Fish Passage Rulemaking Technical Workshop

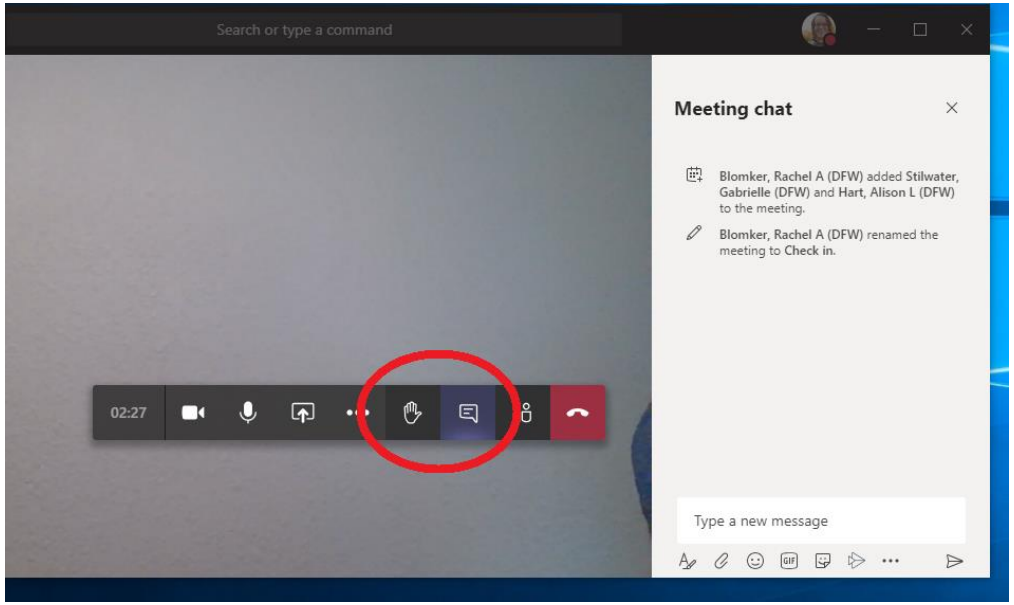
Neil Aaland/Ben Floyd
Facilitators

Washington Department of FISH and WILDLIFE

How to ask questions during workshop

Please use the chat box:

- Our moderators will review and track questions throughout presentations.
- The facilitator will refer your questions to the correct presenter.
- Raise your hand if your video is on.



If you have additional questions or feedback, please email: FishPassageRules@dfw.wa.gov.

General Process for creating rules

Three Rulemaking Phases:

- Cr-101: announces that the agency is undertaking rulemaking; was published July 1 in state register, WSR 20-13-094.
- CR-102: when the state files the proposed rule language and publishes in the state register; this is what the formal public hearings will be focused on.
- CR-103: the final rule filing; rules are in effect 30 days after this is published in the state register.

We're in the process between the 101 and 102 - trying to get first general thoughts. In fall 2020, we'll want feedback on policy ideas that we think will be included. In December 2020/January 2021, we'll have rule language and get reactions/comments before filing the proposed rule and holding hearings.

Overview of Workshop

What to expect during this workshop:

– Why DFW is doing rulemaking

– Screening Presentation

- Q&A

–Fish Passage Presentation

- Q&A

–Climate Adaptive Structures Presentation

- Q&A

–General discussion about topics for rulemaking

- An opportunity to provide feedback, share ideas and concerns

– Next Steps – what to expect

Fish Passage Rulemaking Overview

Tom Jameson
Fish Passage and Screening Division Manager,
Habitat Program

Washington Department of FISH and WILDLIFE

Overview

The Habitat Program is reviewing the Revised Code of Washington (RCW) 77.57 to implement updated rules surrounding fish passage improvement work.

Statutes for considerations:

Statute	RCW Title
RCW 77.57.010	Fish guards required on diversion devices—Penalties, remedies for failure.
RCW 77.57.030	Fishways required in dams, obstructions—Penalties, remedies for failure.
RCW 77.57.040	Director may modify inadequate fishways and fish guards.
RCW 77.57.050	If fishway is impractical, fish hatchery or cultural facility may be provided in lieu.
RCW 77.57.060	Director may modify inadequate fishways and protective devices.
RCW 77.57.070	Diversion of water—Screen, bypass required.

Current Statutory Authority

To require fish passage and screening remedies that are approved by WDFW

Laws were created in 1949 with only technical updates since

Some language is outdated – how to synch with other legislative expectations to improve compliance?

Department of Fish and Wildlife

Main Goals

The goal for rulemaking is to codify current standards used by WDFW for:

- Instream structures;
- Screening and diversions; and
- Climate adaptive water crossing structures.

Additionally, rulemaking will also address compliance issues for instream structures and screening.

New considerations will look at technical assistance programs and tools to support fish passage and screening barrier owners.

WDFW Fish Screening

Danny Didricksen
Fish Screening Section Manager, WDFW

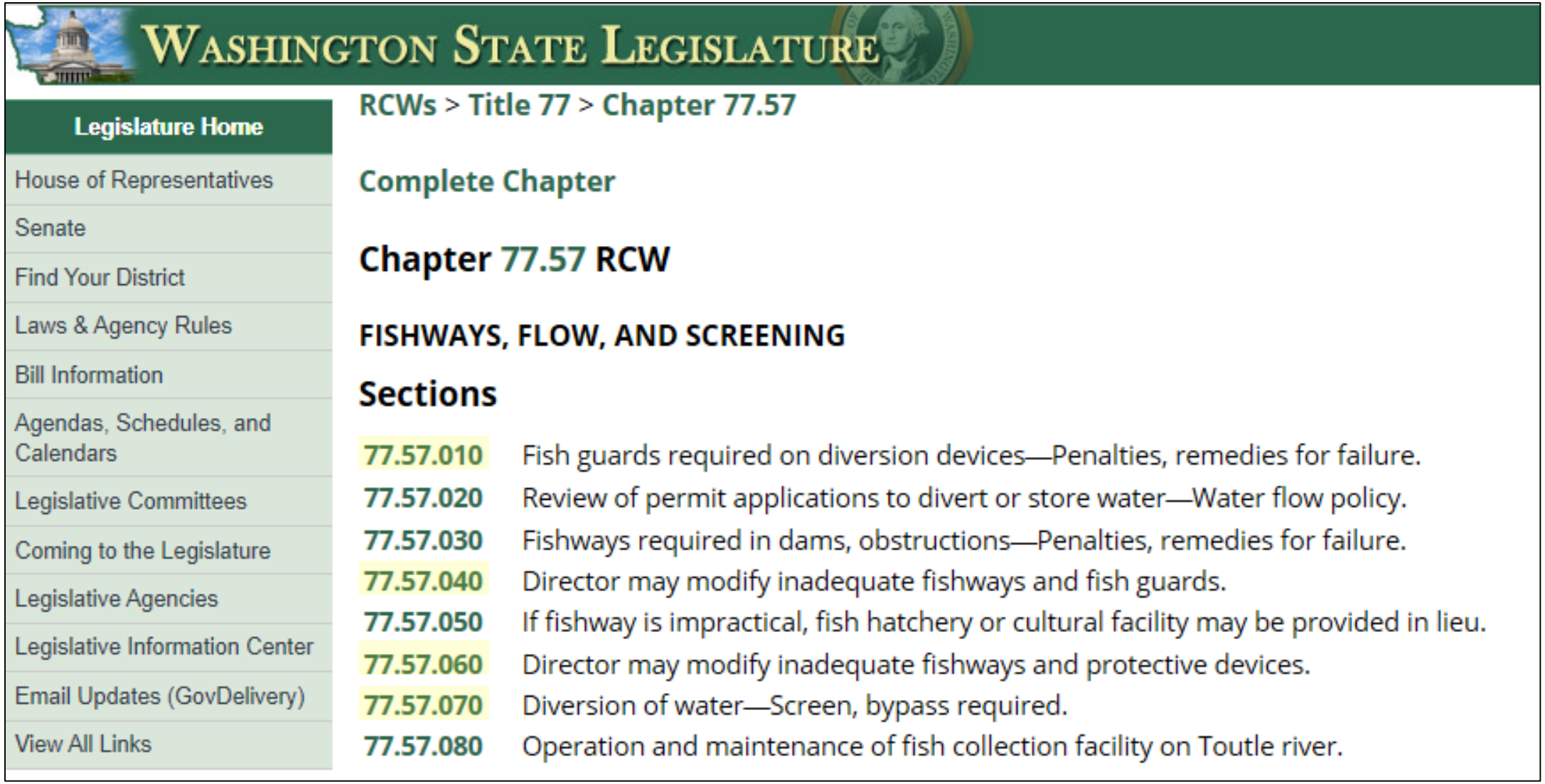
Washington Department of FISH and WILDLIFE

Presentation overview

Goal: Encourage feedback to better inform WDFW's fish screen rule making process. How can we better explain our RCW's and provide guidance?

- Introduction and background
- Current practices
- Fish screen examples
- Questions

Introduction and background



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RCWs > Title 77 > Chapter 77.57

Complete Chapter

Chapter 77.57 RCW

FISHWAYS, FLOW, AND SCREENING

Sections

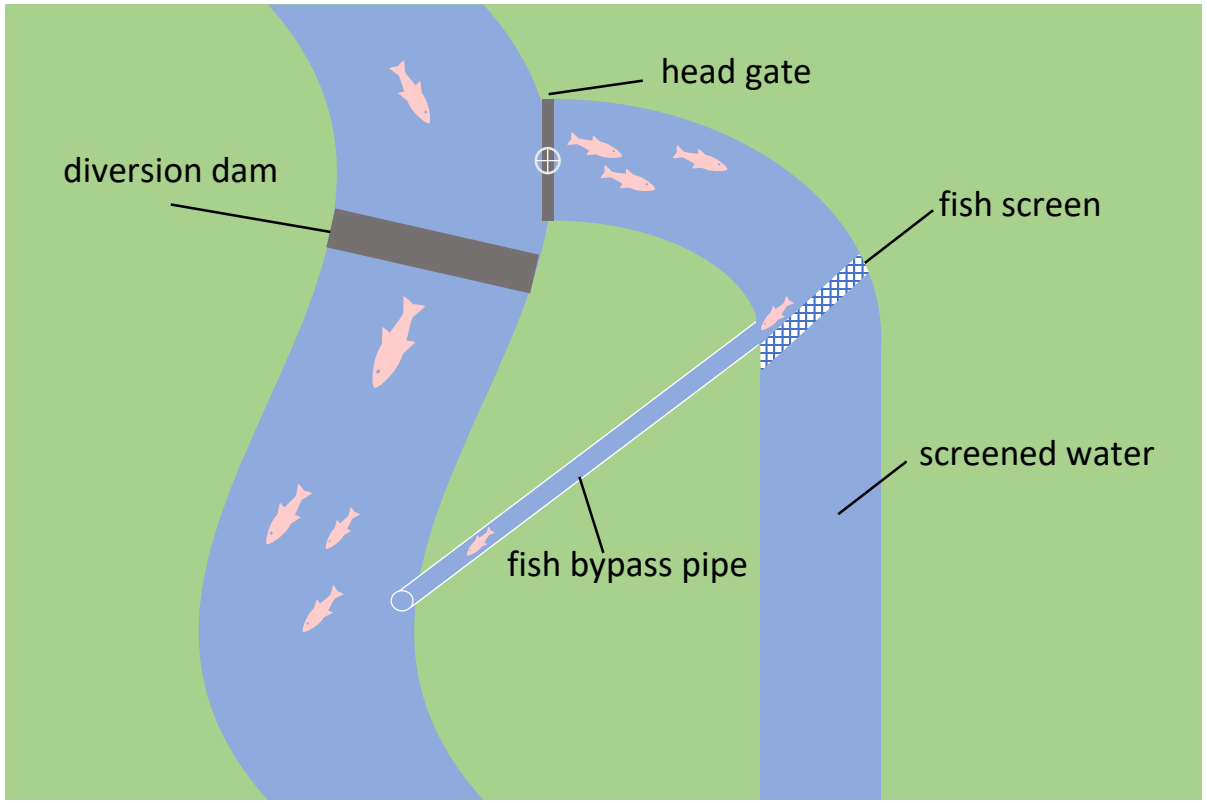
77.57.010 Fish guards required on diversion devices—Penalties, remedies for failure.
77.57.020 Review of permit applications to divert or store water—Water flow policy.
77.57.030 Fishways required in dams, obstructions—Penalties, remedies for failure.
77.57.040 Director may modify inadequate fishways and fish guards.
77.57.050 If fishway is impractical, fish hatchery or cultural facility may be provided in lieu.
77.57.060 Director may modify inadequate fishways and protective devices.
77.57.070 Diversion of water—Screen, bypass required.
77.57.080 Operation and maintenance of fish collection facility on Toutle river.

What are fish screens?

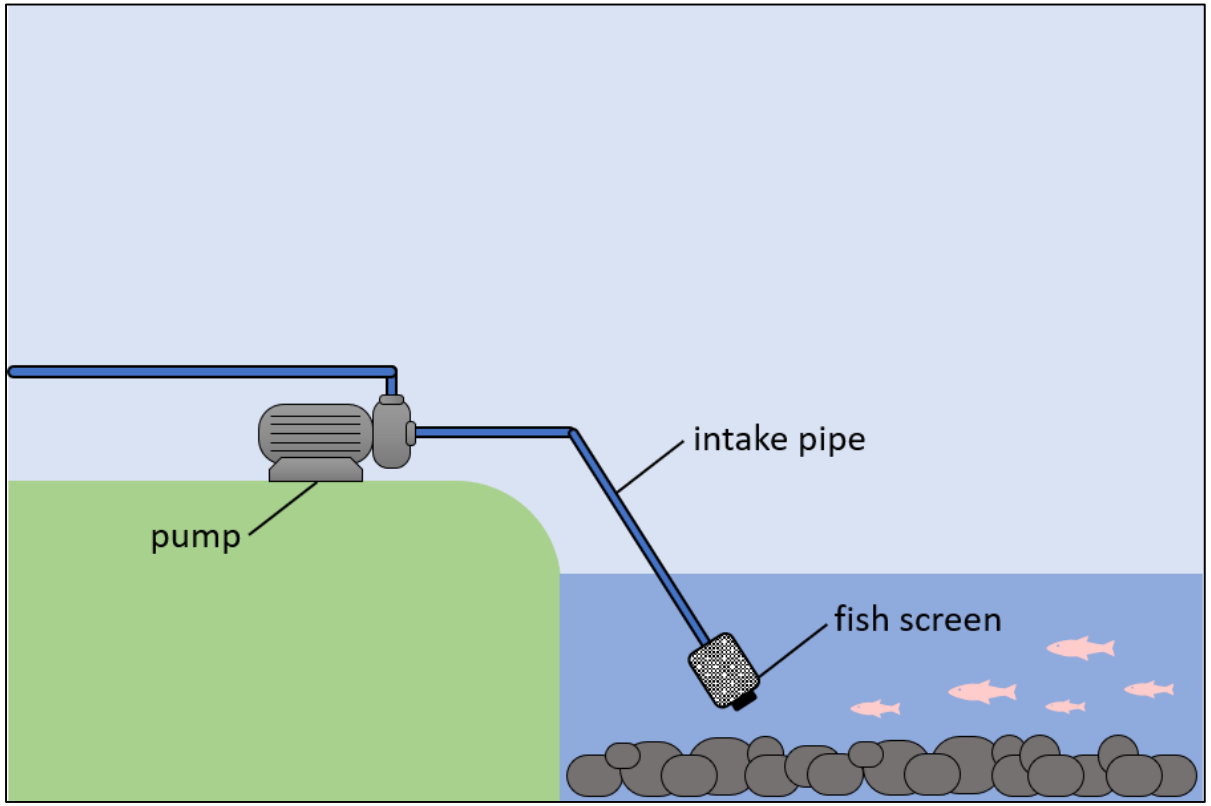
"Facilities that prevent fish (primarily young fish, fish with poor swimming capabilities, and larvae) from being entrained into water diversions."

