

# Use of Weirs to Control Straying of Hatchery Origin Fish

Todd Alsbury

District Fish Biologist

Oregon Dept. of Fish & Wildlife



# 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

# Former Marmot Dam, Sandy River



# 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 (↑ 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?)

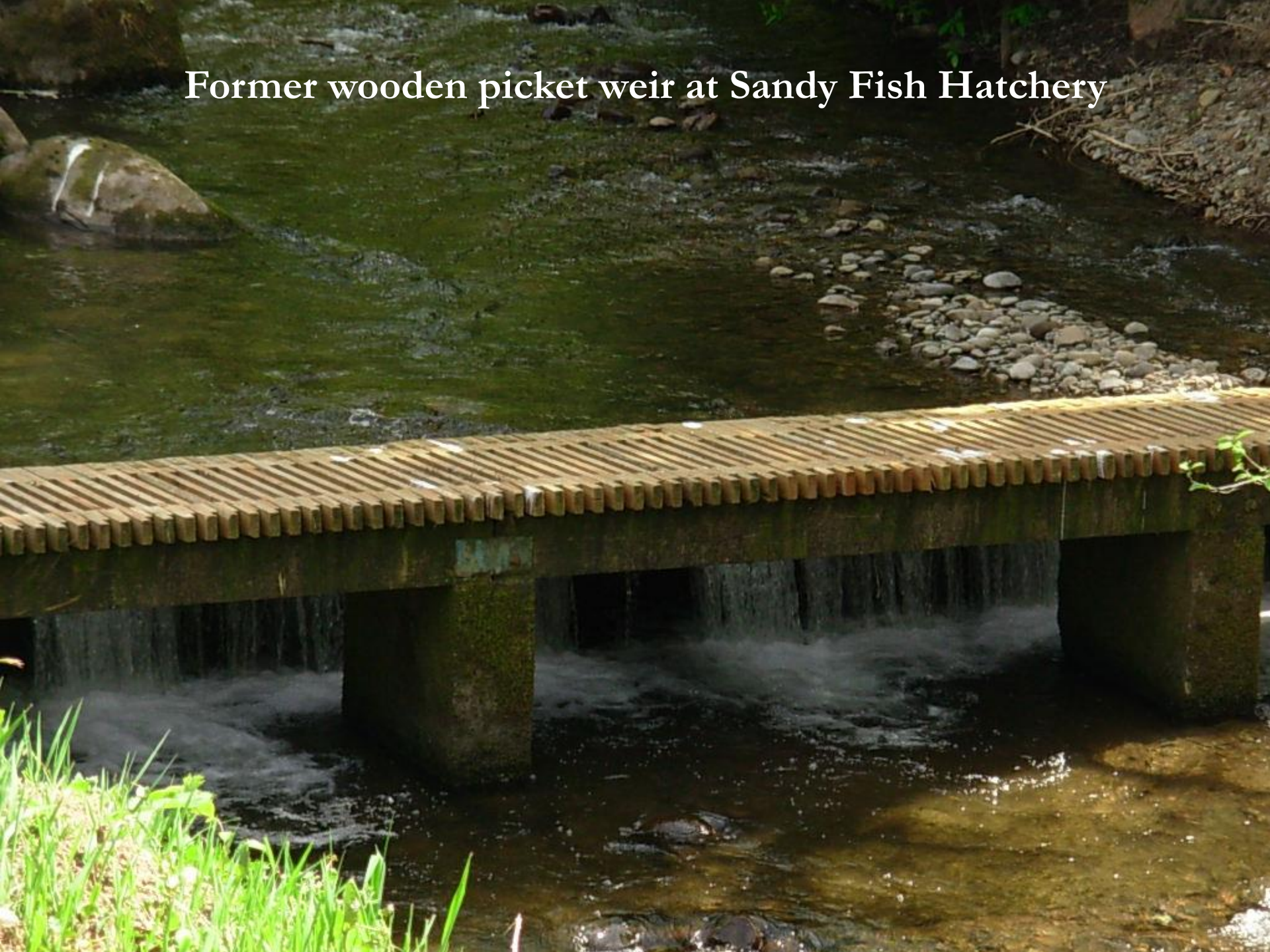


A photograph showing two men standing in a shallow stream. They are positioned on either side of a simple picket weir, which is a structure made of vertical wooden or metal slats. The man on the left is wearing a bright blue t-shirt and jeans, while the man on the right is wearing a plaid shirt. They appear to be working together, possibly adjusting the weir. In the background, a blue pickup truck is parked on a road, and there is lush green vegetation on the right bank. The water is flowing over the weir, creating a small cascade.

