ADF&G Fish Passage Inventory and Assessment Program

Gillian O'Doherty
Alaska Department of Fish & Game

Goal

Assess structures on fish bearing streams for impacts to fish passage

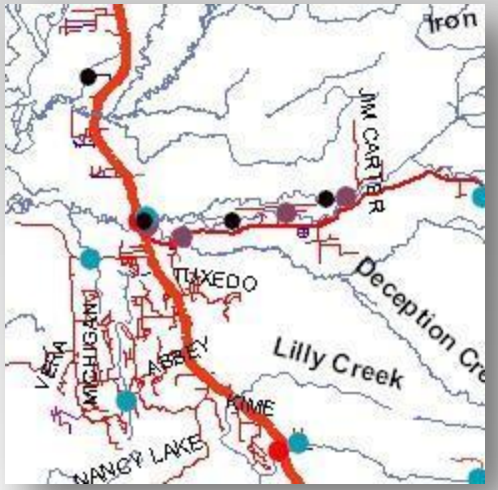
Process

- Assess culverts for impacts to juvenile salmonid passage using a standard assessment protocol
- Additional assessments to address Gray culverts or other life stages or species
- Data is used to identify and prioritize barriers for replacement

Standard Assessment Protocol

First Step: Locate all crossings

- Known locations
- Predicted based on NHD
- Drive all roads
- Railroad, bike trails, access roads, parking lots & driveways



Step two: Inventory

Bridges, fords, non standard culverted crossings, non fish-bearing channels, ephemeral channels

Step Three: Assessment

- Site Description
- Photographs
- Site sketch
- Culvert & channel dimensions
- Long Profile
- Fish trapping

	Structure Type	***Green*** *Conditions assumed adequate to pass fish*	***Grey*** *Conditions may not be adequate to pass fish, additional analysis required*	***Red*** *Conditions assumed not adequate to pass fish, additional analysis required*
1	**Bottomless pipe arch, embedded pipe arch, CMP, box culvert or other embedded structure that functions in a similar fashion.**	**Installed at channel gradient (+/- 1% slope), AND culvert span to OHW width ratio greater than or equal to 0.75 OR fully backwatered**	**Structure not installed at channel gradient (+/- 1%), OR culvert span to OHW width ratio of 0.5 to 0.75**	**Culvert span to OHW width ratio less than 0.5**
2	**Culverts (all span widths) with 2 X 6 inch corrugations or greater, not embedded.**	**Culvert gradient less than 1.0%, AND outfall hgt.= 0, AND culvert span to OHW width ratio greater than 0.75 OR fully backwatered**	**Culvert gradient 1.0 to 2.0%, OR less than or equal to 4-inch outfall hgt., OR culvert span to OHW width ratio of 0.5 to 0.75**	**Culvert gradient greater than 2.0%, OR outfall hgt. greater than 4 inches, OR span to OHW width ratio less than 0.5**
3	**Pipe arch or circular CMP (span width greater than 4 feet), less than 2 X 6 inch corrugations, not embedded**	**Culvert gradient less than 0.5%, AND outfall hgt. = 0, AND culvert span to OHW width ratio greater than 0.75 OR fully backwatered**	**Culvert gradient 0.5 to 2.0%, OR less than or equal to 4-inch outfall hgt., OR culvert span to OHW width ratio of 0.5 to 0.75**	**Culvert gradient greater than 2.0%, OR outfall hgt. greater than 4 inches, OR culvert span to OHW width ratio less than 0.5**
4	**Pipe arch or circular CMP (span width less than or equal to 4 feet), less than 2 X 6 inch corrugations, not embedded**	**Culvert gradient less than 0.5%, AND outfall hgt.= 0, AND culvert span to OHW width ratio greater than 0.75 OR fully backwatered**	**Culvert gradient 0.5 to 1.0%, OR less than or equal to 4-inch outfall hgt., OR culvert span to OHW width ratio of 0.5 to 0.75**	**Culvert gradient greater than 1.0%, OR outfall hgt. greater than 4 inches, OR span to OHW width ratio less than 0.5.**
5	**Non-embedded box culverts, culverts with non-standard configurations or materials, culverts with baffles or downstream weirs or step pools, fish ladders, bridges with aprons.**	**Fully backwatered as described below.**	**All others**	**Outfall height at downstream end of structure greater than 4 inches.**
6	**Multiple Structure Installations**	**Individual culverts all classified as Green as above**	**Individual culverts all classified as Gray or as some mix of Green, Gray or Red as above.**	**Individual culverts all classified as Red as above.**