How do fish screens work?

Gravity



Pump



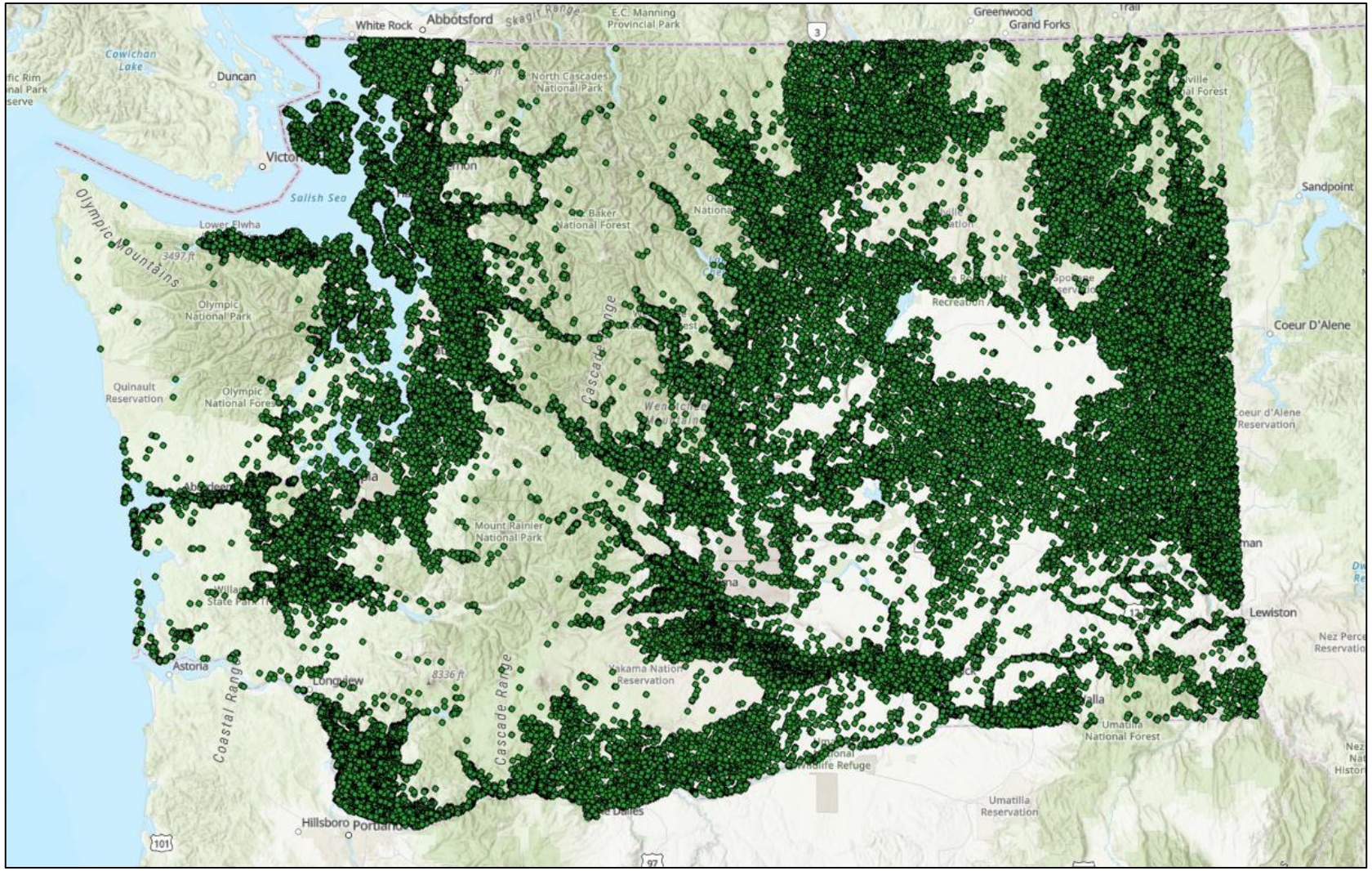
What do fish screens prevent?

Fish stranding in a canal

Unscreened pump diversion

Current practices

Surface water diversions in WA



Current practices

WDFW has been participating in fish screening projects for nearly 100 years. We have found that **outreach** and **education** play a vital role in long-term project success and fish protection.

- Primary focus in Eastern WA and the Olympic peninsula
- The Screening Section through State General Funds and grant awards.
- WDFW provides technical assistance across the state to help water users screen compliantly.

WDFW
Fish Screening Section

Danny Didricksen
Fish Screening Section Manager

Katrina Simmons

Jenni Novak

Josh Rogala

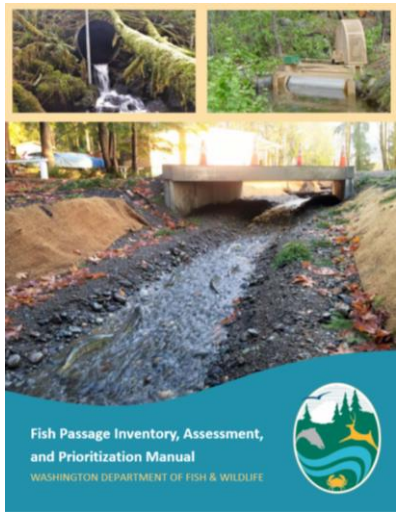
Sean Taylor

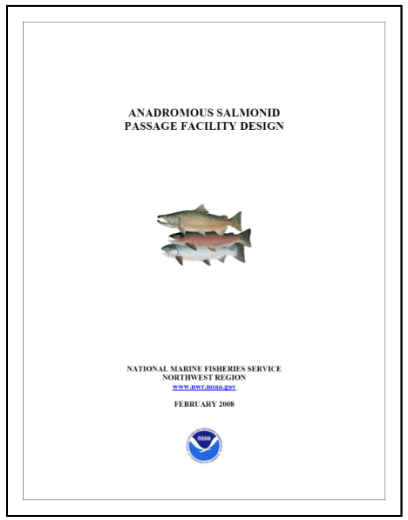
Operations and maintenance

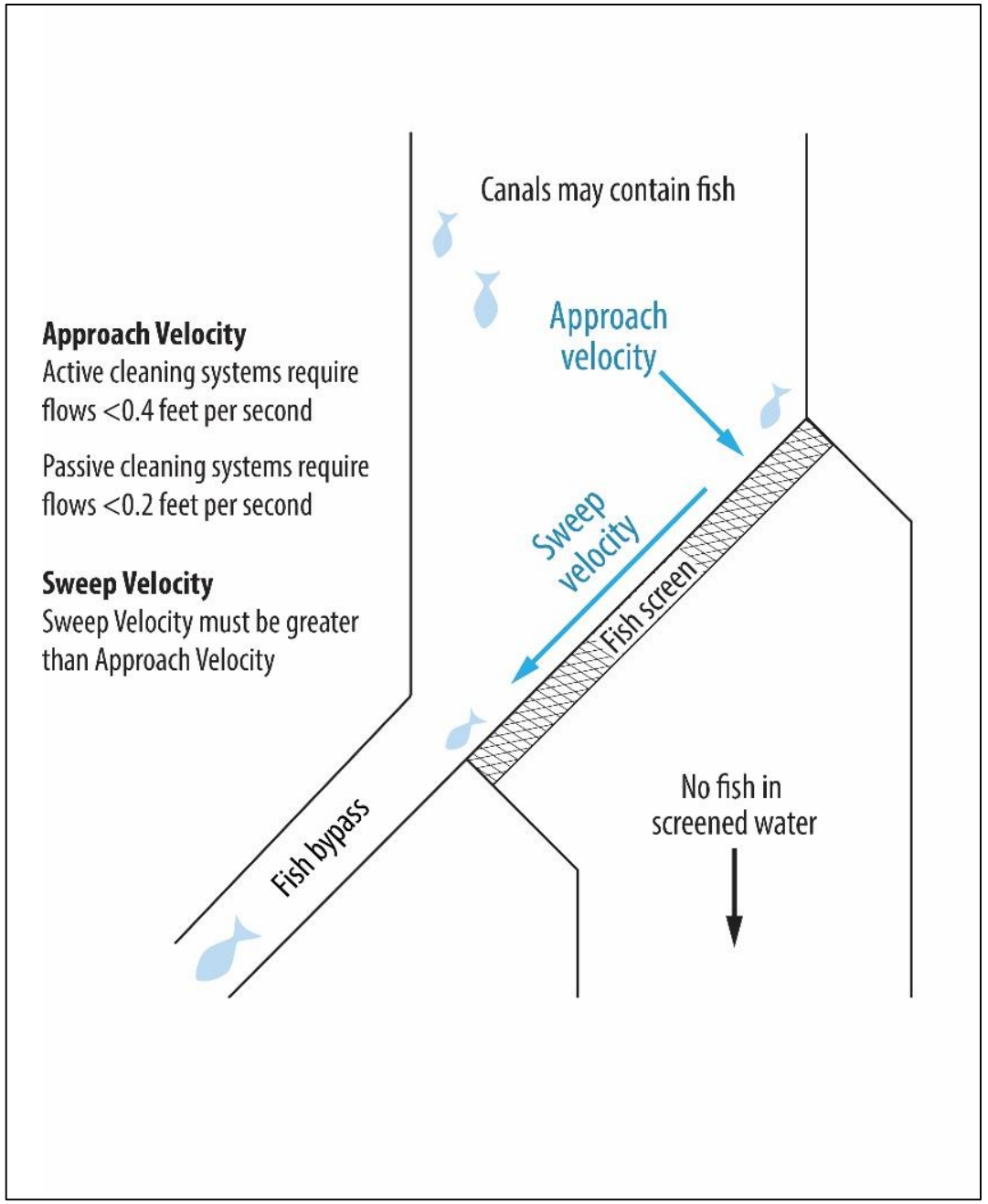
Technical details

Fish screening is detailed. Each point of water diversion is unique. WDFW strives to provide the best customer service we can while giving responsible direction for screening.

– Online resources for fish screening guidance:







Fish screens

Not all “fish screens” are equal

In order to protect fish life WDFW utilizes the best available science and current fish screening standards when assisting with screening projects.

Fish screen examples

Summary

How can WDFW better explain our RCW's and provide guidance?

Our entire WDFW team looks forward to continuing a logical and pragmatic approach to fish screening that will protect our native fishes.

Questions?

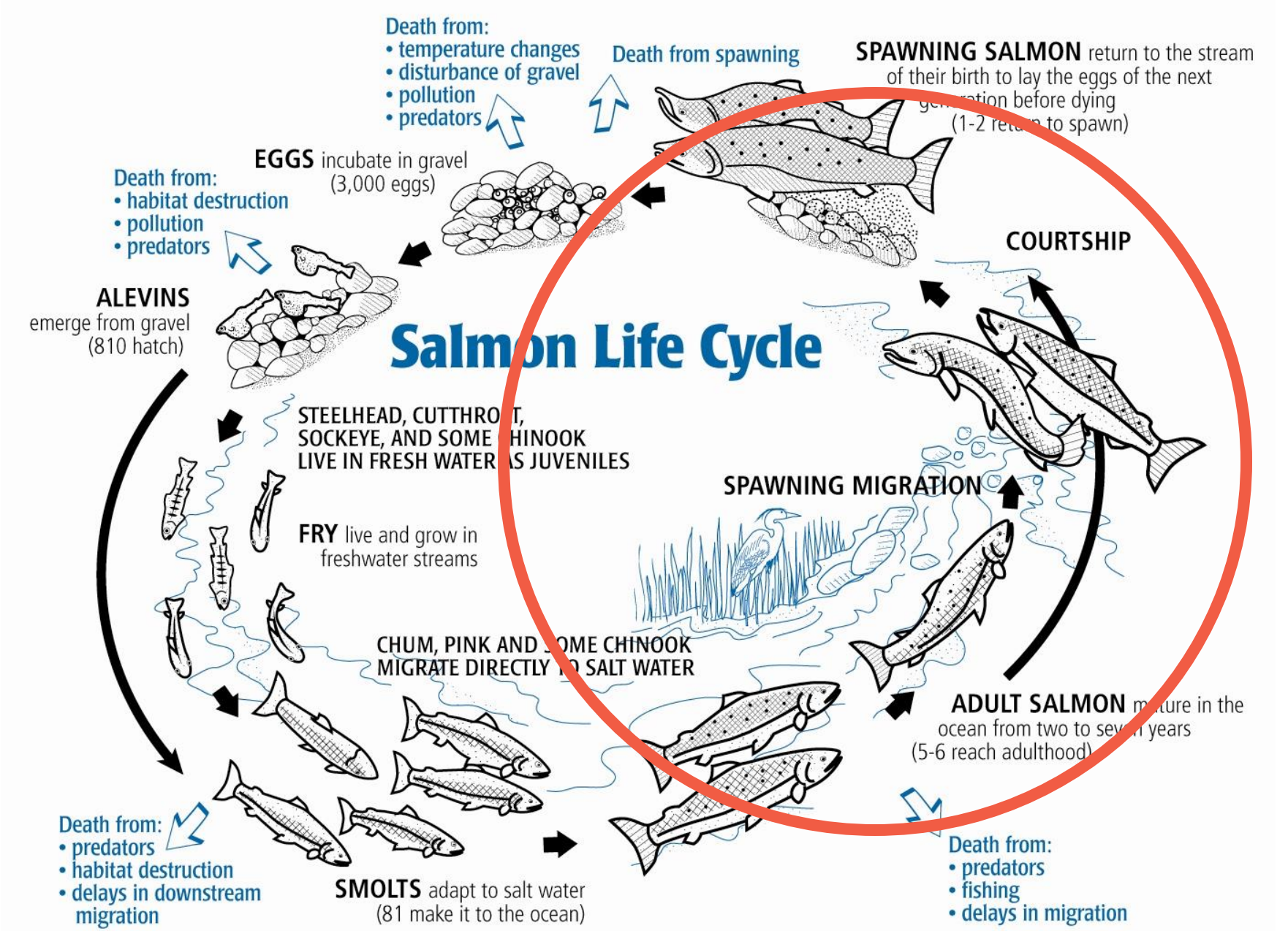
FishPassageRules@dfw.wa.gov

Fish Passage Barriers – An Overview

Christy Rains
Fish Passage Inventory and Assessment Section Manager,
Habitat Program

Washington Department of FISH and WILDLIFE

What is “Fish Passage”?


Death from:
• temperature changes
• disturbance of gravel
• pollution
• predators
Death from spawning
SPAWNING SALMON return to the stream of their birth to lay the eggs of the next
(1-2 return to spawn)
EGGS incubate in gravel
(3,000 eggs)
Death from:
• habitat destruction
• pollution
• predators
COURTSHIP
ALEVINS
emerge from gravel
(810 hatch)
Salmon Life Cycle
STEELHEAD, CUTTHROAT,
SOCKEYE, AND SOME CHINOOK
LIVE IN FRESH WATER AS JUVENILES
SPAWNING MIGRATION
FRY live and grow in
freshwater streams
CHUM, PINK AND SOME CHINOOK
MIGRATE DIRECTLY TO SALT WATER
ADULT SALMON mature in the
ocean from two to seven years
(5-6 reach adulthood)
Death from:
• predators
• habitat destruction
• delays in downstream migration
SMOLTS adapt to salt water
(81 make it to the ocean)
Death from:
• predators
• fishing
• delays in migration

RCW 77.57.030 – Dams and Other Obstructions

RCW 77.57.030 – Summary

(1) A “dam or other obstruction across or in a stream” must be provided with a fishway that continuously supplies “sufficient water to freely pass fish.” (est. 1949)

(2)(a) If landowner fails to construct/maintain fishway or remove dam or obstruction in satisfactory way, within 30 days of notice to comply to landowner, director may construct fishway or remove dam or obstruction. Expenses incurred by department constitute the value of a lien upon the dam and personal property of owner.

