tidal protocol when tide gates are present.
- Provided instructions for determining fish passage when racks are present at the inlet or outlet of a culvert.
- Created a decision sequence to determine barrier status on multiple-culvert crossings.
- Removed the 'Reason' determination from the Level A workflow.
- Rewrote the Level B section to better reflect current barrier assessment methods using commercially available software.
- Removed the Level B flow chart.
- Removed references to the Level B analysis spreadsheet, and backwater analysis.
- Provided a link to a new "Hydraulic Analysis Workbook". Workbook includes a Qfp calculator and Level B data entry worksheet that can be submitted to WDFW.
- Corrected and elaborated upon circumstances where a Level B analysis is appropriate.
- Described in greater detail where to measure elevations at the downstream control and how to measure the downstream channel slope.
- Added instructions for measuring channel substrate at the downstream control.
- Removed ordinary high water measurements on the east side of the cascades, and removed the average channel substrate segment.
- Added instructions for measuring instantaneous flow rates when Level A or Level B analysis does not apply.
- Updated the Level A field form with fields for presence of rack and determination of tidal influence.
- Updated the Level B field form with fields for substrate at downstream control and distance between water surface elevations; removed field for substrate downstream of control.

Chapter 4: Non-Culvert Crossings

- Created a separate chapter for non-culvert crossings.
- Provided additional guidance on distinguishing non-culvert crossings from culvert crossings or miscellaneous obstructions, including highlighting the requisite that crossings must be motorized.
- Included a suggestion that the channel bankfull width and bridge span should be collected, when feasible.
- Updated the field form with fields for bankfull width and span.
- Indicated that flow meters may be used, under certain circumstances, to determine whether a non-culvert crossing creates a barrier condition.
- Provided more detailed definitions of fords and puncheon/fill crossings.
- Clarified which non-culvert crossing information is considered relevant, and when it should be collected.

Chapter 5: Dams

- Stated that the definition of dams, as used in this manual, is not a legal definition. It is not intended to supplement or supersede the Washington State Department of Ecology definition.

- Clarified the difference between a vertical standpipe functioning as a dam, and a vertical stormwater input functions as a culvert.
- Provided detailed descriptions for each field on the Dam field form.
- Provided clarification on how to define the “outlet type”.
- Provided instructions on measuring dam length.
- Provided guidance on how to assess dams that do not have an outflow.
- Provided guidance on assessing the barrier status of dams with attached trash racks.
- Adjusted the wording to allow measurements of water surface difference at standpipes.
- Referred to Chapter 3 for assessing gated culverts instead of simply classifying gates as barriers based on whether they are flap or self-regulating.

Chapter 6: Miscellaneous Obstructions

- Removed some Miscellaneous Obstruction types which are no long assessed from the field form.
- Provided written definitions of miscellaneous obstruction types and included pictures for each obstruction classification.
- Provided guidance on assessing the barrier status of obstructions with attached racks.

Chapter 7: Natural Barriers

- Clarified when a natural gradient should be considered a barrier.
- Provided additional guidance for determining the barrier status of waterfalls, incorporating launching and landing conditions, seasonal flow variation, and the potential for fish to circumnavigate the worst barrier conditions using step pools or alternate channels.
- Included directions for assessing chutes and cascades for barrier status, considering leap angle, horizontal and vertical leaping abilities of specific salmonid species, turbulence, and depth.
- Provided instruction for assessing ‘partial’ natural barriers.
- Added ‘cascade’ to the field form as a barrier type, and removed ‘subsurface flow’.

Chapter 8: Fishways

- Redefined fishways to better match the definition in the Washington Administrative Code.
- Clarified the purpose and intent of fishways, and how that influences barrier determinations.
- Clarified how to assess the barrier status of sites with attached fishways.
- Provided instructions on what to do when there are obvious maintenance issues with a fishway, and how to assign a barrier status.
- Included a disclaimer about fishway passability determinations, which continues to be based primarily on hydraulic drops and the leaping ability of a 6” trout during fish passage flows – a 100% passability value should be viewed with uncertainty as it does not necessarily indicate full passage for all species and life stages.

- Provided definitions of each fishway type, described the typical flow regimes, and described how they should be assessed for passability.
- Provided guidance on assessing the barrier status of streambed control fishways, allowing for Level A and Level B barrier determinations when appropriate.
- Removed the Fishway Inspection section from the chapter. Inventory and assessment crews are not expected to perform fishway inspections. A separate fishway inspection protocol is in development.

Chapter 9: Surface Water Diversions

- This chapter was significantly rewritten to better describe the data collection expected of inventory crews.
- Removed the instructions for reading staff gages and calculating diversion flow amounts. Diversion flow amounts require a greater level of analysis than is expected of inventory crews, and crews should not disturb diversion equipment in order to measure flows.
- Because the mesh size measurements require special instruments, and may necessitate moving the diversion equipment, mesh sizes are no longer measured by the inventory crew.
- Re-categorized the screen types and eliminated the need to record the pump screen shape.
- Clarified how to treat informal or home-made screens.
- Removed instructions for determining screen compliance. Determining screen compliance requires far greater analysis than is expected of inventory crews.
- Updated the field form to include determination of presence of active cleaning system.

Chapter 10: Habitat Assessment

- Removed the instructions for how to perform the Full Survey (FS). If Full Survey guidance is needed, refer to the 2009 Fish Passage Barrier and Surface Water Diversion Screening Assessment and Prioritization Manual.
- Updated the instructions for contacting landowners given newer technologies.
- Provided instructions for performing the downstream fish access check, detailing which data should be collected.
- Provided additional instruction on where to break reach, and how to name tributaries and reaches.
- Changed substrate composition “rubble” to “cobble”.
- Changed “canopy cover” to “thermal cover”.
- Provided more quantitative methods for assigning a rearing habitat HQM, as well as representative photographs.
- Provided additional instruction for recording limiting factors.
- Provided more quantitative methods for determining the spring factor, and included representative photographs.
- Updated the section on upstream comments and photographs. Described specific information that is expected in the upstream comments.
- Provided guidance on documenting landowner denials.
- Changed the habitat gain criteria for resident-only fish.

Chapter 11: Habitat Assessment Data Entry

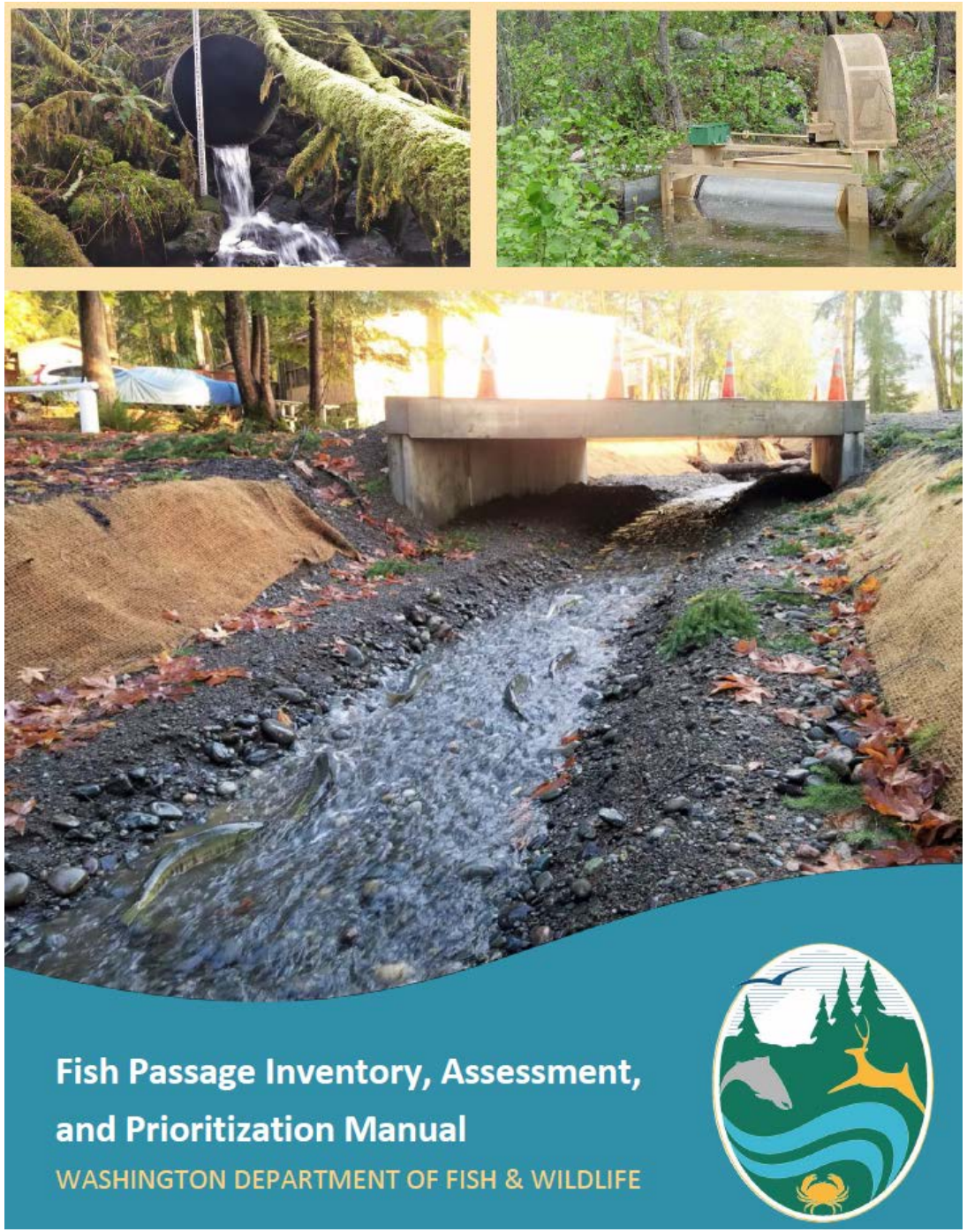
- Created a separate chapter for habitat data entry, and updated the "Physical Habitat Survey" Excel workbook.
- Provided more detailed step-by-step instruction for entering and interpreting habitat data.
- Provided formatting suggestions for the upstream and downstream comments.
- Removed the "Habitat Survey Summary" section, and replaced it with the "Additional Barriers" section, providing guidance on how to fill out the Additional Barriers spreadsheet in order to calculate PI numbers.
- Provided a link to the updated Additional Barriers spreadsheet.

Chapter 12: Prioritization

- Updated the Species Condition Modifier and Cost Modifier instructions for the PI, and the Species Condition Modifier for the SPI.

Appendices

- Moved 'Summary of Significant Updates' to Appendix B; this was provided in Chapter 1 of the 2009 version of this manual.
- Created new guidance for measuring bankfull width (Appendix G). New guidance derived from WDFW bankfull width estimation procedures: Atha and Wilhere (2015) and Barnard et al. (2013).
- Created new guidance for estimating fish passage flows (Appendix C).
- Created new guidance for photographing fish passage features (Appendix F).
- Created new guidance for instantaneous flow rate measurements (Appendix J). For suspected velocity barriers that cannot be assessed using the Level B hydraulic analysis, this appendix describes how to measure cross-sectional mean velocity, the applicability, and how to interpret the results.
- Removed WAC that was provided in appendix of 2009 version.
- Removed Level B spreadsheet instructions and precipitation map that were provided in appendices of 2009 version. These are now provided within the Hydraulic Analysis Workbook, with link in Chapter 3.
- Removed screening requirements that were provided in appendix of 2009 version. These requirements are outside of the scope of this manual.