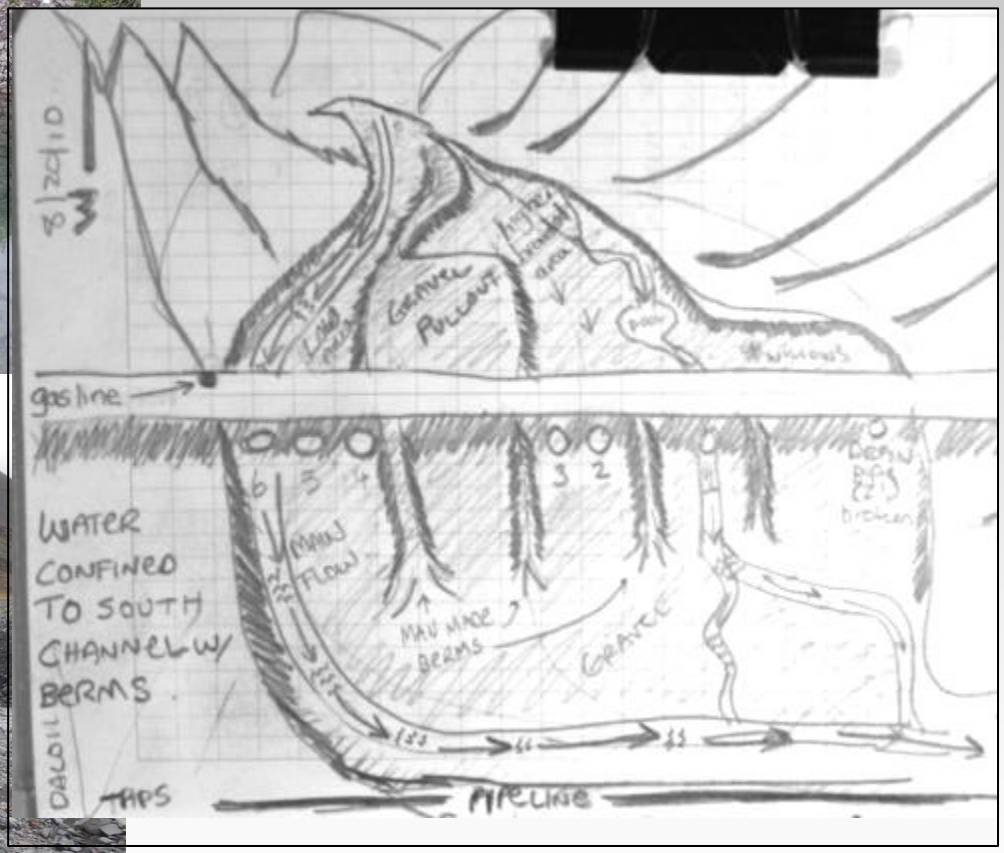
Step Four. Classify sites in relation to fish passage

- Green: conditions at the crossing are likely to be adequate for fish passage,
- Gray: conditions at the crossing may be inadequate for fish passage and
- Red: conditions at the crossing are assumed to be inadequate for fish passage.

