Partnership with WDFW starting in 1991

Fish barrier inventory and prioritization

Statewide (as of 8/14):
- 7,033 culverts evaluated
- 1,982 barriers identified
  (including 1,537 with significant habitat)

Correction of barriers through:
- stand alone prioritized projects
- part of highway projects
- part of some maintenance activities

282 barrier corrections have been made
opening 976 miles of potential habitat
(as of 8/14)

SR 548 Terrell Creek Northwest of Ferndale
WSDOT Statewide Fish Barrier Culverts
Culvert Case

US v WA Background

• 1850’s Stevens Treaties: Tribes ceded lands but reserved fishing rights

• 1974 Boldt Decision: Treaties entitle Tribes to a fair share of fish and a related decision raised the question of the State’s responsibilities to prevent habitat degradation

• In 2001, Twenty-One Western WA Tribes filed suit against the State claiming culverts were blocking substantial amounts of salmon habitat and reducing the salmon available for harvest

• In 2007, Federal District Court Judge Martinez agreed to the claim and said the State was in breach of the Tribes’ treaty rights

• In October 2009, the court convened a trial to determine a remedy

• On March 29, 2013, Judge Martinez issued a permanent injunction for the State to fix barrier culverts in the case area

SR 112 Trib to Pysht River West of Port Angeles
**WSDOT culverts in the US v. WA Case area**

**Who? State of Washington**

*WSDOT, WDNR, WDFW, Parks*

**Where? Case area**

*Western Washington WRIA’s 1-23*

**How many are there?**

<table>
<thead>
<tr>
<th></th>
<th>Summer 2013</th>
<th>Summer 2014*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Case Area barrier culverts</td>
<td>1,014</td>
<td>989</td>
</tr>
<tr>
<td>Culverts with significant habitat (&gt;200 m upstream)</td>
<td>847</td>
<td>825</td>
</tr>
</tbody>
</table>

*Since summer 2013, 6 barriers were corrected, 22 determined not to be barriers, 3 new barriers identified. Numbers will be updated annually.*
Culvert Injunction: Key Points

- **Sept 2013**: Develop culvert barrier list in consultation with Tribes

- Use bridge or stream simulation design for barrier corrections

- **Oct 2016**: WDFW, DNR, & Parks to fix all their culverts.

- **March 2030**: (16 years) WSDOT to fix barriers with significant habitat (> 200 meters upstream)

- WSDOT can defer corrections up to 10% of the total upstream habitat until end of culvert’s useful life

- WSDOT to correct culverts with <200 meters upstream habitat at end of useful life or through larger transportation projects

- Ongoing effort to identify & assess barriers, monitor effectiveness & maintain culverts

- Notify Tribes of State’s activities with time for comments
WSDOT culverts in the US v. WA Case area
Current Barrier Correction Effort

- Fish Passage Program funding in 13-15 – $36 Million.
- $20 Million of that directed to ramping up scoping and design
- Formed 4 Specialty Fish Passage Design Teams in 3 regional offices
- Goals:
  - Designing 34 projects
  - Scoping 75 additional projects

SR 112 Nelson Creek near Port Angeles
Fish Passage Project Selection

**Past** - Projects selected based on a priority index (PI).

**Present** - Regions assist to select projects based on some of the following criteria:

- Upstream habitat
- Location of barrier compared with other WSDOT barriers
- Future WSDOT safety/mobility project inclusion
- Future local agency project relationship
- Project grouping efficiencies
  - Traffic impacts during construction
  - Combined construction
- Maintenance issues and structure condition
- Estimated cost (High, Medium, Low)
- Tribal priorities
- Partnership opportunities
- ESA “take” allowance for listed species
Fish Passage Program
HQ Hydraulics Deliverables to Region

• 25% Technical Memorandum - Contains supporting documentation
  – Site Reconnaissance
  – Hydrology
  – Hydraulics
  – Required Structure Span
  – Streambed material type/size

• 25% Design – Used for design “check-in” with WDFW and Permit Drawings
  – Plan View
  – Profile
  – Typical Sections
Fish Passage Program  
HQ Hydraulics Deliverables to Region

• 60% Design
  – Scour Analysis (Data received from Bridge/Geotech)
  – Substructure elevations determined based on substructure type and scour depth

• Specialty Report (Stamped Basis of Design Report)
  – Contains engineering calculations to support 100% PS&E