Simple picket weir

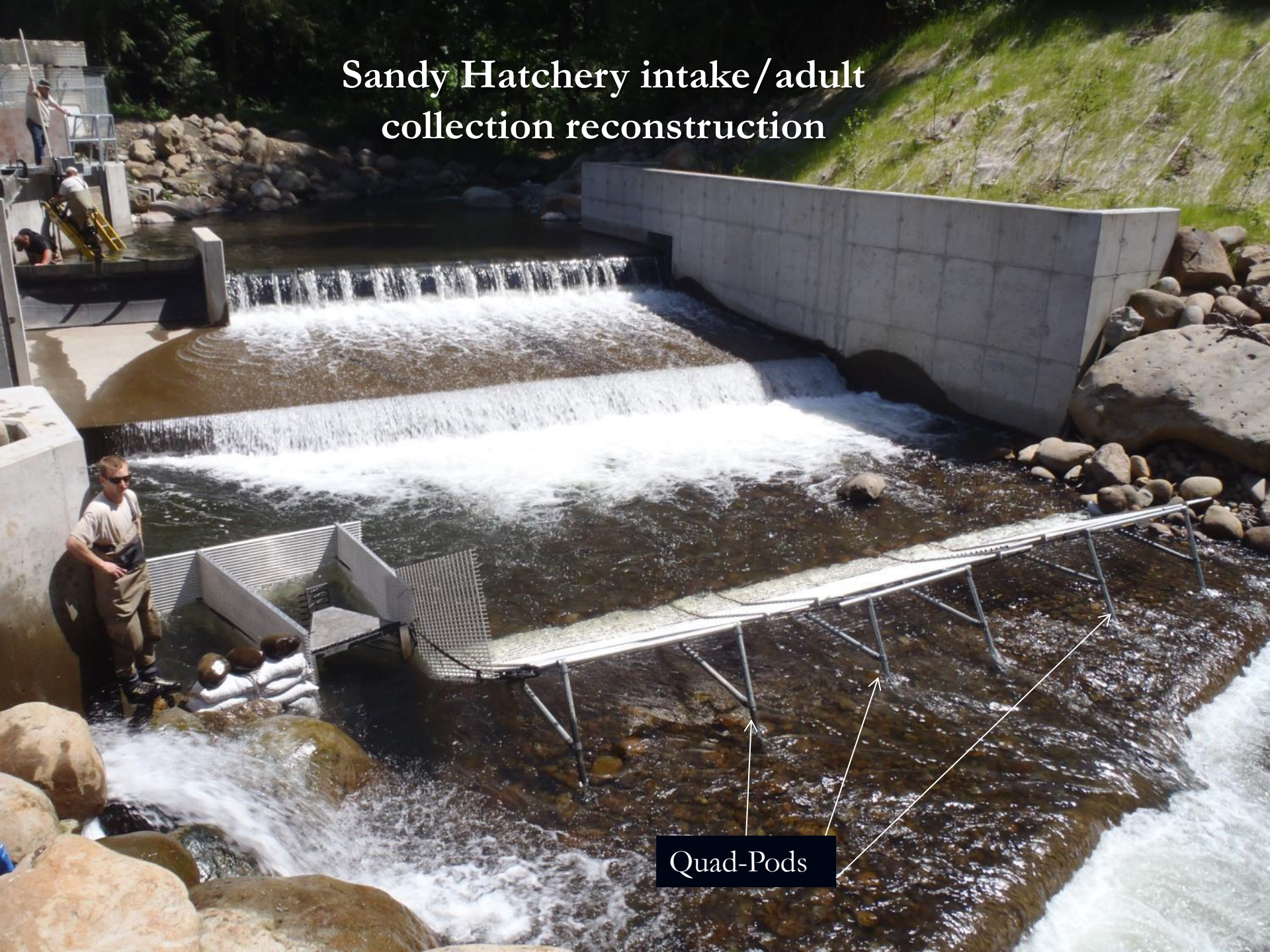


Former wooden picket weir at Sandy Fish Hatchery





# Sandy Hatchery intake/adult collection reconstruction



Quad-Pods







# 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





**DANGER**  
Keep Away  
from Weir and  
Fish Trap

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.