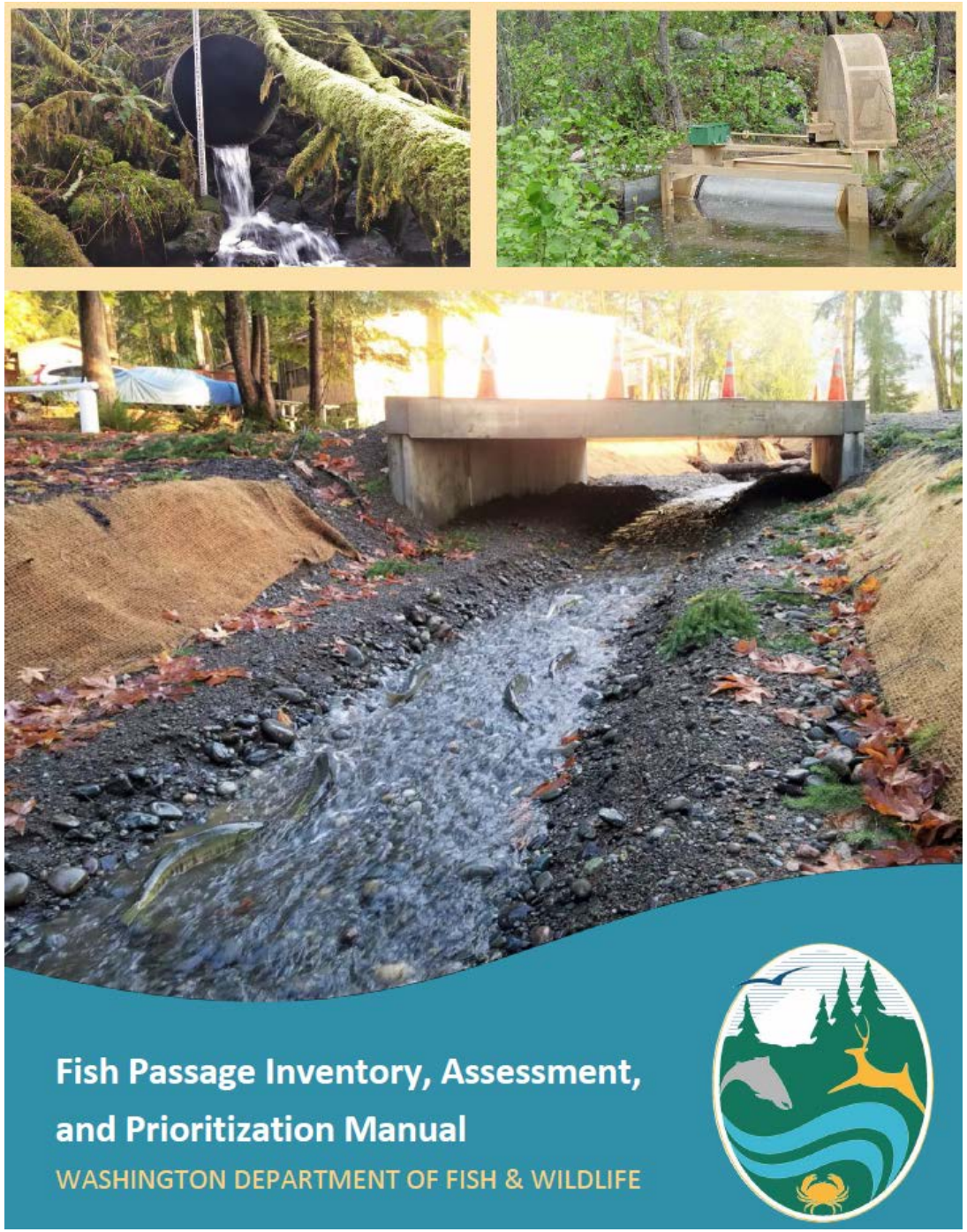


Replaces 2009 Manual (and earlier editions)

Started updating in 2015

Reasons for update:

- 'learnt up'
  - previously unaddressed conditions encountered by WDFW staff
  - insightful questions from training participants
- software improvements
  - hydraulic analysis : FishXing, HY-8

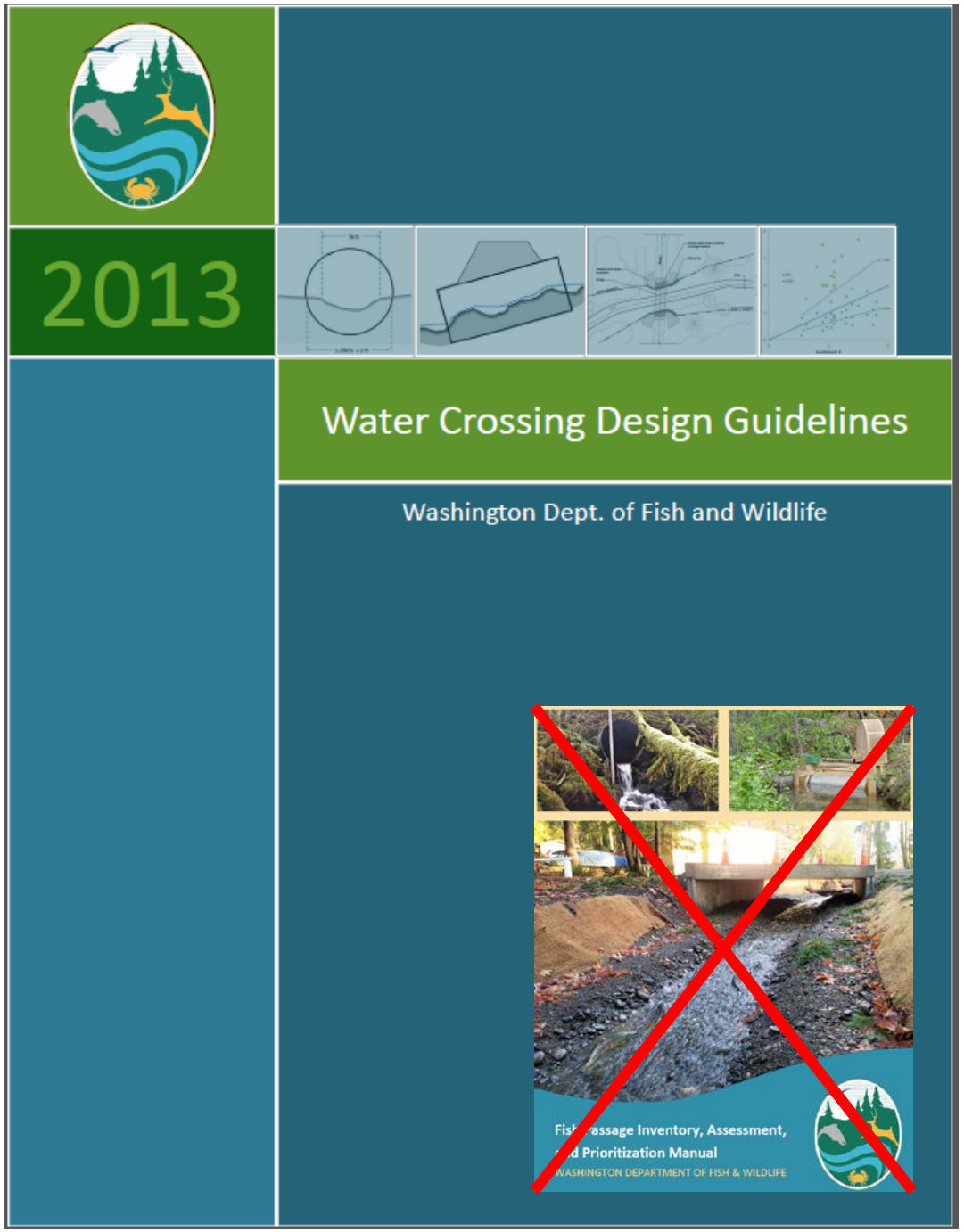


Guidance for:

- determining potential adult salmonid use
- determining if instream feature is impediment to upstream adult salmonid migration

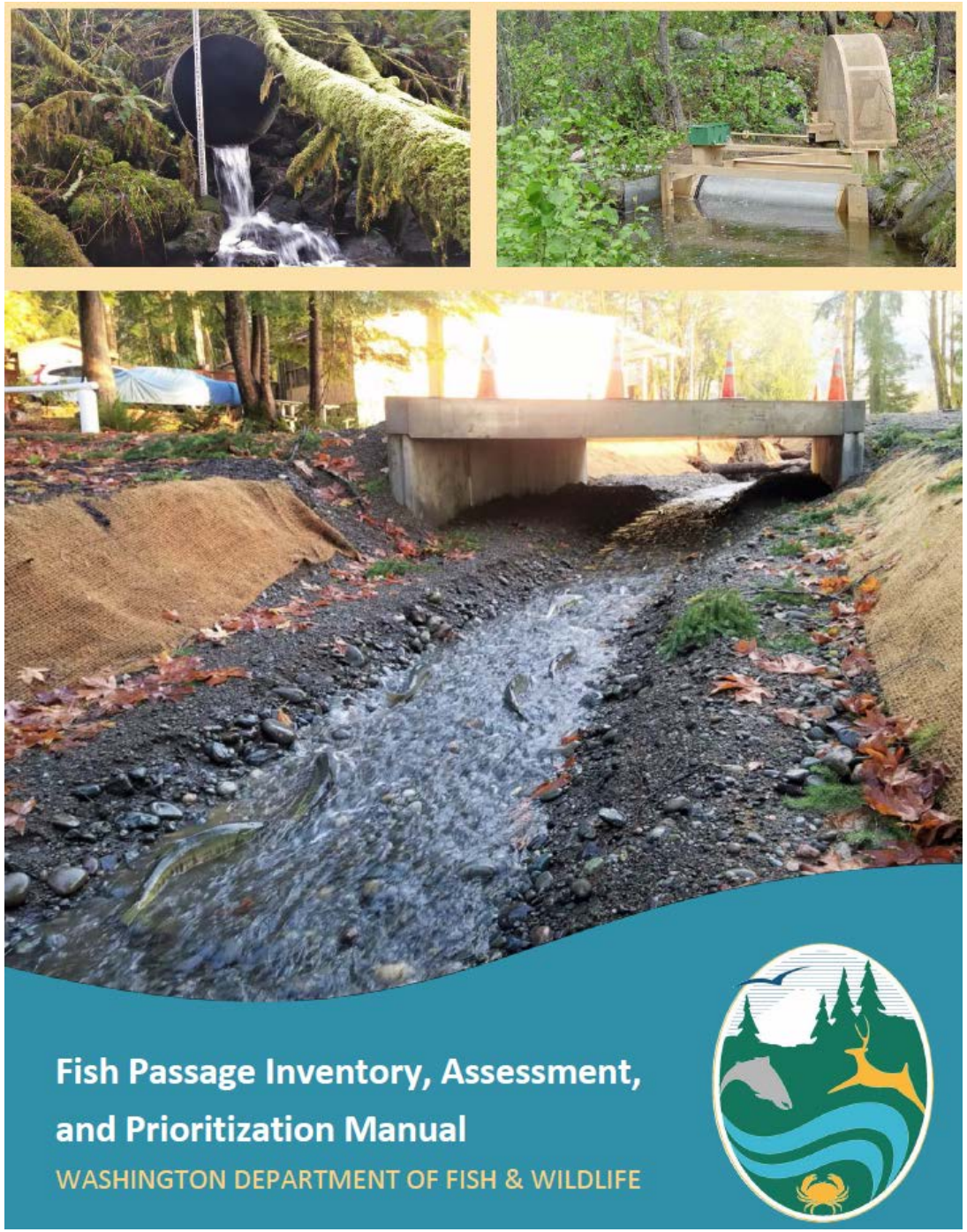
‘adult salmonid’ = following species with a length ≥ 6”: resident trout, searun cutthroat trout, bull trout, steelhead, coho, sockeye, pink, chum, and Chinook