(3) “Other obstruction does not include tide gates, flood gates, and associated man-made agricultural drainage facilities” originally installed as part of agricultural drainage on or before May 20, 2003

WDFW has established processes:

- How to define instream features (i.e. dams, fishways, other obstructions)
- Protocols to determine barrier status and passability of instream features
- Preferred methods for fish passage barrier correction, in general removal or correction with a non-barrier structure, and then formal fishway when other options not available
- How to design instream features to “freely pass fish”

What we're working to understand:

- How to use our current tools to address correction?
- What variables might we consider to order and prioritize corrections?
- How do we interact with barrier owners?

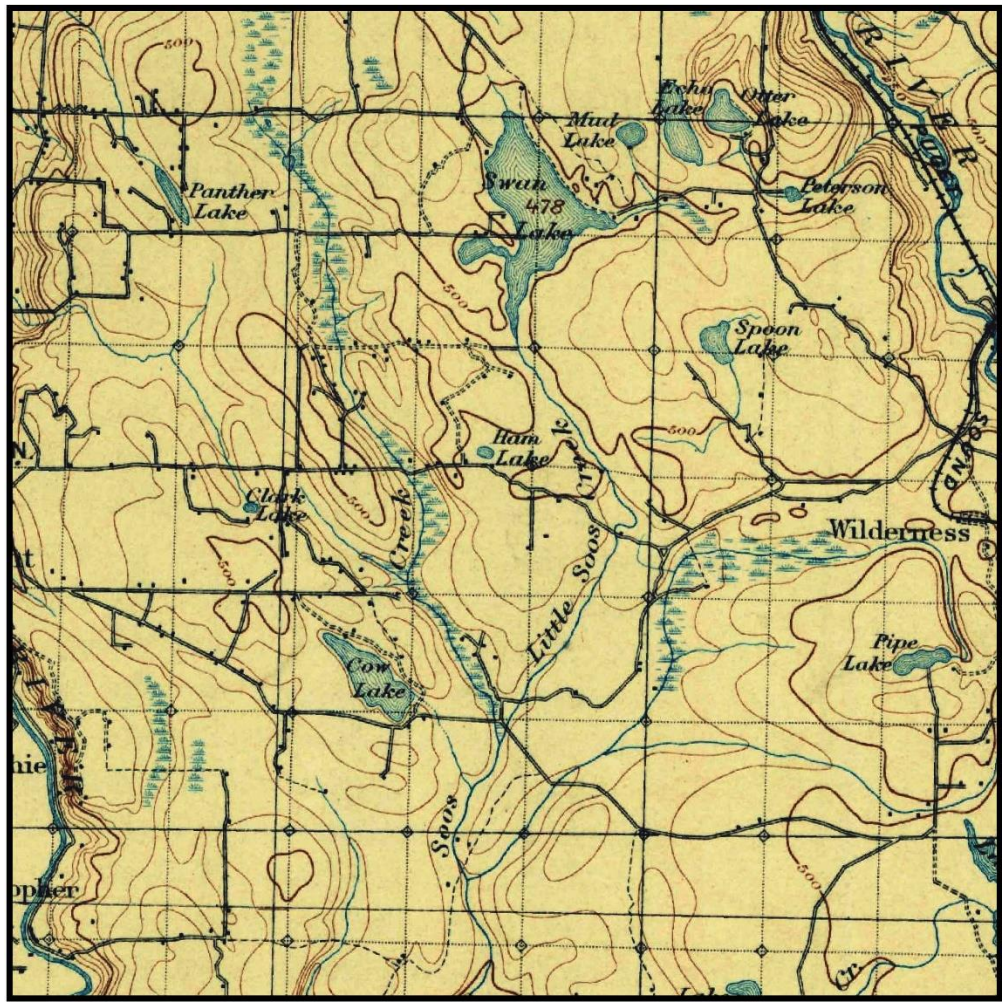
Barriers to Salmon: Dams & Other Obstructions

Barriers to Salmon: Dams & Other Obstructions

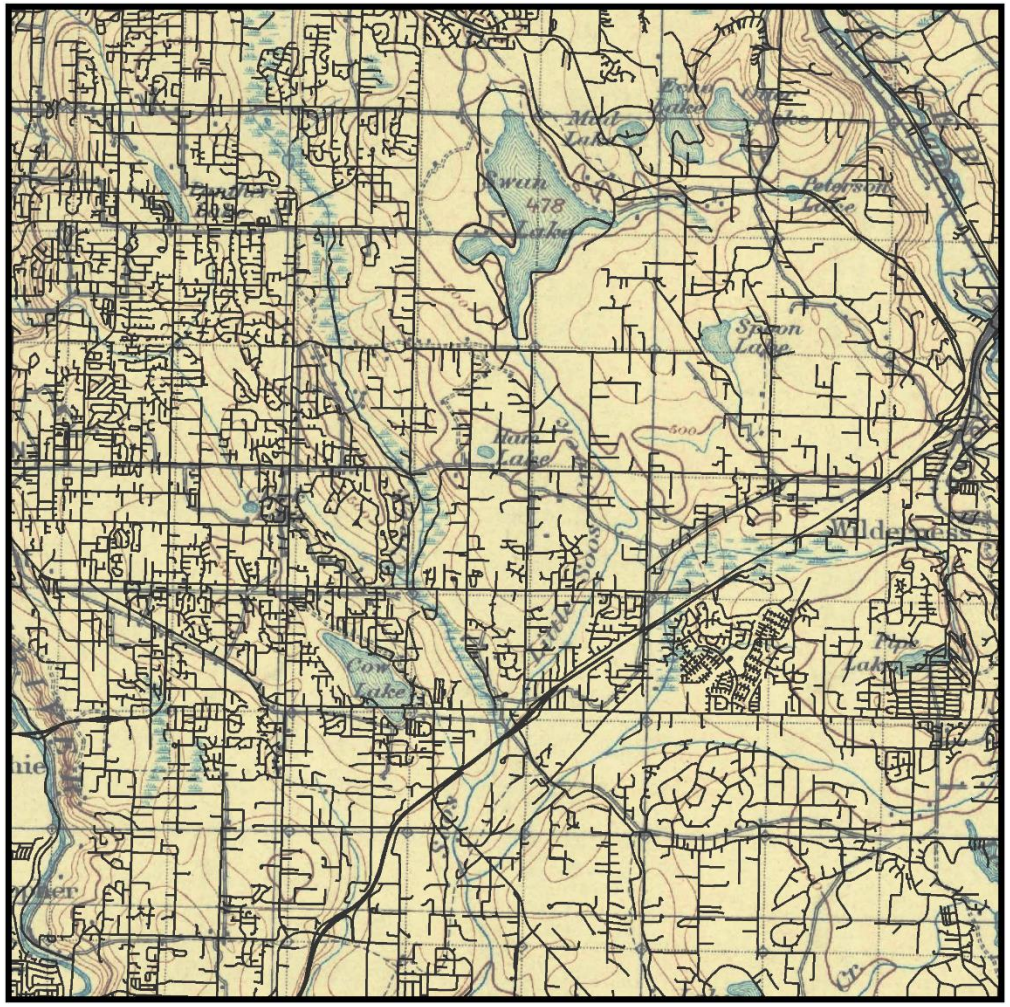
Primary Purpose

- Irrigation
- Navigation
- Hydroelectric
- Fish Propagation
- Wildlife Habitat
- Stock or Farm Pond
- Water Supply
- Flood Control
- Water Quality
- Tailings
- Recreation

Barriers to Salmon: Road Culverts

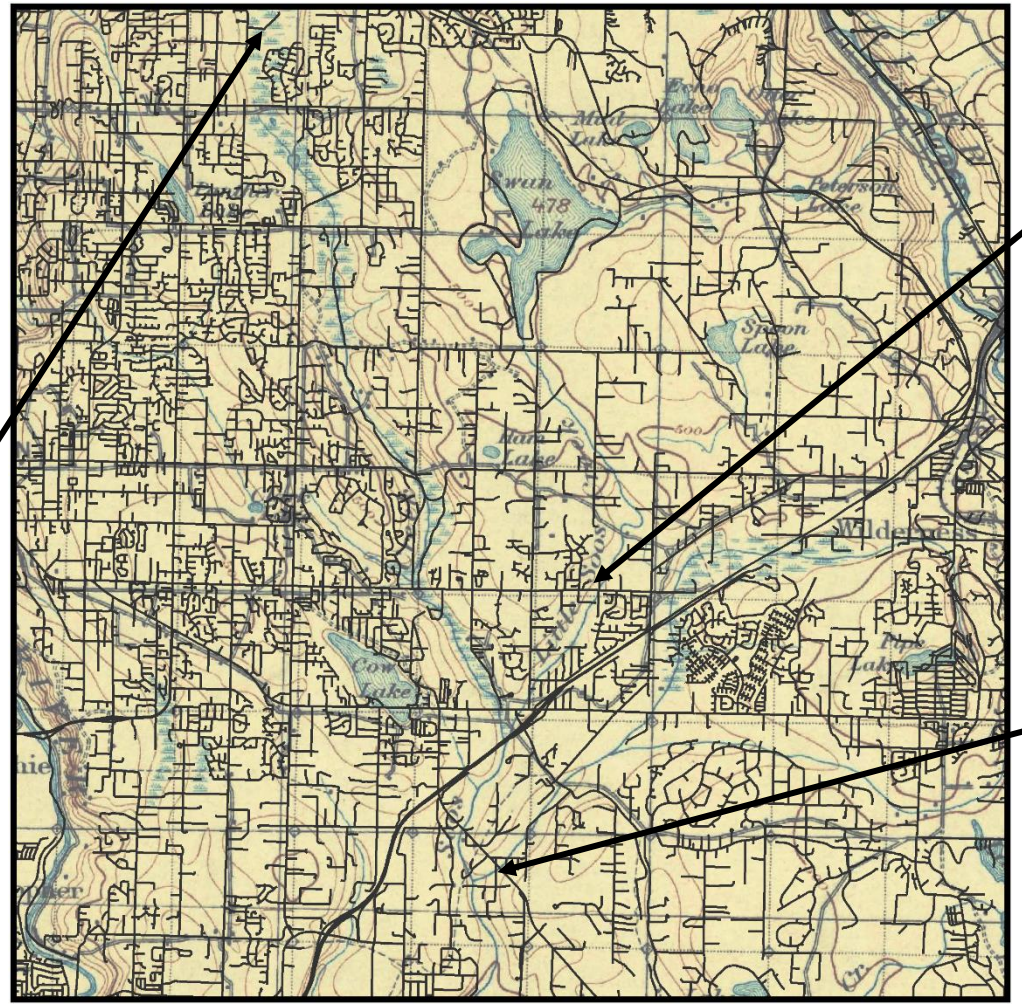


Big Soos Cr (1897)

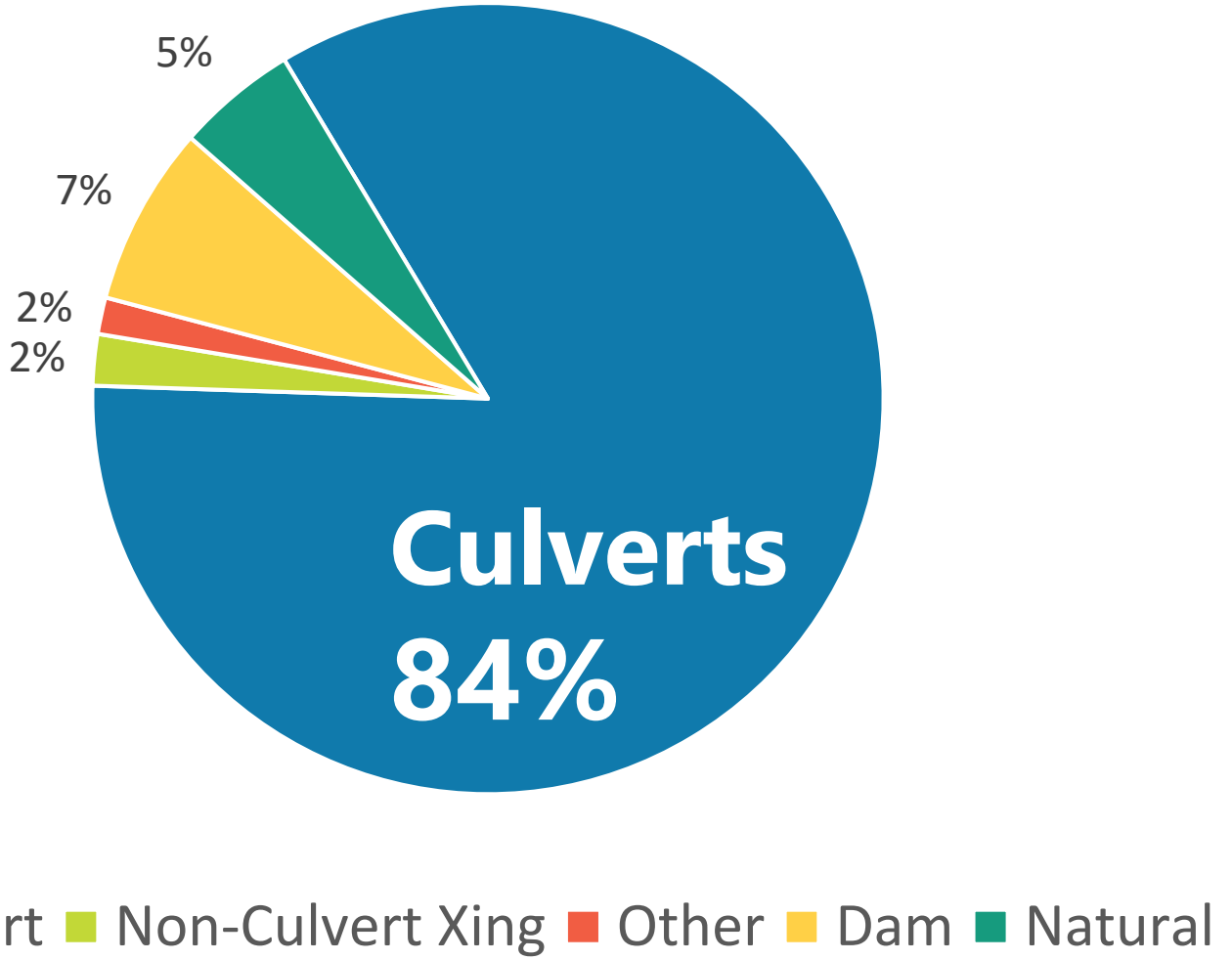


Big Soos Cr (2013)

