The legislature appropriated funds for drought response during the 2015-2017 biennium. WDFW estimated we would need $ 1.2 million for drought response as follows:

Fish in nature

Adult fish passage intervention: Upstream migration can be delayed or blocked because flows are too low for fish to swim. Fish congregate in pools and deplete available oxygen, are vulnerable to illegal harvest, and can die if conditions aren't remediated. Example solutions include 1) salvaging dead or dying fish (removing them); 2) trapping adult fish and hauling them upstream or to a hatchery facility; 3) modifying a blocked channel to restore passage. WDFW last performed these activities during the 2005 drought; cost estimates for 2015 are based on a range of individual–project costs from $2,500 to $25,000. We estimated 10 such projects statewide at $6,290 each. We are watching literally every stream in Washington for occurrence of these problems.

Fisheries Closures: When water temperatures get too high, or pools are too small to accommodate fish comfortably, fisheries can be closed to reduce stress on fish returning to spawn. Closures so far in 2015 include Sol Duc River near the hatchery, Grande Ronde River, and a summer chinook closure in the mainstem Columbia.

Fish in Hatcheries

Disease treatments: Fish are more vulnerable to disease when water temperatures are warm. Depending on the disease, treatments can include antibiotic fish food or treating hatchery water with formalin or salt. Treatments due to warm hatchery water supply are starting two months earlier than originally anticipated.

Aerators and re-circulation pumps: Many hatchery facilities do not have backup water supplies. When flow is reduced and temperatures are warm, hatcheries can keep fish alive by recirculating water and increasing the amount of oxygen in the water. WDFW rents or purchases pumps, and oxygenate using compressed air tanks or using low-tech diffusion boxes that WDFW fabricates. WDFW is also considering renting large-scale water chillers, which are an expensive solution.

Pumping costs: For hatcheries having groundwater or surface water backup water supplies, costs for additional electricity to pump water supply from these sources is significant to WDFW.

Dissolved oxygen meters: WDFW purchased new oxygen meters so that more hatcheries can monitor water for oxygen levels.

Broodstock collection: Most hatcheries have structures through which adult fish return to the facility. At low flows, the access to these structures can be blocked. This means hatchery staff must collect adult fish from a location off the hatchery grounds. The labor costs to pursue broodstock can be significant to WDFW in a drought year.

Water Supply improvements: WDFW is reviewing all hatchery facilities to ensure that water supply can be sustained over low flow months in 2015. Work ranges from reconstructing water intake plumbing to well system renovations to performing maintenance dredging at water intake channels. These are activities that are already scheduled for future work, but have become urgent because of anticipated conditions in 2015. Unfortunately, not all water supply deficits can be addressed this summer, so hatchery managers are planning for fish transfers to other facilities,

early releases of some fish, and other strategies for reducing the number of fish needing to be sustained at each facility.

Maintain water access

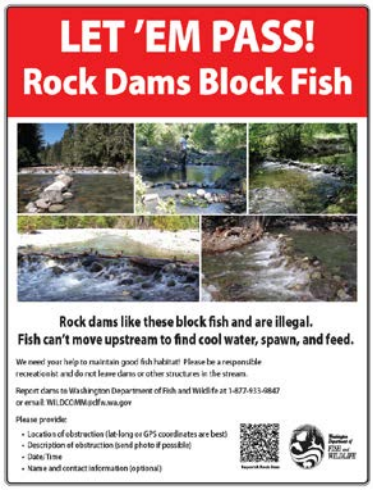
WDFW owns about 700 water access sites statewide. WDFW seeks to maintain access at three-to-four sites in 2015, which will be chosen out of a list of 10 sites initially prioritized for this work. These sites become hazardous for users under low flow or low lake elevation conditions, so ramps are extended and drive surfaces renovated. Ramps on the finalists list for consideration in 2015 include: Mattoon Access (Kittitas County); Granger Pond Access (Yakima County); Silver Lake Access (Whatcom County); Campbell Lake Access (Skagit Basin); and Offut Lake Access (Thurston County). Ramps that can't be fixed this year will be closed when their use becomes unsafe.

Water right transfer assistance

WDFW is planning to review irrigation activities and other water use on agency lands that might be foregone in 2015 so water can contribute to enhanced stream flows.

Signage

WDFW posts two types of signs during low-water events. At water access sites, WDFW posts signs warning boaters of hazards that are uncovered at low water. WDFW also posts signs reminding river recreationists that leaving rock dams across rivers can impede or prevent fish migration during low stream flows, and are illegal.



Fish Salvage

Fish stranding and kills are already occurring throughout Washington. WDFW will soon post a citizen drought observation reporting mechanism to report distressed or dead fish and fish migration blockages. Any fish salvage work must be undertaken through direction of WDFW staff.

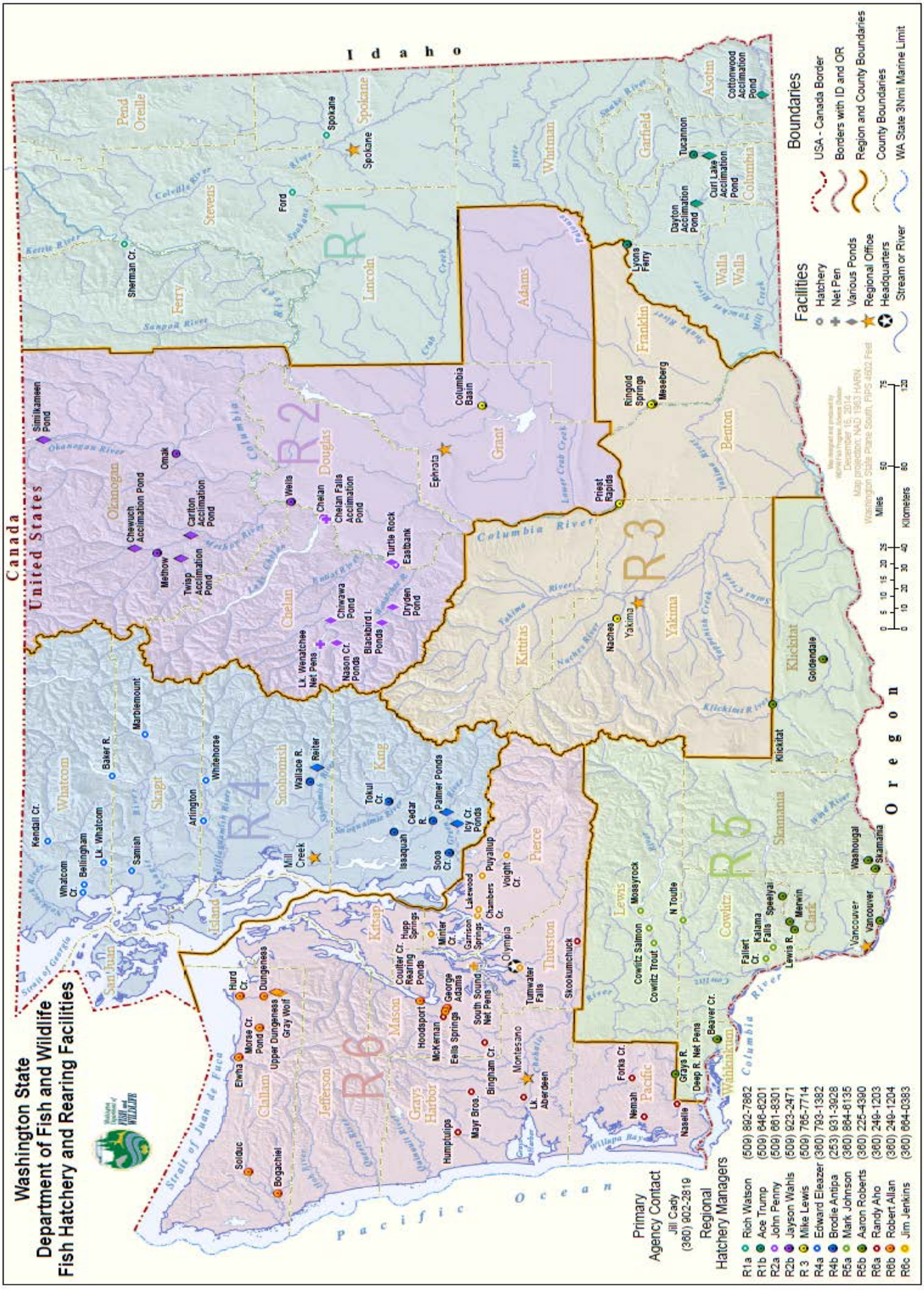
For Further Information:

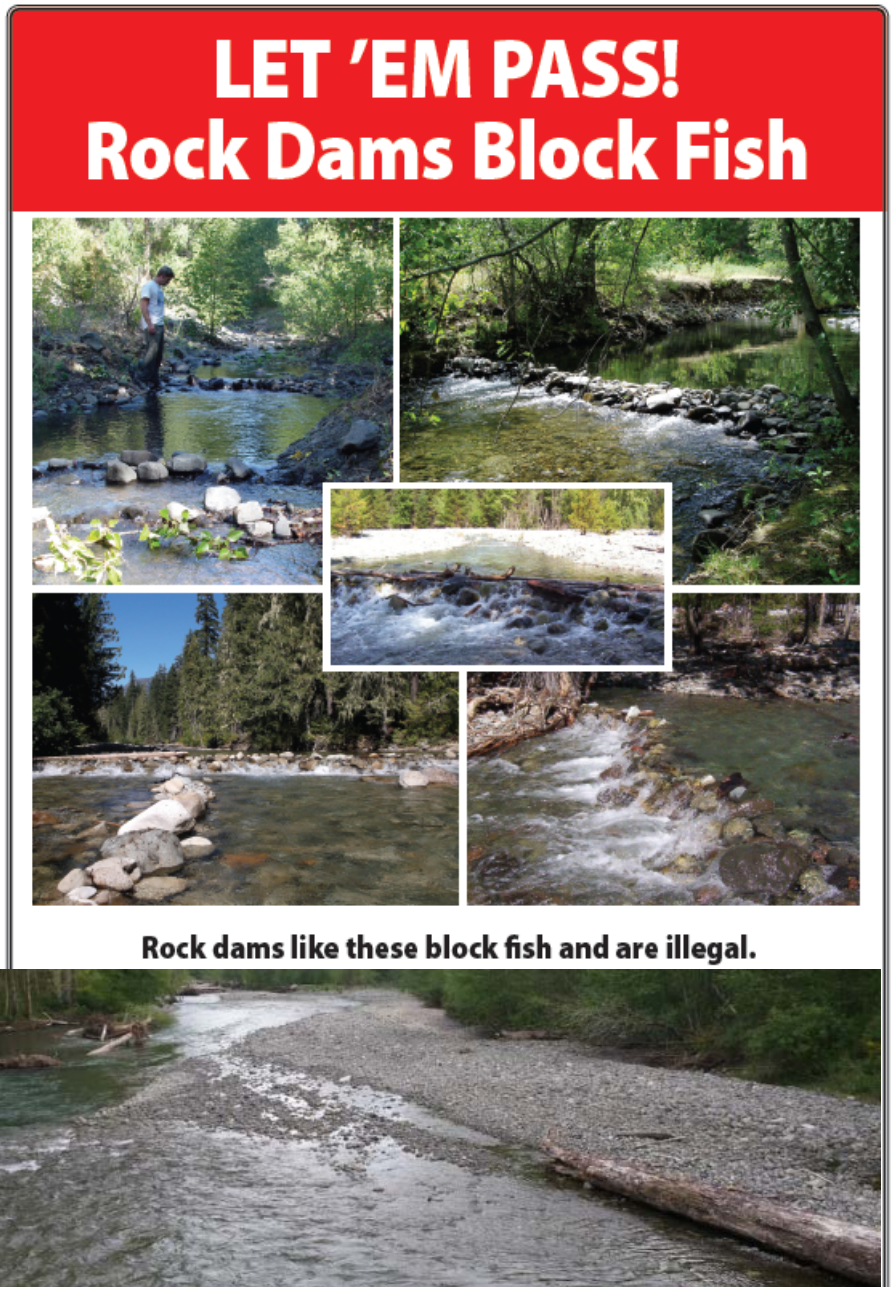
WDFW's Drought Response 2015

Ecology's "Washington Drought 2015"

Contact WDFW Drought Coordinator Teresa Scott at teresa.scott@dfw.wa.gov or (360) 902-2713.

Washington Department of Fish and Wildlife Fish Hatchery & Rearing Facilities



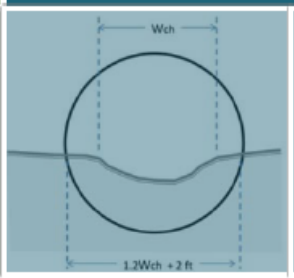


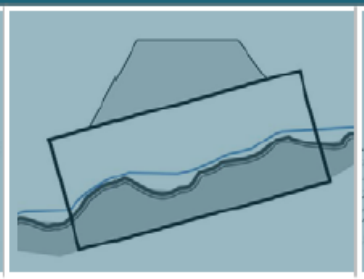
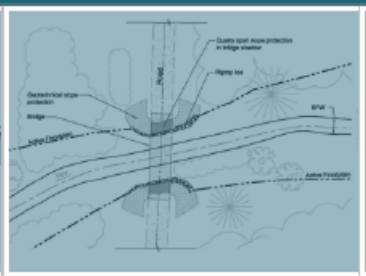
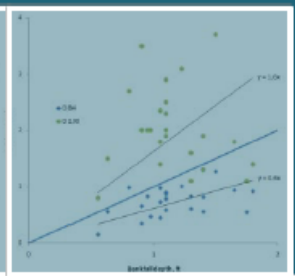
Above: Dungeness River at Old Olympic Hwy on April 16, 2015
Below: Dungeness River at Old Olympic Hwy on July 3, 2015

Above: In 2005 Box Canyon Creek goes sub-surface before reaching Lake Kachess.
Below: Box Canyon Creek channel modification 2005 (flume) connects creek with lake.

Above: Pushing new boat ramp planks into place (Clear Lk, Thurston County)
Below: Completed ramp (Williams Lake, Spokane County) July 2005

2013



Water Crossing Design Guidelines

Washington Dept. of Fish and Wildlife

Introduction to
2013 Water Crossing Design Guidelines

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360-902-2547

WASHINGTON'S AQUATIC HABITAT GUIDELINES (AHG) PROGRAM

An Integrated Approach to Marine, Freshwater, and Riparian Habitat Protection and Restoration

2013 Water Crossing Design Guidelines

Washington Department of Fish and Wildlife

Principal Author:
R.J. Barnard

Contributing Authors:
K.M. Bates
P. Brooks
B. Heiner
J. Johnson
J.P. Klavas
D.C. Ponder
P.D. Powers
P.D. Smith

Published by:
Washington State Aquatic Habitat Guidelines

- 2009 Effectiveness Study:
- Randomly selected 110 Puget Sound culvert HPAs from 1998, 2003, and 2007
- 33 Excluded
- 77 Analyzed
- 23 of 77 (30%) Barriers
- Reinforced the need for continued guidance.

Price, D. M., T. Quinn, et al. (2010). **Fish Passage Effectiveness of Recently Constructed Road-Crossing Culverts in the Puget Sound Region of Washington State.** North American Journal of Fisheries Management

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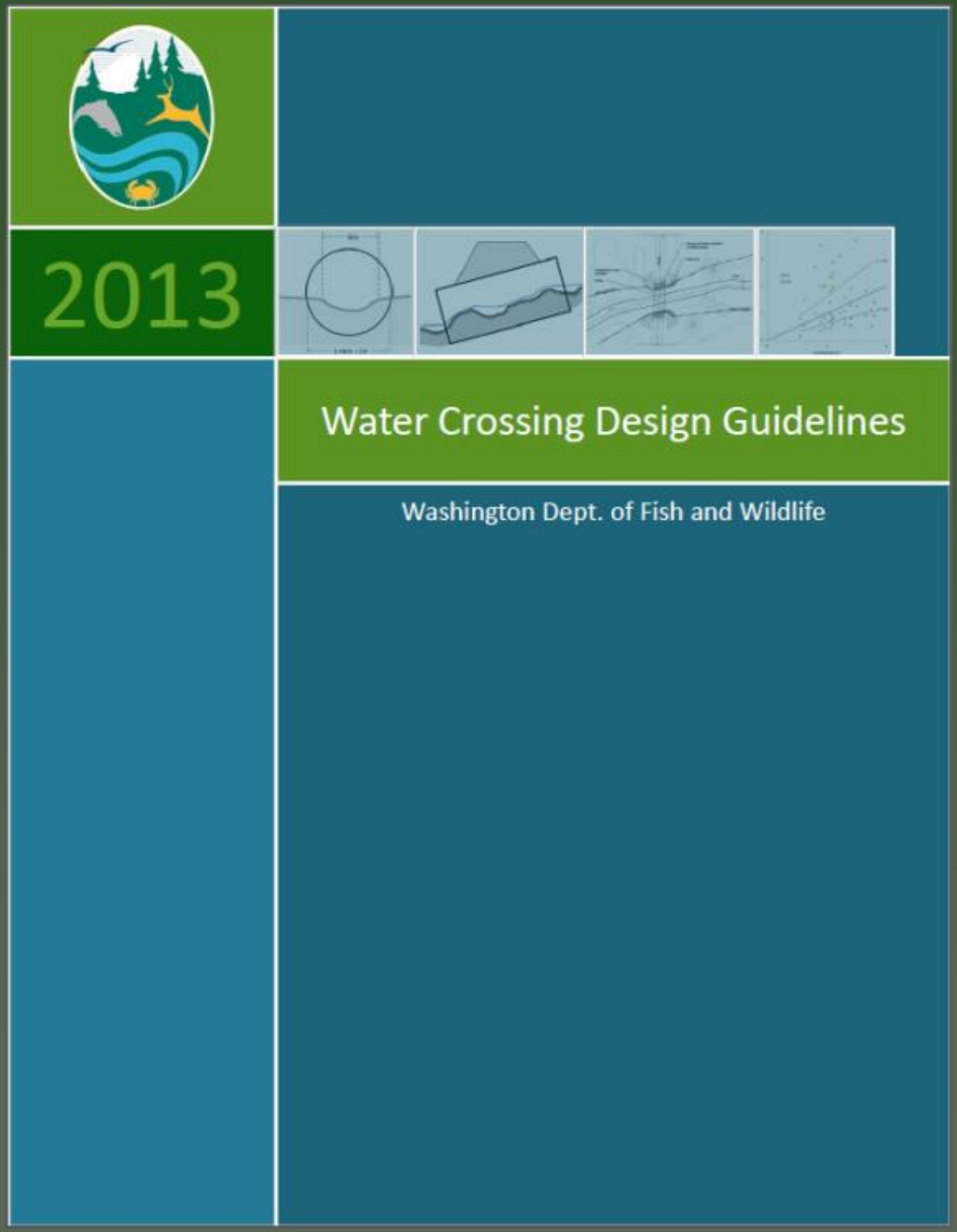
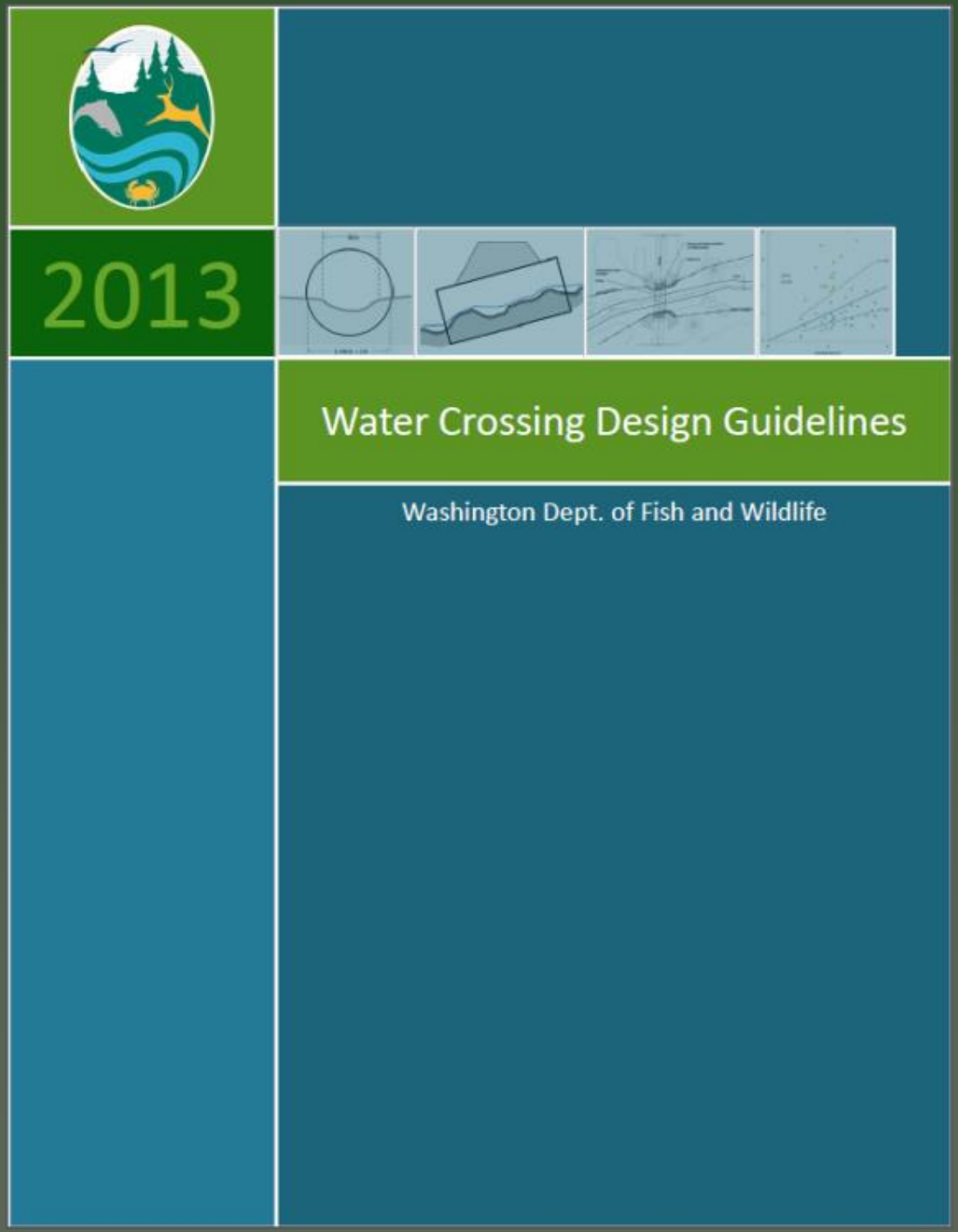


