Use of Weirs to Control Straying of Hatchery Origin Fish

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Presentation Outline

- Why control movement of fish?
  - What is a stray?

- Different weir types
  - Ridged picket weir vs. resistance board weirs (RBW)

- Cost and other considerations
Why control movement of fish?

- What is stray?
  - (Verb) : to go in a direction that is away from a group or from the place where you should be

- “Stray” is a natural adaptation for migratory salmonids
  - Habitat colonization/re-colonization
  - Maintains gene flow within and among adjacent populations
Why control movement of fish?

- “Stray” hatchery fish may contribute to fitness decline in wild populations
  - Hatchery origin fish may not “imprint” on hatchery source water well enough to home back to a specific collection point
  - Imprinting occurs during egg incubation, parr-smolt transition, and can occur during times of stress ($\uparrow$ cortisol)
  - Genetic introgression, intra- and inter-specific competition
Why control movement of fish?

- In the past, some hatchery programs overwhelmed wild fish in terms of numbers on spawning grounds.
  - Unintended stray or hatchery fish simply returning to their point of release???
  - Fisheries often took advantage of upper basin areas to expand fishing to more remote sites
Weir types

- **Ridged picket weir**
  - Constructed of wood, steel, or aluminum/steel
  - **Benefit**
    - Relatively easy to install
    - Flexible over varying substrate
    - Useable in small to medium sized streams (10-120 feet)
    - Relative low cost (***)
    - Very durable even in flooding flows (too durable?)
Simple picket weir
Former wooden picket weir at Sandy Fish Hatchery
Sandy Hatchery intake/adult collection reconstruction
Salmon River, near Brightwood, OR
Weir types

- **Ridged picket weir**
  - Costs
    - High risk depending on stream type and hydrology
    - Debris loading a big challenge (SAFETY!)
    - Not as flexible as RBW’s

- **Resistance Board Weirs (RBW)**
  - Constructed of UHMW composite, PVC tubing, steel channel and SS cable, SS clamps, marine grade plywood for resistance board
RBW w/ridged picket weir panels at Dodge Park on the Bull Run River
Clear Creek, Clackamas River RBW
Bankfull flow event (~400 cfs)
- Resistance panels release at very high flows to reduce pressure against the weir.
- Limited fish movement at these flows but trap is closed to reduce risk to fish and staff working trap.

Anchor ice formed during prolonged cold spell. Weir worked to prevent passage but trap was completely inaccessible to fish or staff.
Weir types

- Resistance Board Weir
  - Benefits
    - Highly flexible in medium to large rivers
    - Labor intensive but relatively easy to install (w/exception of substrate rail and trap)
    - Operates in high range of flows (20-2000 cfs+)
    - Debris loading tends not to be a problem
  - Costs
    - Comparatively high initial cost
    - More challenging to install as you need a “clean base”
Steel substrate rail with 3/8” stainless steel cable

3/4” rebar
4’ x 20’ panels connected to 3/8” SS cable

1” Sch40 PVC
Species considerations
• Lamprey
• Juvenile salmonids
• Species of concern (ESA)
• Downstream movement of adults/kelts

Size and number of fish can dictate trap size and specifications (i.e. bar spacing, height, fyke spacing)
Cost (RBW vs. picket weir)

- **Per foot cost of weir material**
  - Picket weir - $80-$100/foot
  - RBW - $160/foot

- **Trap costs vary depending on size**
  - $10’x20’x6’ = $8,000

- **Operational costs**
  - Labor (install and operate)
    - Picket – 6 crew x 2 days install
    - RBW – 6 crew x 4 days install
Cost (RBW vs. picket weir)

- **Operational costs**
  - 2 person crew per trap x 3 traps
    - 6 person crew
    - 6 months operation = $200,000

- **Maintenance**
  - Ridged weir – Higher risk of catastrophic failure and higher corresponding maintenance costs
Predation
Hydrology - Variable flows
Navigable waterways require signage to warn boaters of potential danger downstream.
Thank you!

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