Barriers to Salmon: Road Culverts



Barrier Feature Types



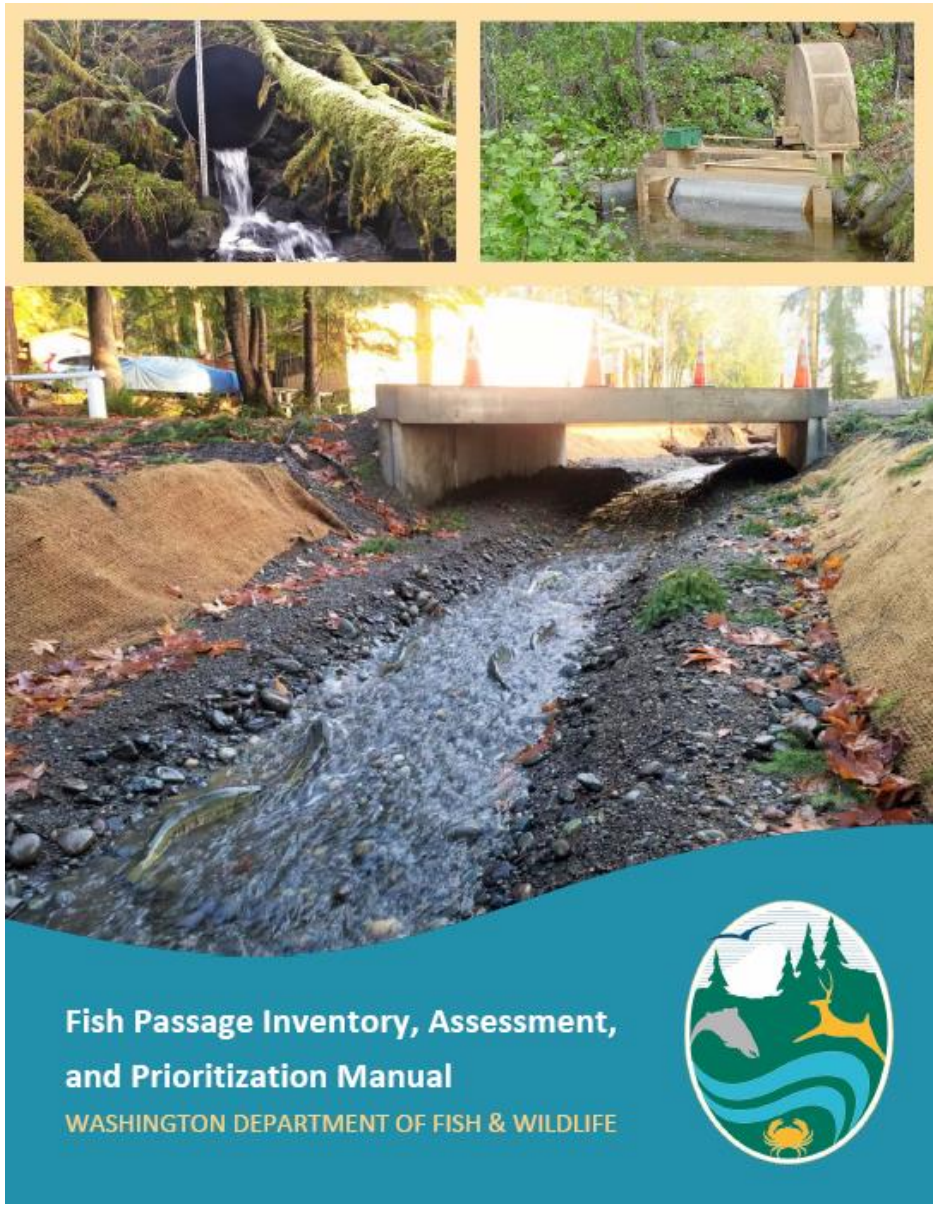
WDFW Fish Passage Division

WDFW Fish Passage Provides Support:

- Protocol for habitat identification & barrier assessment
- Centralized database – storage of statewide barrier data
- Access to those data – Fish Passage Web Map Application
- Free training on protocols
- Barrier correction/fish passage improvement guidance & design
- Ongoing technical assistance
- And more…

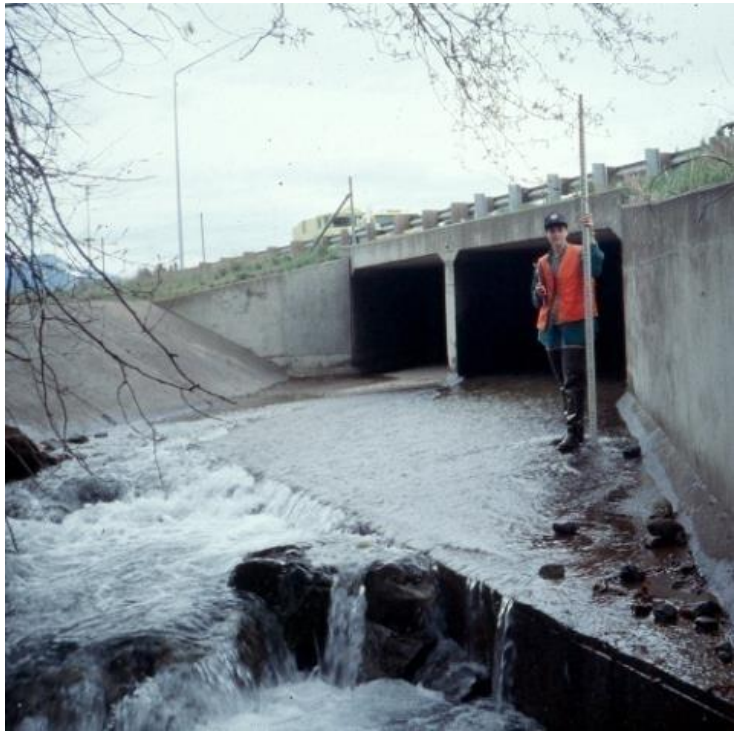
Fish Passage Inventory, Assessment, and Prioritization Manual (2019)

- Details our current fish passage barrier criteria
- Used for the **U.S. vs Washington Culvert Injunction**



Barrier Criteria

Water Surface Drop



Shallow Water Depth

High Water Velocity

Barrier Criteria:
Based on Swimming Ability of Adult Salmonids

Weak Swimming and Leaping **6" Trout**

- Water Surface Drop Criteria
- Velocity Criteria

Large Bodied **Adult Chinook**

- Depth Criteria

Example: Barrier Assessment for Culverts

Level A – Quickly identifies obvious water surface drop and slope barriers

- slope is surrogate for depth and velocity in culverts

Level B – Hydraulic analysis to determine depth and velocity barriers

Additional Barrier Conditions

Sediment/Debris

Racks/Gates

Damage or Deterioration

Fish Passage Database - FPDSI

Centralized repository for statewide fish passage data

- Barriers
- Diversions
- Screening

Culvert Details — **Level A Parameters**

ID	Shape	Material	Span	Rise	Length	WDIC	Apron	WSDrop	Location	Countersunk	Backwater	Slope (%)
1.1	RND	PCC	1.52	1.52	19.20	0.26	BE	0.00		No	0	2.08

All dimensions in meters

Channel Description

Toe Width (m):	2.5
Average Width (m):	3.05
Culvert/Stream Width Ratio:	0.50

Plunge Pool

Length (m):	-999.99
Max Depth (m):	-99.99
OHW Width (m):	-999.99

Road

Fill Depth (m):	4.00

Assessment Results

Barrier:	Yes	Passability (%):	0	Method:	Level A
Reason:	Slope	Fishway Present:	No	Recheck:	

Fish Passage & Diversion Screening Inventory (FPDSI) Database

Inventory and Assessment

Data collected by WDFW field crews

Current contracted collaborations:

- Dept. of Transportation (WSDOT)
- Counties (WSAC)
- Cities (AWC)
- Fish Barrier Removal Board (FBRB)

Training

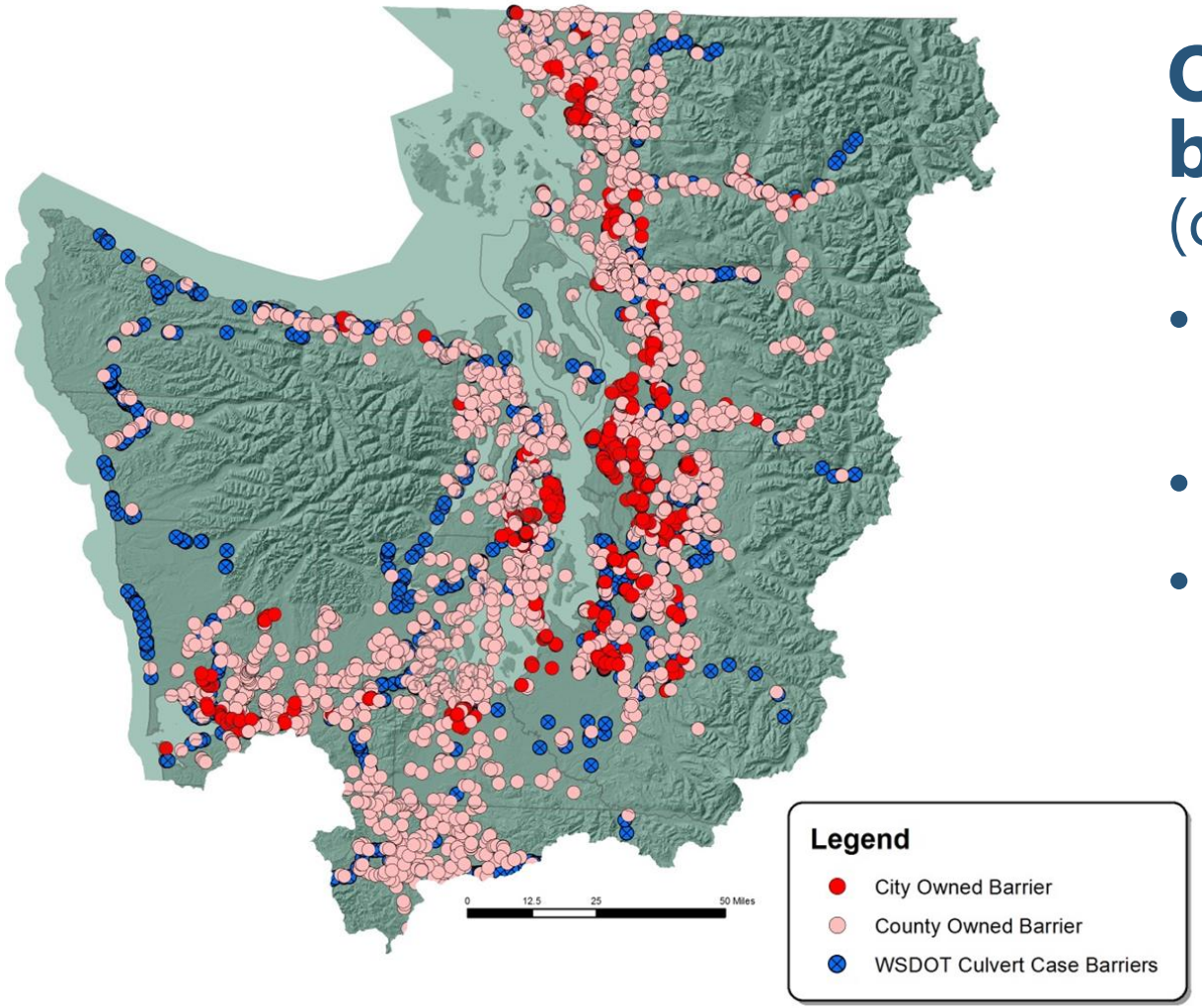
- Free training offered
- Data collected by outside groups

  i.e. Cities, Counties, Fisheries/Salmon Enhancement Groups, Conservations Districts, Federal Agencies, etc.
- Submitted to the FPDSI database

Training

- Adopt-A-Stream
- Cascade FEG
- Central WA Univ.
- City of Bellingham
- City of Redmond
- City of Sammamish
- City of Sumner
- Colville Tribe
- Dept. Nat. Resources
- Evergreen College
- Grays Harbor CD
- Hoh Tribe
- Hood Canal SEG
- Island Co.
- Jamestown Tribe
- King Co.
- Kitsap Co.
- Kittitas CD
- Klickitat CD
- Mid Col. Fisheries
- Nisqually Tribe
- NMFS
- N. Oly. Salm. Coal.
- North Yakima CD
- Pac. Coast Salm. Coal.
- Pend Oreille Co.
- Pierce Co.
- Quinault Indian Nation
- Skagit Co.
- Skagit FEG
- Skokomish Tribe
- Snohomish Co.
- Snoqualmie Tribe
- Spokane Co.
- Spokane Tribe
- S. Puget Sound SEG
- Suquamish Tribe
- Tacoma Power
- Thurston Co.
- Trout Unlimited
- Underwood CD
- Upp. Skagit Ind. Tribe
- USACE
- US Forest Service
- USFWS
- USGS
- WA Cons. Corps
- Weyerhaeuser
- Wild Fish Cons.
- WSDOT
- Yakama Nation

Magnitude of the Problem

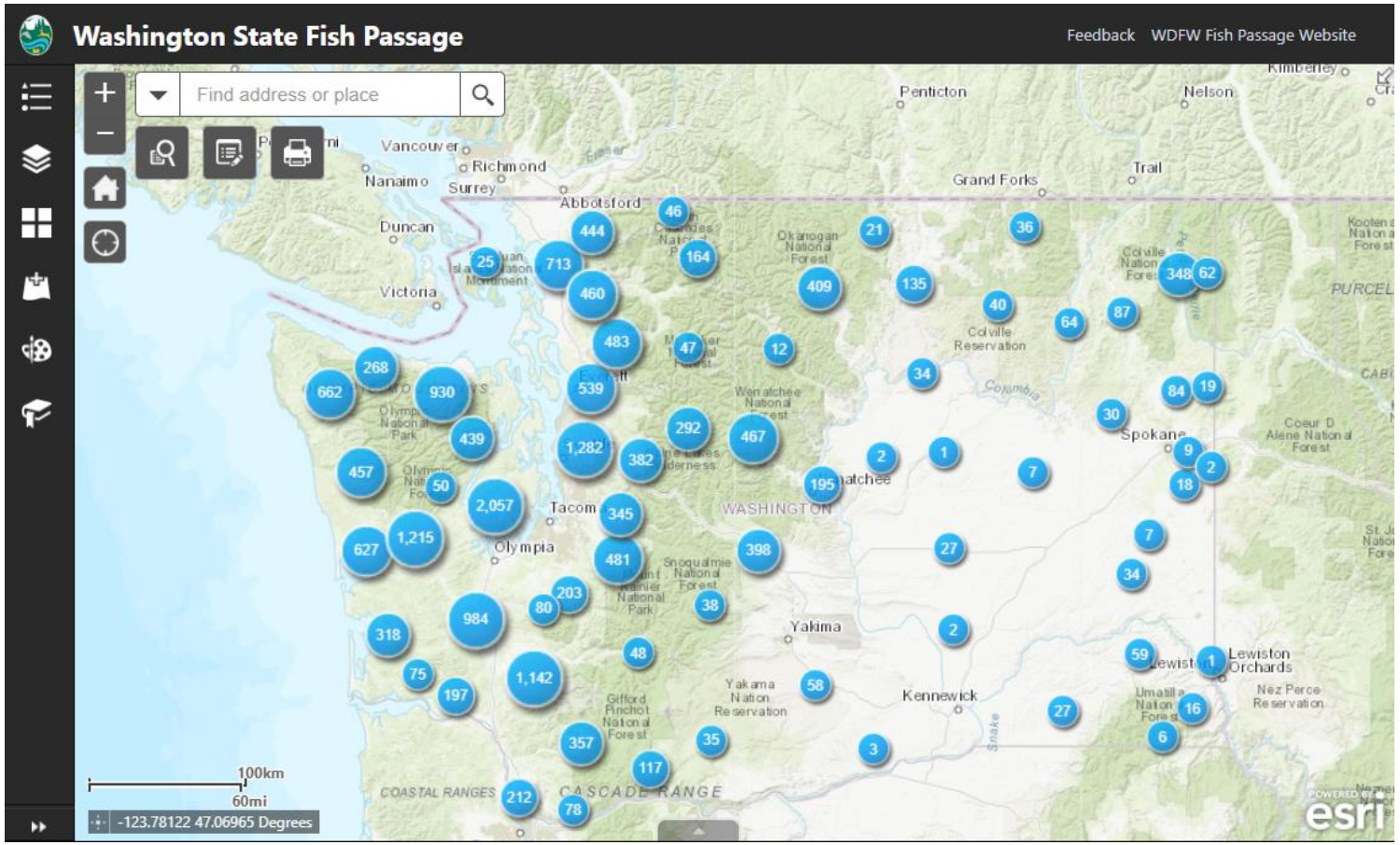


Over 19,000 known barriers statewide
(complete and partial)

- Barrier inventory is incomplete
- Number increases weekly
- Image snapshot of ownerships

Fish Passage Web Application

- Updated weekly
- Identify Projects
- Compare relative benefit



geodataservices.wdfw.wa.gov/hp/fishpassage

Habitat Surveys

- To quantify and qualify habitat gain
- Variables collected depend on survey goals
- Performed by WDFW and other organizations
- Training available

Barrier Corrections: Water Crossing Structures

- Existing rules: removal of barriers or the installation of fish passable structures
- Landowner works with WDFW biologists & engineers – options depend on site conditions

WAC 220-660-190: Water crossing structures methods for design: *Water Crossing Design Guidelines*

Barrier Corrections: Fish Passage Improvement Structures

- Existing rules: improvement structures to facilitate fish passage
- Landowner works with WDFW biologists and engineers – options depend on site conditions

WAC 220-660-200: Fish passage improvement structures, i.e. fish ladders, weirs, roughened channel, etc.