- 4 years
- 5 drafts
- Widely reviewed
  - WSDOT
  - DNR
  - Ecology
  - RCO
  - WSACE
  - WFPA
  - FHWA
  - NOAA/NMFS
  - Tribes
- > 1000 comments
- SEPA complete 5/3/13



- 300+ pages
- Digital only
- Google: “2013 Water Crossing Design Guidelines”
- Google: “Aquatic Habitat Guidelines”
- Search tool WDFW Website: “Aquatic Habitat Guidelines”

- Fish passage barriers
- Old school designs
- Current design methods:
  - Culverts
  - Bridges

Common barrier conditions:

- Outfall drop
- High velocity
- Shallow depth
- Debris
- Turbulence
- Physical conditions

Fish Passage Barrier Culvert Conditions:

Excessive Water Surface Drop

High Velocity

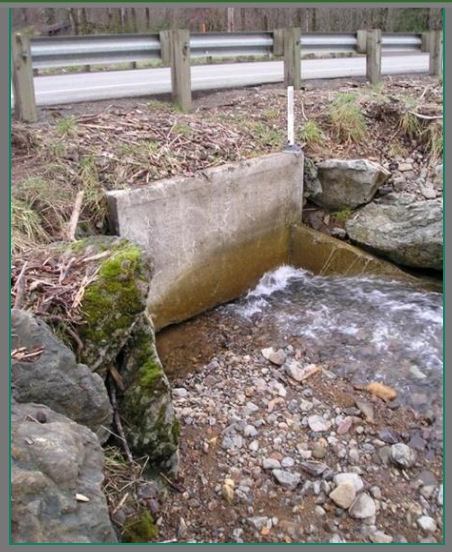
Shallow Water Depth


velocity
drop
turbulence

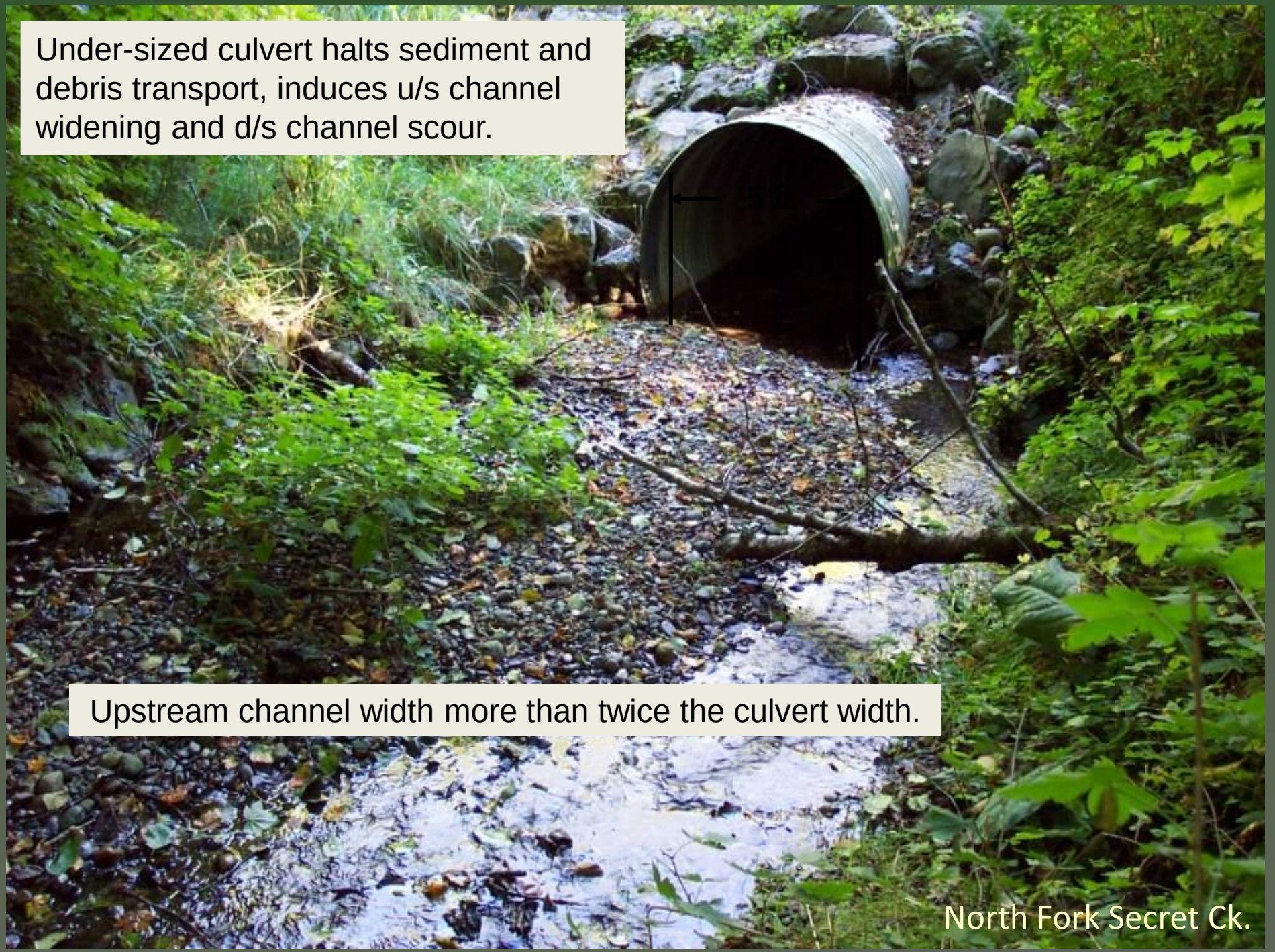
Other Fish Passage Barrier Conditions:

Trash Racks and Flap Gates

Culvert Plugged with Sediment or Debris



Deteriorating Culverts

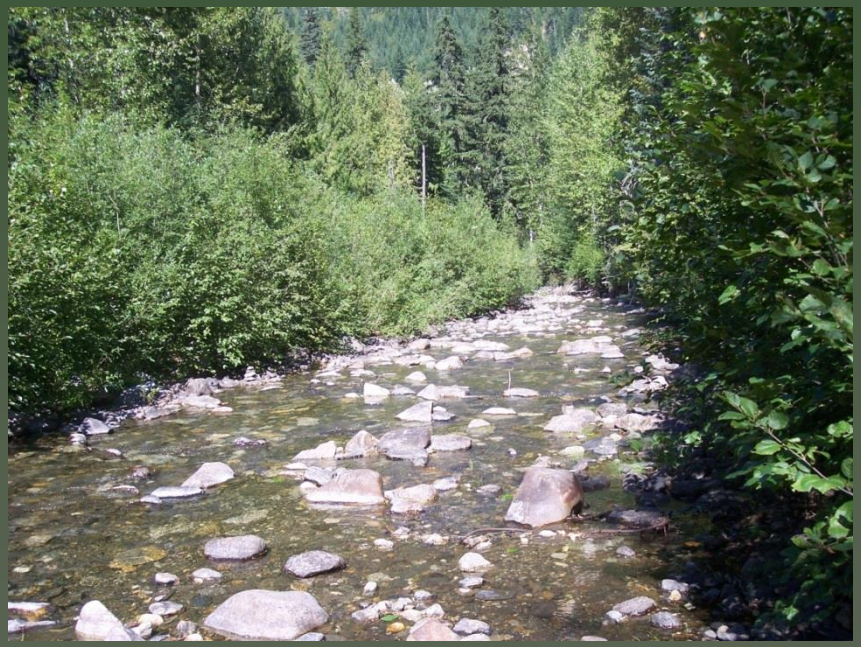

Under-sized culvert halts sediment and debris transport, induces u/s channel widening and d/s channel scour.
5 ft
Upstream channel width more than twice the culvert width.
North Fork Secret Ck.

What is Geomorphic Approach?

- A crossing selection and design process intended to have the least effect on the natural processes that create and support the stream structure in which fish live and migrate.
- Emphasis on continuity of the stream processes.
- Based on assessment of the adjacent channel.
- Applicable for No Slope and Stream Simulations culverts, and bridges

Stream Simulation Example

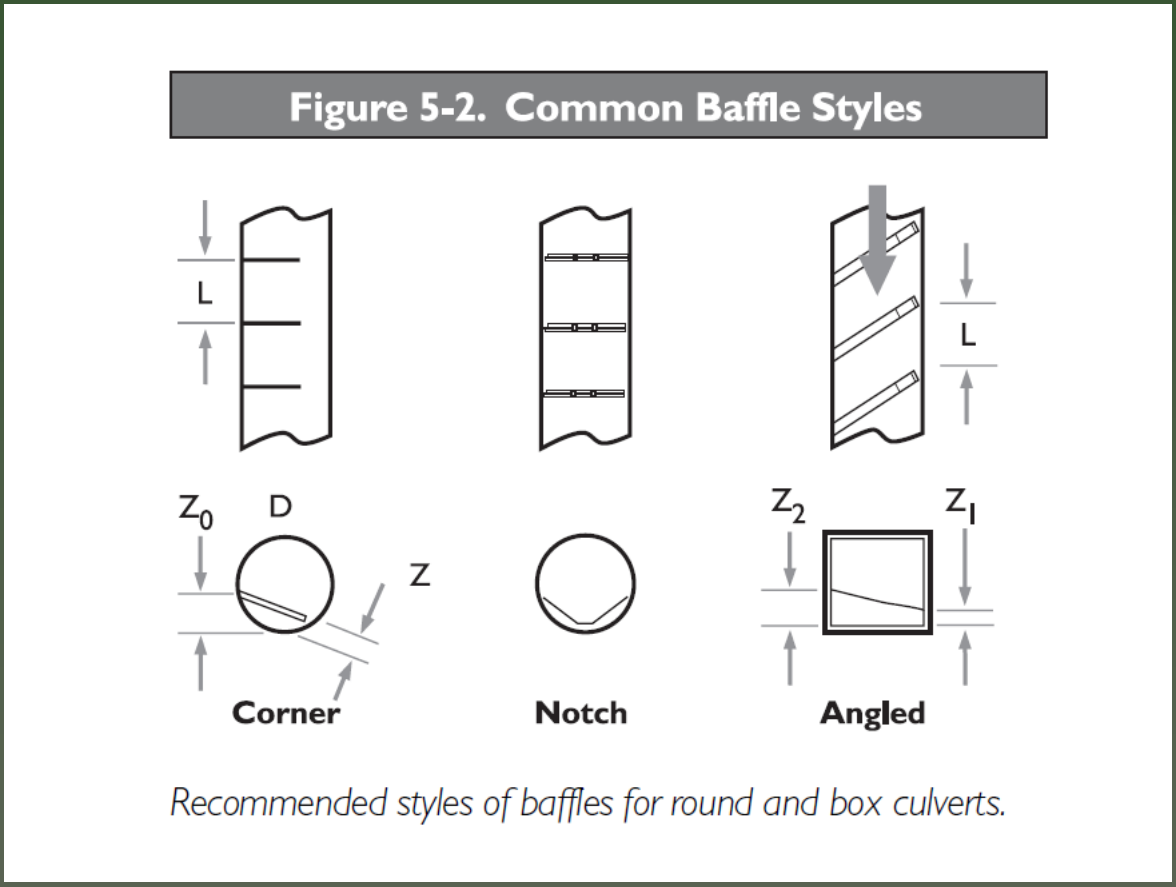
A method used to create and maintain natural stream processes present in the adjacent channel in a culvert.



The premise is that if fish can move through the natural channel they can move through simulated channel in a culvert.

How did we get here?

Hydraulic designs were fun for engineers…



…but hindered fish migration.

Figure 7-1a. Option 1: Downstrean Grade Control

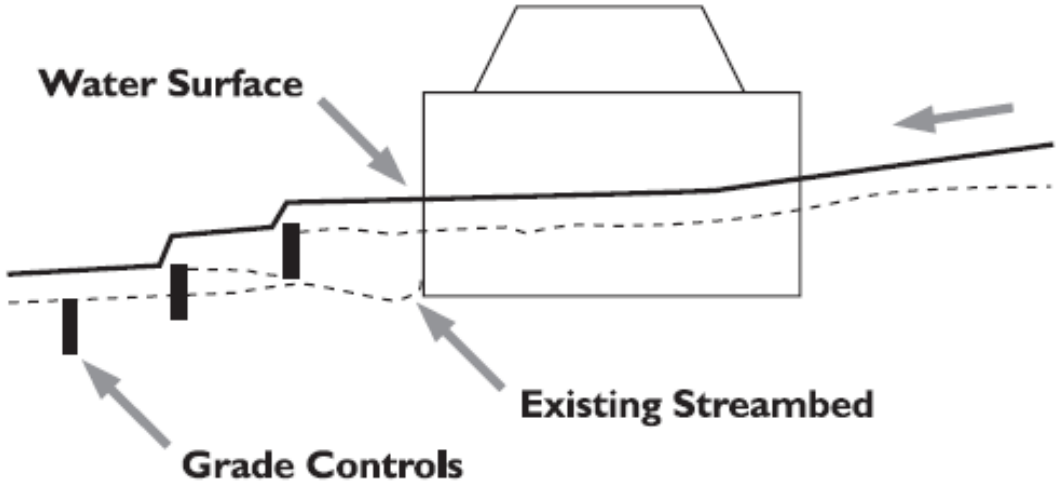
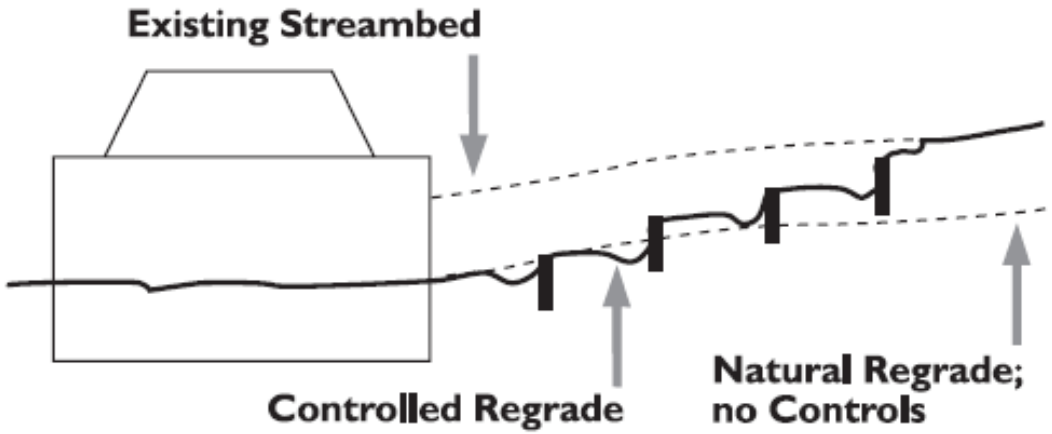