The **Red, Gray, Green** Classification is based on:

1. **a 55mm Coho**
2. **Culvert Type**
3. **Measured Critical Values**
   - Slope
   - Perch Height
   - Constriction Ratio

Beyond Red-Gray-Green: other factors that affect fish passage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WATER
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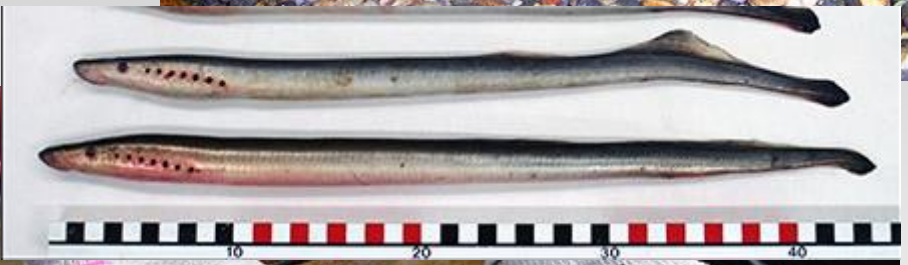
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Technologies Inc.

How to accommodate?

Added to Matrix

- Backwatering
- Tidal influence
- Predictable non standard structures such as fish ladders and weirs

Considered on an site-by-site basis

- Maximum Gradient
- Blockages
- Damage
- Beaver grates
- Channel type and flow

Standardize- ex: damage

(1) *Defective*, culvert is in dire need of prompt repair or replacement, flaws threaten to disrupt or are hindering traffic;

(2) *Poor*, culvert is in need of repair and shows potential for further deterioration;

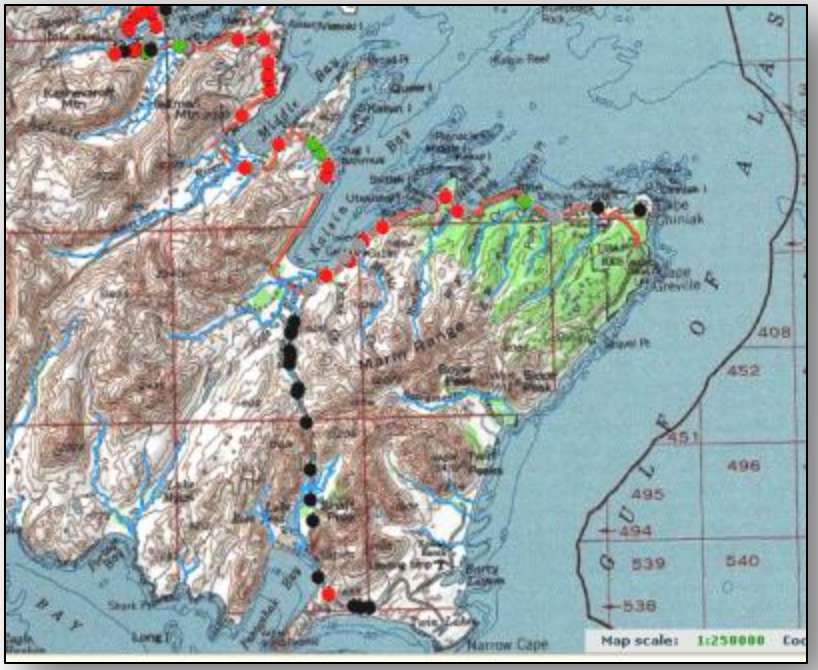
(3) *Fair*, culvert is operational but may need maintenance to restore function to full potential, distinct rust line and/or abraded bottom present, adverse conditions could lead to major problems;

(4) *Good*, culvert shows minor deficiencies, beginning of rust line formation may be visible; with continued maintenance should be trouble free;

(5) *Excellent*, culvert shows no signs of problems or rust, could allow flow at full capacity without disrupting traffic.
(Baker et al unpublished)

Unclassified

- Location known but not yet surveyed
- Replaced & not yet re-surveyed
- Unsafe to survey
- Photos only