Contributes to Better Restoration Outcomes

Projects that **effectively** open up salmon habitat

Lambert Creek, Lewis Co – at least 2.9 km of habitat gain

WDFW has established processes: Recap

- Provide manual with inventory & assessment protocols that define instream features & how to identify fish passage barriers
- Maintain a centralized & publicly accessible database of barrier assessments and corrections statewide
- Understand required habitat variables to quantify/qualify & provide a rough understanding of the benefit of removing one barrier over another
- Expertise for determining barrier removal and correction design

Considerations for Rulemaking: Recap

- How to use our current tools to address correction?
- What variables might we consider to order and prioritize corrections?
- How do we interact with barrier owners?

Questions?

Incorporating Climate Change Projections into Culvert Design

Jane Atha
Fluvial Geomorphologist, Habitat Science Division

Consideration for rule-making

What factors should WDFW consider when weighing criteria and standards for requiring a wider culvert to accommodate future flows, thereby avoiding premature replacement of the structure due to climate change?

Project Team

Timothy Quinn
Jane Atha
George Wilhere
Lynn Helbrecht
Dan Dulan

Guillaume Mauger
Ingrid Tohver

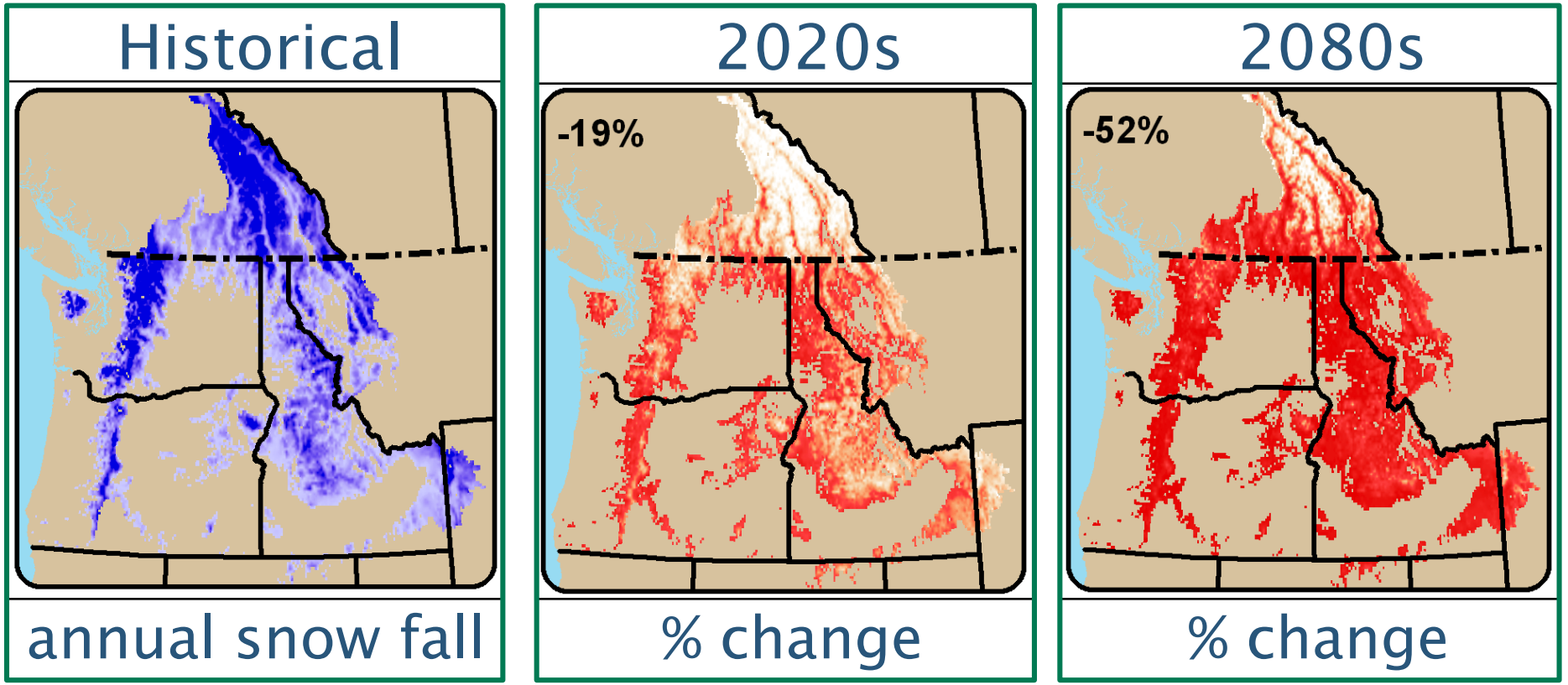
Partially funded by the U.S. Fish and Wildlife Service.
Currently funded, in part, by the U.S. Geological Survey.

WDFW's Role in Culvert Design

- Provides design guidance for the protection of fish life and fish habitat.
- Issues permits for the installation of culverts. Enforces regulations.
- Designs culverts for its own lands and other clients. Reviews designs.