Figure 7-1b. Option 2: Upstream Regrade

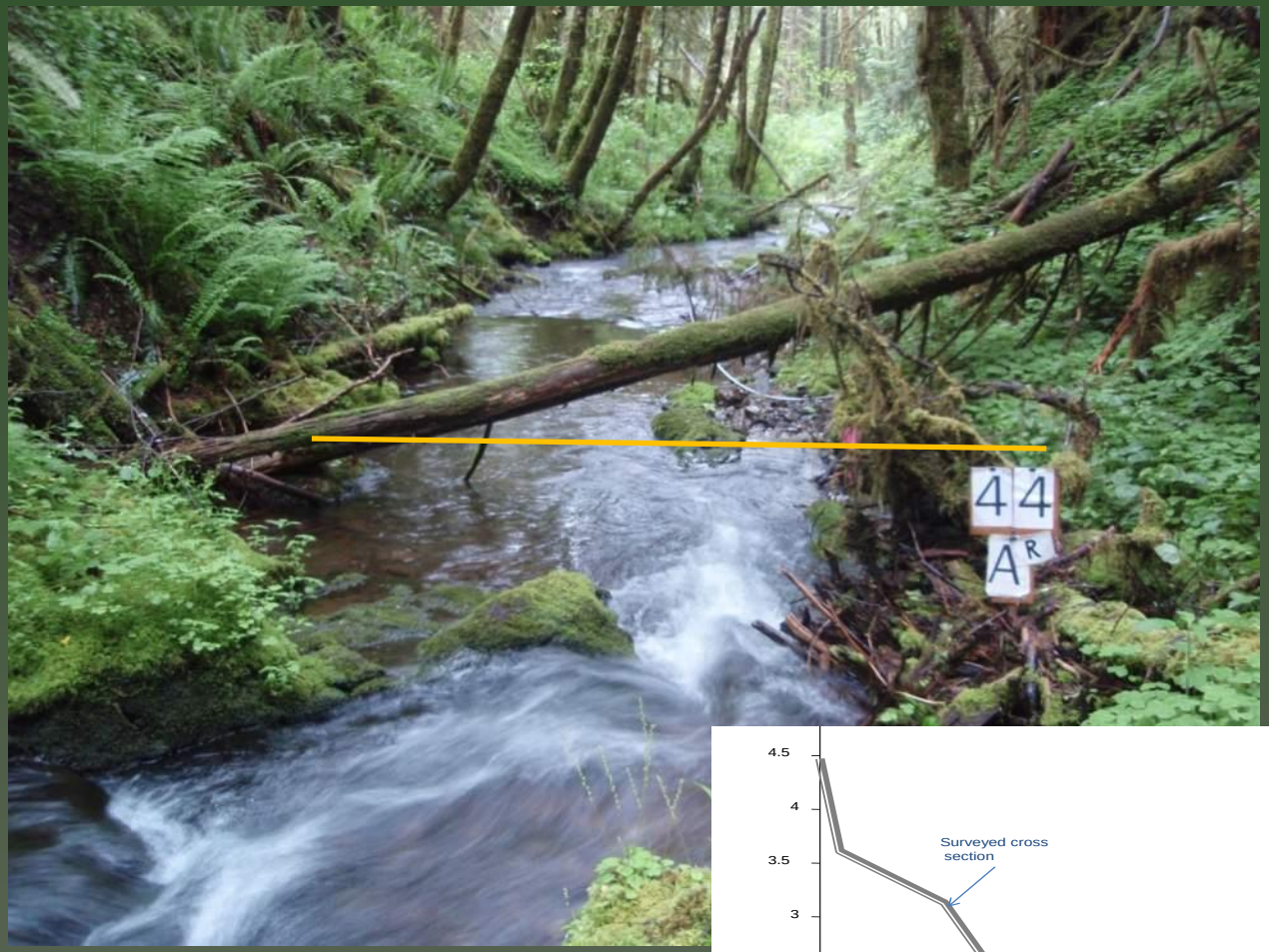


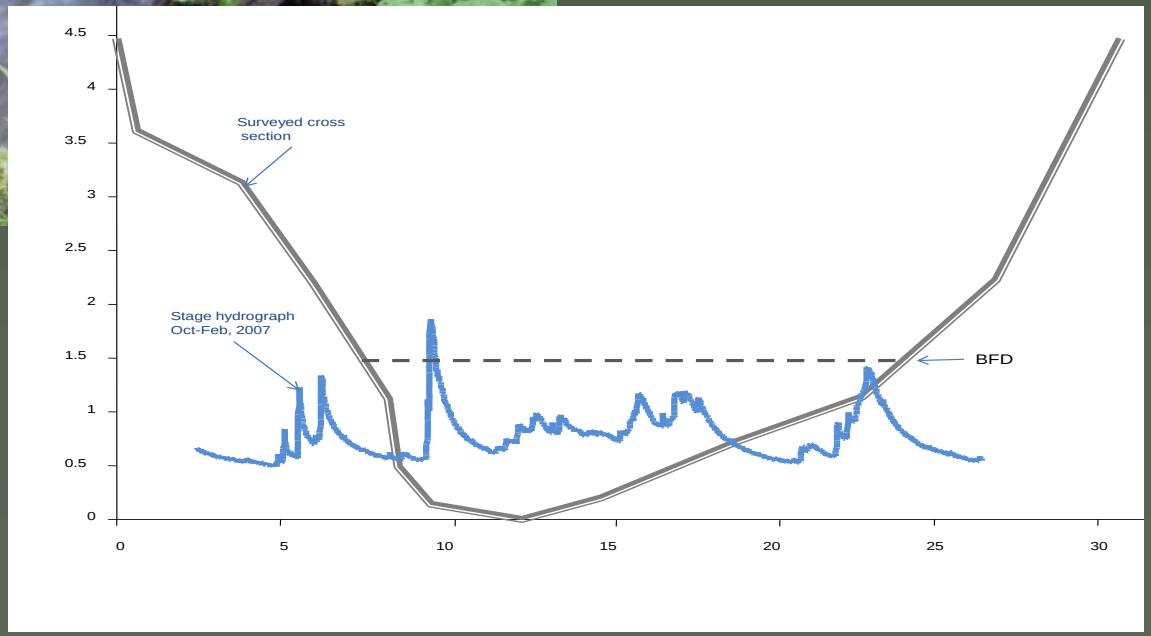
Channel-steepening options.


Trib. to Tibbetts Cr.


Swamp Creek

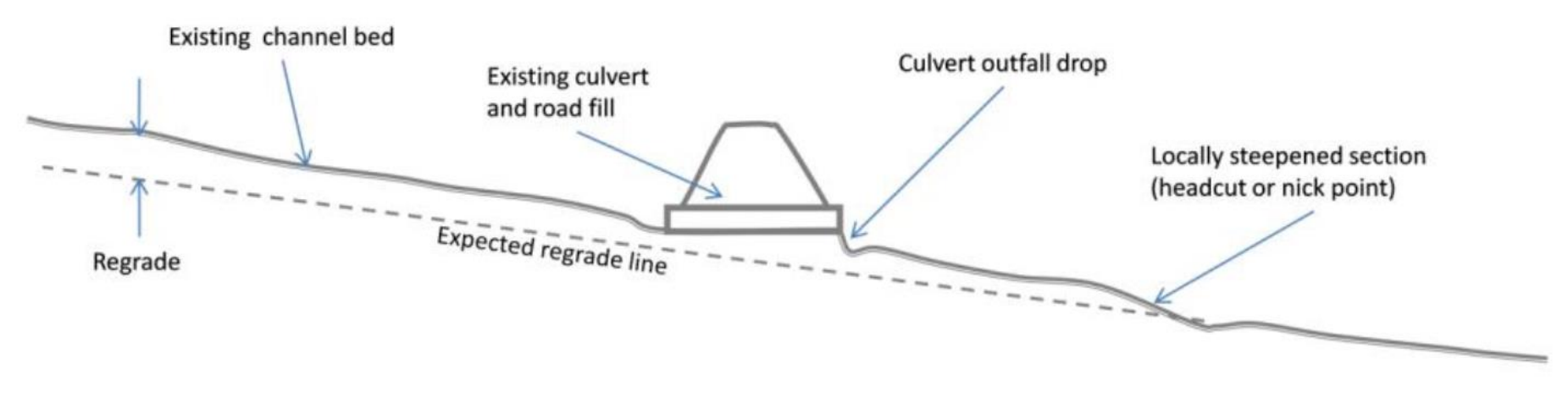

Taylor Cr.





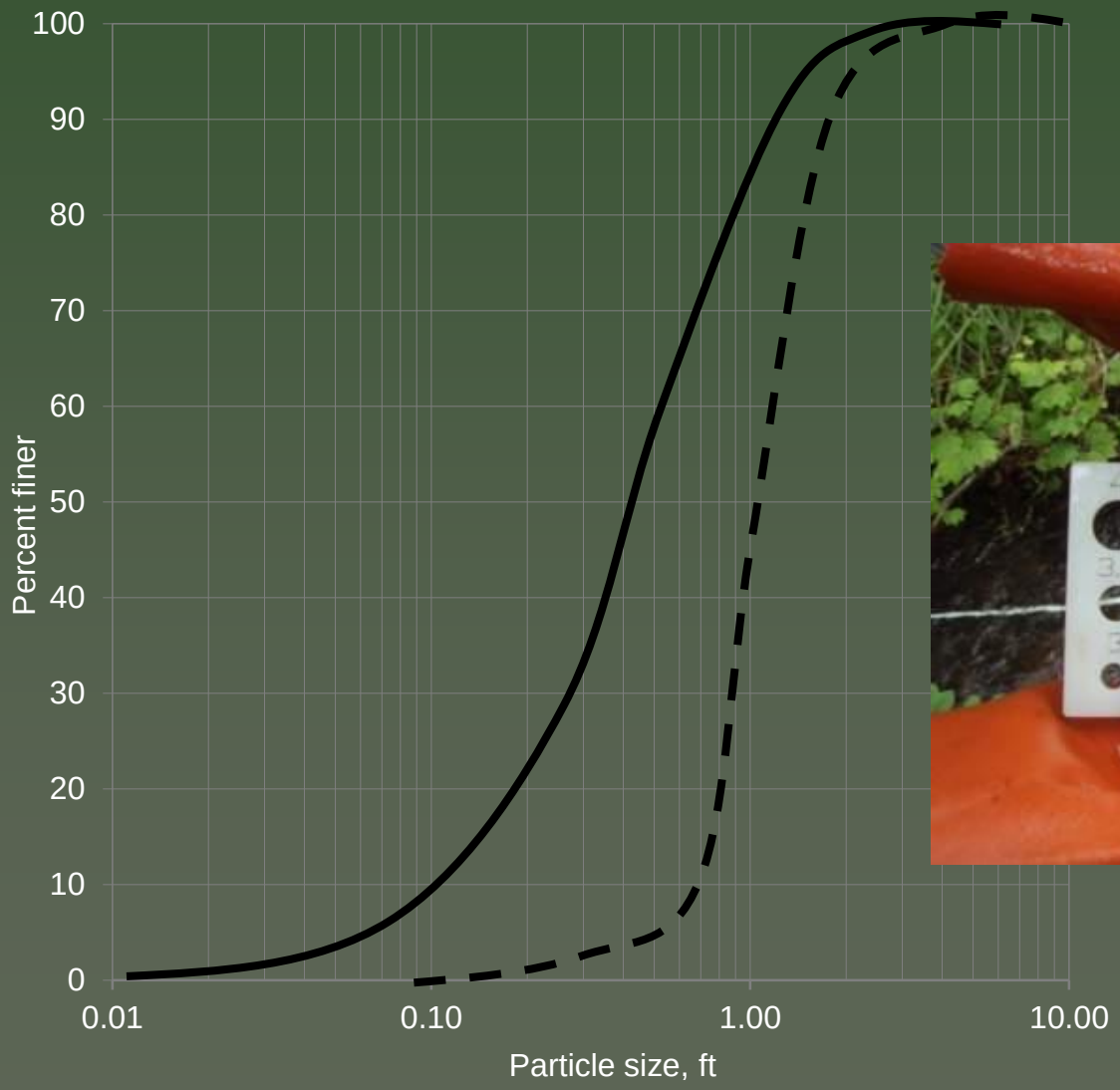
Bankfull width

Long Profile



- Long Profile: 20 channel widths or 200’ minimum upstream and downstream
- Essential for determining characteristics of the channel and appropriate degree of countersink for a new culvert
- Reveals true channel slope and expected extent of scour

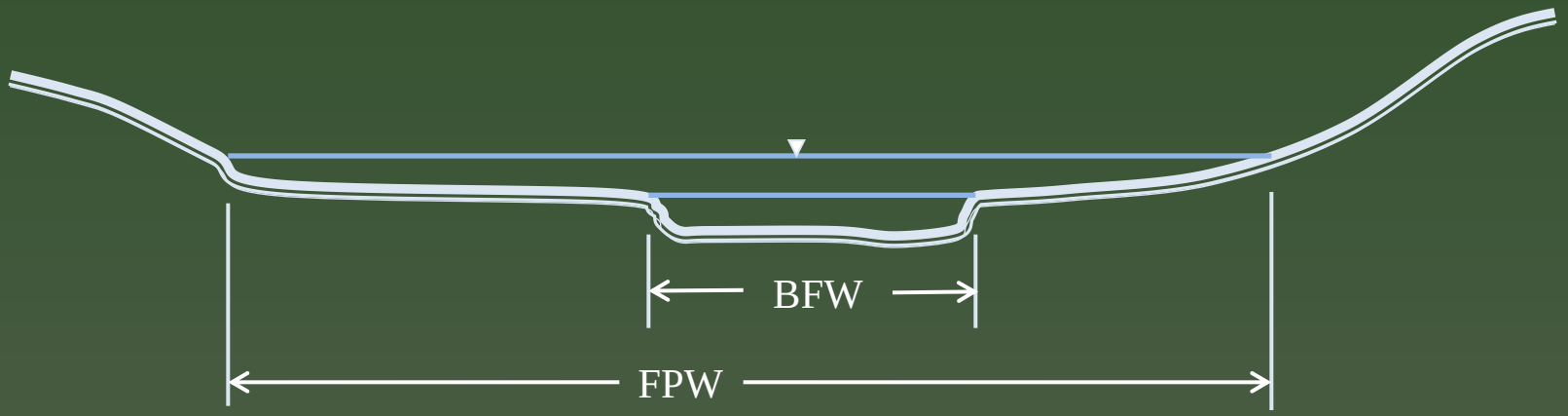
Sediment assessment



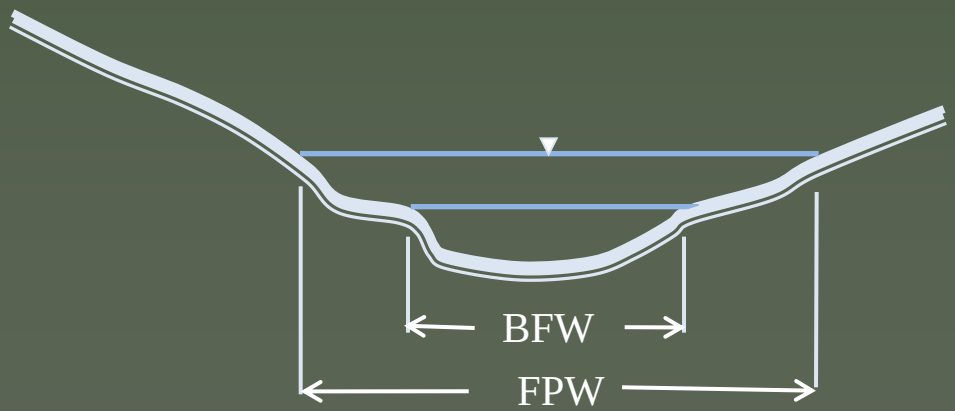
Debris Passage

- What size and type of debris moves through the system?
- Geomorphic approach means channel > BFW
- Continuity of channel function (debris passage) greatly reduces problems
- Debris prone systems best suited for bridges

Channel Types



Unconfined, not suitable for culvert, bridge ok



Confined, culvert or bridge ok

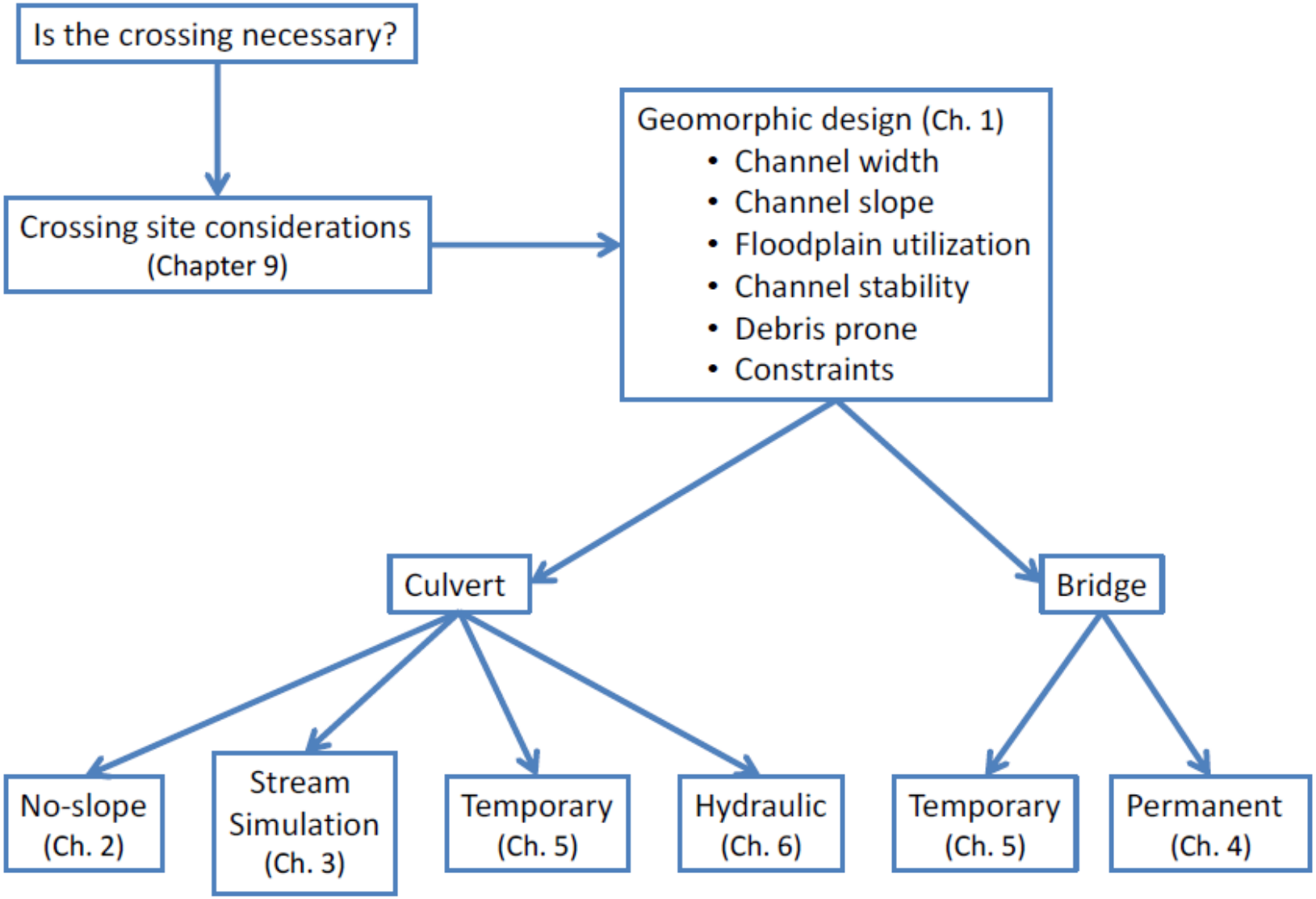


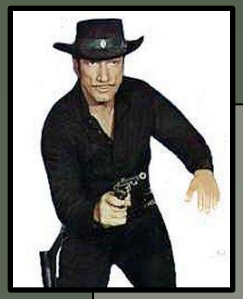
Figure 1.2: Flow chart for selecting a crossing method.

Constraints

Adjacent structures

Homes or other structures

Shallow pipeline crossing



Uncooperative landowner.