• 100% PS&E
  – Stream Design (Plan, Profile, Section and Details)
  – Scour Countermeasures
  – Water Crossing Design
  – Streambed Material Design
Fish Passage Barrier Culvert Conditions

Excessive Water Surface Drop

Shallow Water Depth

High Velocity
Fish Passage Barrier Culvert Conditions

Culvert Plugged with Sediment or Debris

Deteriorating Culverts
Fish Passage Crossings
Statewide Design Options

- **Stream Simulation** – mimics natural channel processes through the crossing

- **Hydraulic Design** – hydrologic and hydraulic analysis to determine suitable conditions for fish

- **No Slope** – properly sized culverts set at zero gradient

- **Retrofit** – series of steps facilitate passage of fish through, over, or around an instream barrier

2013 WDFW Water Crossing Design Guidelines
Fish Passage Crossings
Federal Injunction Case Area Design Options

- **Stream Simulation** – mimics natural channel processes throughout the crossing

- **Bridges** – bridges facilitate habitat connection for fish and wildlife

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**2003 WDFW Water Crossing Design Guidelines**

**2008 Forest Service Aquatic Road-Stream Crossing Design Guidance**
# Fish Passage Crossings Design Methods

<table>
<thead>
<tr>
<th>Size</th>
<th>Flow Event</th>
<th>Flow (cfs)</th>
<th>Culvert WSE (NAVD88)</th>
<th>Max Channel Depth At Culvert Inlet (feet)</th>
<th>Channel Velocity At Culvert Inlet (ft/s)</th>
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<tbody>
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<td>Proposed 20 Foot Box</td>
<td>FP Q-Low</td>
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<td>8.2</td>
<td>1.3</td>
<td>1.9</td>
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<td>FP Q-High</td>
<td>56.8</td>
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<td>Proposed 26 Foot Box</td>
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<td>188</td>
<td>9.9</td>
<td>2.9</td>
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## Modified Shields Equation

\[ \tau_{ci} = \tau_{D50}^* (\gamma_s - \gamma)D_i^{0.3}D_{50}^{0.7} \]

## Critical Unit Discharge (Bathurst)

\[ q_{cD50} = \frac{0.15g^{0.5}D_{50}^{1.5}}{S^{1.12}} \]

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US 2 - Mill Creek

Before – 11 foot CMP was a velocity barrier

After – 37 ft arch constructed in 2006
SR 106 Twanoh Falls Creek

Before – 5 foot concrete box

After – 20 foot 3-sided structure constructed in 2013
SR 106 Twanoh Falls Creek under construction
SR 104 – Unnamed Tributary to Squamish Harbor

Before – 2.5 foot CMP with 2 foot drop

SR 104 near Hood Canal Floating Bridge

After – 12 foot 3-sided constructed in 2009
US 101 – Mosquito Creek

Before – 4 foot CMP

After – 16 foot Concrete Culvert constructed in 2009

US 101 south of Aberdeen, WA
US 97 – Butler Creek

Before – 10.5 foot CMP
US 97 – Butler Creek

After – 65 foot bridge constructed in 2012
I-90 – East Fork Issaquah Creek

Before – 12 foot CMP with failed downstream sakrete weirs

After – 34 foot bridge project completed in 2012
SR 9 – NPCreek

Before – 8 foot concrete box

After – 17 foot concrete box constructed in 2013

Wickersham, WA
Partnership Example
I-5 Squalicum Creek

- WSDOT partnered with the City of Bellingham, WDFW, the WA Department of Ecology, and others to restore Squalicum Cr, which flows to Bellingham Bay.
- In 2013, WSDOT constructed an open, fish-friendly stream crossing to open ~ 22 miles of salmon habitat upstream while also protecting the existing I-5 bridges.
- In 2015, the stream will be rerouted by the City of Bellingham under the I-5 bridges into an old, historic channel.
**Partnership Example**  
**SR 11 Padden Creek**

- WSDOT partnered with the City of Bellingham, WDFW, the WA Department of Ecology, and others to restore a 0.50 mile reach of Padden Cr along SR 11 that runs through a brick tunnel built in the 1890’s.

- In 2013, WSDOT constructed a small bridge on SR 11 with a new stream alignment near the existing culverts which will assist in opening ~7 miles of upstream salmon habitat.

- In 2014, the City will reroute the stream out of the tunnel into a new stream channel.
Questions?

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