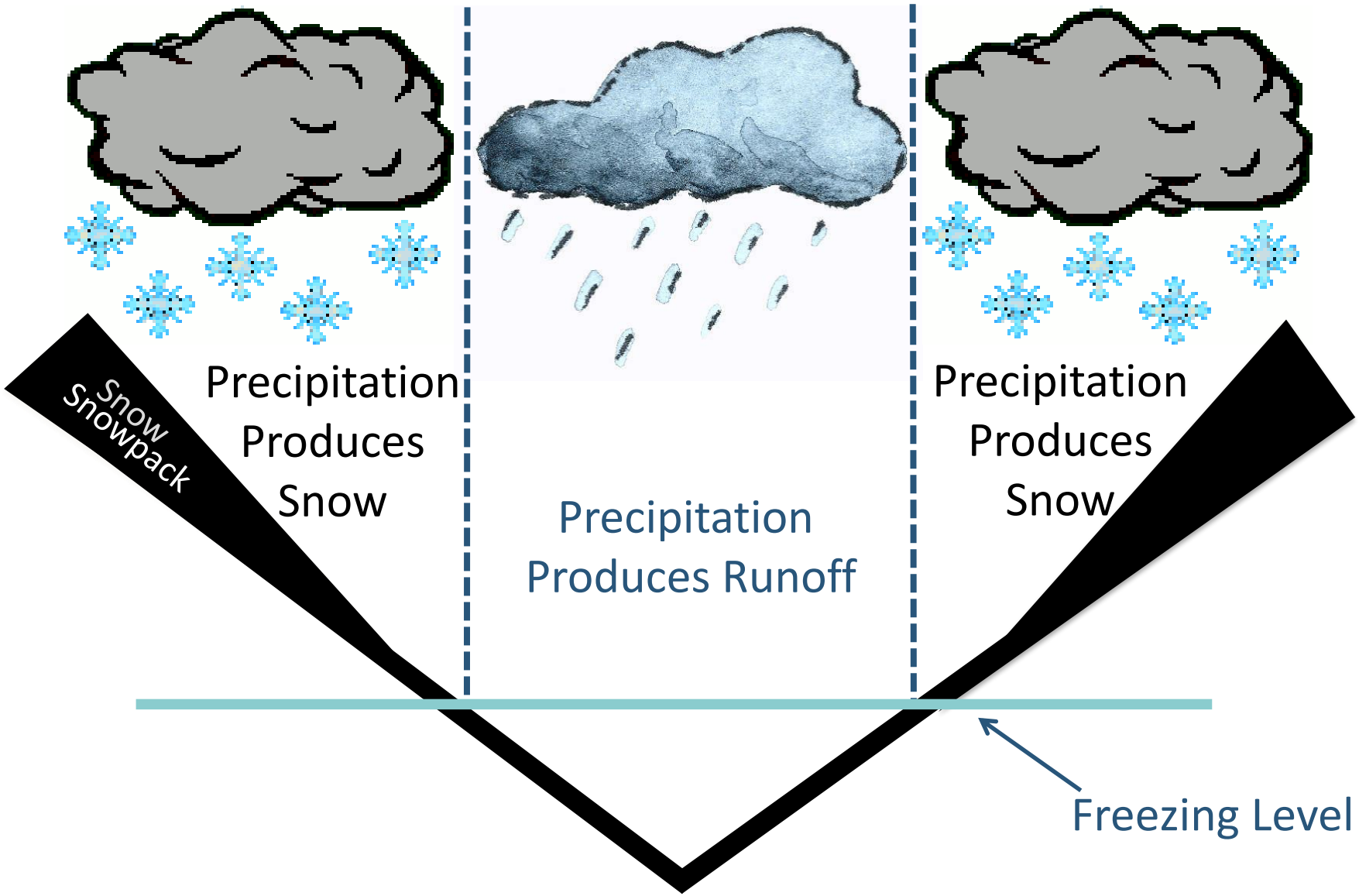
Washington State Climate is Changing

Key Regional Response: Less Snow and More Rain

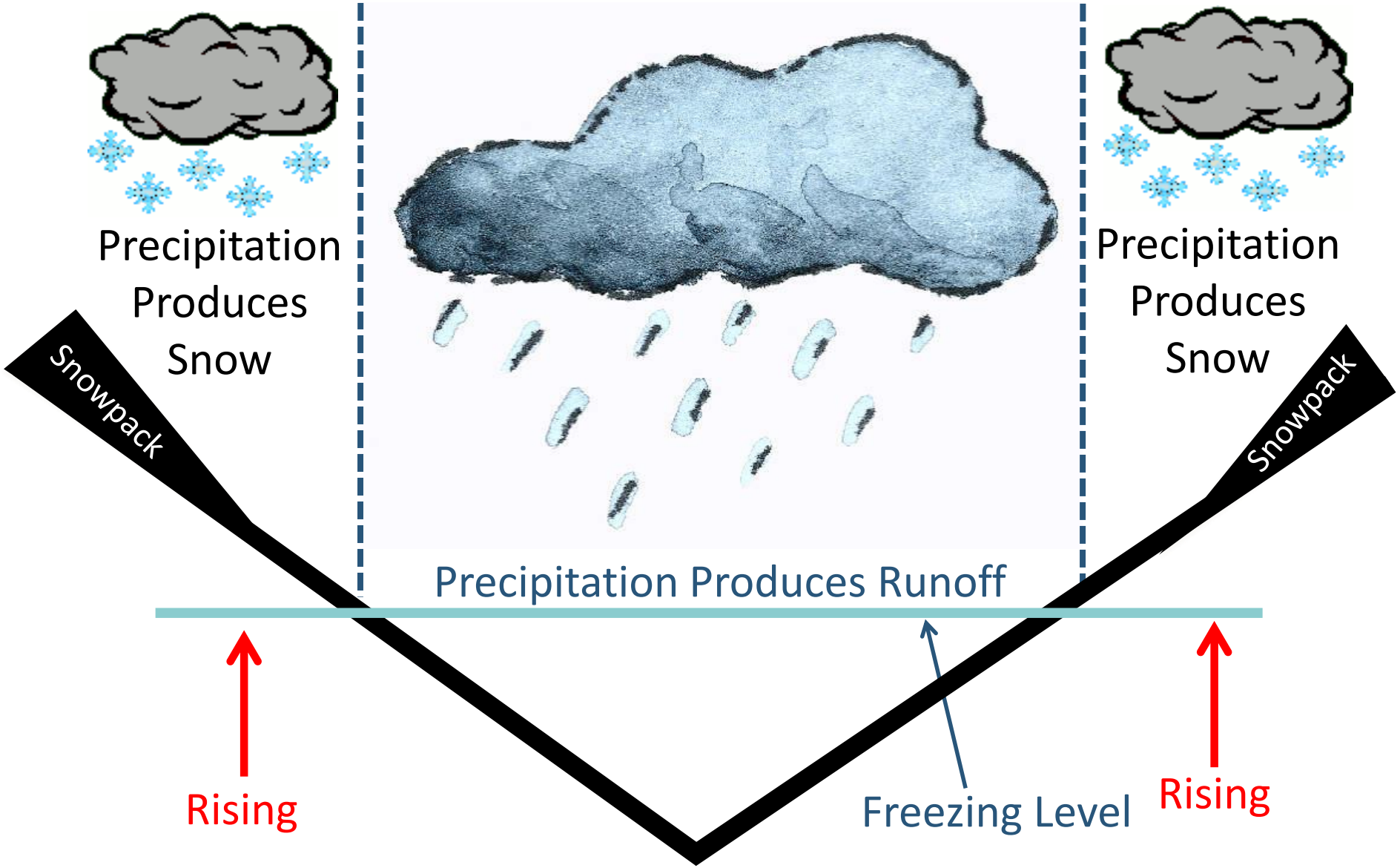


- Same precipitation but as rain
- Higher peak flows

Schematic of a Cool Climate Flood



Schematic of a Warm Climate Flood



Projected Changes in Rain-dominant Basins

Projected shifts in seasonality

- more intense rain events in winter
- drier in summer

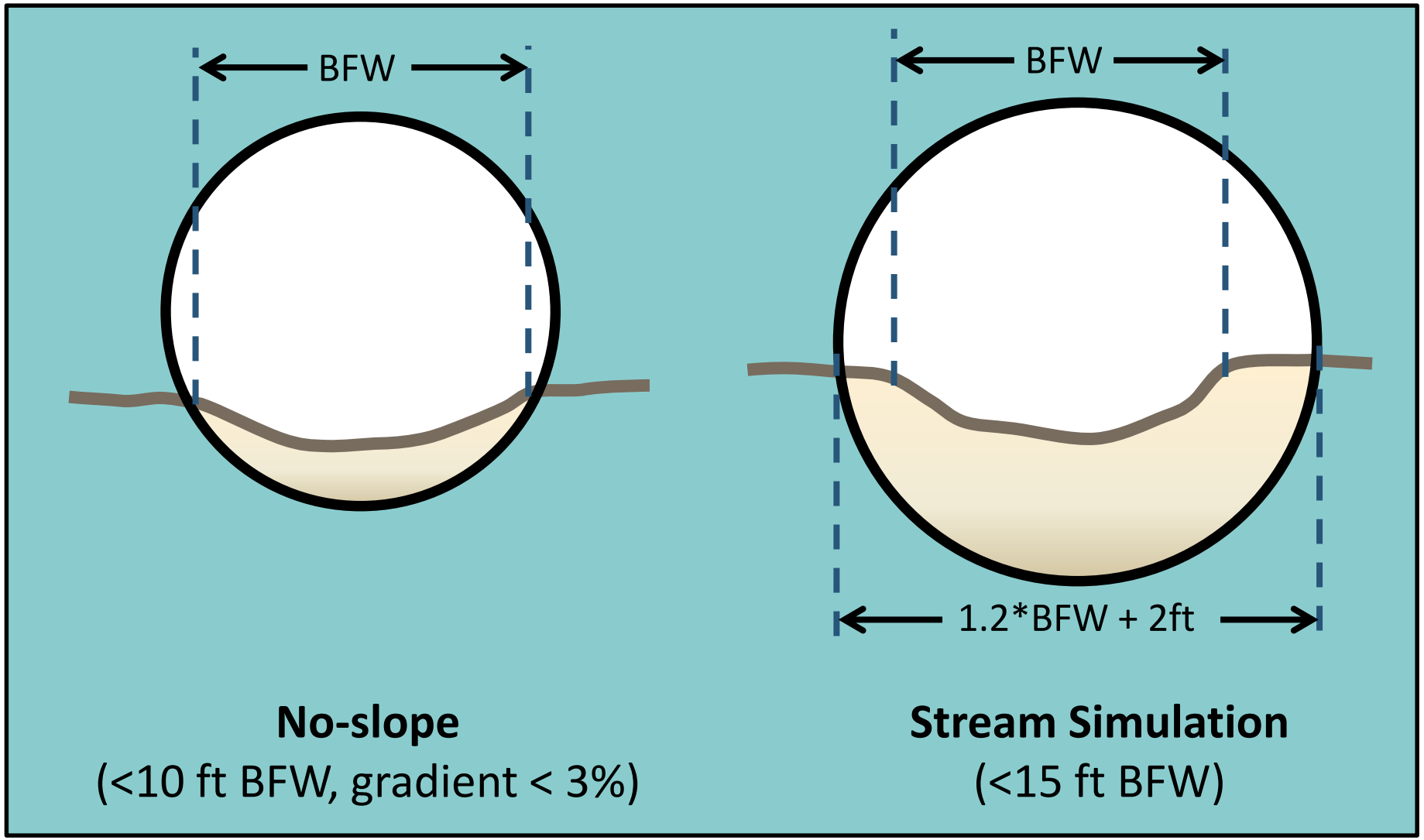
Geomorphic Culvert Design

Design Principles

- “Simulate” geomorphic processes
- Channel inside ≈ Channel outside
- Fish passage inside ≈ Fish passage outside

Culvert Design

Bankfull width (BFW) is a key parameter

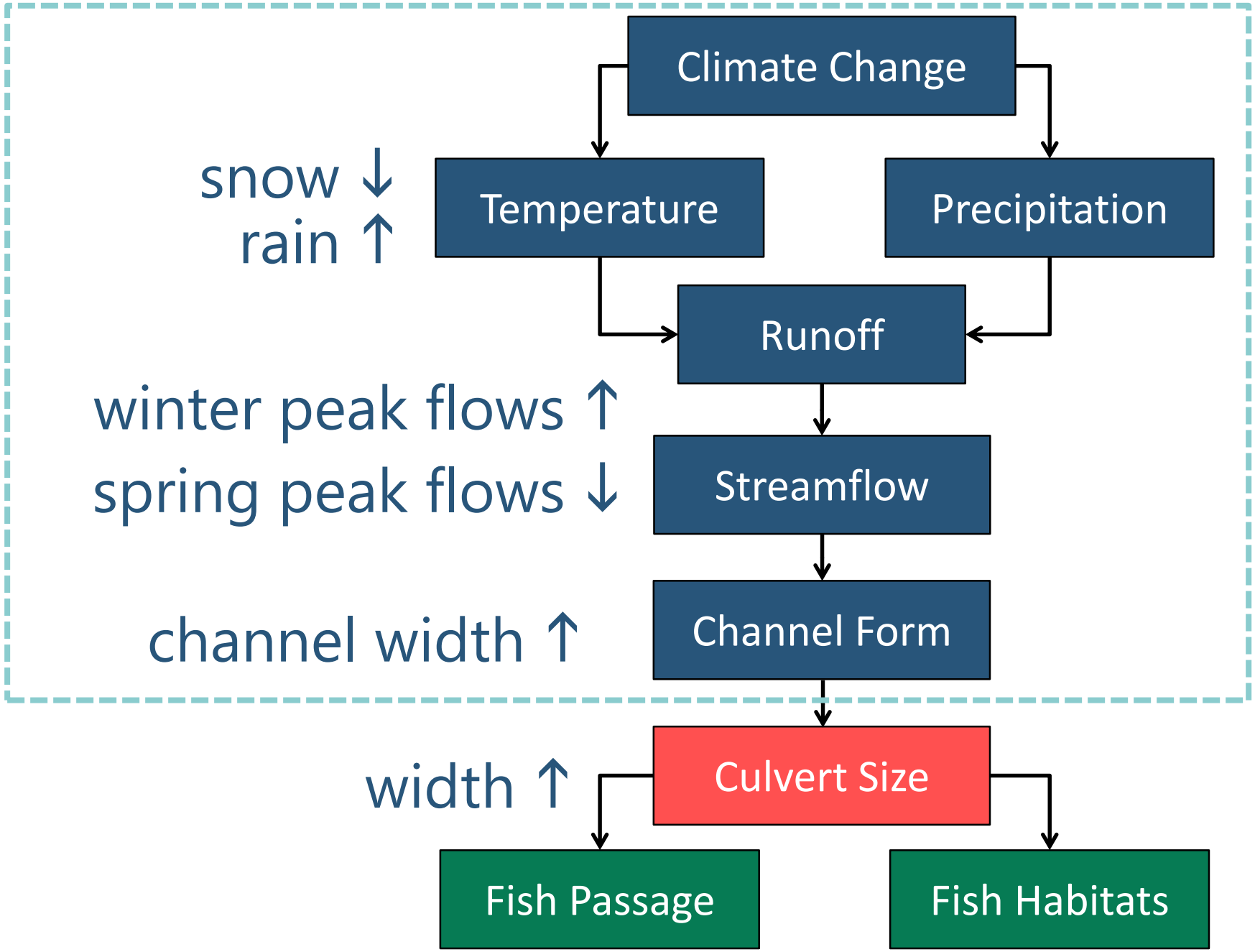


Structure Width Matters

Future Climate and Culverts

Future changes in climate will cause future changes in stream morphology

Projecting Future Changes in Bankfull Width Due to Climate Change


Climate Change
snow ↓
rain ↑
Temperature
Precipitation
Runoff
winter peak flows ↑
spring peak flows ↓
Streamflow
channel width ↑
Channel Form
width ↑
Culvert Size
Fish Passage
Fish Habitats

Modelling Process

UW

Global Climate Models
future projections: temp. and precip.

Hydrologic model projects runoff

WDFW

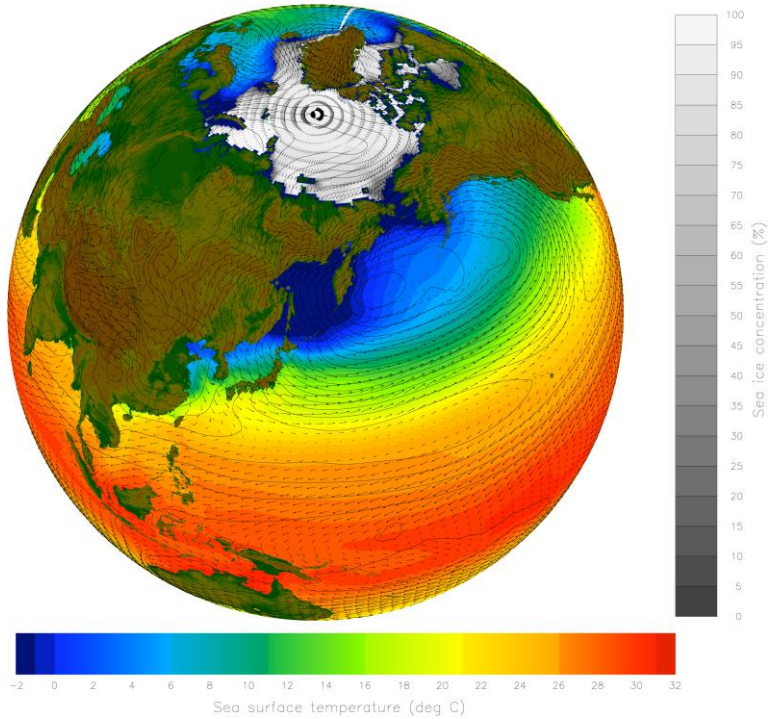
Estimate bankfull flow

Predict bankfull width

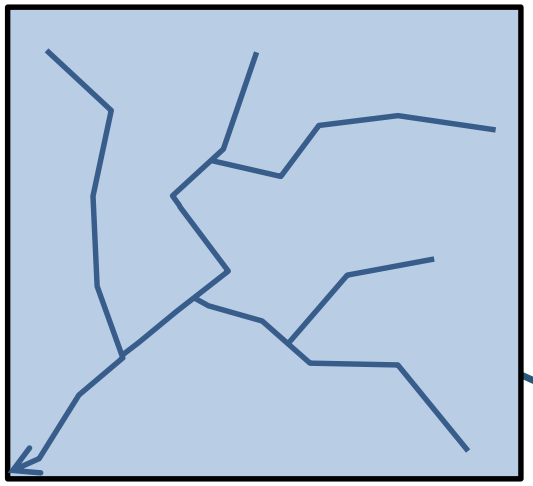
Global Climate Models

- Projections from 10 independent models
- 1 global emissions scenario: moderate A1B
- Down-scaled and bias-corrected for PNW
- Climate projections for 2 future time periods

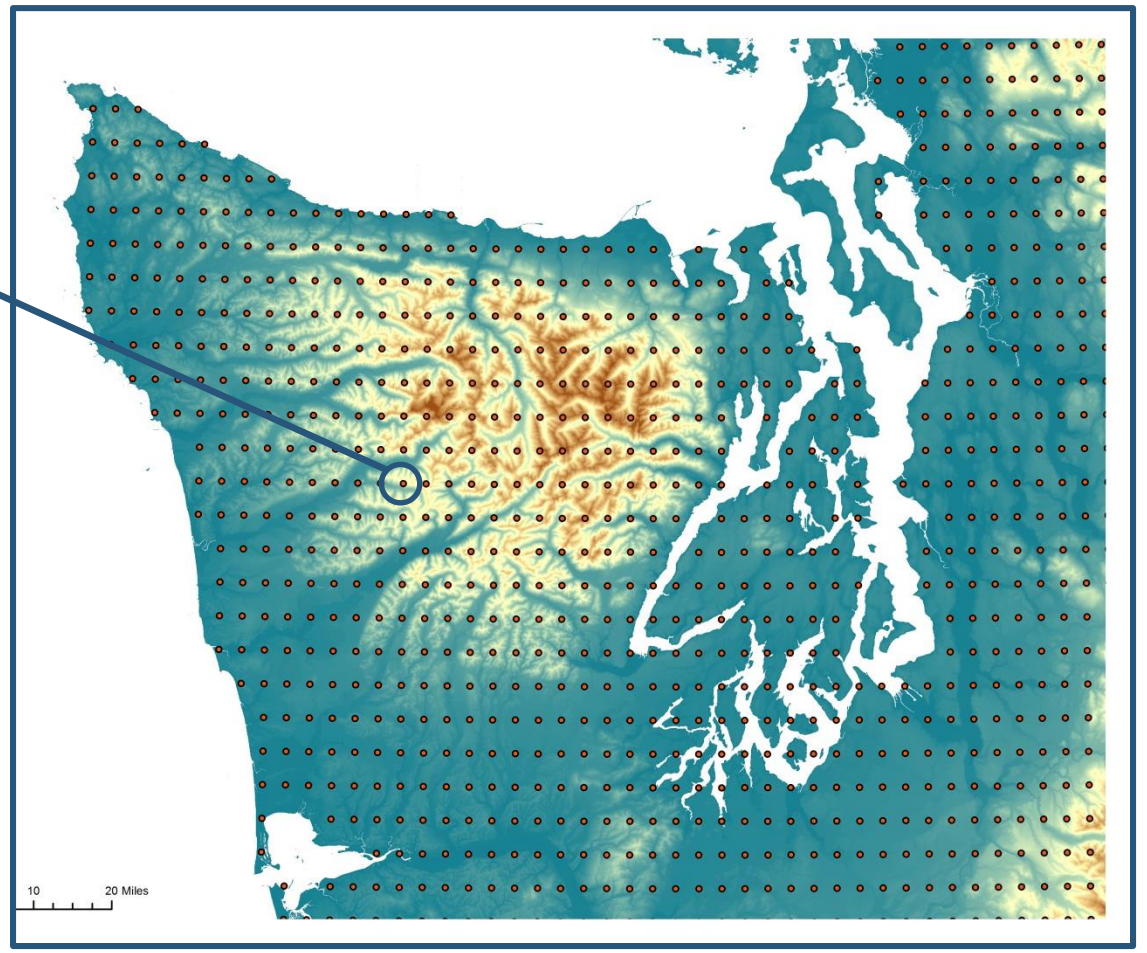
  2030–2059 (2040s)
  2070–2099 (2080s)