Habitat considerations

Geomorphic Design Summary:

- Mimic the natural channel
- Provide continuity of channel slope, stream bed material, bank full width, channel shape
- Constraints may prevent us from achieving full geomorphic approach in some instances

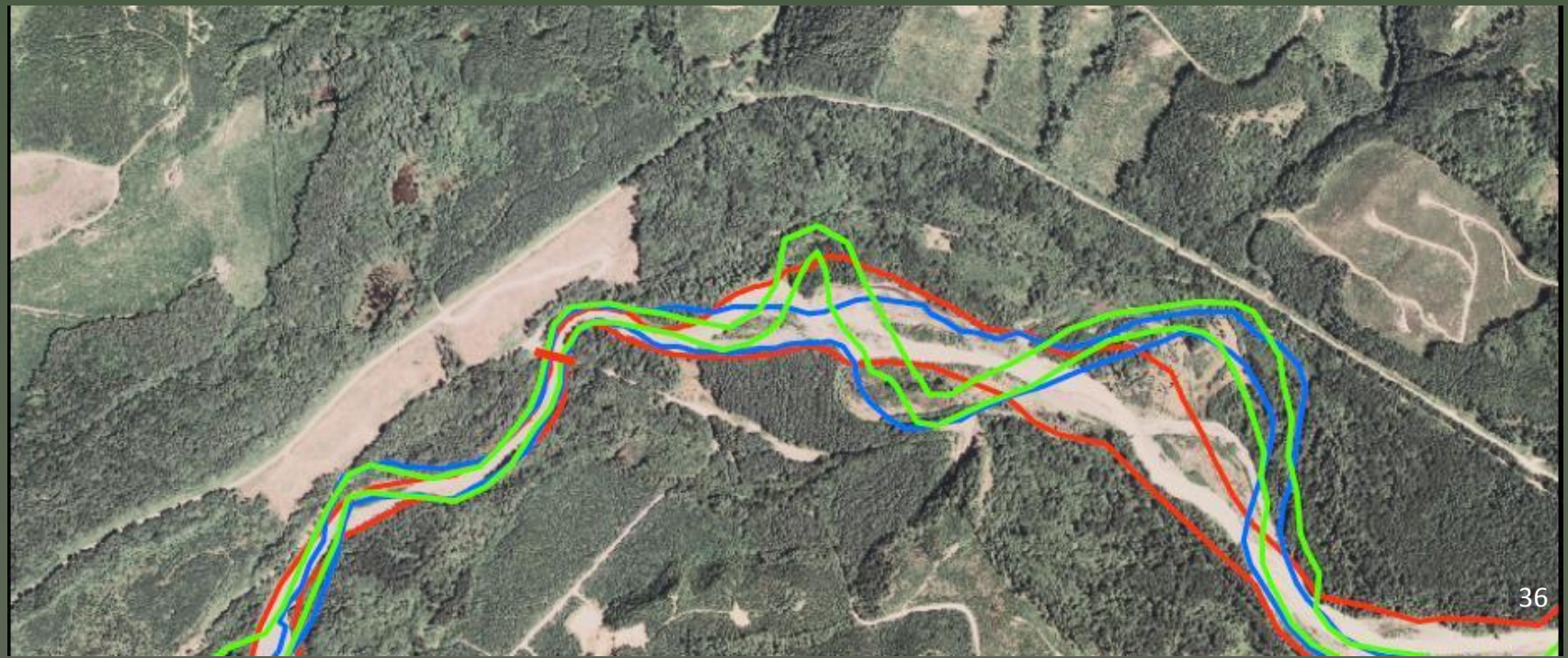

Bridge design for habitat protection

Bridge design for habitat protection goals:

1. Prevent excessive backwater rise during floods.
2. Prevent or limit local scour and coarsening of the stream substrate.
3. Allow free passage of expected woody debris.
4. Allow natural evolution of the channel planform and longitudinal profile
5. Allow continued down-valley flow of water on the floodplain
6. Reduce the risk from catastrophic floods

Reach analysis for bridges

- Describes the geomorphic setting; stream geometry and processes
- Provides the basis for proper bridge design to meet biological performance standards and avoid impacts to fish life
- **Scalable** from none required to major analysis
- **Phased** to match funding and design cycles



Bridge span sizing design sequence

Stepwise approach to bridge design

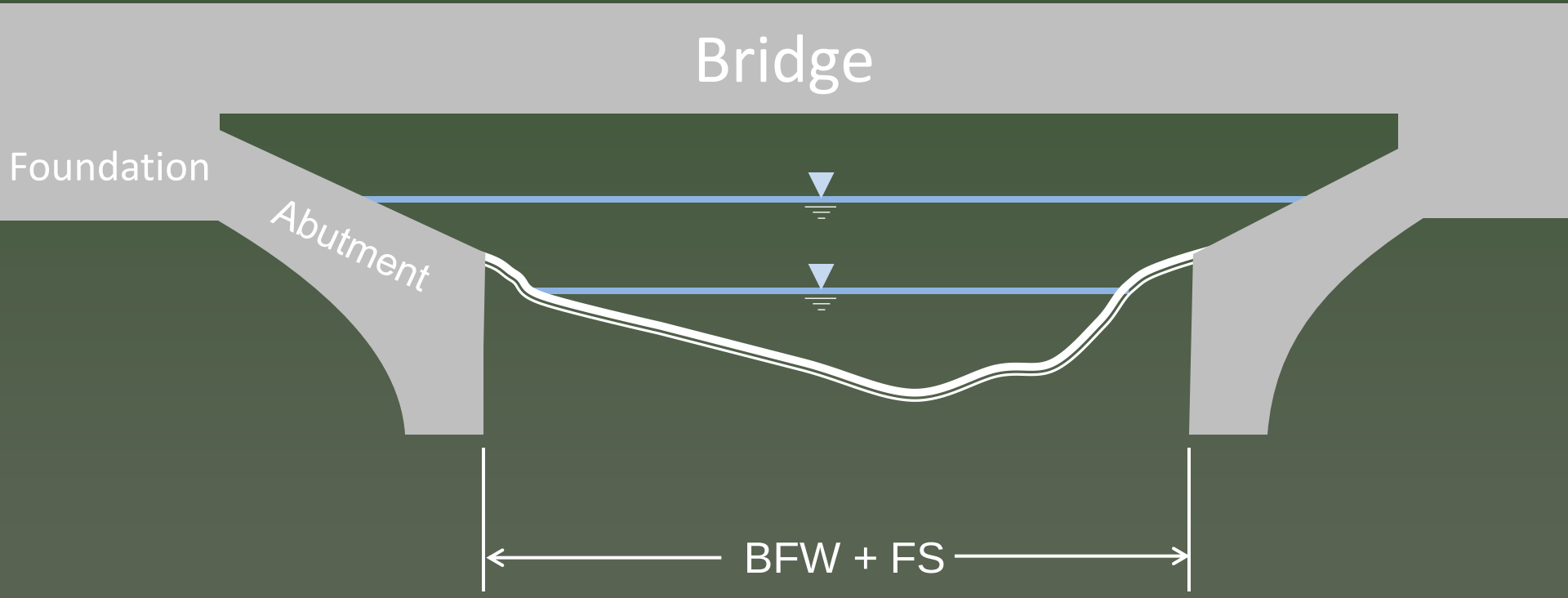
1. **Existing Bridge Condition,** if the old one was good enough, replace in kind
2. **Confined channels**, apply factor of safety for bank-to-bank span
3. **Floodplain and Overbank Areas**, use velocity ratio as a guide
4. **Lateral Channel Movement**, allow for meander migration
5. **Floodplain Management Regulations,** follow the rules
6. **Flood Control Features,** dikes define floodplain, mostly
7. **Other Infrastructure,** if you don't own it, you can't control it
8. **Height of Bridge, Approach Roads and Intermediate Piers**

Existing Bridge Condition, if the old one was good enough, replace in kind

1. The bridge has not received regular or annual maintenance for debris removal, ice removal, or sediment accumulation.
2. Countermeasures have not been required for approach, abutment or pier scour.
3. The channel in the vicinity of the bridge has not scoured below prevailing pool depth or the sediment coarsened relative to undisturbed natural conditions.
4. Channel migration has not been interrupted as identified in a time series of aerial photographs.

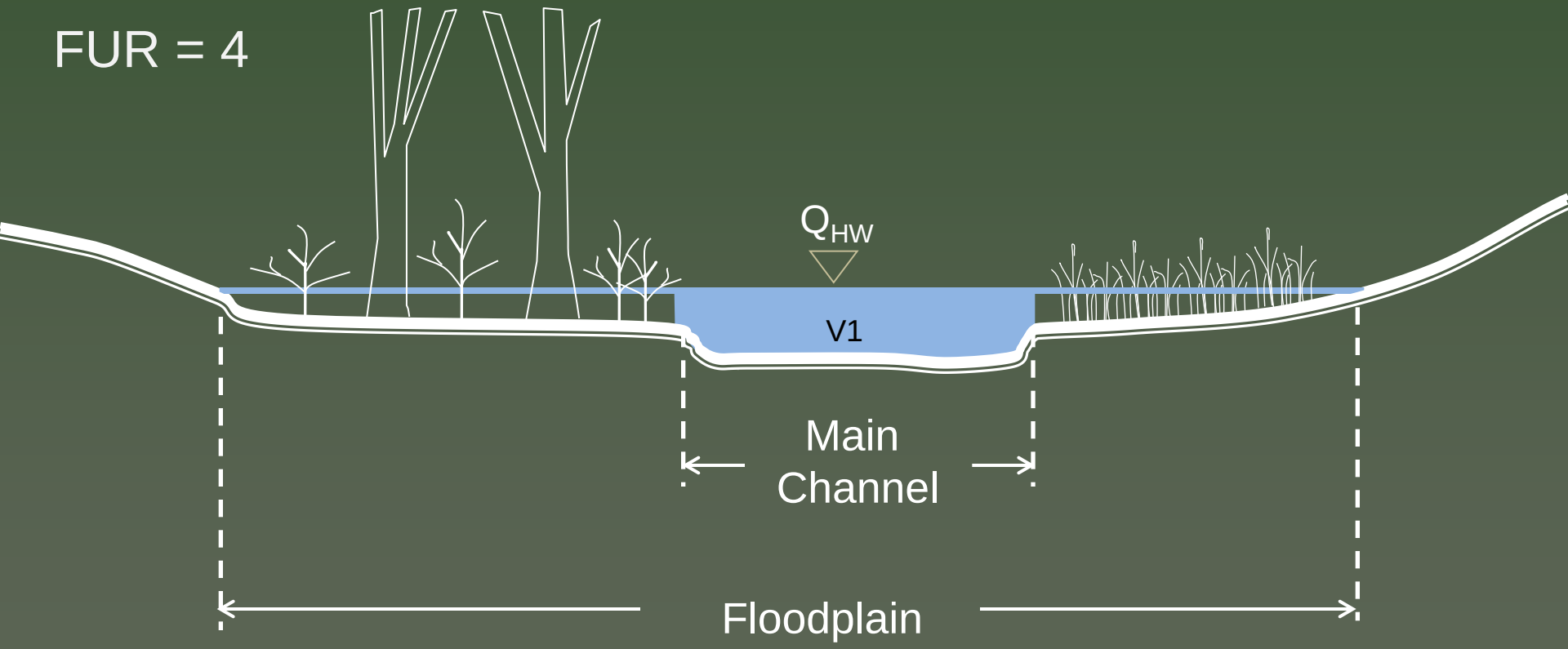
Confined channels

Bridges over confined channels can be based on BFW, but with a factor of safety.



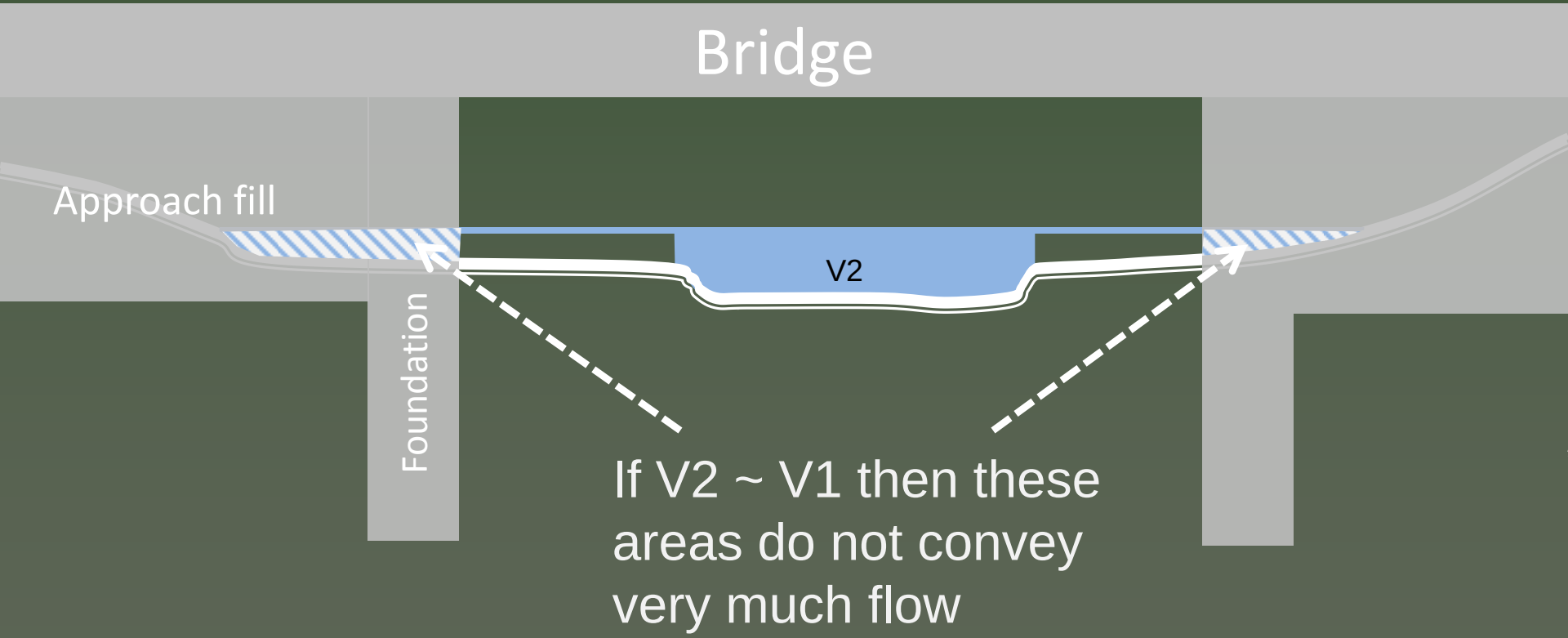
Bridges over unconfined channels can be based on the main channel velocity ratio.

FUR = 4

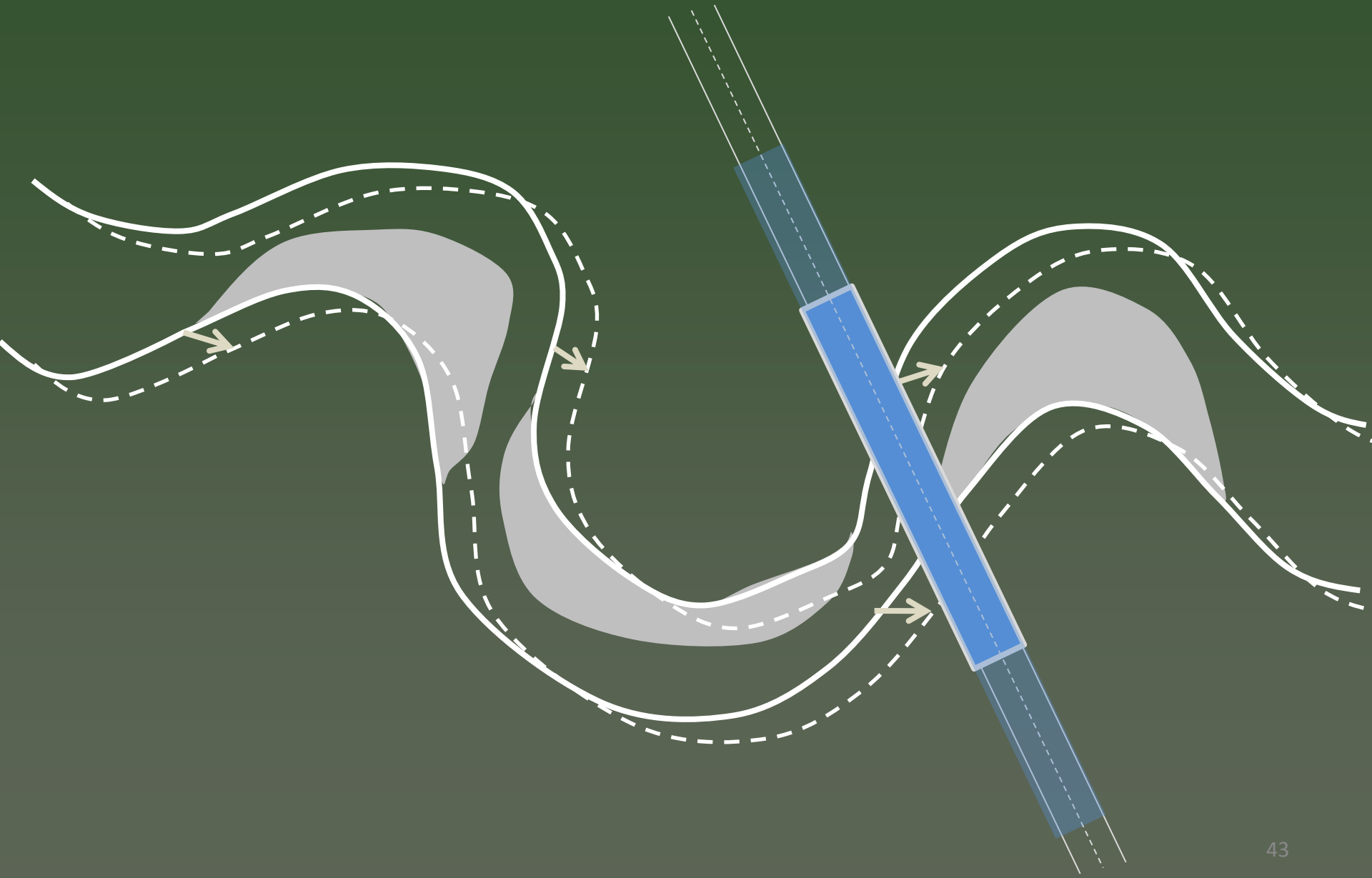


Bridges over unconfined channels can be based the main channel velocity ratio.