‘potential adult salmonid use’ ≠ habitat for all species, all life stages



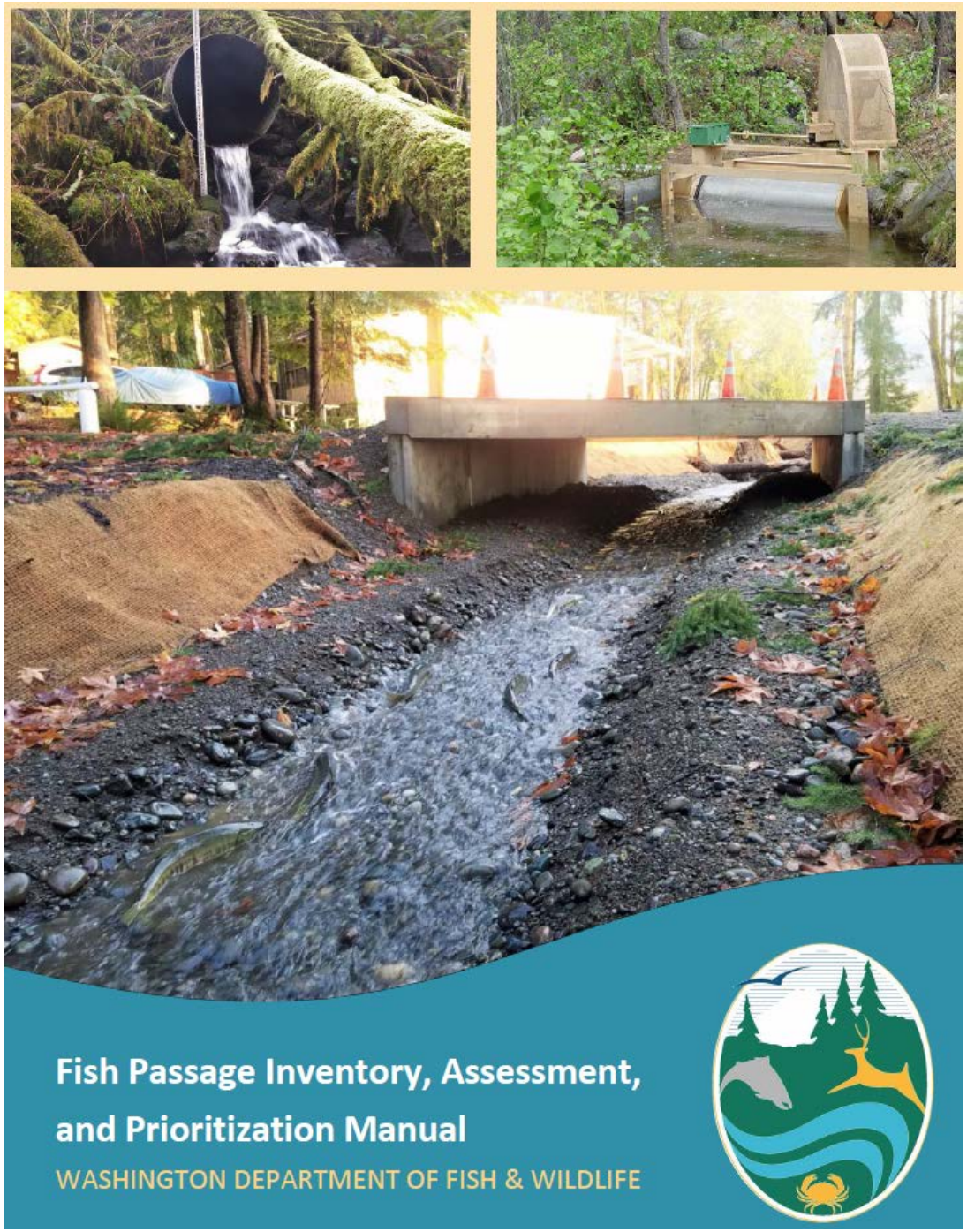
NOT Guidance for:

- design of a new water crossing structure
- determining juvenile fish passage



Barrier criteria remain the same:

- max. allowable water surface drop = 9.4”
- max. allowable velocity = 2-4 ft./sec., depending on length
- min. allowable depth = 1 ft. (if no bed material)

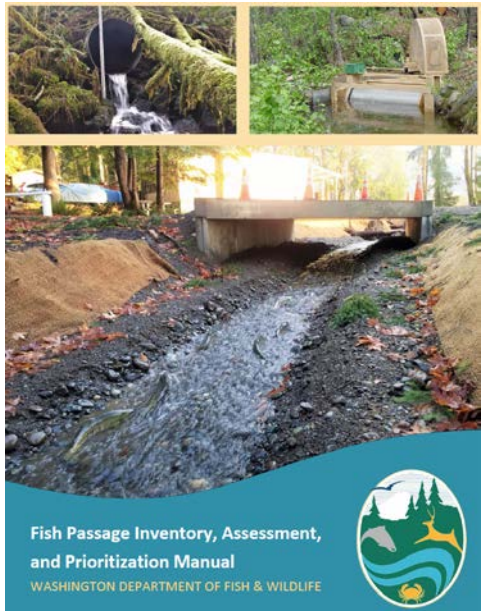


‘Culvert Case’ implications

injunction, ordered 29 MAR 2013, states Defendants shall use the barriers assessment methodologies in 2000 version of Manual, or any later version, provided standards are consistent with terms of injunction

2009 and 2019 editions of Manual are consistent with terms of injunction

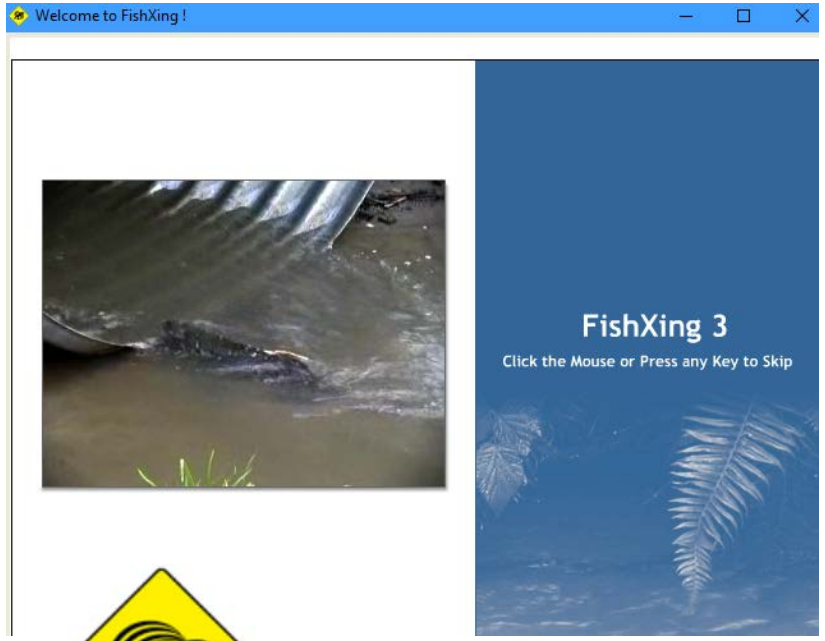
Dam or Culvert?