BFW Changes by Grid Cells

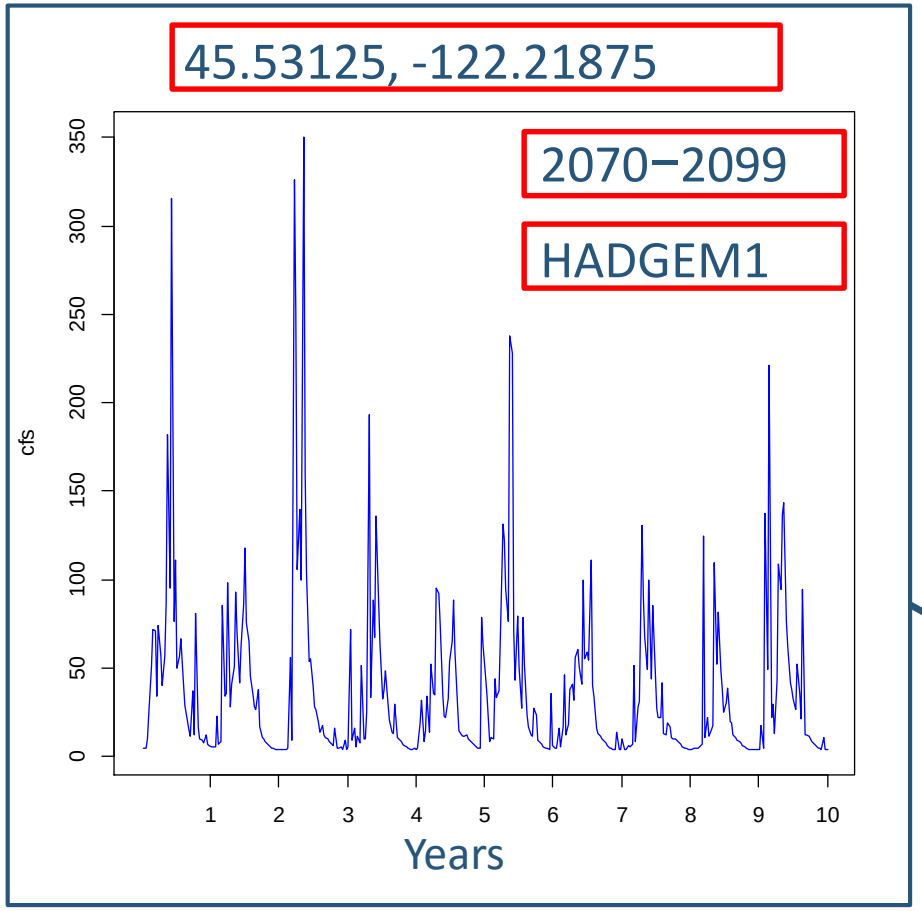


1/16 degree
≈ 5 x 7 km
≈ 12.6 mi²

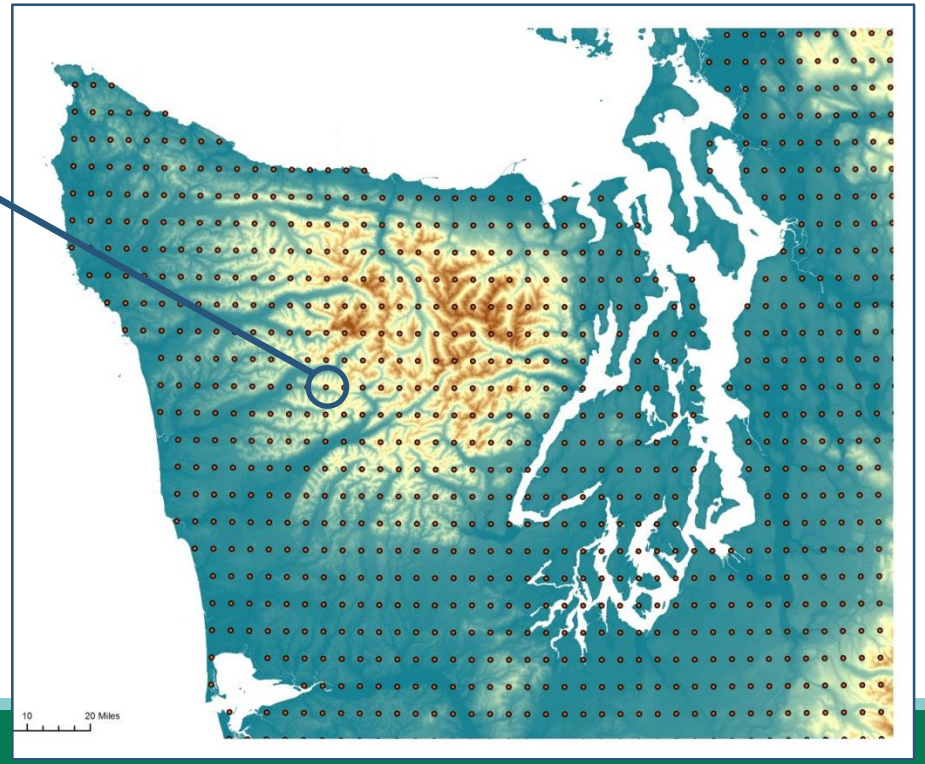


5,270 grid cells
in Washington

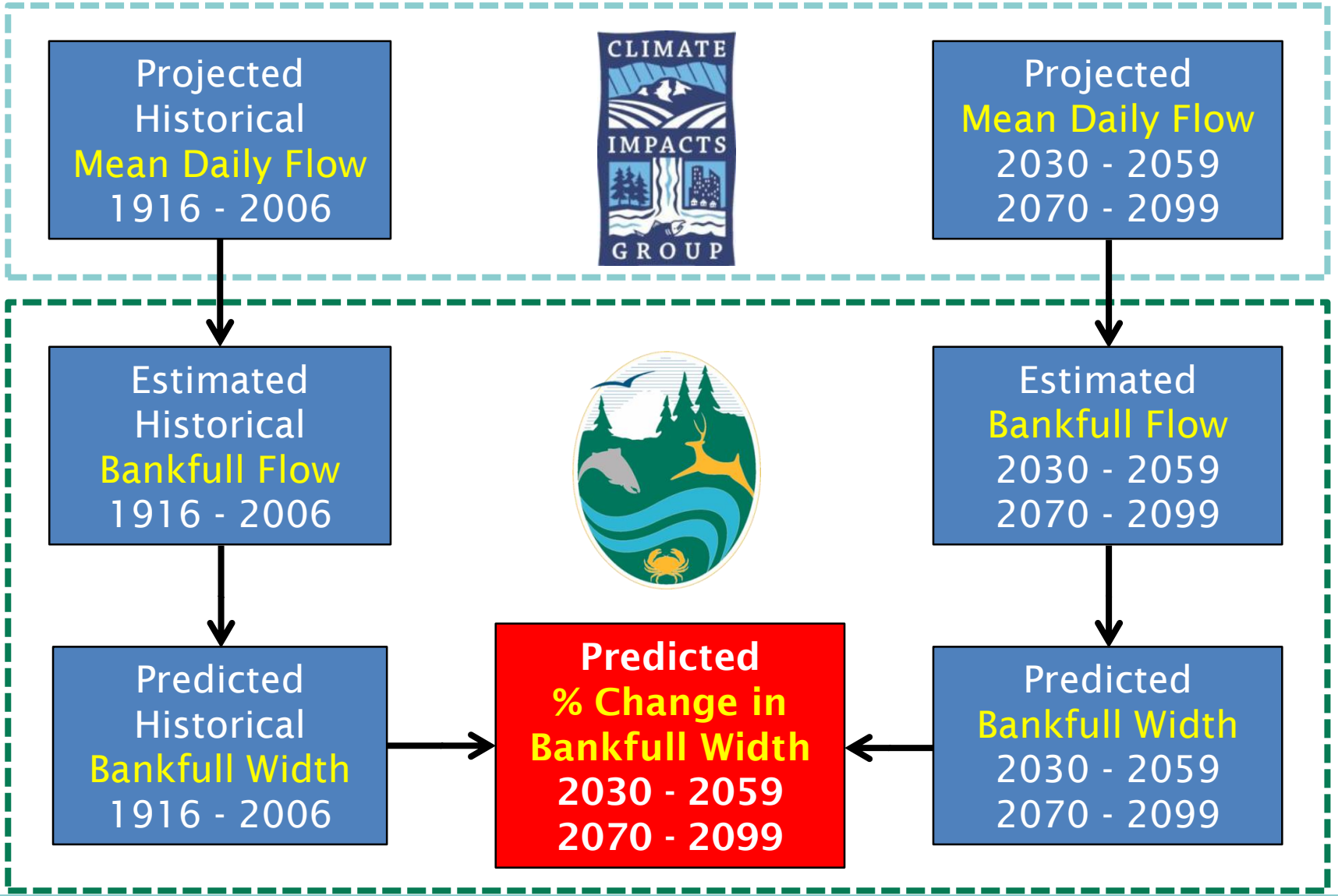
Model Output



- 10 models
- future period (2080s)
- historical period



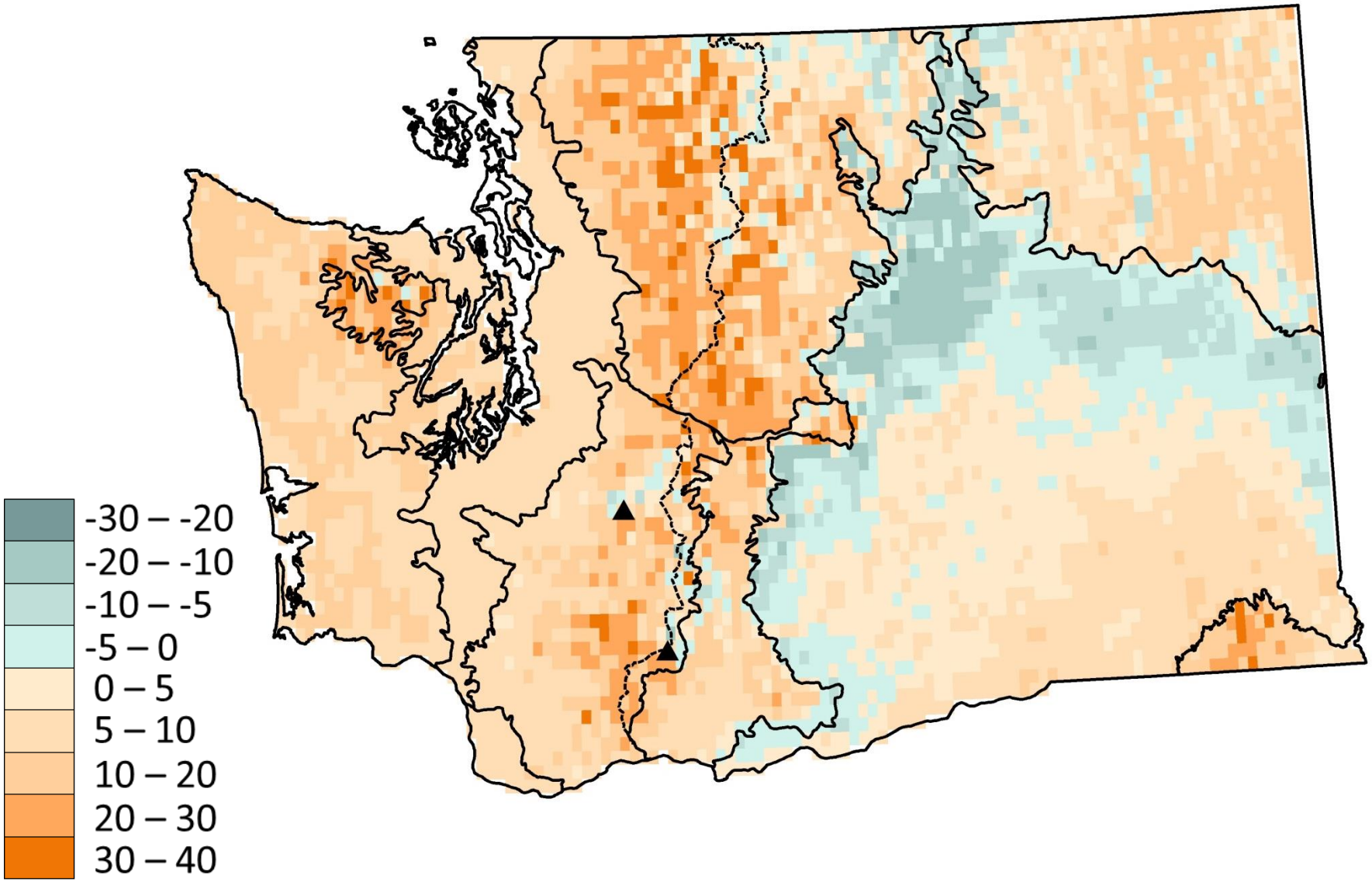
% Change in Bankfull Width



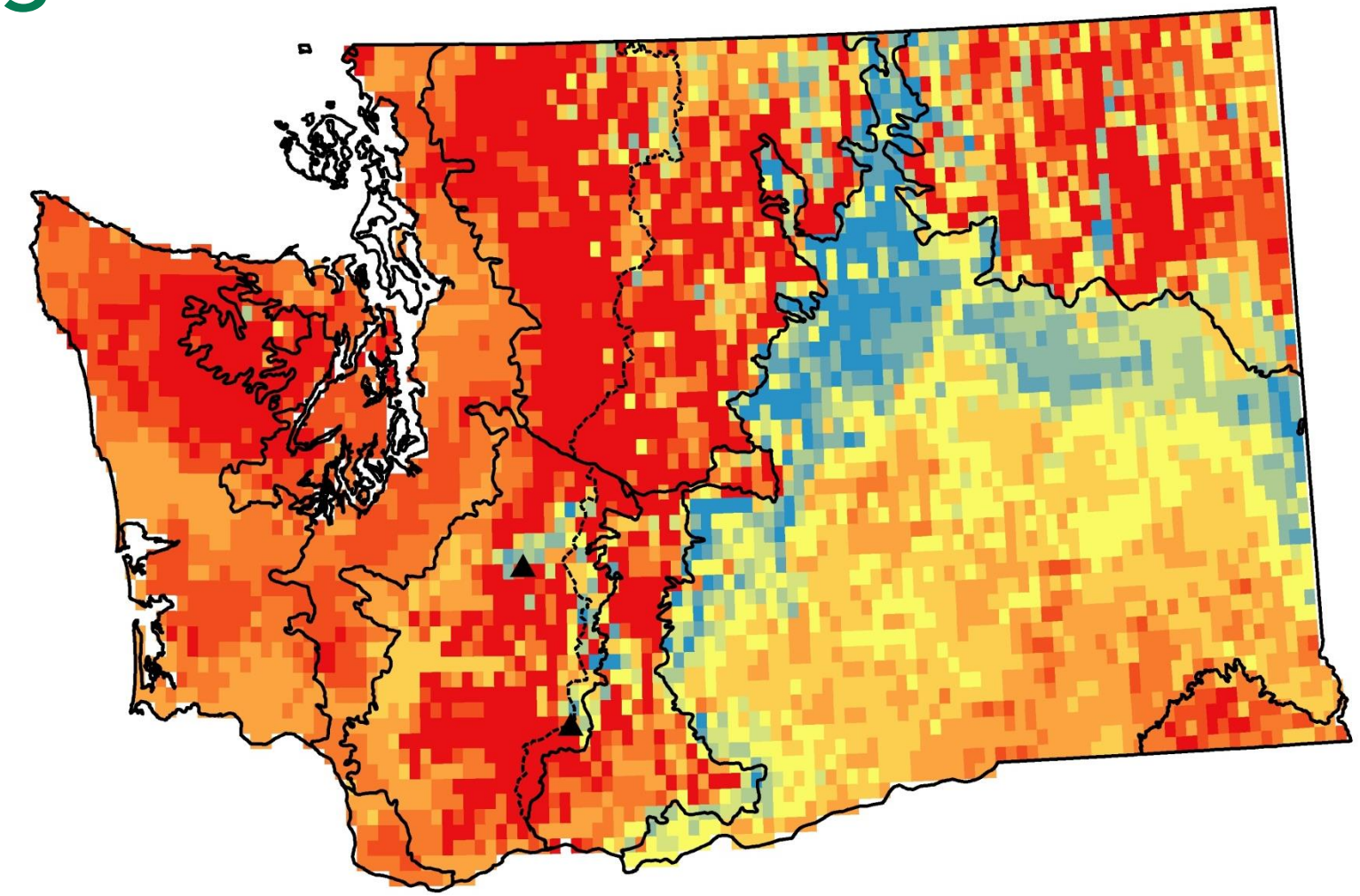
Projected Changes in BFW

- Where?
- How large?
- How likely?