$$\frac{V2}{V1} \sim 1$$

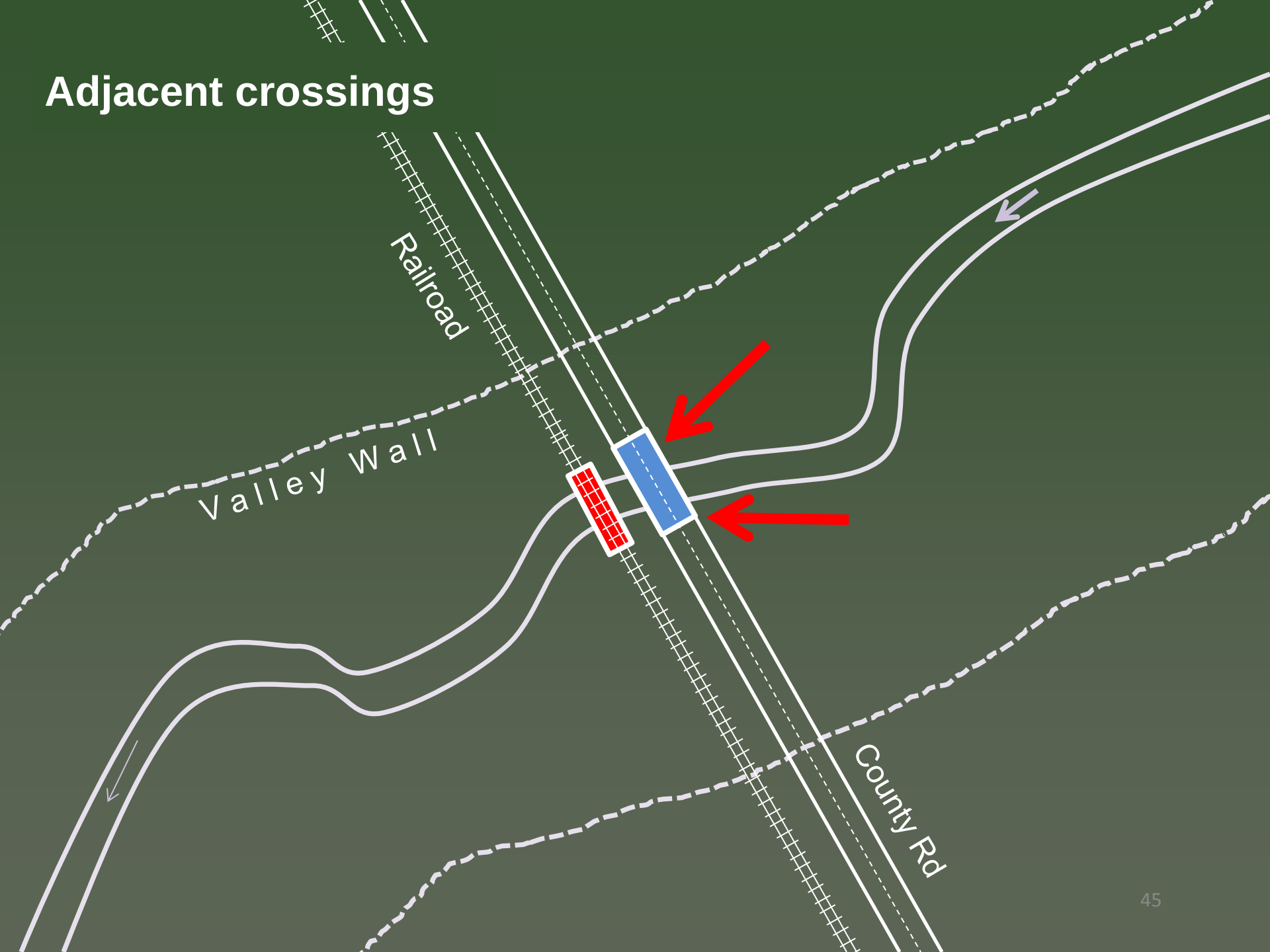


Lateral Channel Movement, allow for meander migration



Flood Control Features: levees define floodplain, mostly

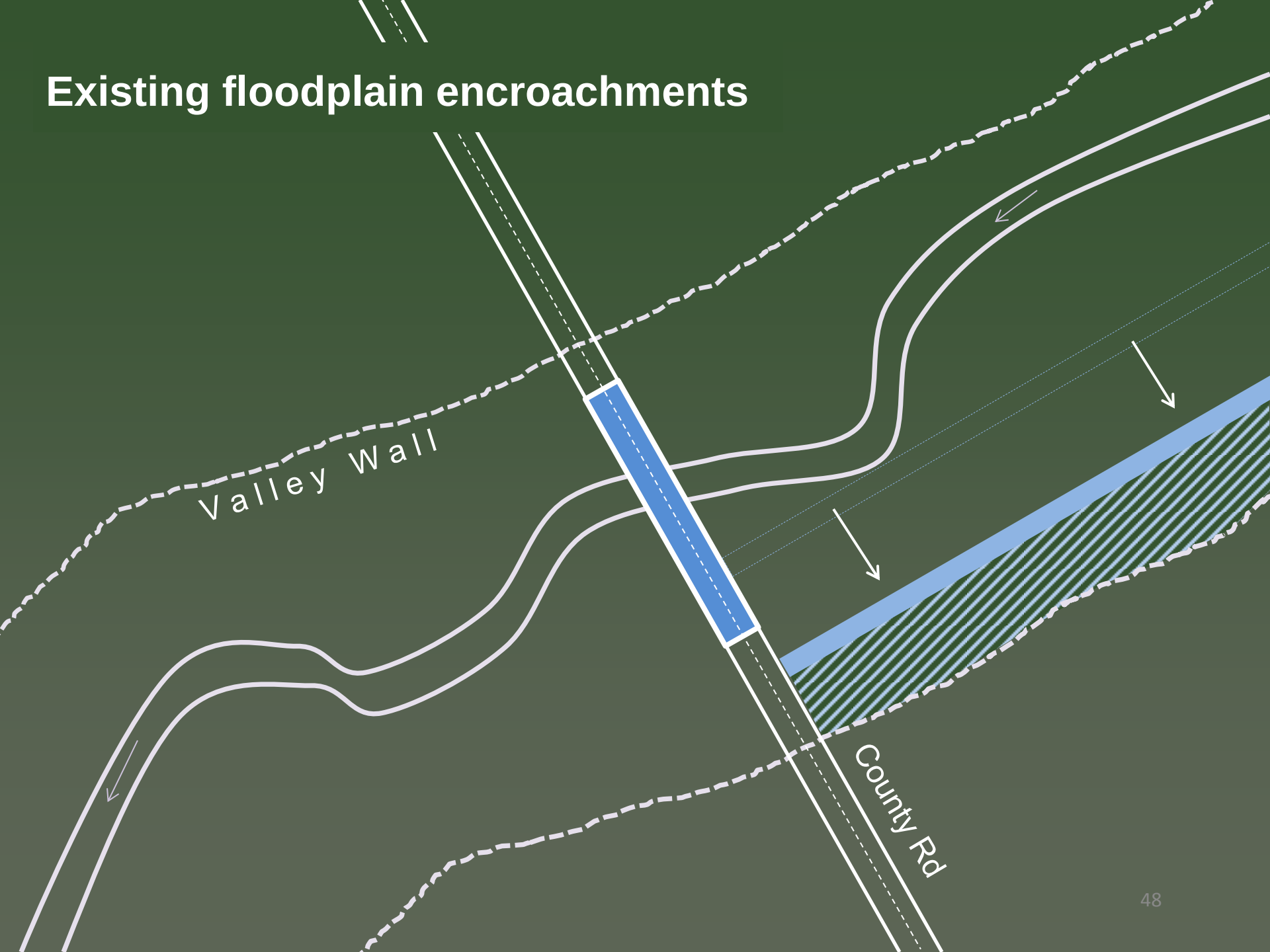
Adjacent crossings




Railroad
Valley Wall
County Rd

Existing floodplain encroachments

Existing floodplain encroachments



Introduction to
2013 Water Crossing Design Guidelines

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360-902-2547

Hydraulic Project Implementation and Effectiveness Monitoring

Hydraulic Code Implementation Citizen Advisory Group
July 2015

“Knowledge itself is power”

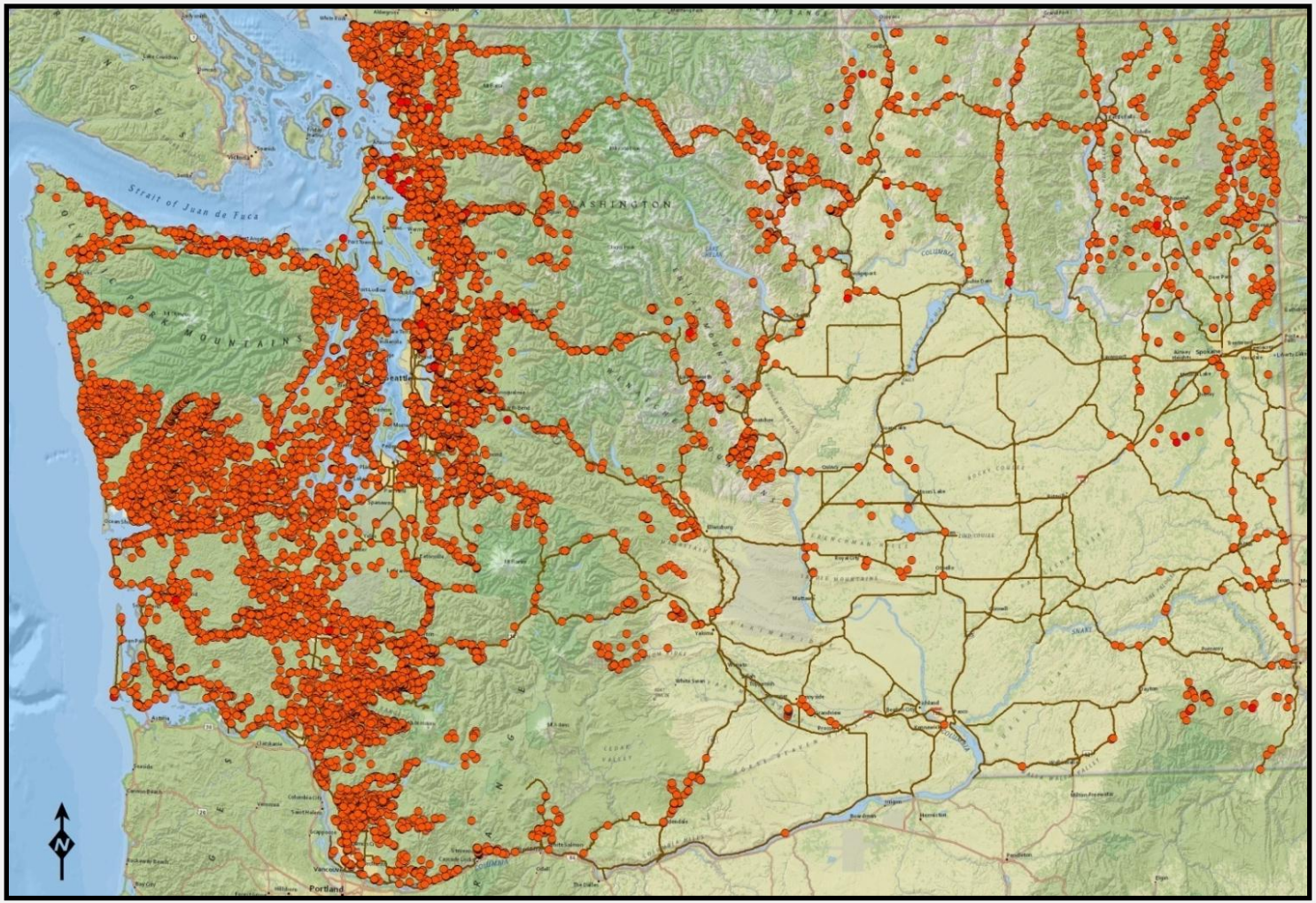
Francis Bacon, 1561 - 1626
father of the scientific method

Why is WDFW monitoring HPA permits and hydraulic structures?

1. Magnitude of the Problem

14,000 known culvert barriers in database

35,000 estimated culvert barriers state-wide



RCW 77.55.021
“proper protection of fish life”?

Excessive Drop

Shallow Water

High Velocity

Fiscal Magnitude of the Problem

- **Culvert Case**: $4 billion for 997 state-owned, barrier culverts in western Washington

- **And**: $25 to $100 billion? to repair ~25,000 barrier culverts in western Washington

2. Uncertainty and Risk

Uncertainty and Risk

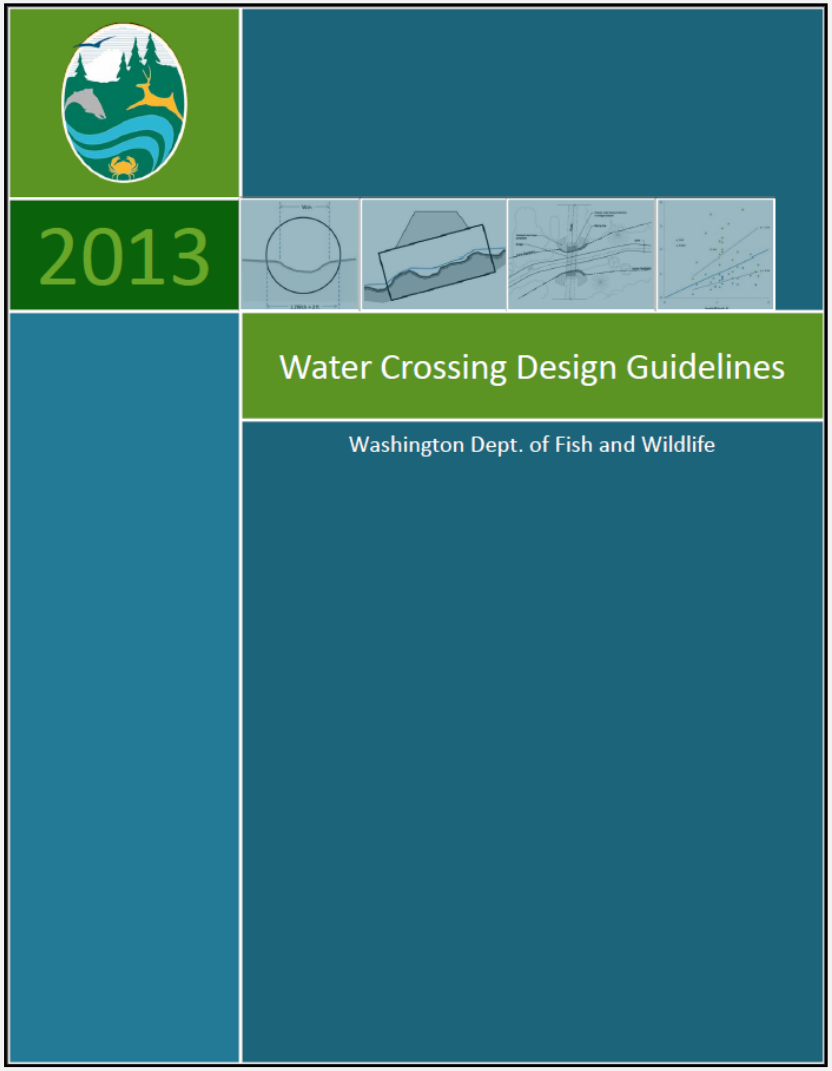
2010

2013

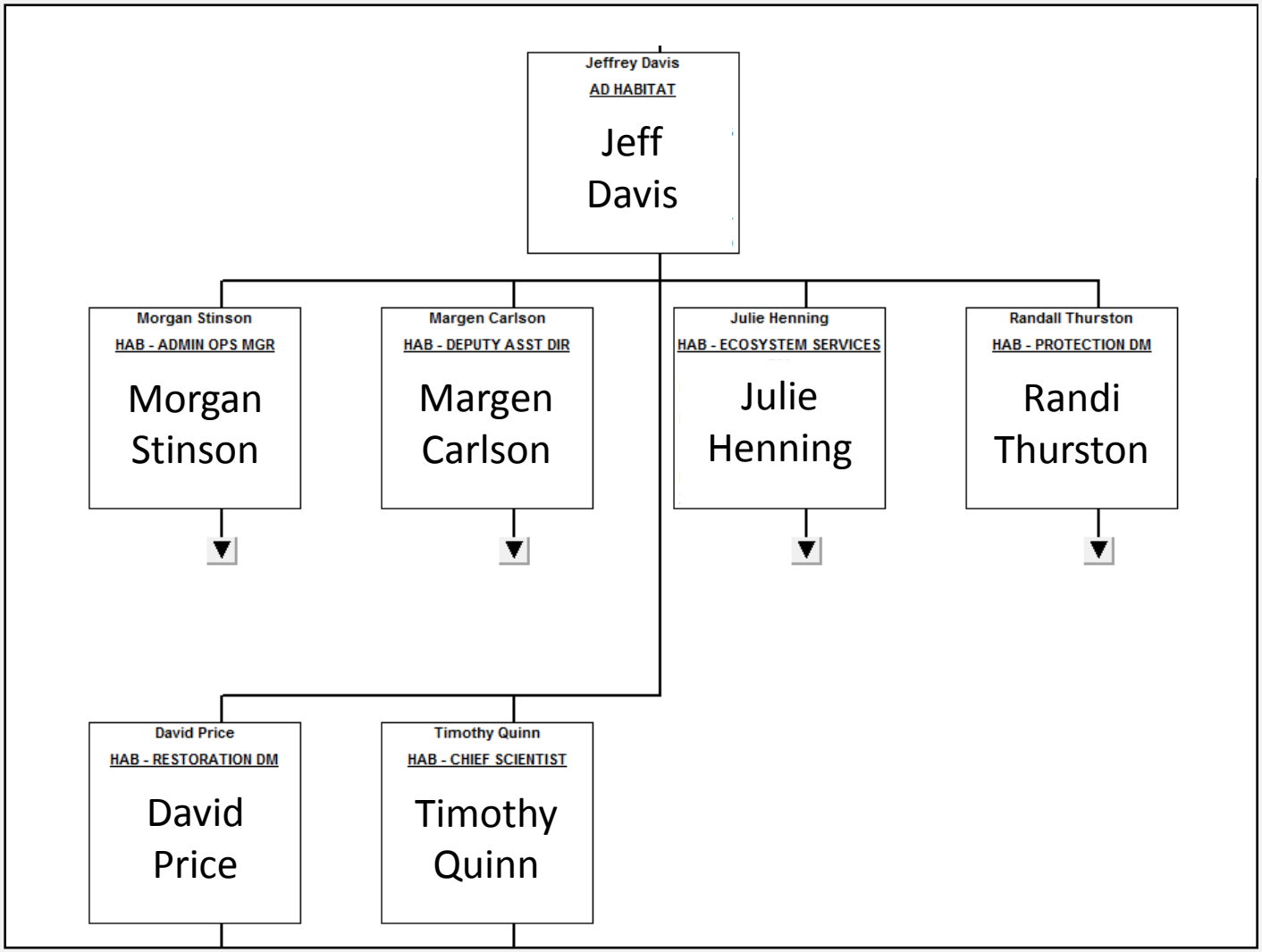
Uncertainty and Risk

Culvert Designs

- no-slope
- stream simulation
- hydraulic



3. Habitat Program Managers



HPA Monitoring

Uncertainty and Risk

- WDFW is **uncertain** about the rate at which hydraulic code rules and permits are properly implemented.
- WDFW is **uncertain** about the general effectiveness of culvert designs at maintaining fish habitats, especially during extreme events.

Risk = probability of damage • amount of damage

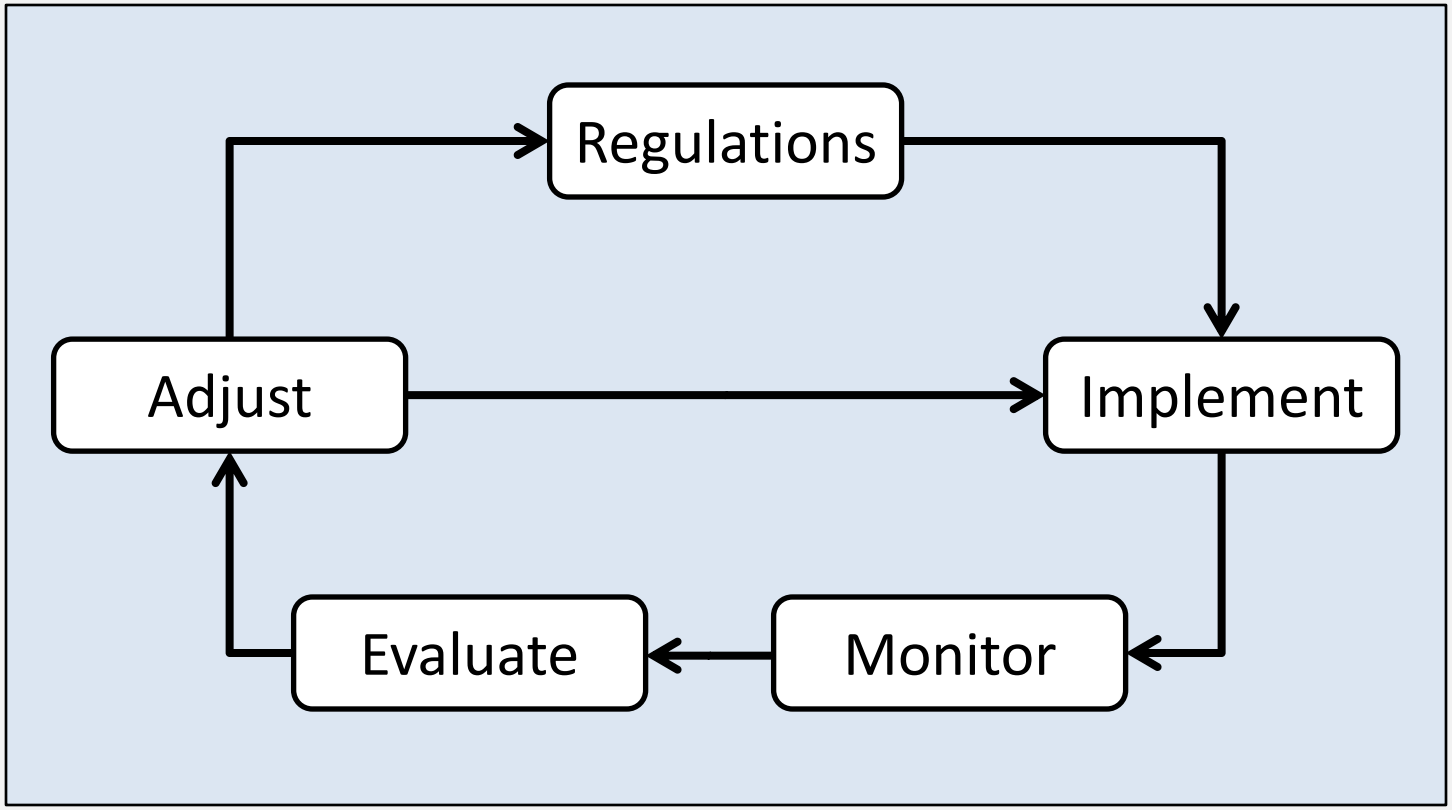
- WDFW believes culvert designs in certain situations present **risks** to fish and fish habitats.
- Culvert designs in certain situations present **risks** to public safety and infrastructure.