Gates / Racks

Excess bed material

Hydraulic Analysis Software



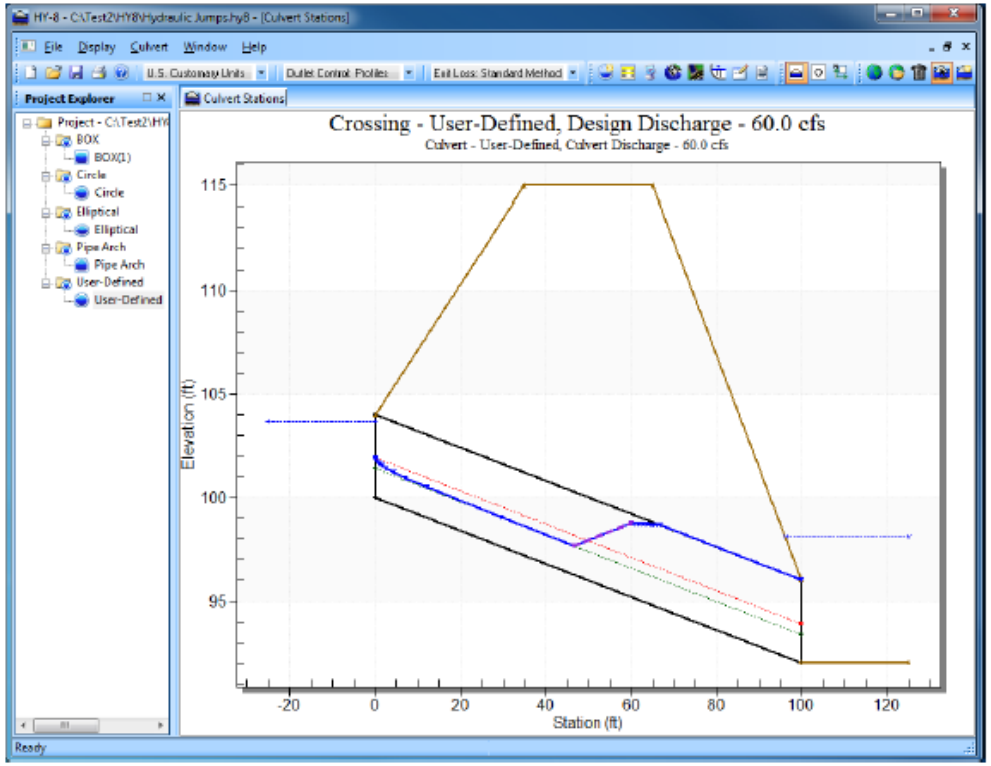
Negative slope

Multiple pipes

Embedment

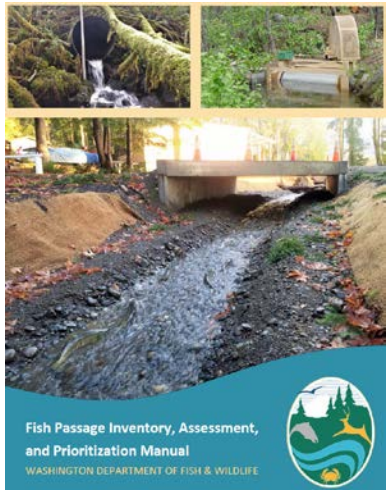
Arch

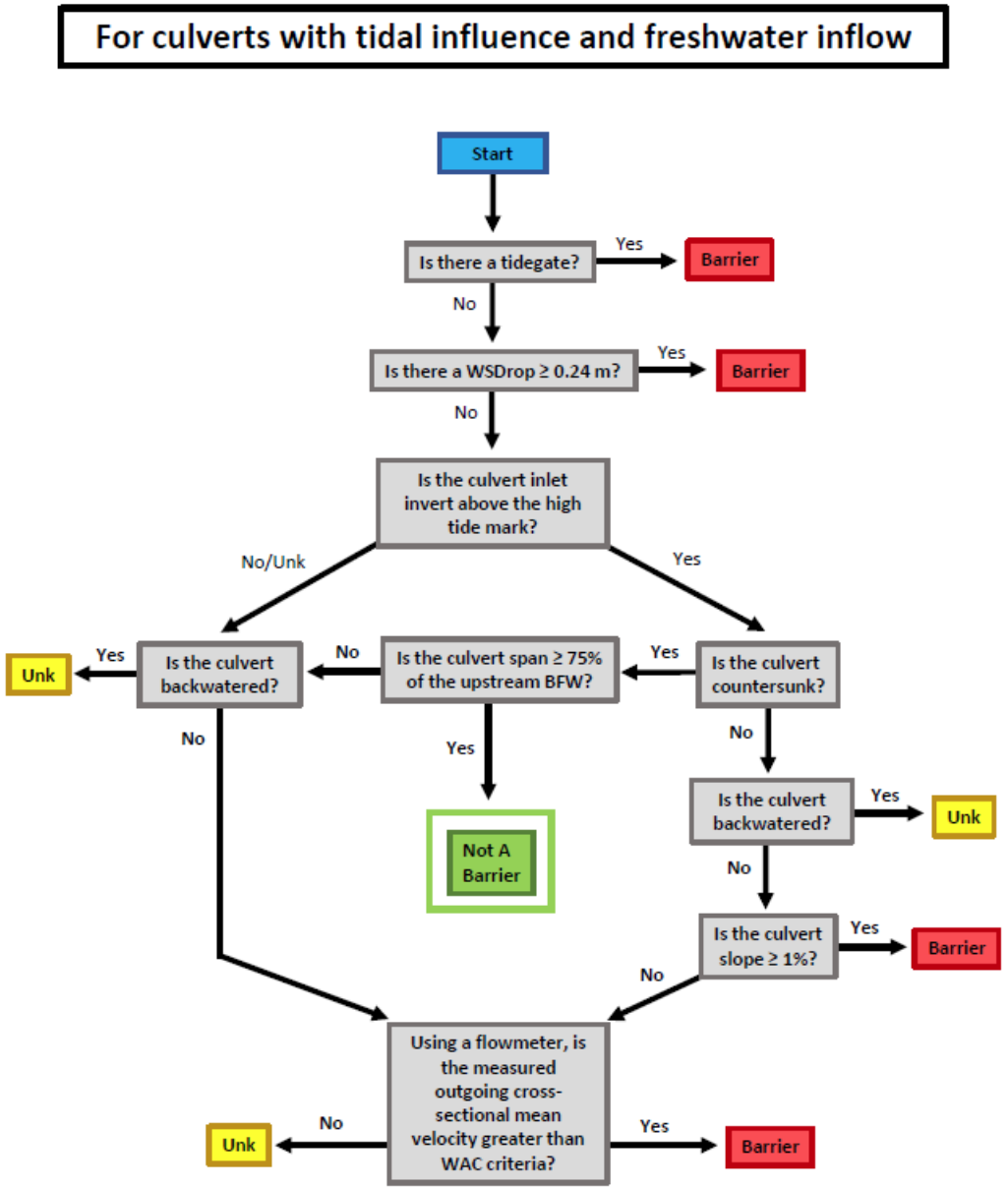
Broken-back



Tidal guidance - in development

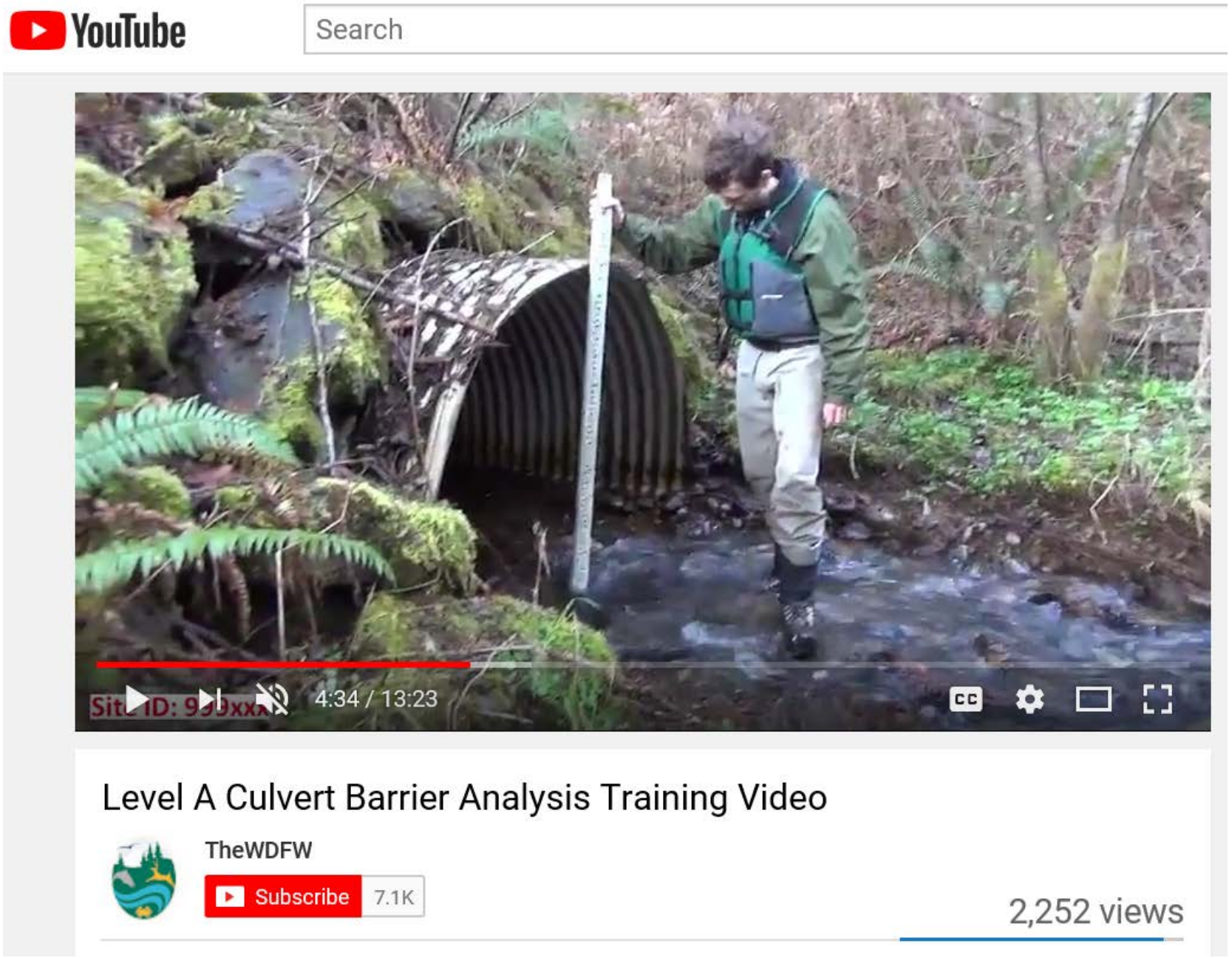
referenced in Manual, but standalone





(version date: 2/19/2019)

Please contact WDFW with any questions:
Dan Barrett, 360-902-2405 / Daniel.Barrett@dfw.wa.gov
or
Justin Zweifel, 360-902-2608 / justin.zweifel@dfw.wa.gov



Training video supplements Chapter 3

Hoko Focus Watershed

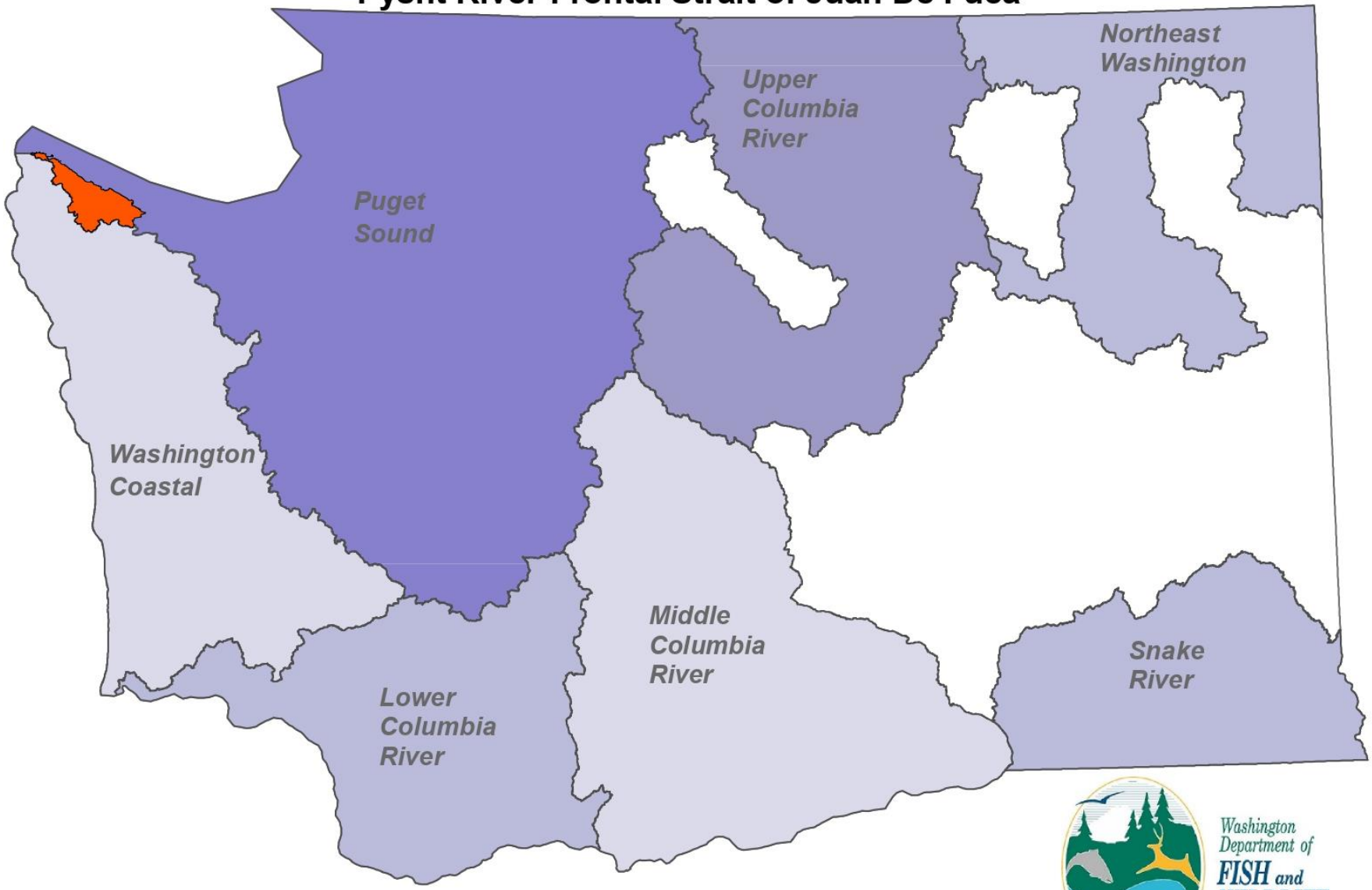
Presented to Washington's Brian Abbott Fish Barrier Removal Board

April 16, 2019, Olympia WA

Cheryl Baumann with Assists by

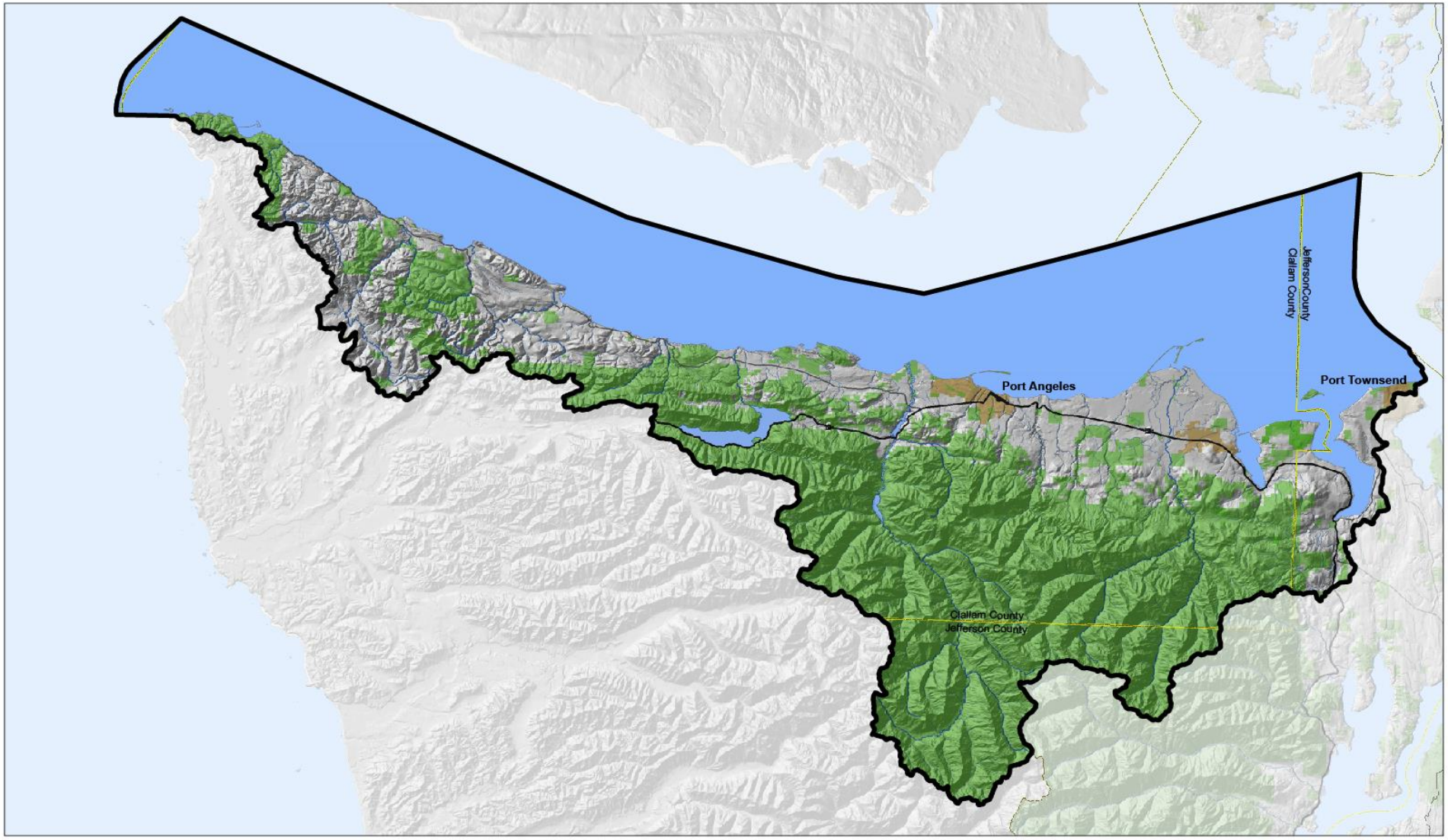
Lara Lampert, Eric Carlsen, Jen Chenoweth & Kevin Long

