



# Culvert Fish Passage Design Strategy

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# Fish Passage Memorandum of Agreement (MOA)

- DOT&PF designs, constructs, and maintains state owned transportation facilities.
- When this requires work in streams that support fish, a fish habitat permit from ADF&G is required.
- This presentation discusses the MOA between ADF&G and DOT&PF for the design, permitting, and construction of culverts for fish passage dated 2001.



# Fish Streams

- In fish streams identified by ADF&G where DOT&PF proposes a new or modified culvert:
  - ADF&G provides the design fish swimming capabilities. The minimum depth is given in the MOA.
  - DOT&PF will design a culvert to meet both the fish passage criteria in the MOA and the DOT&PF criteria for the larger discharges.
  - The fish passage MOA has three culvert design methods to meet the fish passage criteria.



# Tier 1: Stream Simulation Design

- For streams with a slope from  $\geq 1\%$  to  $< 6\%$ , the culvert width must be  $> 0.9 * \text{OHW width}$ .
- For streams with a slope  $< 1\%$ , the culvert slope may be  $< 0.5\%$  if the culvert width is  $> 0.75 * \text{OHW width}$ .
- Otherwise, the culvert slope must be about the stream slope.
- Bury the culvert invert 40% of the diameter for a round pipe and 20% of the rise for a pipe arch.
- Add substrate in the culvert to create a streambed. This should be stable during discharges up to a 50-year return interval. Add baffles as needed.





## Tier 2: FISHPASS Program Design

- Use the FishXing software developed by the US Forest Service.
- To determine if fish passage can occur, this compares the maximum water velocity and minimum depth needed by the design fish to the calculated values in the culvert during the design fish discharge.
- Add resting areas as needed.



# Tier 3: Hydraulic Engineering Design

- This allows an alternate design method that is agreeable to both ADF&G and DOT&PF.
- This is rarely used.
- This is normally used where the tier 1 and tier 2 culvert design methods cannot be met or would be cost prohibitive, such as in steep and/or wide streams.
- Typically, culverts that meet the tier 3 criteria are designed to provide similar water velocities in the culvert as in the natural environment during the design fish discharge.

# Tier 2 fish passage with baffles Alyeska Highway, Girdwood





# Wasilla Creek at Bogard, 17'-0" x 6'-9"





# Fish Creek at Knik Goose Bay Road After, 32' x 12'



# Wasilla Creek at Palmer-Fishhook 17'-2"x11'-4", buried 2.3', 2016, Outlet





# Wasilla Creek at Palmer-Fishhook 2016 looking upstream







# Fish Culverts in the design phase

- Cottonwood Creek at Edlund Road and Endeavor near Knik Goose Bay Road, MP 2.5.
- Docs Creek and Barbel Lake outlet at Knik River Road.
- Goose Creek at Parks Highway MP 93.4