The word “monitor” is derived from the Latin word *monēre*, which means to warn.

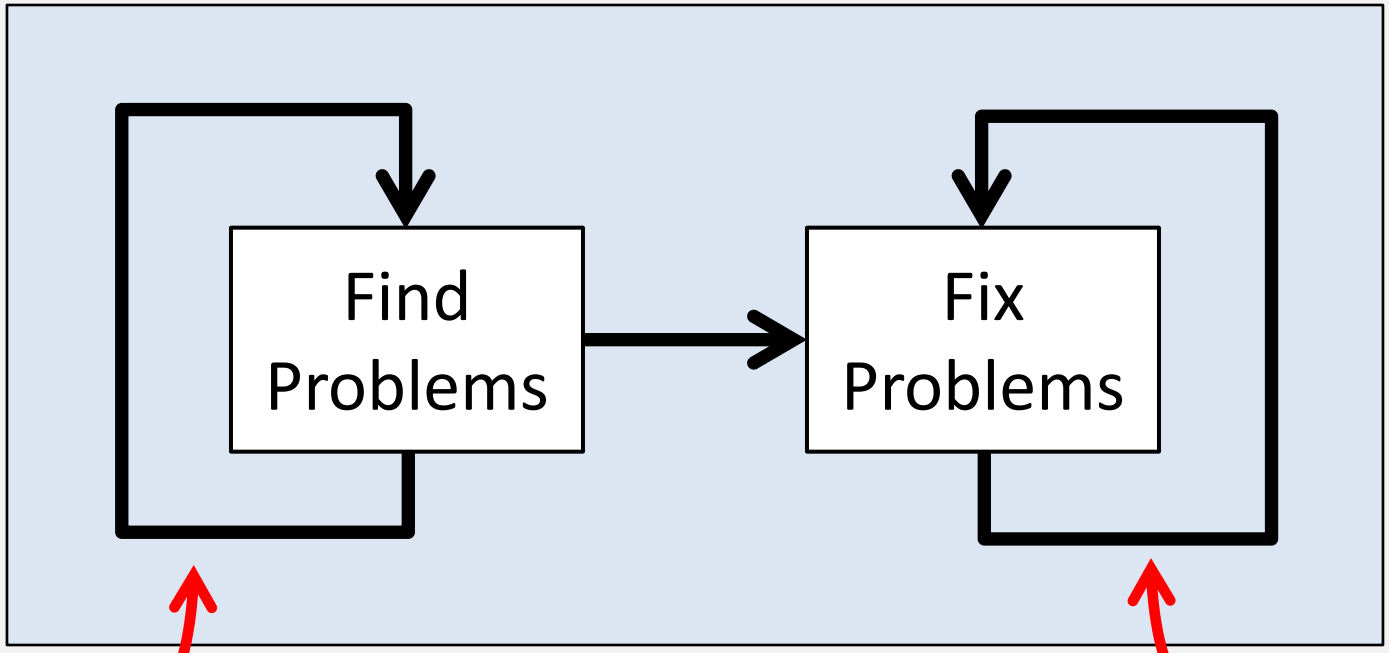
Monitoring provides a warning when management practices are not achieving desired objectives.

Monitor

Adaptive Management



Adaptive Management



Monitoring

Continual Process Improvement

Types of Monitoring

Inspection & Enforcement – determines whether permittee violated the permit.

Implementation Monitoring

Internal – monitors performance of Habitat Program.

External (Compliance) – monitors performance of permittees.

Effectiveness Monitoring – determines whether projects result in the desired habitat conditions.

Goals of Implementation Monitoring

- Determine whether habitat biologists are issuing HPA permits with correct provisions and specifications.
- Determine whether permittees are complying with HPA permits.
- Identify opportunities to improve HPA administration, including rule or permit clarity.
- Identify opportunities to improve habitat biologist knowledge, skills, and performance.
- Identify opportunities to improve contractor/landowner knowledge, understanding, and compliance.

Goals of Effectiveness Monitoring

WAC 220-660-190

- "Must design water crossing structures in fish-bearing streams to allow fish to move freely through them at all flows when fish are expected to move."

- "All water crossings must retain upstream and downstream connection in order to maintain expected channel processes."

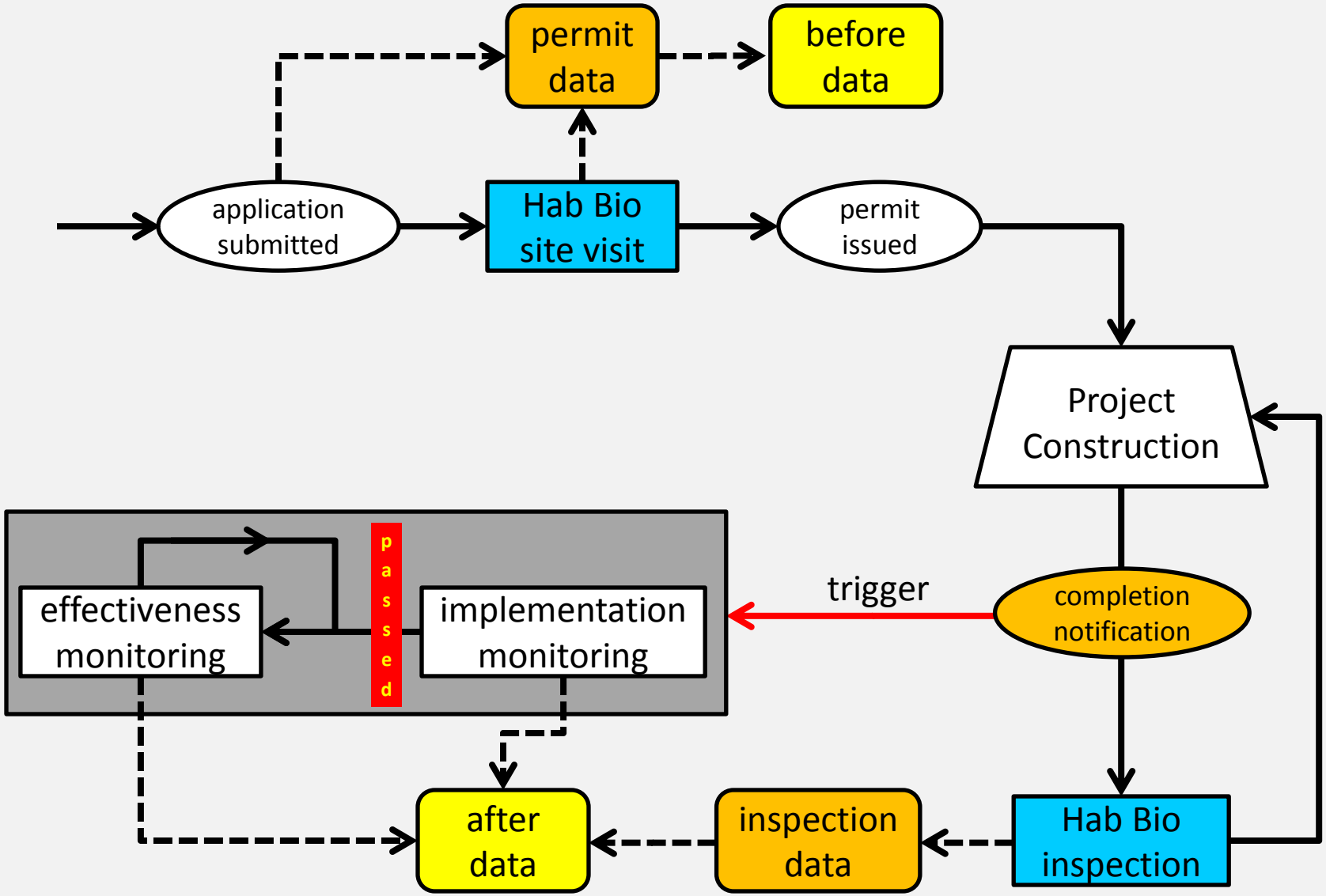
  "These processes include the movement and distribution of wood and sediment and shifting channel patterns."

- "Passage is assumed when there are no barriers due to behavioral impediments, excessive water slope, drop or velocity, shallow flow, lack of surface flow, uncharacteristically coarse bed material, and other related conditions."

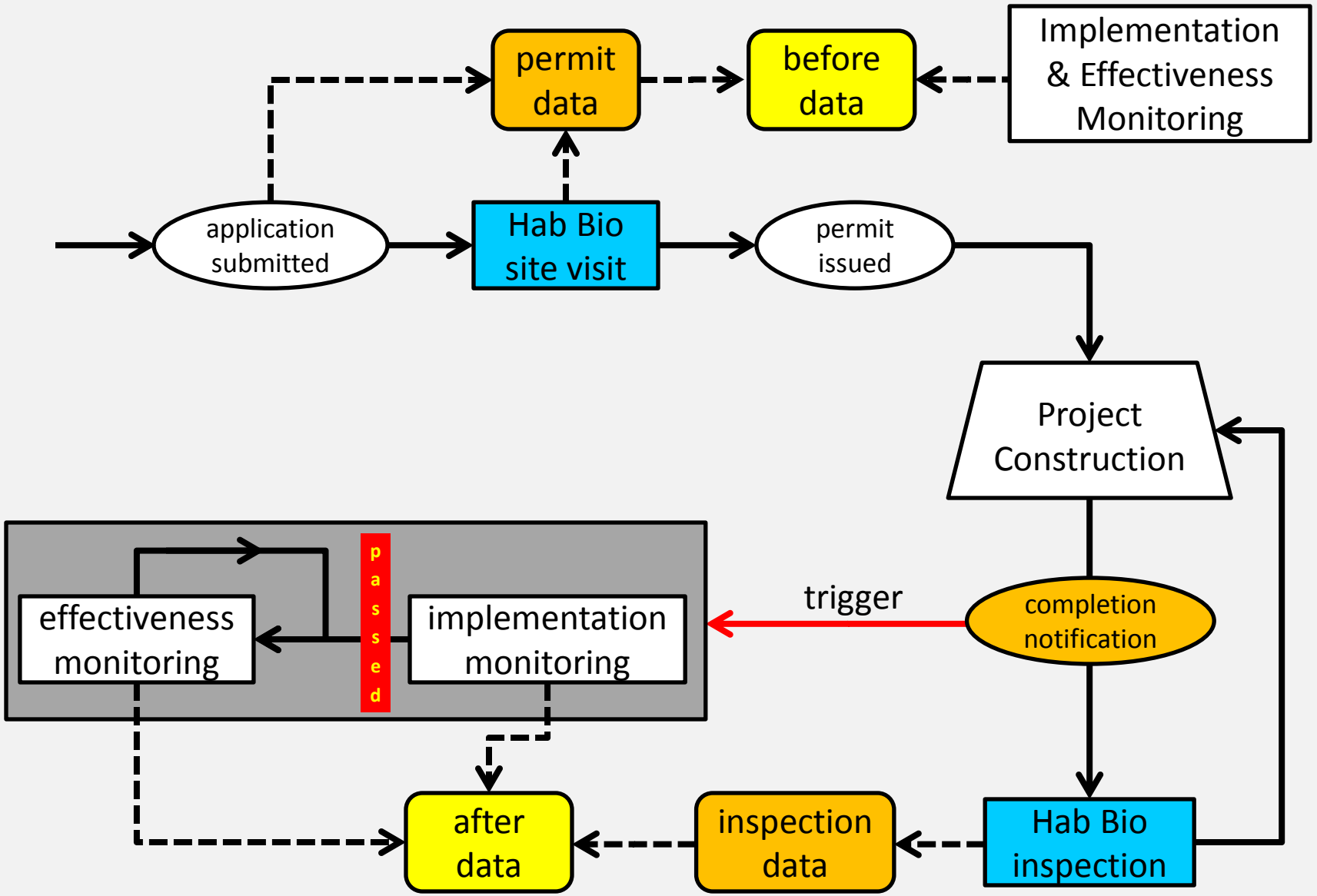
Goals of Effectiveness Monitoring

- Determine whether compliant hydraulic structures are protecting habitats.
  - protection of ecosystem structure, processes, and habitat functions.
  - protection over time: short-term and long-term
- Explain why some compliant hydraulic structures fail to protect habitats.
  - measure variables describing constructed projects and local environmental conditions.
- Identify opportunities to improve protection of and avoid negative impacts to fish life and their habitats.

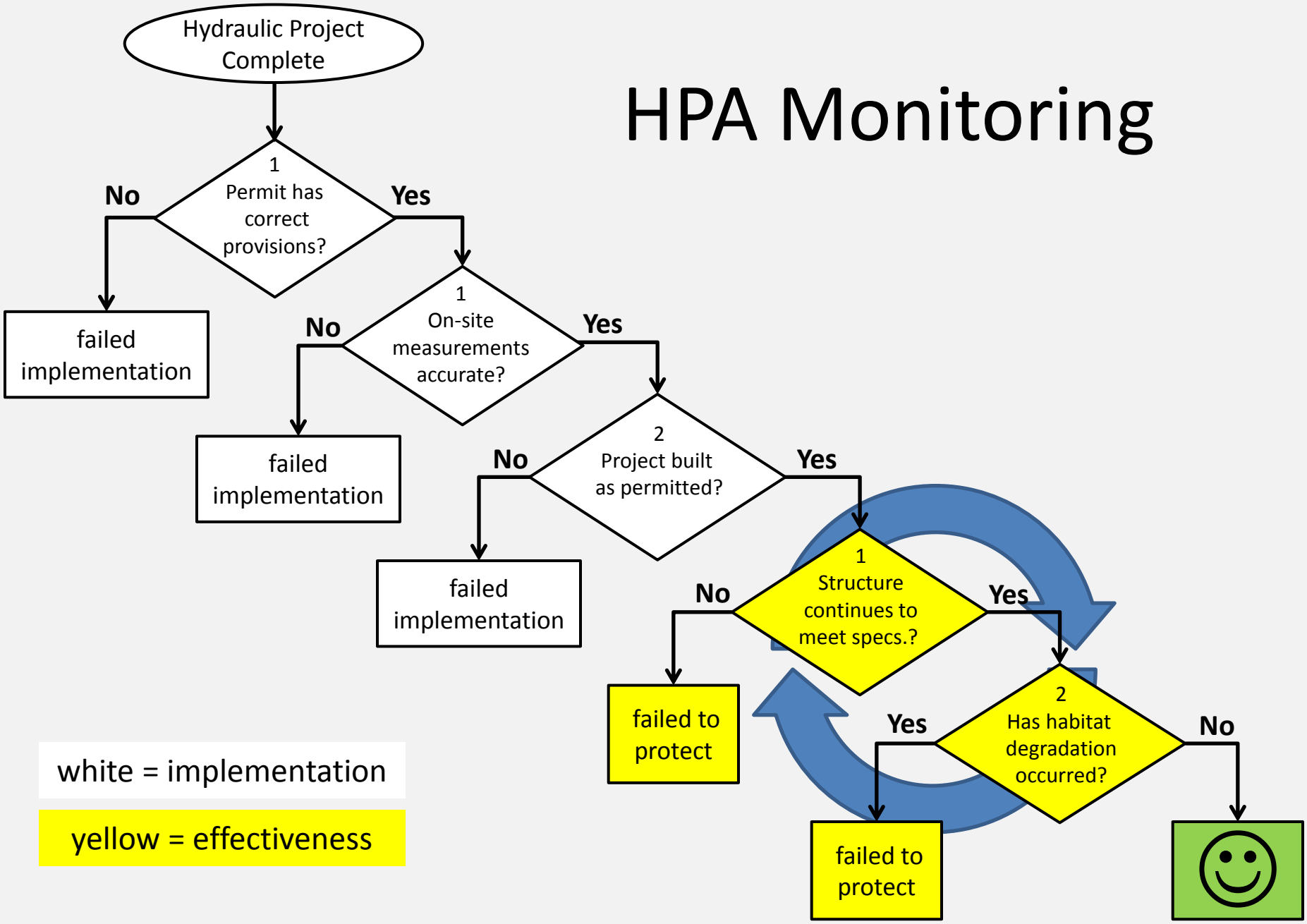
Culvert Monitoring: Sequence of Events



Monitoring of Shoreline Armoring



HPA Monitoring



Thank You

Questions?

Culvert Monitoring in 2013

- 54 HPA permits reviewed
- Focused on four critical structural dimensions:
  - culvert width at streambed
  - culvert slope
  - countersunk depth at outlet
  - culvert length
- Implementation monitoring: 54 culverts
- Effectiveness monitoring: 14 culverts

Implementation Monitoring

4 Key Questions

1) Did the permittor issue a complete permit, that is, one that contains provisions and/or project plans for all critical structural dimensions?

2) Is the permittor's permit consistent with hydraulic code rules or design guidelines? *

3) Did the permittee comply with the permit?

4) Is the completed hydraulic project consistent with hydraulic code rules or design guidelines?

Major Findings from Implementation Monitoring

Culverts

Did the permit or application materials contain other information needed to determine consistency with rules and/or guidelines?

1. Channel width information was *unavailable for roughly 50%* of 54 culverts (in application or permit materials).

2. Many permittees reported estimates for “stream width”, “stream size”, “streambed width”, “channel bed width”, “width at ordinary high water mark”, and something called “top channel width.”

Implementation Monitoring

Additional Question

Did the permit or application materials contain other information needed to determine consistency with rules and/or guidelines?

examples: bankfull width, channel slope

Major Findings from Implementation Monitoring

Culverts

Did the permit or application materials contain other information needed to determine consistency with rules and/or guidelines?

3. Only 20% of 54 applications reported an estimate of bankfull width.

4. When permittees reported a BFW estimate in their application materials (N=10), *80% of the time their estimate was narrower* than our monitoring team's estimate.

5. And, when the applicant's BFW estimate was narrower, it was about 22% narrower, on average.

Major Findings from Implementation Monitoring

Culverts

Did the permittor issue a complete permit, that is, one that contains provisions and/or project plans for all critical structural dimensions?

1. One-fifth of permits lacked a specification in permit provisions or project plans *for at least one critical structural dimension* (culvert width, culvert slope, countersink depth, or length).

2. Permits for 9 culverts lacked information needed to determine compliance (for at least one critical structural dimension).

3. The design type could not be determined for 9 of 54 culverts (17%).

Major Findings from Implementation Monitoring

Culverts

Did the permittee comply with the permit?

1. Permittee compliance with permit for the four critical structural dimensions was 76% (N=45).

2. 11 culverts (24%) were noncompliant: 5 were too narrow and 6 were countersunk too shallow.

3. Compliance with permit by culvert type:

no-slope	85% (N= 13)
stream simulation	60% (N=10)
bottomless	85% (N=13) *
unknown	67% (N=9)

Major Findings from Implementation Monitoring

Culverts

Is the completed hydraulic project consistent with hydraulic code rules or design guidelines?

1. 50% of 40 culverts had a critical structural dimension that was not consistent with the hydraulic code rules or culvert design guidelines.

2. Consistency with rules for no-slope culverts:
   47% (N=19) using our monitoring team's BFW estimates;
   80% (N=10) using the permittees' channel width estimates.

3. *Finding for consistency with rules/guidelines may be unreliable because we lack a widely accepted, standard procedure for measuring BFW.*

Main Recommendations for Improving the HPA Permitting Process

Culverts

1. Key information – such as bankfull width, channel slope, culvert design type, and culvert dimensions – should be reported and easy to find in application and permit.
2. Language referring to stream channel width should be identical in hydraulic code rules, permit provisions, and culvert design guidelines.
3. Standard procedures for estimating mean bankfull width and channel slope should be developed by WDFW and widely distributed for use by HPA applicants.
4. Bankfull width measurements submitted by HPA applicants should be checked by WDFW or some other credible organization.


Treaty Rights at Risk
the "Culvert Case"
Washington State Legislature
Paying HPA Permitees

Major Findings from Implementation Monitoring

Marine Shoreline Armoring

Did the permit or application materials contain other information needed to determine consistency with rules and/or guidelines?