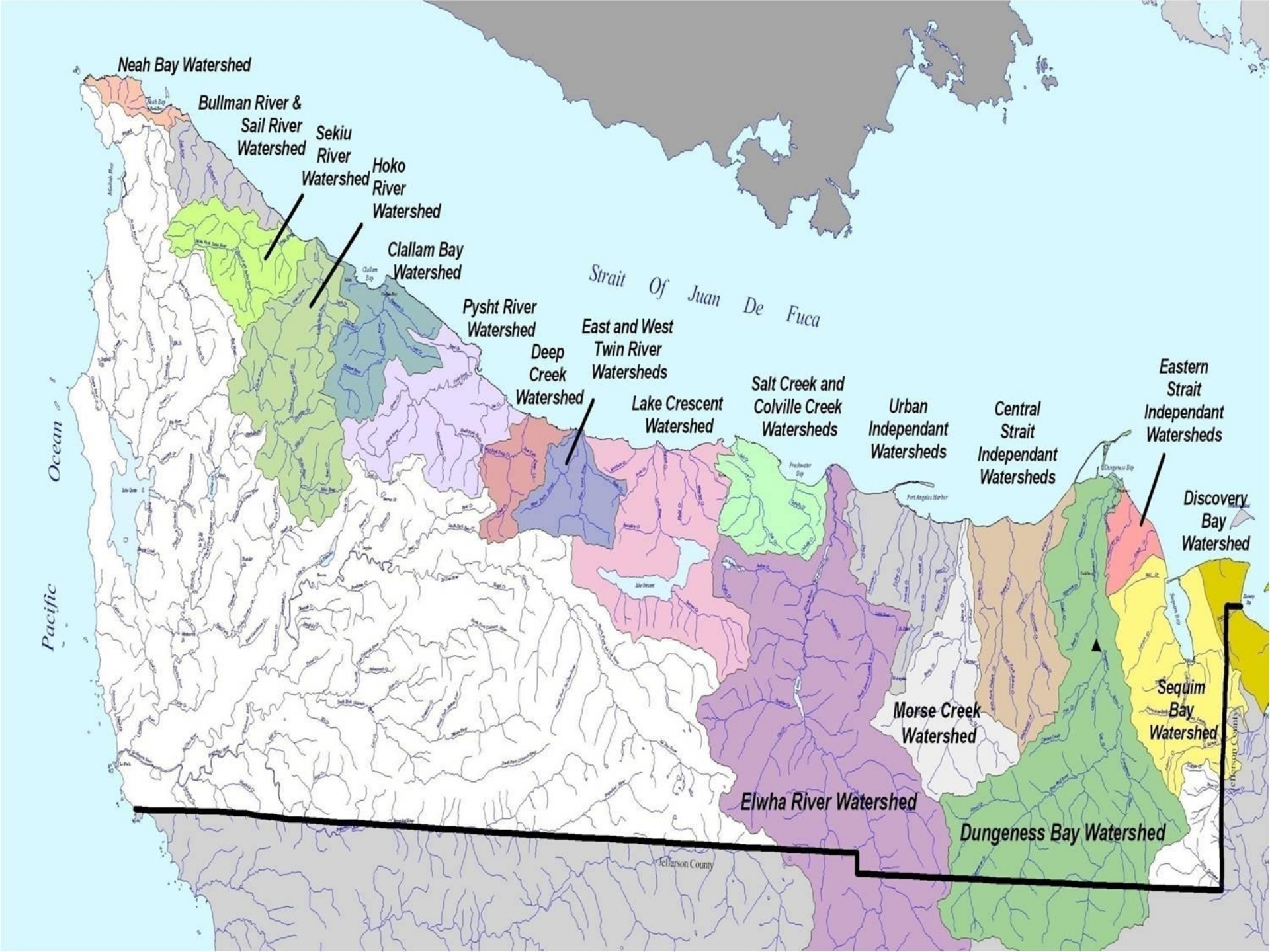
North Olympic Peninsula Lead Entity for Salmon
Pysht River-Frontal Strait of Juan De Fuca



Washington Department of FISH and WILDLIFE

Date: June 8, 2016


Port Angeles
Port Townsend
Jefferson County
Clallam County
Clallam County
Jefferson County
0
2.5
5
10
15
20
25
Miles


Neah Bay Watershed
Bullman River & Sail River Watershed
Sekiu River Watershed
Hoko River Watershed
Clallam Bay Watershed
Pysht River Watershed
Deep Creek Watershed
East and West Twin River Watersheds
Lake Crescent Watershed
Salt Creek and Colville Creek Watersheds
Urban Independant Watersheds
Central Strait Independant Watersheds
Eastern Strait Independant Watersheds
Discovery Bay Watershed
Sequim Bay Watershed
Morse Creek Watershed
Elwha River Watershed
Dungeness Bay Watershed
Strait Of Juan De Fuca
Pacific Ocean
Jefferson County
Clallam Bay
Port Angeles Harbor
Dungeness Bay

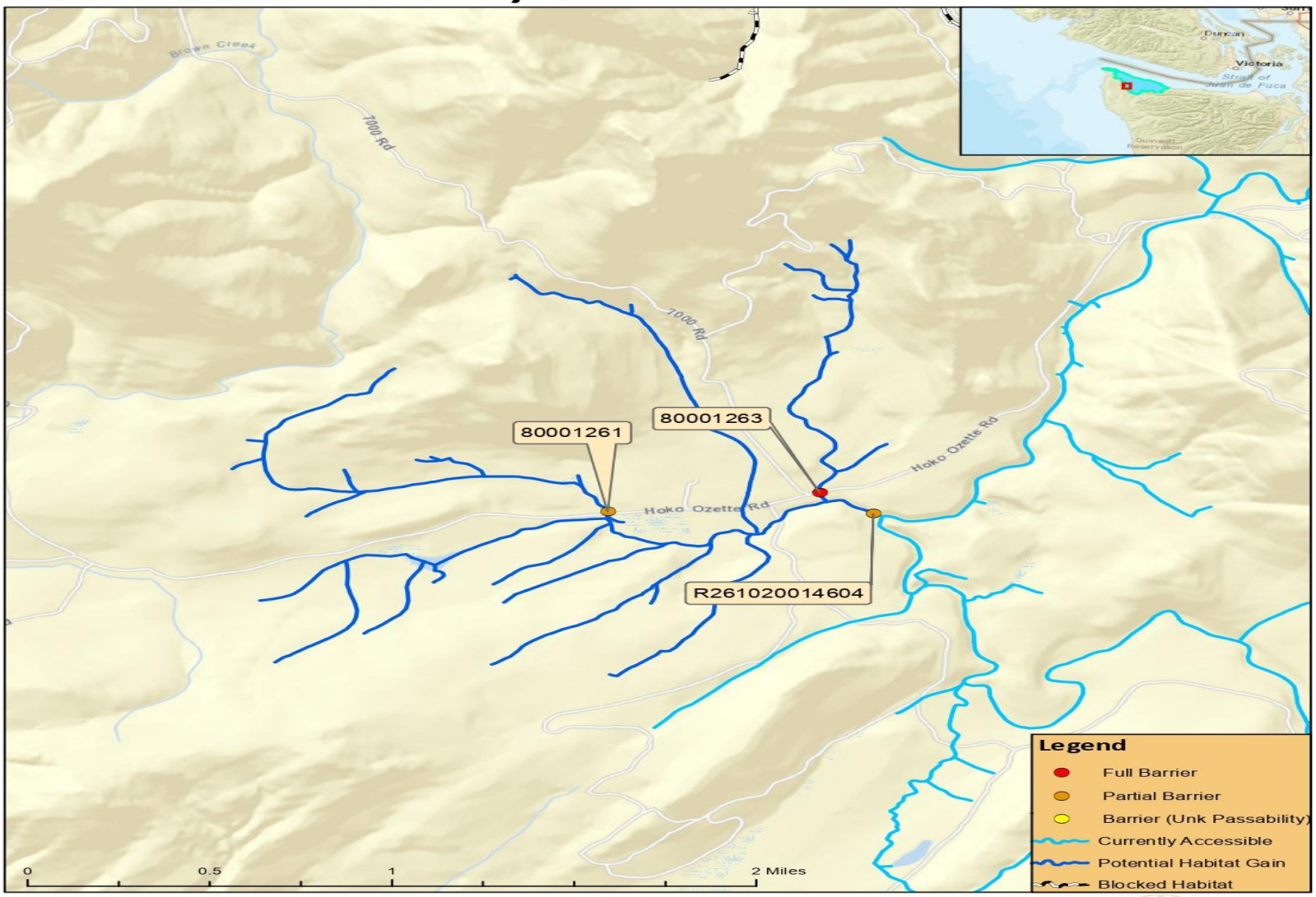
The Local Hoko Partners

- The Makah Tribe
- The North Olympic Salmon Coalition
- The Elwha Klallam Tribe

- Clallam County – Roads & Community Development & Board of Commissioners

- The North Olympic Lead Entity for Salmon

Hoko Watershed Priority 1



North Olympic Peninsula Lead Entity for Salmon

Fish Barrier Removal Board
11/8/2016

Washington Department of FISH and WILDLIFE

1.	SITE ID / STREAM	R261020014604 / Johnson Creek
	Project Sponsor	NOSC
	OWNERSHIP-PRIVATE	Private (Hawthorn Timberlands LLC)
	PASSABILITY/REASON	33% / Drop
	POTENTIAL SPECIES	Coho, Steelhead, SR Cutthroat
	BANK FULL WIDTH	32 ft
	CHANNEL GRADIENT	0.7%
	EXISTING STRUCTURE	12 ft x 12 ft x 200 ft Round Culvert
	PROPOSED STRUCTURE	Full Removal with 52 ft toe width
	COST ESTIMATE	$2,759,000
	GAIN TO NEXT BARRIER	6.2 miles
	HABITAT	Forested with fish bearing wetland habitat upstream. Coho, steelhead, fall Chinook, and chum salmon potentially use lower Johnson Creek.

From the FBRB 2017 write up:

"If this culvert fails, it could release fill that is approximately 60 feet in height. The potential failure threatens salmon productivity in all 12 miles of downstream mainstem habitat, and during a major flood or other high flow could threaten the lives of downstream homeowners."

North Olympic Salmon Coalition

The Latest on 4601 Johnson Creek

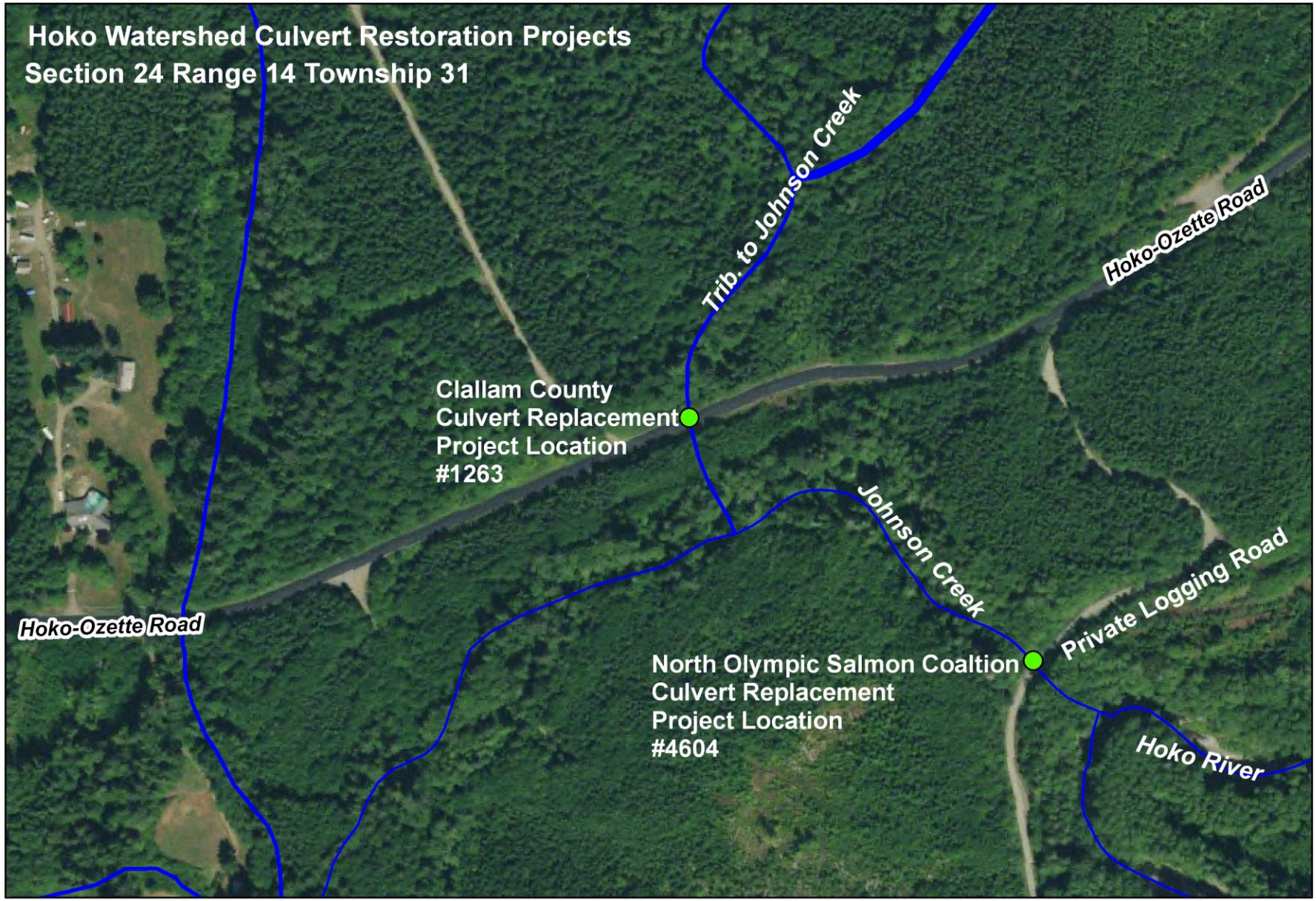
- The new bridge is going in upstream this month!
- The failing culvert will be removed this summer.
- I am “excited to get a culvert taken out I’ve been hearing about in my 15 years doing this work.”