Photo provided by  
SP Cramer & Assoc.





Photo provided by

# 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”





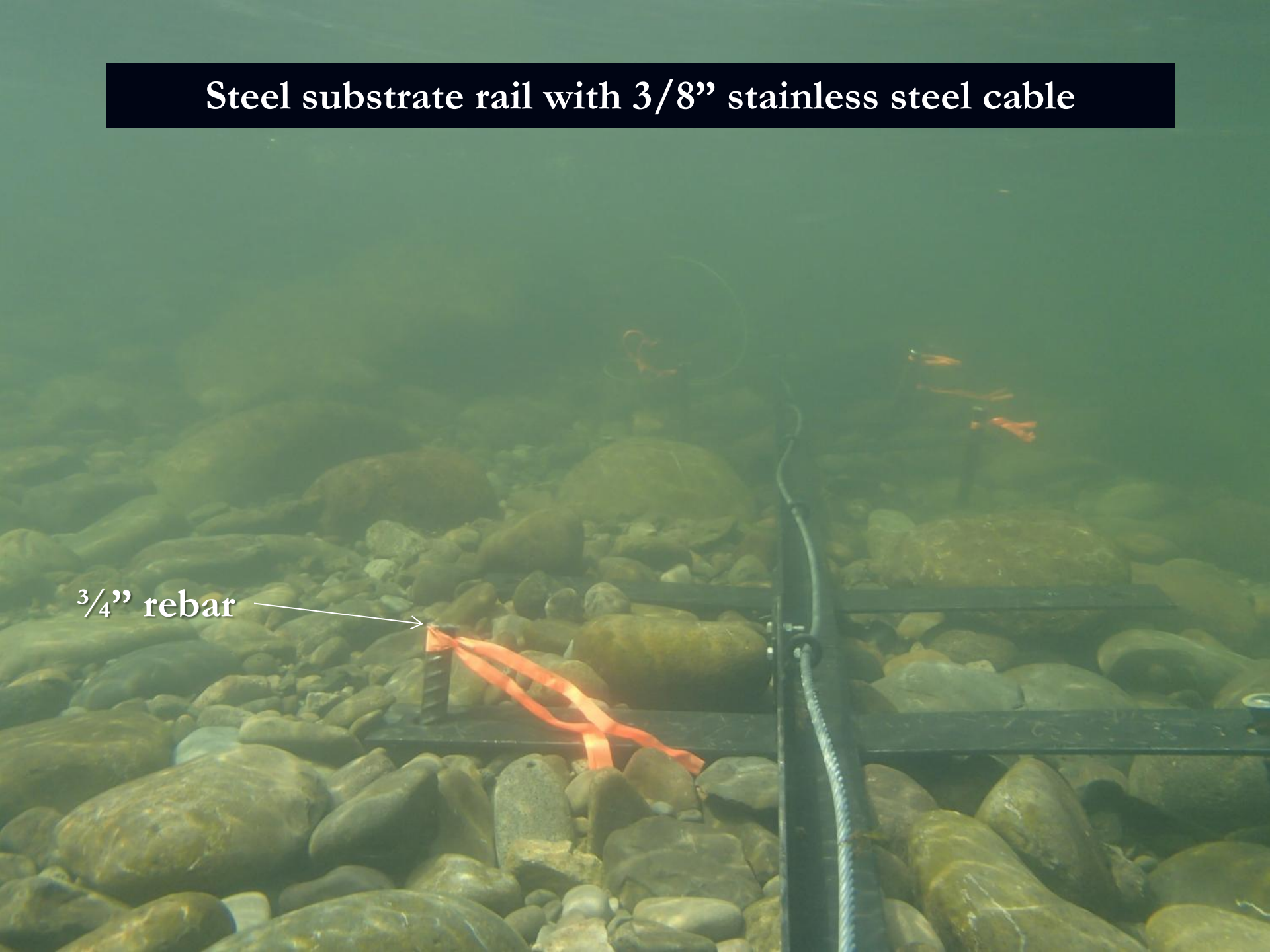






# Steel substrate rail with 3/8" stainless steel cable

3/4" rebar





4' x 20' panels connected to 3/8" SS cable

1" Sch40 PVC



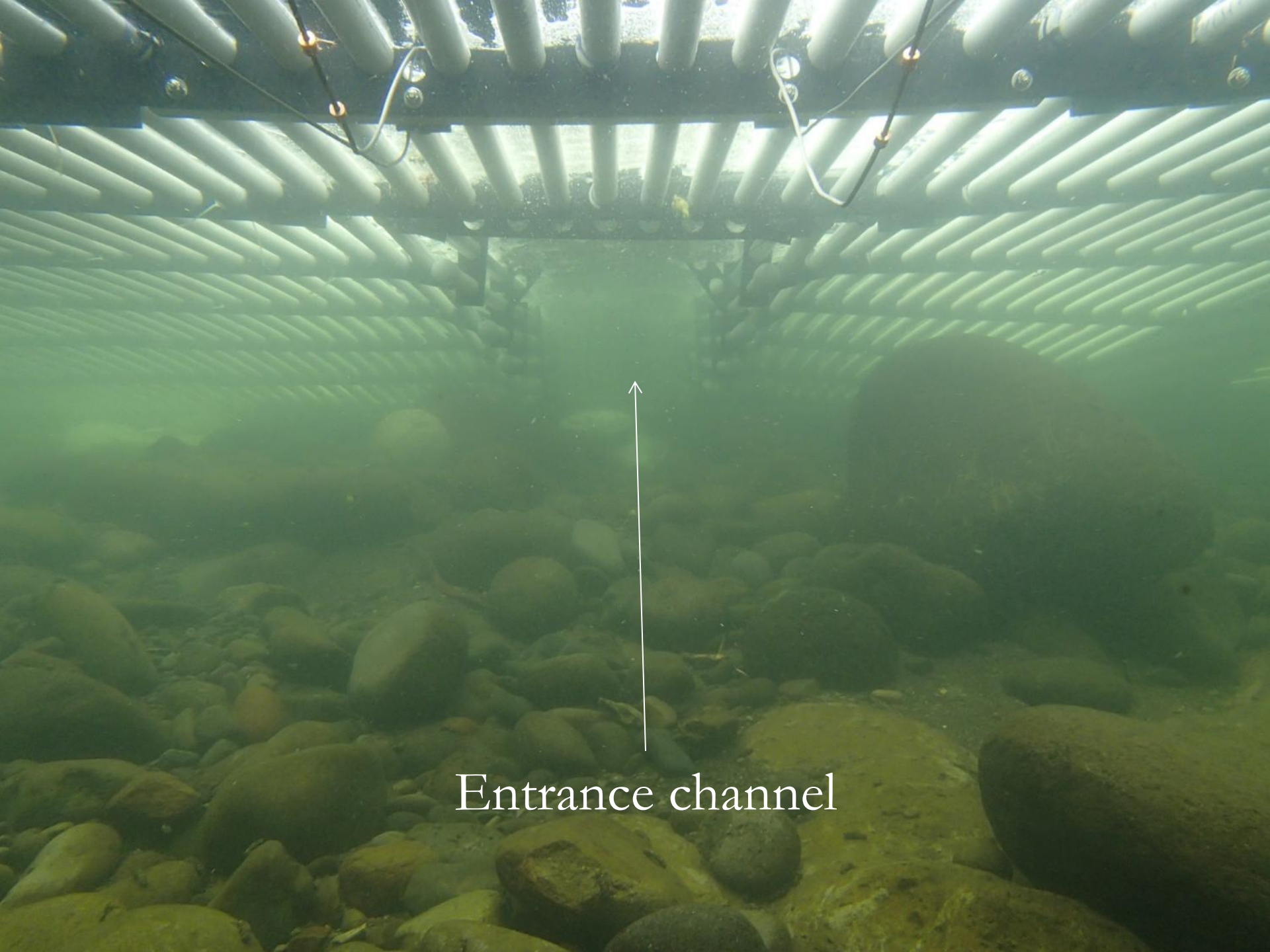












Entrance channel











## 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



# Vandalism





# Hydrology-Variable flows













## Navigability/Recreation



Navigable waterways  
require signage to warn  
boaters of potential danger  
downstream





A scenic view of a river flowing through a forest. The trees on both banks are heavily covered in snow, creating a winter scene. The river is dark and reflects the light from the sky. The sky is overcast and grey.

**Thank you!**

**Todd Alsbury**

**District Fish Biologist**

**Oregon Dept. of Fish & Wildlife**

**971-673-6011**

**503-781-8286**