Mean % Change in BFW



Model Agreement



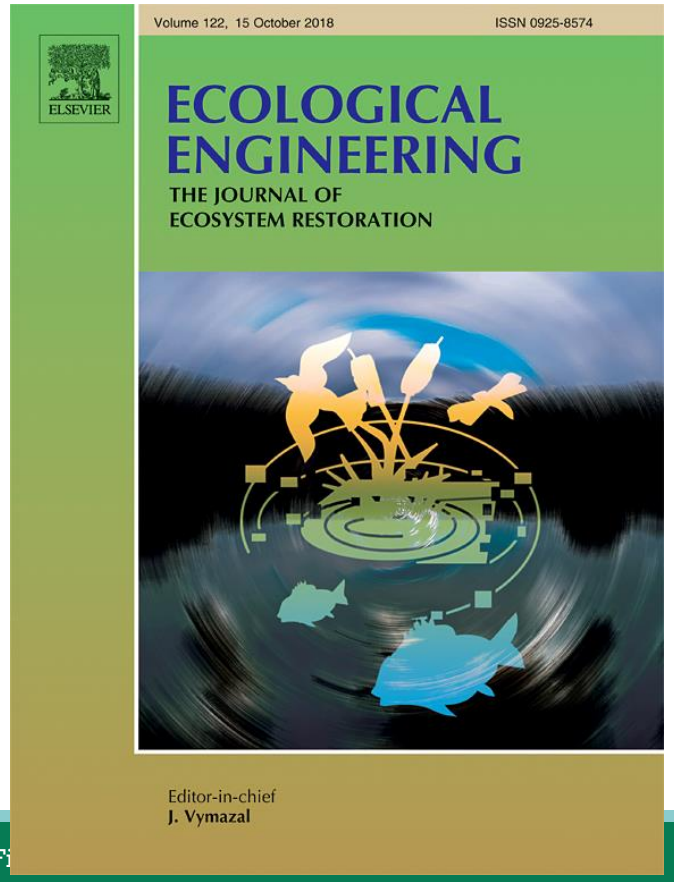
Number of models projecting BFW ↑:

Research paper

Incorporating climate change into culvert design in Washington State, USA

George F. Wilhere[a,*], Jane B. Atha[a], Timothy Quinn[a], Ingrid Tohver[b], Lynn Helbrecht[a]

[a] *Washington Department of Fish and Wildlife, 600 Capitol Way North, Olympia, WA, 98501, USA*
[b] *Climate Impacts Group, University of Washington, John Wallace Hall, 3737 Brooklyn Ave. NE, Seattle, WA, 98105, USA*



Ecological Engineering (2017) vol. 104, pp. 67-79

Voluntary Actions

Washington Department of FISH and WILDLIFE

Culvert Design: Planning for Climate Change

...design affects
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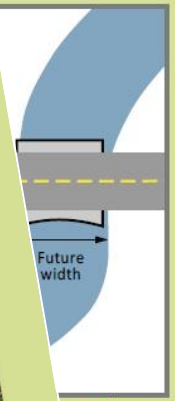


...crease in

...oblem

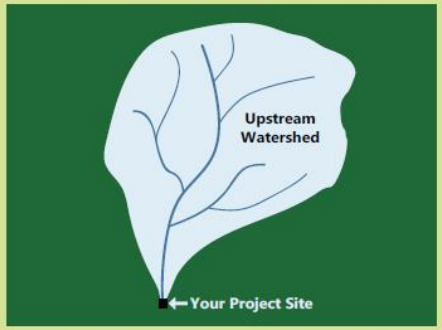
...itat

...costs

How to design your project for the future

Climate change will affect each stream differently. We can estimate channel width for your project site in 2045 and 2085 and explain how this may affect your project.

How do we predict channel width?



WDFW can assess the likelihood of stream channel changes at your project site by predicting future stream flow above your site.

With this information, you can make an informed decision about your project design. This may include installing a wider culvert or bridge.

Learn more about culverts and climate change at **www.wdfw.wa.gov**.

Benefits of planning ahead

It is possible to consider climate change in project design to ensure natural stream conditions will continue into the future.

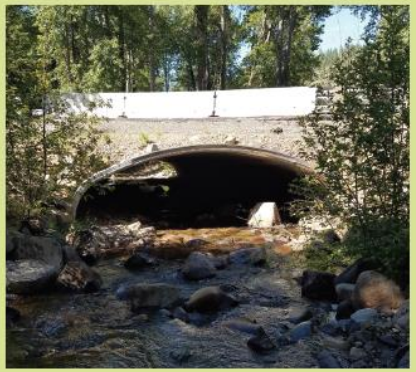
The benefits of building culverts and bridges to accommodate higher stream flows begin immediately.

Reduced flood risk - culvert passes flood flows and large debris

Fish passage - allows passage of all fish and aquatic organisms

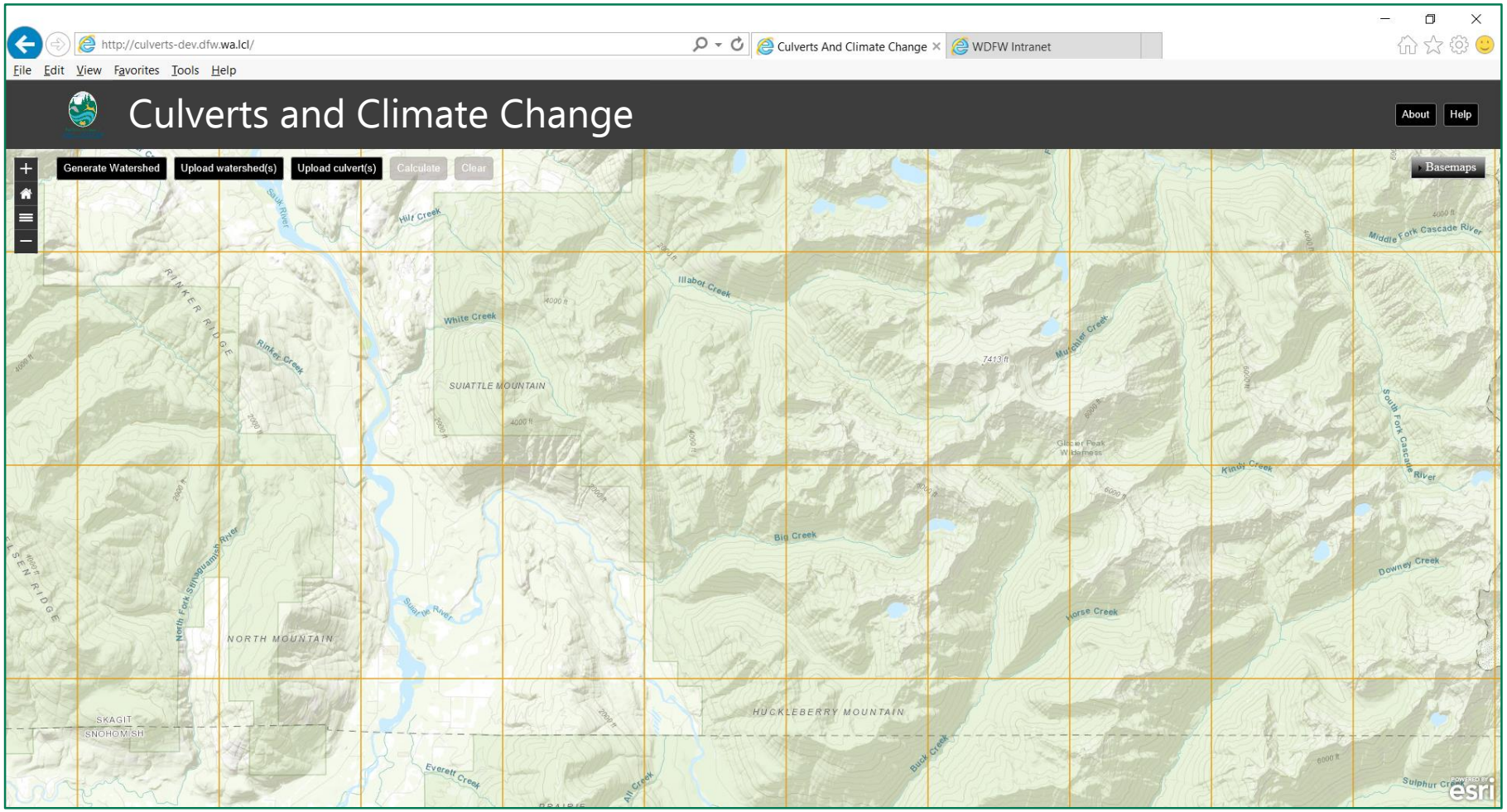
Healthy habitat - maintains natural stream processes

Cost savings - reduces future maintenance and repair costs



Climate Adapted Culverts Web-Application

Habitat Program Internet Site



Projections of future % change in

BFW and 100-year flood discharge

Internet Site Output

Future Projections for Climate-Adapted Culvert Design

Project Name: culvert on Polson Camp Rd

Stream Name: Big Creek

Drainage Area: 269 ac

Projected mean percent change in bankfull flow:

2040s: 16.1%

2080s: 21.4%

Projected mean percent change in bankfull width:

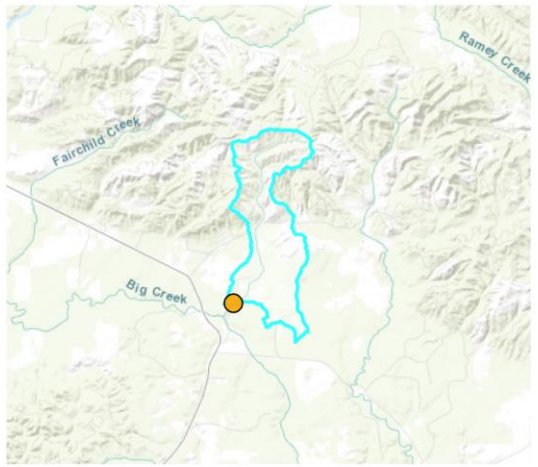
2040s: 7.8%

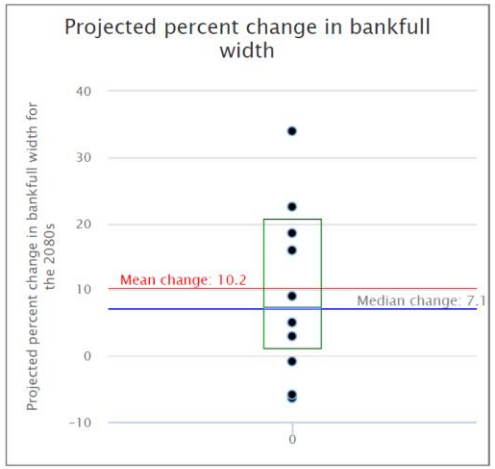
2080s: 10.2%

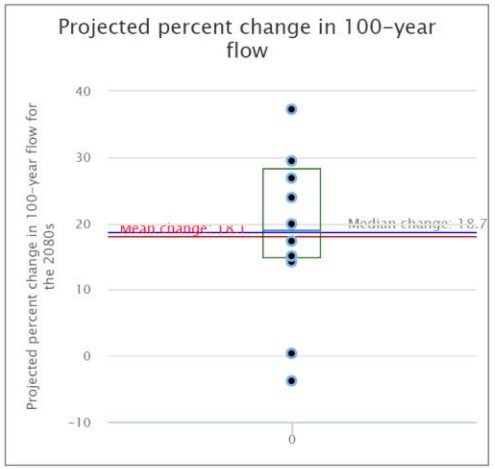
Projected mean percent change in 100-year flood:

2040s: 9.8%

2080s: 18.1%







Black dots are projections from 10 separate models

The Washington Department of Fish and Wildlife makes no guarantee concerning the data's content, accuracy, precision, or completeness. WDFW makes no warranty of fitness for a particular purpose and assumes no liability for the data represented here.

Internet Site Output

project location

drainage area

bankfull flow

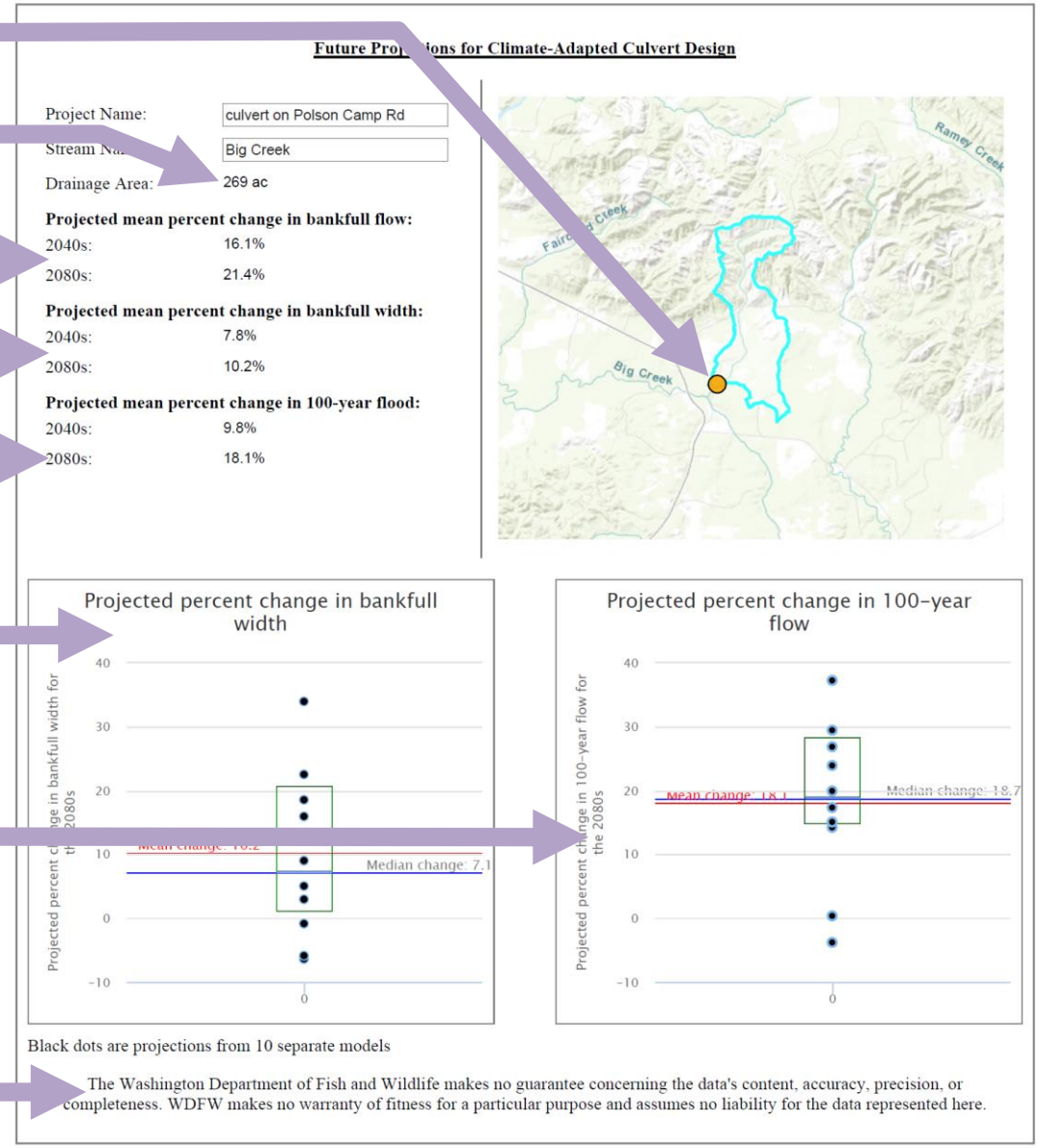
bankfull width

100-year flood

bankfull width

100-year flood

disclaimer



Current Work

- Updated projections
  - Newer climate models
  - Better landcover in hydrologic model
  - Smarter
- Improved web app
  - Met with user group
  - Better function and usability
- Continued technical assistance
  - Rule-making process
  - Web-application and interpretation

The Bottom Line

- Bankfull width is projected to increase in many watersheds due to climate change.
- Many culverts are at risk of being undersized.
- We now have a spatially-explicit, state-wide assessment of the magnitude and likelihood of change in bankfull width.
- We have developed a framework for addressing uncertainty inherent in climate change projections.

Consideration for rule-making

What factors should WDFW consider when weighing criteria and standards for requiring a wider culvert to accommodate future flows, thereby avoiding premature replacement of the structure due to climate change?

Questions?

To Provide Feedback:

FishPassageRules@dfw.wa.gov

Website:

https://wdfw.wa.gov/species-habitats/habitat-recovery/fish-passage/rule-making