-Kevin Long, Project Manager for the North Olympic Salmon Coalition.

2nd Project “Unnamed Trib” 1263

The Latest on the Tributary to Johnson Creek

- 2 culverts & 2 bridge alternatives being reviewed
- Leaning towards culvert
- Design & Construction Grant with 2017 Fish Barrier Removal Board Funding
- Clallam County Roads Providing Cash & In-Kind Match
- Looking at Construction in 2020



Project Location:
Hoko-Ozette Road, Milepost 8.8
lat.48.180543 / long. -124.450515

Thank You!

BRIAN ABBOTT
FISH BARRIER
REMOVAL BOARD

What Lead Entities Can Do for You…

- Integration
- Collaboration
- Fish Knowledge
- Vetting & Prioritization
- Making sure New Projects are Submitted!!

Questions?

Not a Pipe Dream…

North Olympic Lead Entity for
Salmon's Epic Culvert Inventory

The Mission

Since August of 2012, the North Olympic Lead Entity for Salmon has been conducting an inventory of all county road culverts in Watershed Resource Inventory Areas (WRIA) 17 West (Blyn area), WRIA 18 East (Dungeness),WRIA 18 West (Elwha) & WRIA 19 (Lyre-Hoko)

Our Funding & Project Partners

- ***Strait Ecosystem Recovery Network***
- Clallam County Road Department
- Streamkeepers of Clallam County
- Puget Sound Partnership
- Puget Sound Acquisition & Restoration (PSAR)
- National Estuary Program, EPA, WDFW,
- Lower Elwha Tribe
- Makah Tribe
- North Olympic Salmon Coalition

It takes a Village…

- Elwha Klallam Tribe
- The North Olympic Lead Entity for Salmon
- Makah Tribe
- North Olympic Salmon Coaltion
- Clallam County Road Department
- Streamkeepers of Clallam County
- Clallam County Department of Community
  –Development

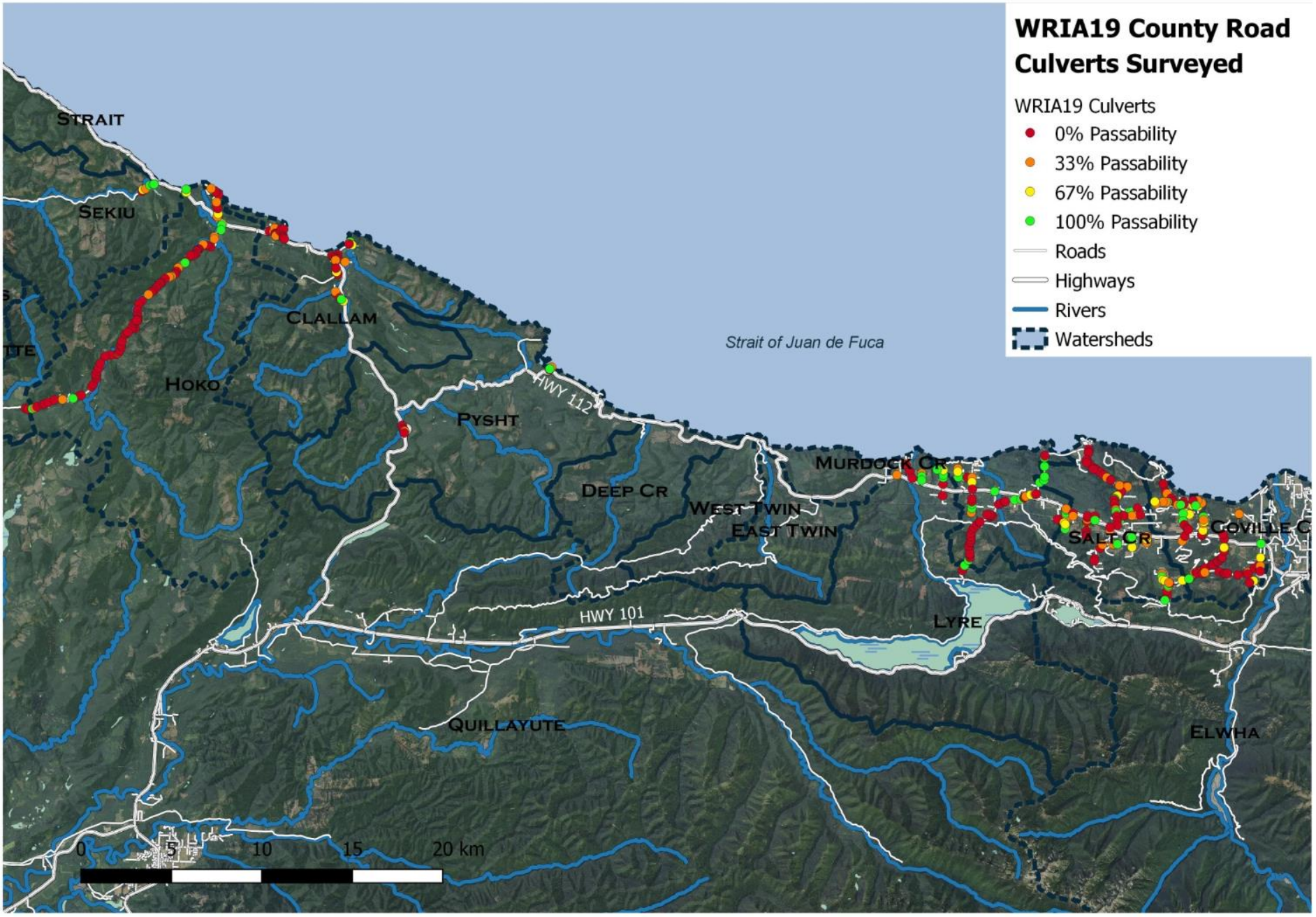
Eric Carlsen & Lara Lampert making it happen!

Why Now?

- Forward thinking in response to culvert court decisions
- Just fixing state barriers does not solve the problem
- US Supreme Court in 2018 upheld lower court ruling WA state obligated to fix barriers
- Puget Sound Acquisition & Restoration (PSAR) & NEP/EPA funds include funding to advance project development
- Timely given the creation of the state's Fish Passage Removal Board
- Evolve organizationally

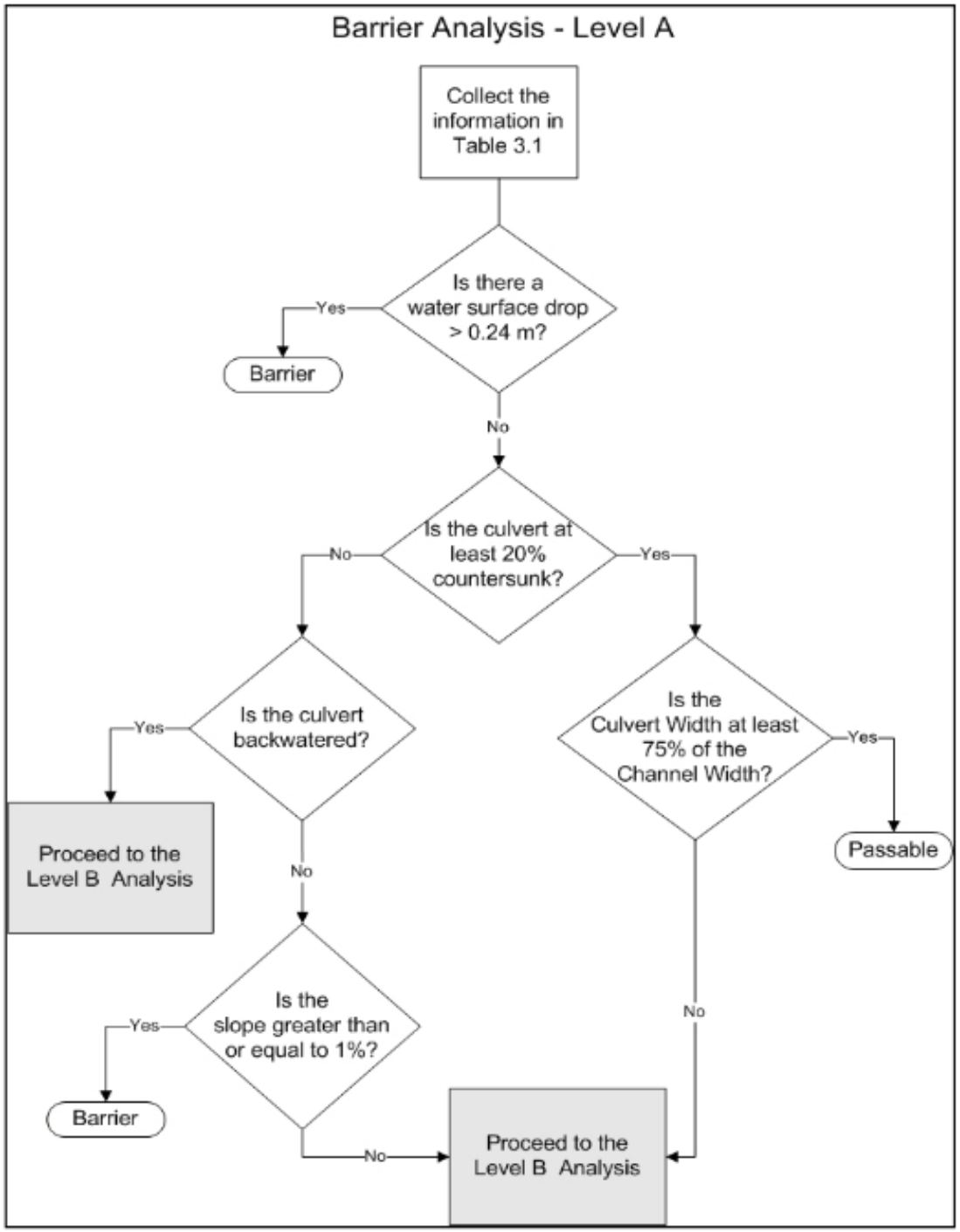
How it Helps Advance Salmon Recovery

- By identifying & prioritizing total fish-blocking culverts, failing & undersized or inappropriately-sited culverts along county roads.
- This inventory will be used to help gain funding to fix barriers negatively impacting area salmon runs.
- Improving Fish Passage is Exhibit A for Salmon Recovery


WRIA19 County Road Culverts Surveyed
WRIA19 Culverts
0% Passability
33% Passability
67% Passability
100% Passability
Roads
Highways
Rivers
Watersheds
Strait of Juan de Fuca
Strait
Sekiu
Clallam
Hoko
Pysht
Hwy 112
Deep Cr
West Twin
East Twin
Murdock Cr
Salt Cr
Coville C
Hwy 101
Lyre
Quillayute
Elwha
0
5
10
15
20 km

Protocols

- We are following WDFW Fish Passage Barrier & Surface Water Diversion Screening Assessment & Prioritization Manual
- Over 400 Level A Barrier Assessments completed in WRIA19 (~3000 county-wide)
- When barrier status cannot be determined using the Level A method, then the Level B method will be used.
- Level B Assessment evaluates flow & water depth



Flow Chart of the Level A culvert analysis

Crew Measuring Scour Line Width

Measuring Channel Width

Culverts with Hydraulic Drop at Outlet

Completed Level A Barrier Assessment Form

chicken Coop Rd.