1. Compliance was challenging to assess due to difficulties with interpreting plans and use of reference points that could change over time or be altered by construction activities.

2. Though information was provided in the permit materials, compliance with some provisions could not be assessed with only a post-construction survey.

Major Findings from Implementation Monitoring

Marine Shoreline Armoring

Did the permittor issue a complete permit, that is, one that contains provisions and/or project plans for all critical structural dimensions?

1. 38% of 106 permits for marine shoreline armoring had no clear statement of the project's length in the permit's text.

2. Of 26 hard armoring permits, only 12% described the structure's location as a distance to a benchmark or permanent structure.

3. For the other 88% of hard armoring permits, determining compliance with the permitted location was difficult if not impossible.

Major Findings from Implementation Monitoring

Marine Shoreline Armoring

Did the permittee comply with the permit?

1. 9 of 10 structures had at least one structural dimension that was inconsistent with the permitted dimension.

2. 50% of the structures were longer than indicated in the permit.

3. 30% were taller than indicated in the permit.

4. 60% were farther water ward relative to at least one reference elevation.

Main Recommendations for Improving the HPA Permitting Process

Marine Shoreline Armoring

1. Key information – such as bulkhead length, bulkhead height, bulkhead design type –should be reported and easy to find in application and permit.

2. The location of marine shoreline armoring should be described in HPA applications with respect to engineering benchmarks or permanent structures that will not change over time.

Implementation and Effectiveness Monitoring Data Collection in 2013

Culverts

- 54 permits reviewed
- focused on four critical structural dimensions: culvert width at streambed, culvert slope, countersunk depth at outlet, and culvert length
- 54 culverts for implementation monitoring
- 14 culverts for effectiveness monitoring

Marine Shoreline Armoring

- 106 permits reviewed
- 10 sites for implementation monitoring
- 3 sites for effectiveness monitoring

Overview of Current Implementation and Effectiveness Monitoring

Implementation Monitoring

- *Compliance* means the hydraulic structure constructed by the *permittee* conforms to the HPA permit.
- *Permittor Accordance* means the HPA permit issued by the *permittor* includes provisions, including provisions referring to the permittee's plans, that are necessary and sufficient for construction of a hydraulic structure which conforms to hydraulic code rules or WDFW's design guidelines.
- *Structure Accordance* means the structure conforms to hydraulic code rules or WDFW's design guidelines.

Effectiveness Monitoring

- Fish passage over time – Level A fish passage barrier assessment in 2013.
- Channel morphology over time – maintaining natural channel structure is key assumption of stream simulation culvert design.
- Beach composition and structure over time – maintaining natural qualities is assumed to maintain fish habitat.

Where We've Been: Habitat Program's History of HPA Monitoring

2006 (Quinn et al.)

- Over 60% of permitted projects were not fully compliant with hydraulic code rules.
- 62% of culverts were noncompliant.
- 15% of marine bank protection projects were noncompliant.

1998, 2003, and 2007 (Price et al.)

- 30% of culverts (23 of 77) permitted under the HPA process for fish passage were barriers to fish movement.
- Most passage failures were due to noncompliance with permit provisions, particularly culvert slope.
- 29% of HPA permits excluded at least one of the three most important provisions: culvert width, culvert slope, or countersunk depth.

2008 & 2009 (Habitat Program, Protection Division)

- At least 35% of culverts were noncompliant for at least one structural dimension of the culvert.
- 15% of marine bank protection projects were noncompliant.

2010 (Habitat Program, Protection Division)

- Frequently difficult or impossible to determine which culvert design was permitted under the HPA.
- Culvert width was the most difficult culvert dimension to locate in the permit, and was frequently found solely on drawings or schematics.
- Frequently, there was no clear link on the application or permit between the permitted culvert width and BFW, consequently, a large number of culverts were undersized relative to BFW.

HPA IMPLEMENTATION AND EFFECTIVENESS MONITORING:

Washington Department of FISH and WILDLIFE

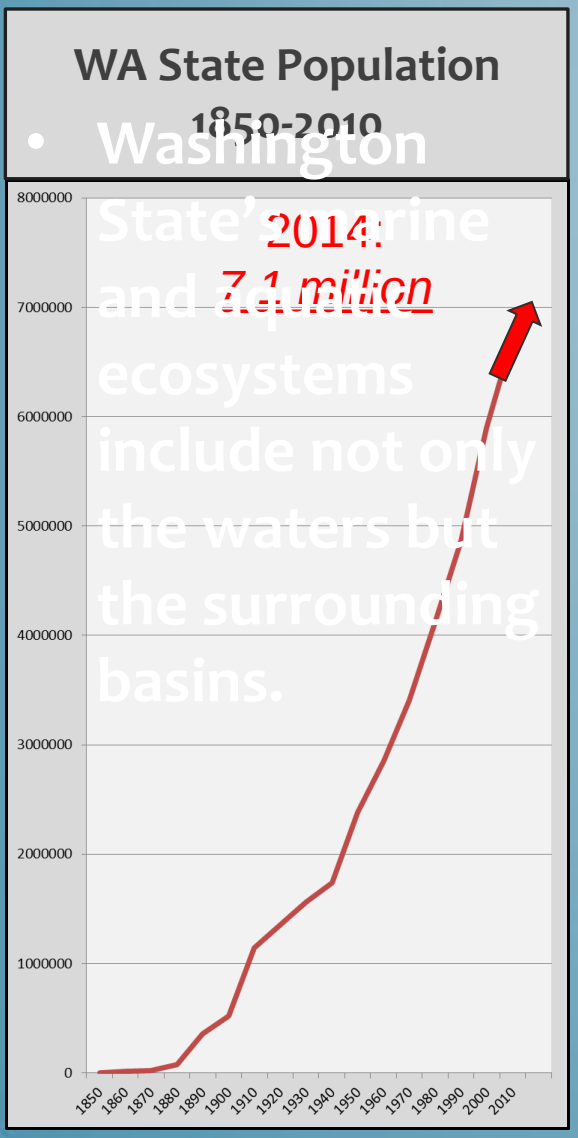
WASHINGTON STATE:
A HISTORY OF HUMAN IMPACTS

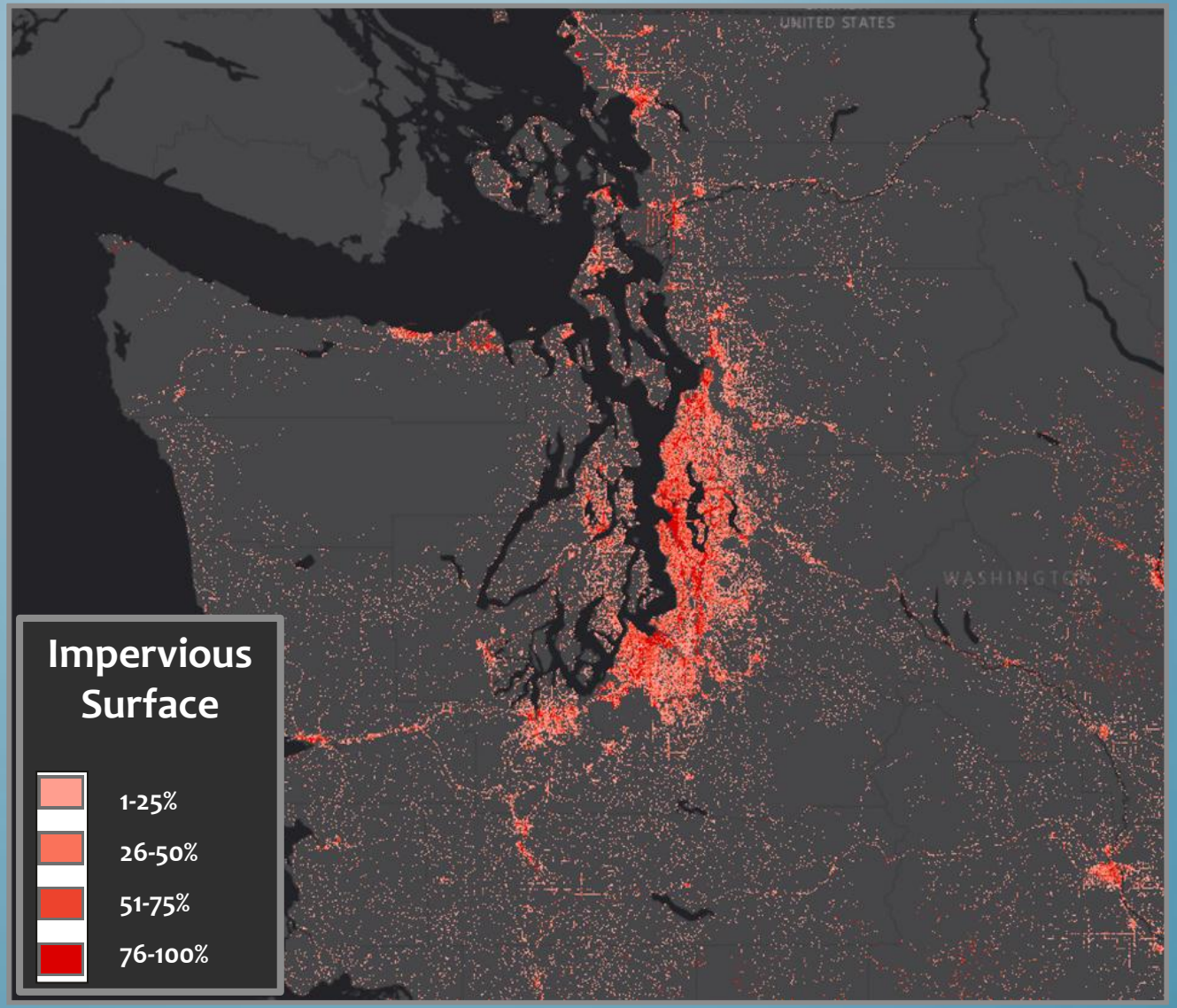
Human Impacts

Our Role
- Regulations
- Monitoring

Growing Population = Growing Impact

- Washington State's marine and aquatic ecosystems include not only the waters but the surrounding basins.

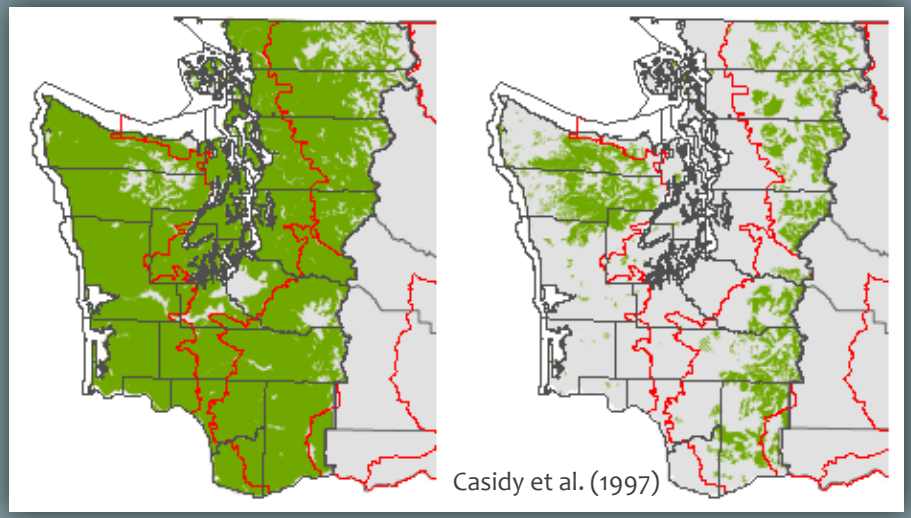




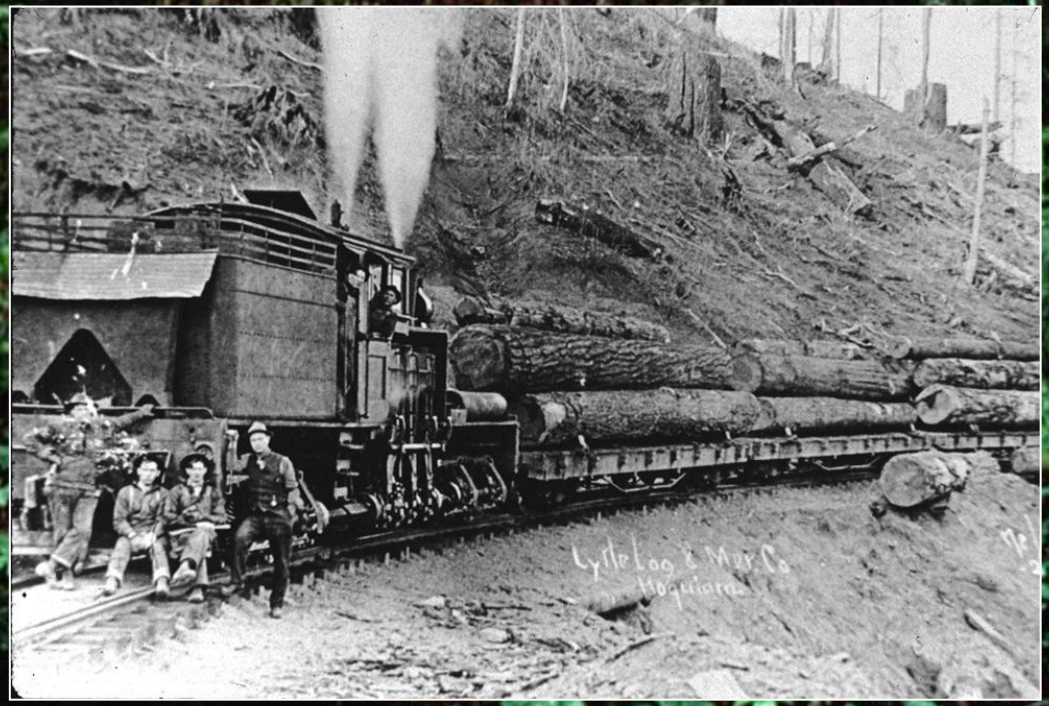
Forests:

- *By 1883, the forests along Puget Sound shoreline were nearly exhausted*
- *Today, about 90% of western WA old growth forests have been converted to young forest*

Western WA Old-Growth Conifer Forest

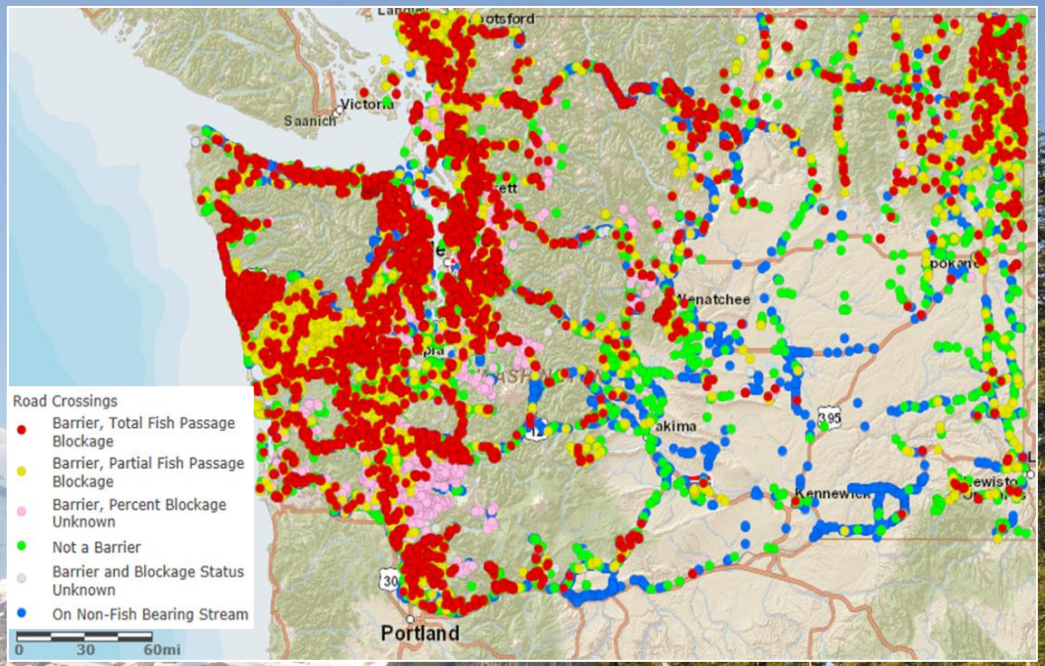


Circa 1850 1995



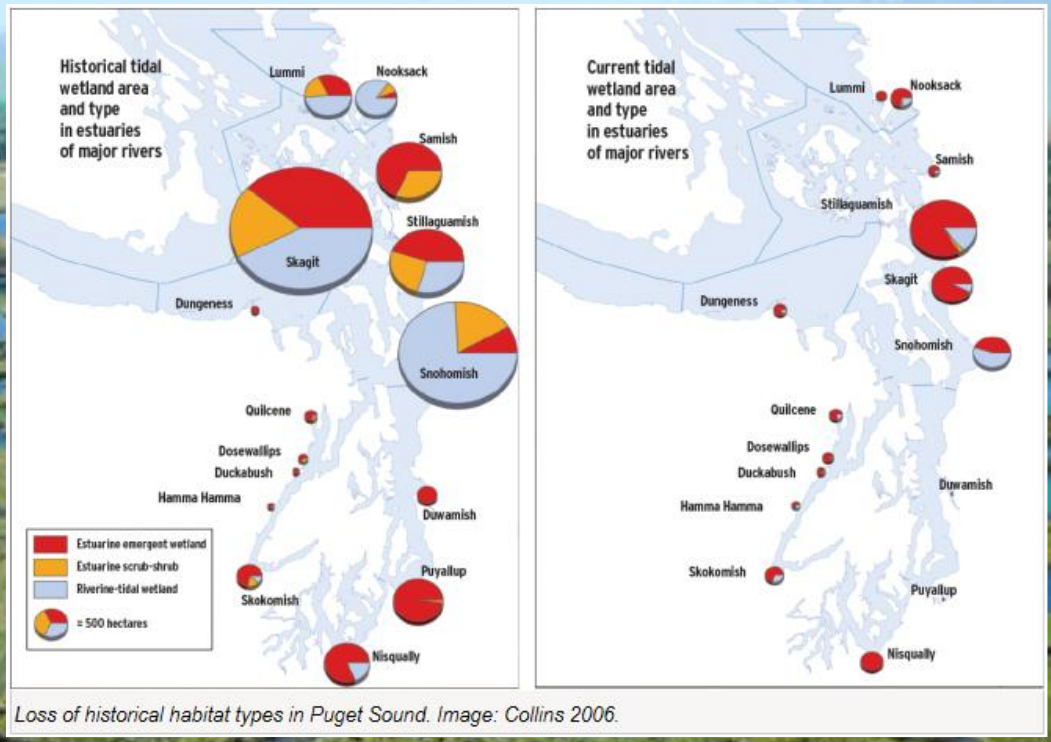
Rivers:

- *1902, Several major dams constructed for urban water supplies and to power mills*
- *Today, there are over 1,000 dams, and thousands of fish passage barriers in Washington State*