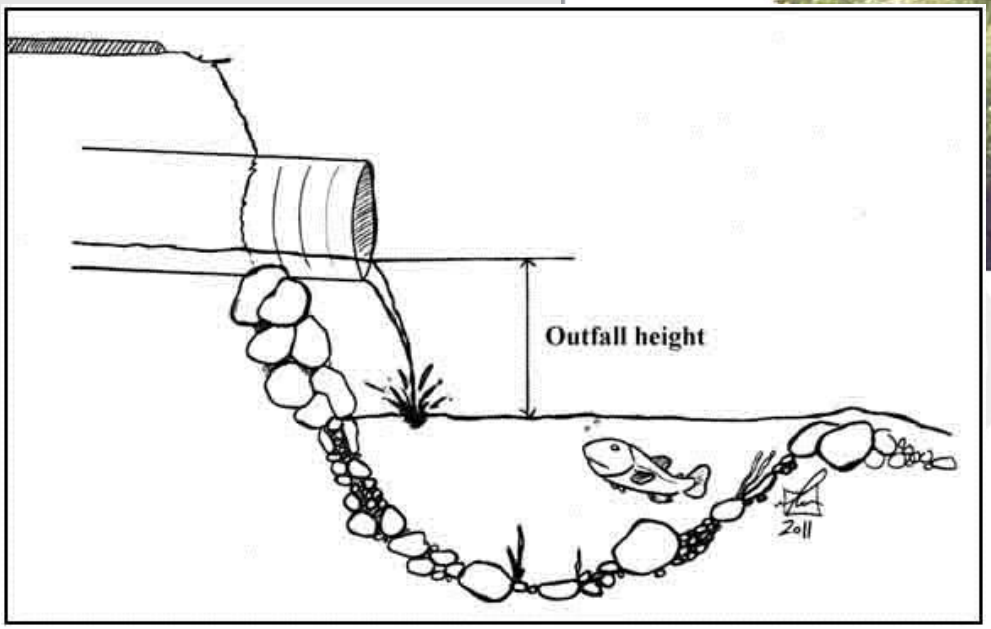
Manual

Alaska Department of Fish and Game

Culvert Inventory and Assessment Manual for Fish Passage in the State of Alaska

A guide to the procedures and techniques used to inventory and assess stream crossings in the State of Alaska: 2009-2014.

Mark Eisenman, ADF&G.
Gillian O'Doherty, ADF&G



Database & Mapper

- ADF&G maintains database of all inventoried & assessed culverts
- Interactive mapper
  - Locate sites
  - Create and print reports
  - View photos
  - View culverts, roads, AWC & Freshwater Fish Inventory data at one time

Results

- Streams are small
  - Juneau 61% are 10ft or less (n=71)
  - MSB average width is 9.3ft
  - Haines 56% are 6ft or less (n=45)
  - The majority of streams are less than 1ft deep
- Many of the streams are unmapped
  - 100 streams w/ barriers in MSB not mapped

Mat Su Borough

Factors affecting fish passage	Sites	Percentage
Gradient Red	211	32%
Mechanical or structural problem incl. parted joints.	132	20%
Outfall height Red	116	18%
Condition rating = 2	95	15%
Constriction ratio Red	96	15%
Gradient Gray	95	15%
Constriction Ratio is Gray	80	12%
Insufficient (shallow) roadfill over culvert	64	10%
Compound gradient	48	7%
Hydraulic capacity inadequate	53	8%
Condition rating = 1	50	8%
Beaver activity in vicinity of crossing	49	7%
Outfall height Gray	46	7%
Poor alignment	43	7%
Inlet perch	38	6%
Culvert sagging in middle	34	5%
Woody debris	33	5%
Sediment accumulation at inlet	25	4%
Other	27	4%

Juneau

Factors affecting fish passage	Number of sites	% of total sites surveyed
Gradient Red	33	27.0
Constriction Ratio Gray	22	18.0
Condition Rating =2	19	15.6
Gradient Gray	19	15.6
Outfall Height Red	19	15.6
Constriction Ratio Red	15	12.3
Condition Rating=1	8	6.6
Hydraulic Capacity inadequate	8	6.6
Mechanical/ Joints Parting/ Structural Problems	8	6.6
Poor Alignment	7	5.7
Beaver Activity	6	4.9
Debris Flow	5	4.1
Inlet Perch	5	4.1
Woody Debris	5	4.1
Gray Outfall	4	3.3
Compound Slope	3	2.5
Sediment Accumulation	3	2.5
Culvert sagging in middle	1	0.8