CULVERT EVALUATION FIELD FORM (Level A) (1/15/09)

R10112OA

1 Site ID: 800005 18.5K

2 Culvert Number: 1.1

3 Field Review Crew
Crew: Carlsen/Patzman/Kawal
Date: 10-11-2012

CULVERT DESCRIPTION

4 Shape: (RND) BOX ARCH SQSH ELL OTH

5 Material: (PCC) CPC CST SST CAL SPS SPA PVC TMB MRY OTH

6 Span/Dia: .46 7 Rise: .46 8 Water Depth in Culvert: —

9 Hydraulic Drop: 2.655 10 Drop Location: Outlet

11 Length: 21.95 12 Culvert Slope: 3.4% 13 Road Fill Depth: 2.69

14 Countersunk: Yes (No)

15 Apron: (None) US DS Both 16 Tidegate: Yes (No)

17 Number of Baffles: — 18 Baffle Type: Concrete Metal Wood Rock Plastic Other

PLUNGE POOL DESCRIPTION

19 Length: 3.6 3.78 20 Maximum Depth: 1.15

21 Scour Line Width (SLW): 1.4

CHANNEL DESCRIPTION

22 Average Channel Width: 3.6

23 Culvert Span / Channel Width Ratio: 0.13

SUMMARY INFORMATION

24 Barrier: (Yes) No Unk 25 %Passability: (0) 33 67 100

26 Method: (Level A) Level B Oth FW Professional Judgment

27 Reason: (WS Drop) (Slope) Velocity Depth Tidegate Obstruction Other

28 Significant Reach: Yes No (Unknown)

29 Comments: _____

d 4.83
Δ −2.69

BLOCKED

d 12.28
Δ .15

d ~~4.78~~ 4.84
Δ ~~2.12~~ 2.09

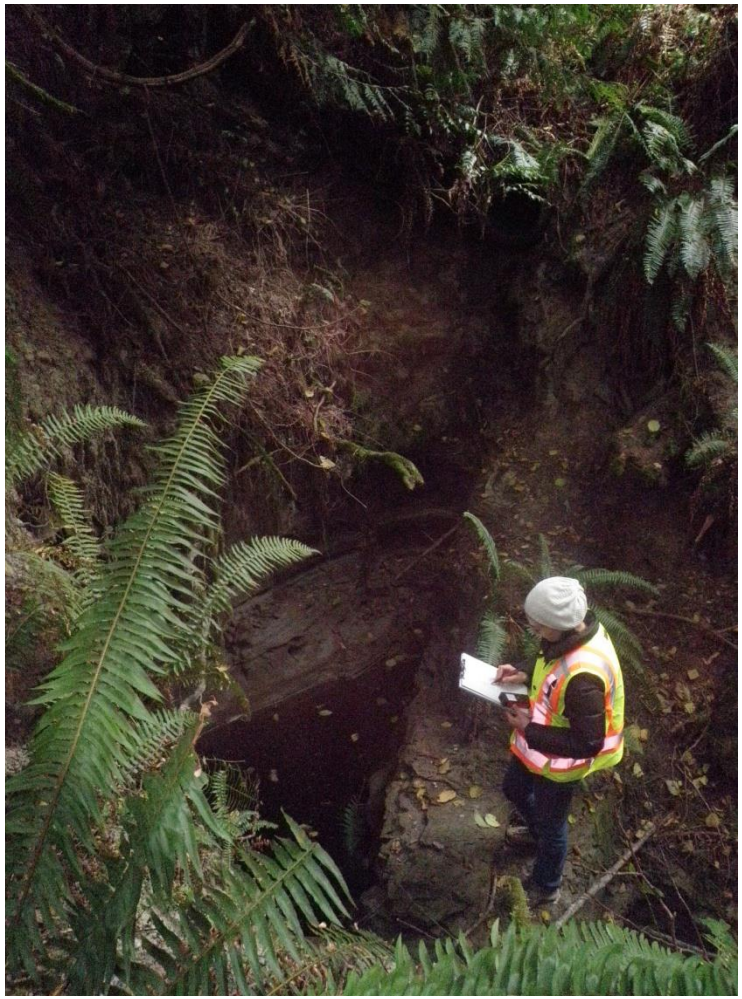
NOT ON NWIFD DISTRIBUTION MAPS > BUT WORTH LOOKING INTO

Eagle Creek Trib

2.69
.15
2.09

7
- 2.84
2.09
.785

156



Data Input Into the GPS Collection

Identify

Identify from: WRIA17

Location: 500,491.319 5,319,649.952 Meters

Attachments (11)

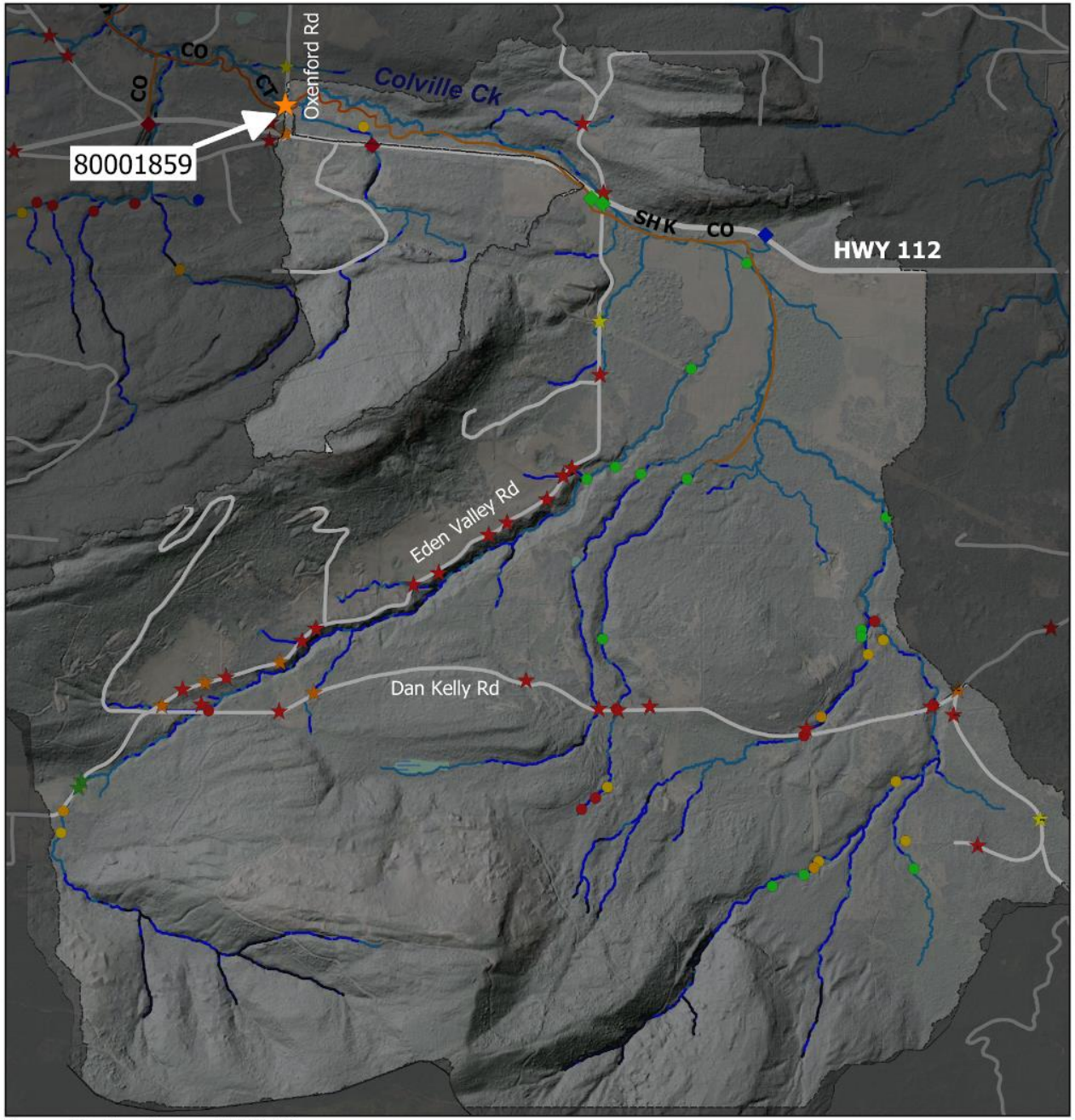
Field	Value
OBJECTID	122
Shape	Point
Site_ID	80000296
Culvert_ID	1.1
Data_Sourc	CLALLAM
Field_Date	12/13/2012
Culvert_Sh	Round
Channel_W	3.7
Street_Nam	OLD BLYN HWY
Commit_	Chicken Cp Ck
Cul_Span_C	0.41
Barrier	Yes
Method	Level_A
Reason	WS Drop>.24m
Significan	Yes
Sockeye_Sp	No
Chum_Speci	No
Pink_Speci	No
Coho_Speci	Yes
SR_Cutthro	Yes
Chinook_Sp	No
Steelhead_	Yes
Res_CT_RB_	No
Bull_Speci	No
Brook_Spec	No
Brown_Spec	No
Passabil	0

Identified 1 feature

Labeling Fast

Culvert Prioritization Guiding Principles

- Passability *(Barriers 0-33% passable were given higher priority)*
- Spatial location *(Sites with Total Barriers below were given less priority)*
- Length of potential habitat above barrier (*Stream Gradient, Wetlands, & Barriers above were all used to determine potential habitat)*
- Stream Channel Width
- Habitat Assessments
- Fish presence *(WDFW Priority Index (PI) & Salmon and Steelhead Habitat Inventory and Assessment Program (SSHIAP) Data)*



80001859 Colville Ck
WRIA19 Culvert Correction Priorities

County Culverts
- 0% Passability
- 33% Passability
- 67% Passability
- 100% Passability

WSDOT Road Crossing Barrier?
- N/A
- Unknown
- 0% Passability
- 33% Passability
- 67% Passability
- 100% Passability

DNR Road Crossing/ Dam/ Other Barrier?
- N/A
- None
- Partial
- Total
- Unknown

HWY 112

Roads

Streams
- <4% Stream Gradient

Streams
- 4% to 16% Stream Gradient

Streams
- >16% Stream Gradient

NHD Waterbody

Statewide Integrated Fish Distribution
- CH Chinook
- CO Coho
- CT Cutthroat
- K Kokanee
- PK Pink
- RB Rainbow
- SH Steelhead

0 0.5 1 1.5 km

Prepared by Lara Lampert 2-21-19

Qualitative Habitat Survey

- Stream Gradient (if needed) : _____ BFW (if needed) A:_____ B:_____ C:_____ Avg:_____
- Photo Log

- 1) Sediment/Substrate Type (estimate %)
- Boulder_____ Cobble_____ Gravel_____ Sand_____ Bed Rock_____ Hardpan_____ Detritus_____ Muck_____ Silt_____ Artificial_____

  Comments:

- 2) Riparian Width/Condition:

  Wide > 50M Moderate 10-50M Narrow 5-10M Very Narrow <5M None / Comments:

- 3) Stream Reach _____ % Pool _____%Riffle _____%Other Description:

- 4) In Stream Habitat Features (estimated number/quality): Log Jams / Root Wads _____

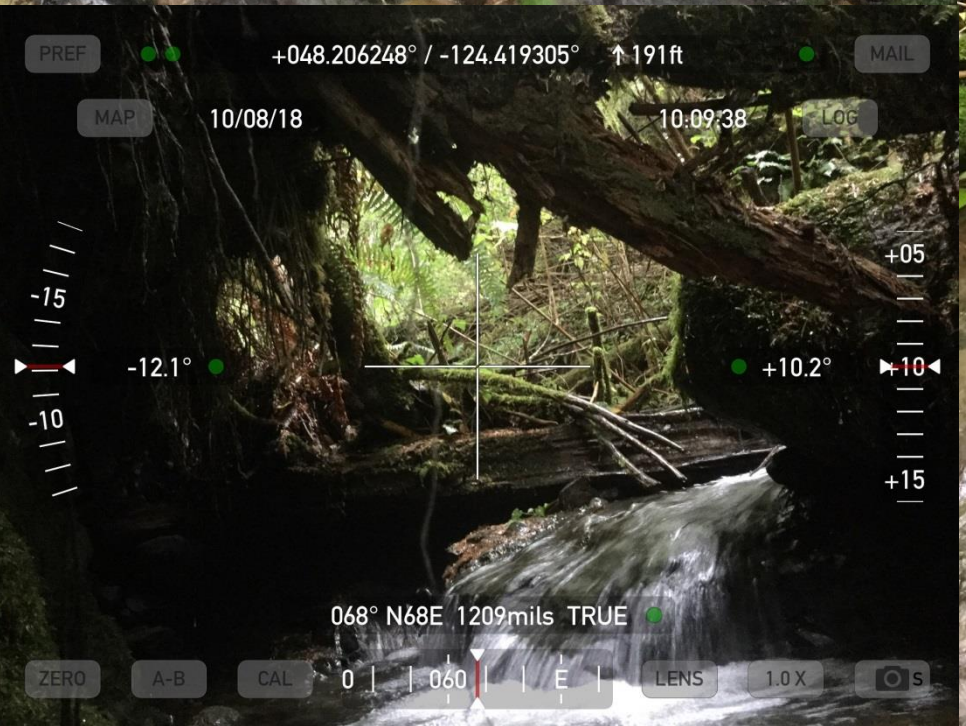
  Description (large complex/sparse minimal etc):