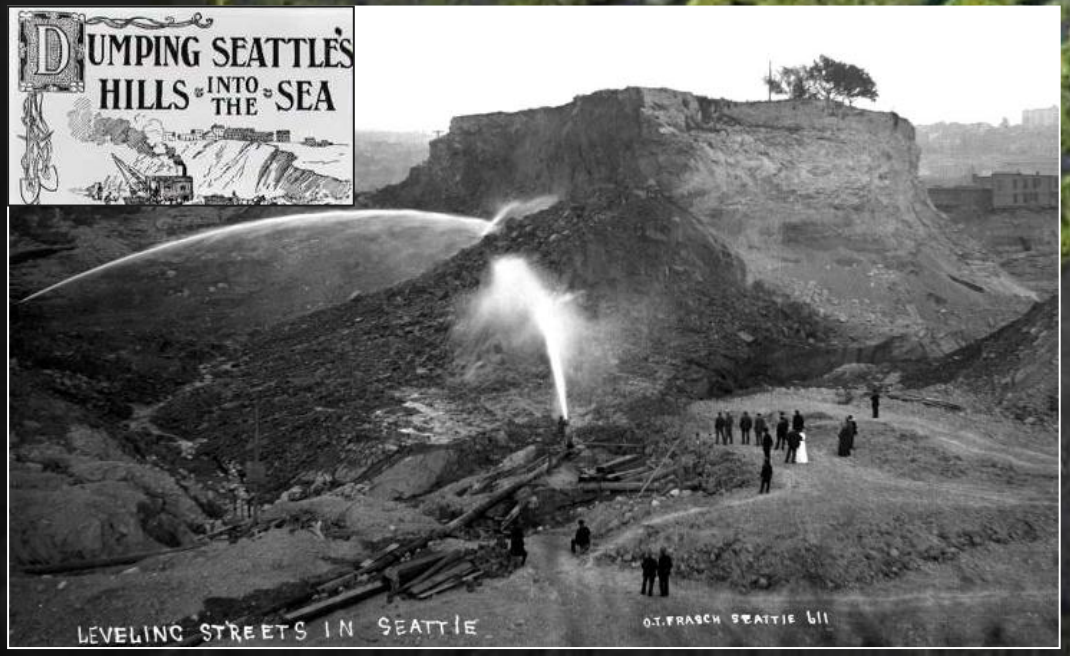


Estuary Wetlands:

- *1870's-1920's, the construction of Seattle, and various ports resulted in the massive filling in of tidelands like Elliott Bay*
- *1863, first dikes constructed in Puget Sound*
- *Today, about 70% of Puget Sound estuary wetlands have been lost*

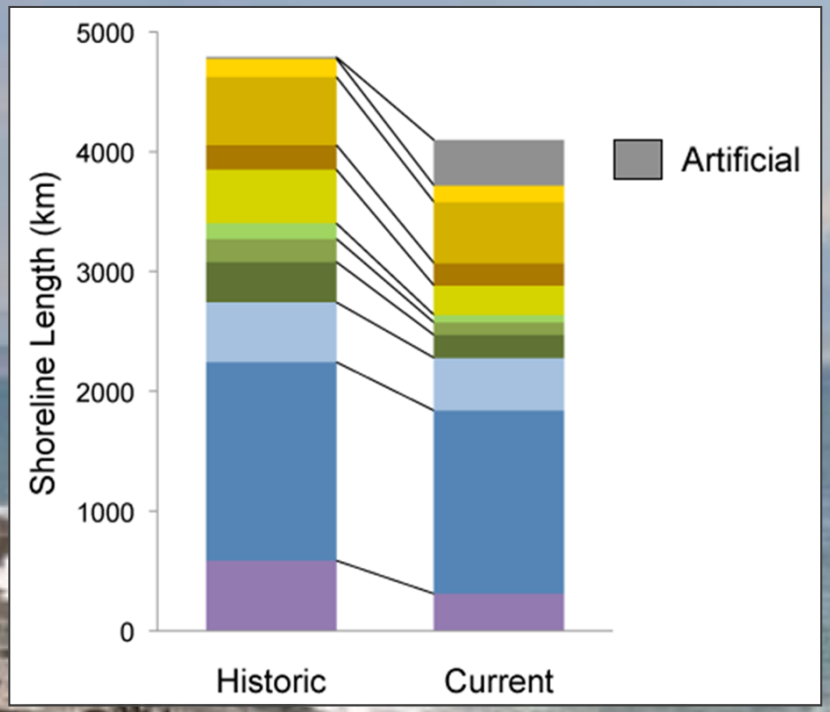


Loss of historical habitat types in Puget Sound. Image: Collins 2006.



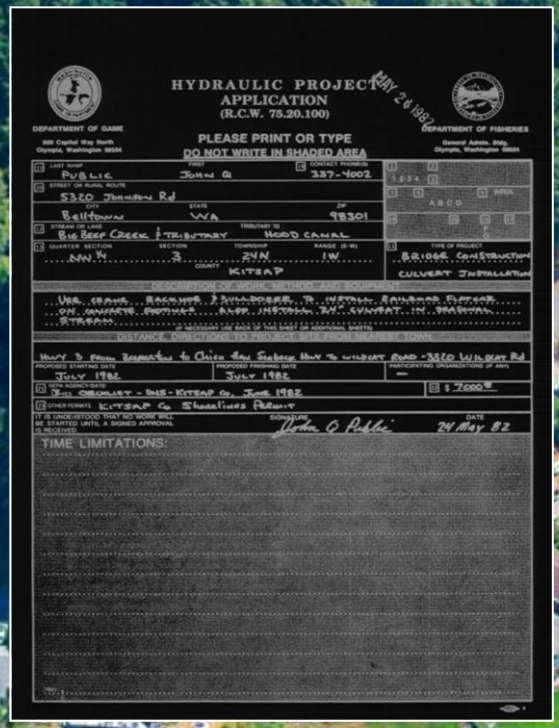
Shoreline:

- *1891, railroads are constructed along Puget Sound shorelines and river basins to access timber*
- *Following WWII, Americans had the means to buy homes outside of cities, this included coastal development for residential use*
- *Today, the shoreline is shorter and less complex than the historic shoreline*



Regulations:

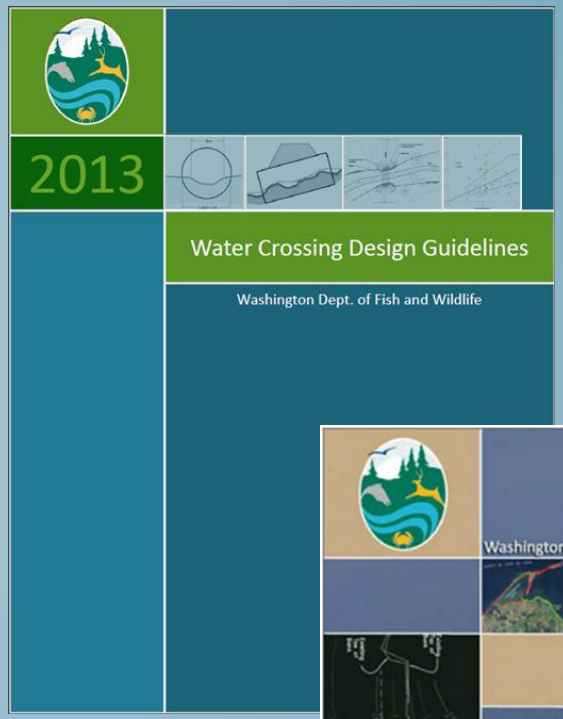
- *In 1949, the legislature passed the first law requiring a permit to work in the waters of the state*
- *In 1972, Shoreline Management Act was adopted to: control pollution, protect natural resources, and promote access*
- *In 1974, Forest Practices Act passed to protect public resources while assuring productive timber harvest*
- *Today, WDFW administers the State's hydraulic Code through the Hydraulic Project Approval (HPA) process and has developed guidance to promote the protection of fish life and habitat*

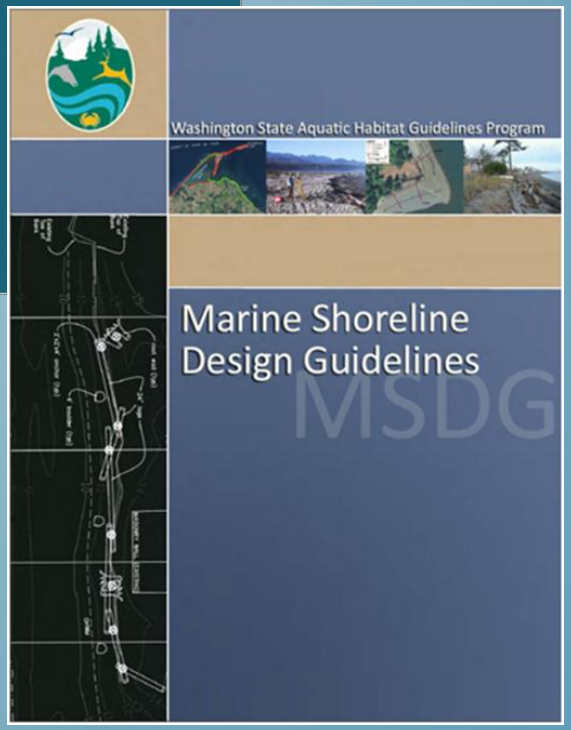

HYDRAULIC PROJECT APPLICATION
(R.C.W. 75.20.100)
PLEASE PRINT OR TYPE
DO NOT WRITE IN SHADED AREA
DEPARTMENT OF GAME
DEPARTMENT OF FISHERIES
TIME LIMITATIONS:

-DESIGN GUIDANCE

-MONITORING

-ADAPTIVE MANAGEMENT

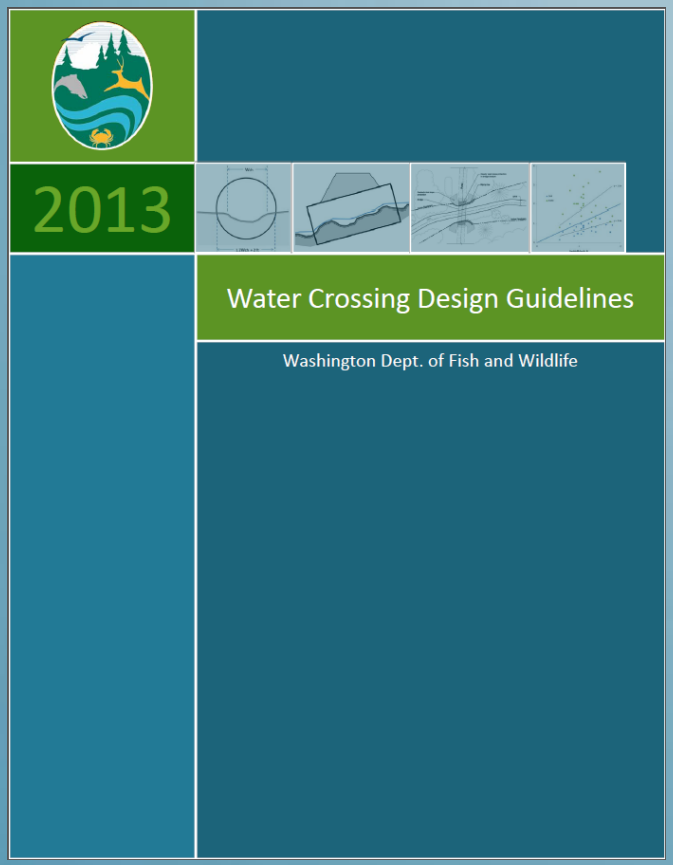




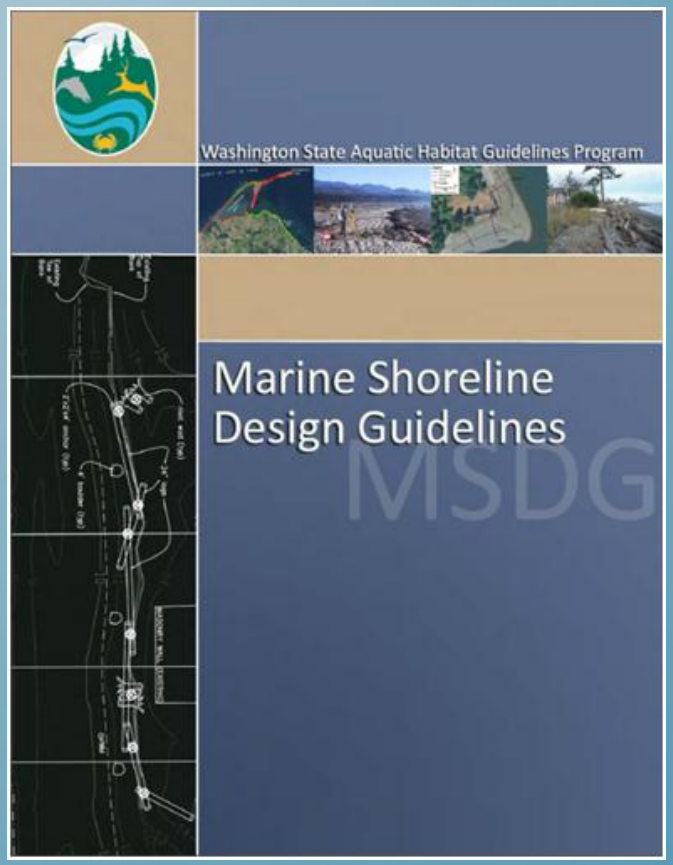
Design Guideline Documents

-*Design of Road Culverts for Fish Passage*, first published 1999

-Latest version, now called *Water Crossing Design Guidelines*, published 2013



-*Marine Shoreline Design Guidelines*, first published 2014



Marine Shoreline Stabilization

-Average about 150 permits per year

-Average about 5,000 feet of new armor per year

-Single family residence account for over 70% of new and replacement armor by length

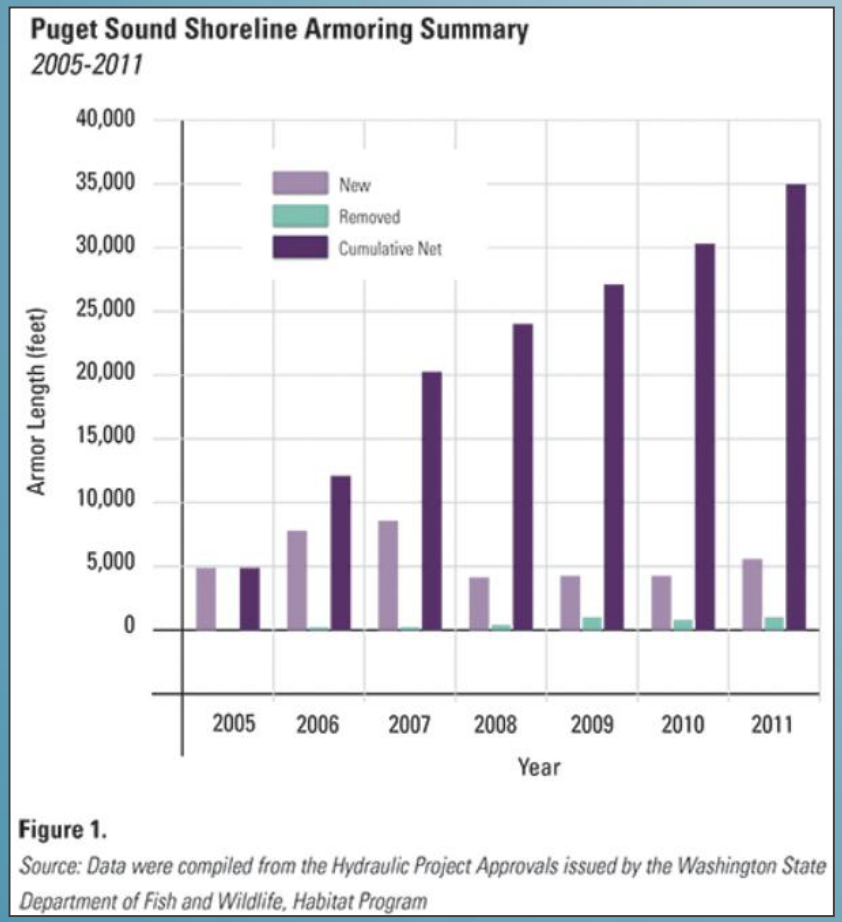
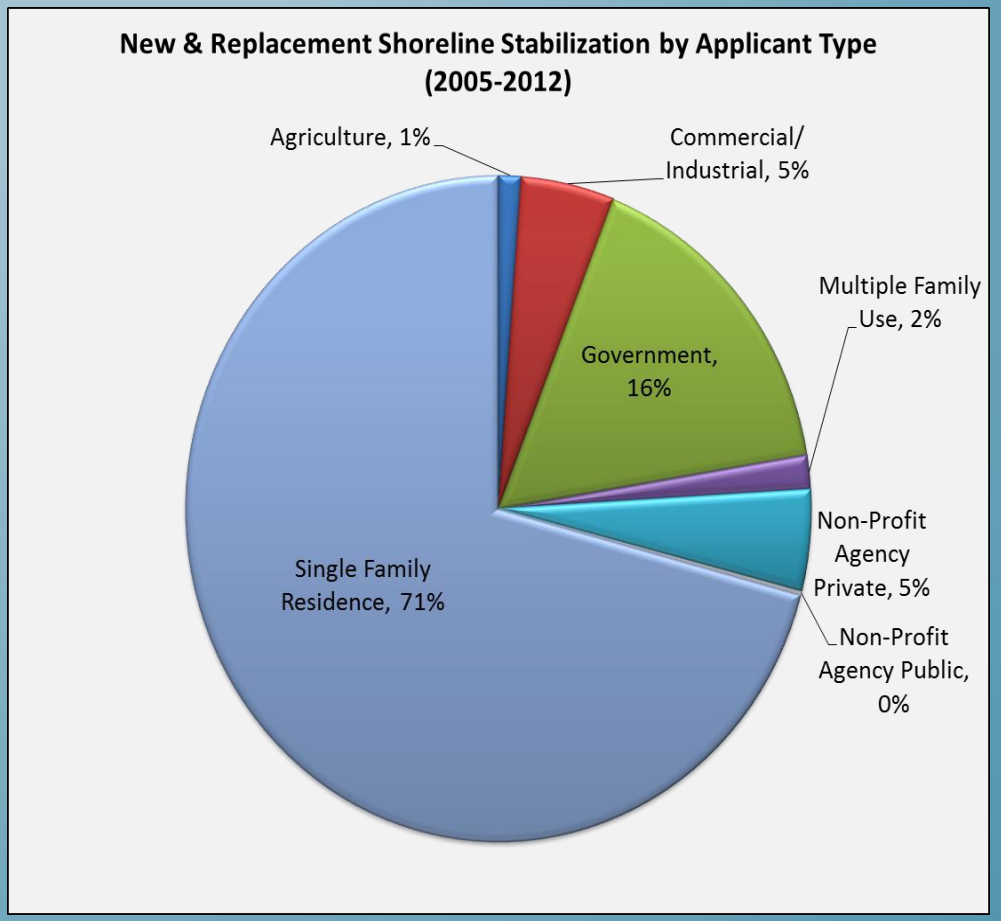


Figure 1.

Source: Data were compiled from the Hydraulic Project Approvals issued by the Washington State Department of Fish and Wildlife, Habitat Program



WHERE WE'VE BEEN:

HABITAT PROGRAM'S HISTORY OF HPA MONITORING

2006, 2008 & 2009 (Quinn et al., Habitat Program, Protection Division)

- *15% of marine bank protection projects were noncompliant.*

2014

- *In many cases it is difficult to impossible to independently confirm compliance post construction due to lack of detail in permit and plans and use of non-stable land marks to reference locations.*
- *For permits issued prior to 2014, most have designs that are not consistent with the preliminary recommendations of the new Marine Shoreline Design Guidelines risk assessment exercise.*

Ongoing

- *Survey new shoreline stabilization projects before and after construction to assess compliance and effectiveness.*

AREAS FOR IMPROVEMENT

1. Utilize the MSDG to guide projects and the permitting process to implement best management practices.

2. Ensure that the project dimensions are provided by plans and permits, and are accurate and sufficient to inform implementation and effectiveness monitoring.

3. Provide documented justification when protective provisions are omitted from a permit, or applied to a permit when it would appear to be above or beyond the guidelines or rules.

WHERE WE'VE BEEN:

HABITAT PROGRAM'S HISTORY OF HPA MONITORING

- **1998, 2003, and 2007 (Price et al.)**
- *30% of culverts (23 of 77) permitted under the HPA process for fish passage were barriers to fish movement.*
- *Most passage failures were due to noncompliance with permit provisions, particularly culvert slope.*
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Phillip Dionne

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Habitat Program/Science Division
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Dungeness Spit Feeder Bluff, 1994