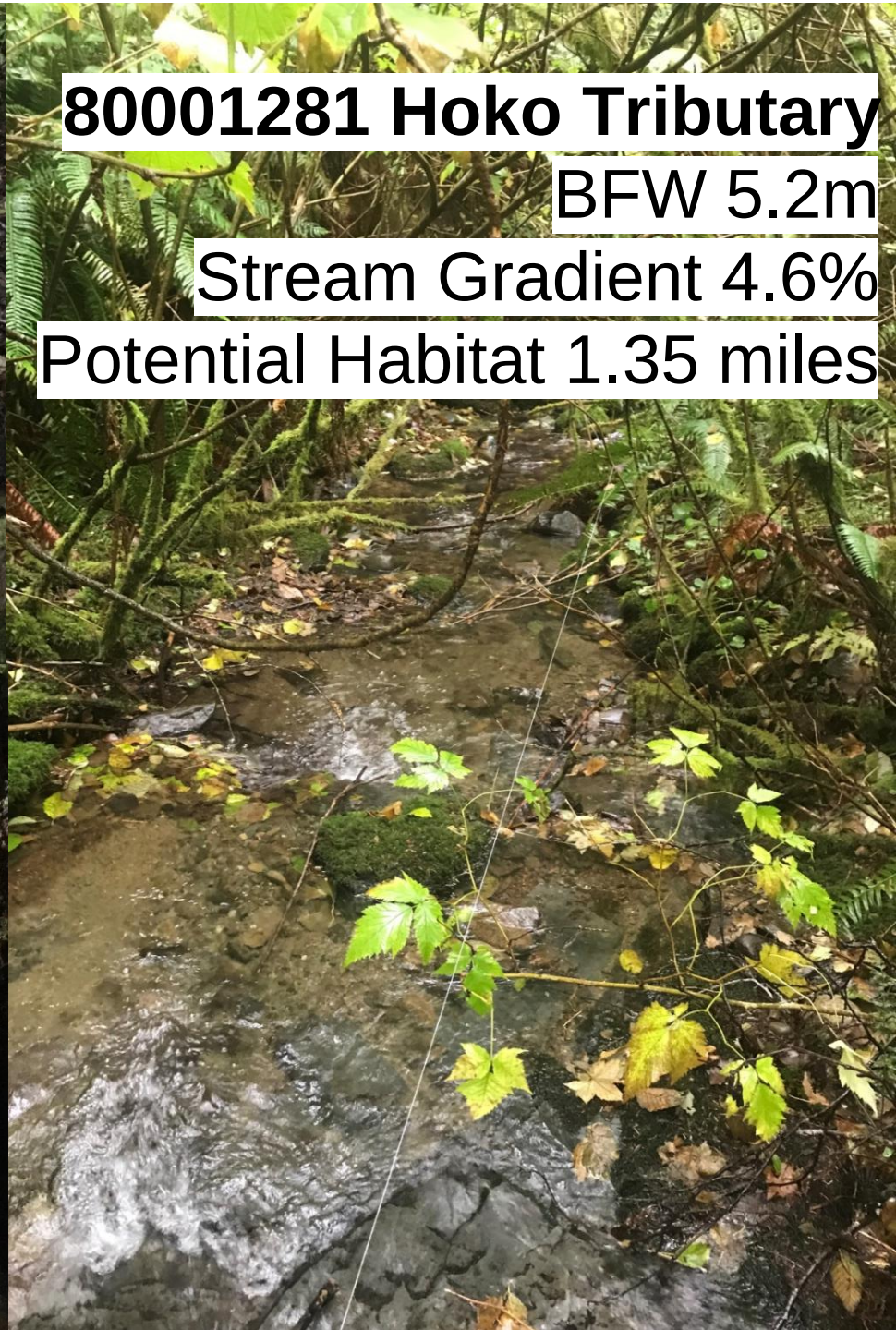
- 5) Quality of spawning and rearing habitat available (good to excellent, fair, poor or no value and are recorded as 1, 0.67, 0.33 or 0, respectively)

  Spawning _____ Rearing _____

- 6) Biologist Professional Judgment Regarding Habitat Quality at the Site.

  Excellent_____ Good_____ Moderate _____ Poor_____





80001281 Hoko Tributary

BFW 5.2m

Stream Gradient 4.6%

Potential Habitat 1.35 miles

80001281 Hoko Tributary Cont.

Field Biologist: Michael L. Blanton/ *Date*:__10-8-2018/ *Site Location*: Hoko - 1281/
Brief Site Description: Round Pipe no substrate with approximately 1-2 inches of water/
Photo Log: 4619-4628 plus Theodolite

1) Sediment/Substrate Type (estimate %)

Boulder 5% Cobble 5% Gravel 75% Sand 10% Bedrock 5%
Comments: As one progress up stream more exposed bedrock substrate appears. At 125 ft upstream a bedrock falls appeared with an approximately 1 ft step.

2) Riparian Width/Condition:

Wide > 50M Moderate 10-50M X Narrow 5-10M Very Narrow <5M None. Comments: Lacking large riparian coniferous trees. Riparian is primarily composed of Salmonberry, Alder and Maple.

3) Stream Reach 50% Pool 25%Riffle _____%Other

Description: Steep pools occur every 5-10 feet (approx.)

4) In Stream Habitat Features (estimated number/quality):

Log Jams / Root Wads

Lacking – Some Boulder/Cobble pools and bed rock pools.

Description (large complex/sparse minimal etc):

None within the 150 ft upstream

5) Quality of spawning and rearing habitat (good to excellent, fair, poor or no value and are recorded as 1, 0.67, 0.33 or 0, respectively)

Spawning 0 Rearing .33

6) Biologist Professional Judgment Regarding Habitat Quality at the Site.

Excellent_____ Good_____ Moderate X_____Poor_____

Misc Notes: The next 25ft of stream at falls (125ft upstream) was on bedrock. Mostly slick bedrock with a few areas of gravel deposition. At ~150ft another boulder step fall that - approximately 2ft drop…with sharply increasing stream gradient. No fish observed.

Summary

- The **Tiered List** can be used to seek funding to correct fish passage barriers

- This list is a living document that will be updated and changed as more data is made available

- More funding is needed for GIS analysis & prioritization of Elwha & Dungeness fish passage barriers

Fish Barrier Removal Board
Work Plan[1]

In 2014, the Washington State Legislature created the Fish Passage Barrier Removal Board to develop a coordinated barrier removal strategy and provide the framework for a fish barrier removal grant program. The board is established by Chapter 77.95 RCW. This workplan is intended to serve as a guide for the Board's work over the next several years. It will be reviewed annually. The due dates for each action are intended to be general, since the Board's workload will be variable, and actual dates may be later. Detailed descriptions of tasks can be found in earlier versions of this work plan and the communications plan.

Mission

The duty of the board is to identify and expedite the removal of human-made or caused impediments to anadromous fish passage in the most efficient manner practical through the development of a coordinated approach and schedule that identifies and prioritizes the projects necessary to eliminate fish passage barriers caused by state and local roads and highways and barriers owned by private parties.[2]

Values

The board values all aspects of salmon recovery and the existing structure developed under the 1999 Salmon Recovery Act, and provides a statewide fish barrier removal strategy and program funding recommendations to the legislature. The board will ensure that the processes to identify, prioritize and fund projects are based on maximizing the opening of high quality habitat through a coordinated investment strategy that prioritizes projects necessary to eliminate fish barriers owned by state and local government, tribes, private parties, and others. This investment strategy values (1) opening high quality salmon habitat that can contribute to salmonid recovery, (2) coordinating with others doing barrier removals to achieve the greatest cost savings, and (3) correcting barriers located furthest downstream.

To achieve the mission, goals, and values the Board will:

- Improve coordination of existing fish passage programs to increase the benefits of barrier removal among multiple jurisdictions.
- Expedite the removal of barriers in the most efficient manner practical through economy of scale and streamline permitting processes.
- Facilitate collaboration, coordination, and communication among state, federal and local agencies, tribes, regional salmon recovery organizations, salmon recovery lead entities, regional fisheries enhancement groups, conservation districts, restoration contractors, landowners and other interested stakeholders on fish passage improvement programs and projects.
- Expedite implementation of on-the-ground projects by identifying and addressing institutional hurdles.
- Educate and increase the public and agency awareness of fish passage issues to develop support for solving problems and preventing new ones.
- Seek funding sources for fish passage projects within Washington and administer a strategic funding program to further the Board's mission once funding is secured.

[1]Workplan update approved November 2018; list of communications tasks approved and added May 2018
[2] RCW 77.95.160 (2) (a)

GOALS, ACTIONS AND TIMELINES

ACTION	TIMELINE	RESPONSIBILITY
Goal 1: The Washington Department of Fish & Wildlife shall chair and administer a Fish Barrier Removal Board (FBRB).		
Chair and Support Fish Barrier Removal Board	Ongoing	WDFW
Review bylaws annually	Winter 2019	FBRB
Periodically review FBRB membership and consider changes	Winter 2019	Chair and FBRB
Develop a workplan and update annually	Fall 2019	FBRB
Goal 2: The Board will strive to operate transparently and reach out to interested parties in developing and implementing its programs.		
Develop and implement a communication strategy to include fact sheets and webpage.	Ongoing	FBRB
Participate in Salmon Recovery workshops	Biennial in odd-numbered years	Chair/other members
Foster ongoing partnership with WFPA	Ongoing	WDFW
Develop a stand-alone FBRB website	Ongoing	WDFW
Goal 3: The FBRB will continue to refine its coordinated approach to identifying and expediting the removal of fish passage barriers.		
Continue to refine a prioritization methodology aimed at prioritizing which focus areas should be addressed first. Board should re-visit its priorities and refine the methodology based upon the funding received for the grant program.	Ongoing	FBRB
Develop a plan to coordinate information sharing and coordination[3] between the FBRB and other entities involved in fish passage barrier removal projects. The Board needs to understand the needs for this task as well as the funding needed to support this. This task may include developing the website referenced in Goal 2 above.	Winter 2019	FBRB
Determine the scope of technical assistance needed through the program and how it has been/will be provided, as directed in RCW 77.95.170 (5) (b).	Ongoing	WDFW with FBRB assistance
Develop and approve a grant manual for use by grant administrators. Monitor any issues and revise as needed.	Completed; revisions ongoing as needed	FBRB and RCO
Develop guidance as needed for future grant rounds, or a process for developing such guidance (e.g. funding removal of creosote pilings found during construction of funded projects)	As needed	FBRB
Consider whether to revise policy around issue of partial and full barriers downstream from barriers proposed for correction.	Before next grant round (2019)	FBRB
Track relevant issues including the impacts of stormwater on fish, climate change	As appropriate	FBRB
Consider SRFB collaboration regarding future use of Intrinsic Potential model	Winter 2019	FBRB, RCO

[3] RCW 77.95.160 (2)(C)

Goal 4: The FBRB will strive to seek out available data and information and develop ways to make data and information readily available.		
Database presentation to FBRB	Fall 2018	WDFW
Training program presentation to FBRB	Fall 2017	WDFW
Goal 5: The FBRB will develop a Grant Program for distributing available funding in an efficient and effective manner.		
Continue to refine the grant program that will allocate available funding, and address elements including match requirements, whether and how funding might be allocated between regions, provisions for opportunities that emerge ("just-in-time" or "shovel-ready" projects) and other factors.	Ongoing	FBRB
Goal 6: The FBRB will participate in efforts to streamline Project Permitting and seek ways to efficiently use mitigation funding for barrier removal projects.		
Seek permitting efficiencies and streamlining regarding federal permits.	Ongoing	WDFW

COMMUNICATION TASKS

ACTION	TIMELINE	RESPONSIBILITY
Develop compelling story that communicates value and urgency of fish barrier removal	Ongoing	FBRB
Meet with SRFB periodically	As needed	FBRB
Reach out to Chehalis Basin program to explore connections	Fall 2018	WDFW
Work with SRFB regarding connections to Lead Entities on communications	Fall 2018	FBRB
Continue engaging with interested agencies to establish FBRB as a resource for fish barrier removal	Ongoing	FBRB
FBRB members update their websites regarding fish barrier removal	Ongoing	FBRB members
WDFW create archive of news stories	Ongoing	WDFW
Build relationships with media		
• Work with WDFW public information office to reach out to media contacts	Ongoing	FBRB, WDFW
• Issue press releases when key milestones occur	Ongoing	FBRB
Engage with national organizations and Federal agencies committed to fish passage	Ongoing	FBRB