

Jun 21st, 1:30 PM - 1:45 PM

Innovations I: Mud Mountain Dam (MMD) Fish Passage Project

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U.S. Army Corps of Engineers

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Mud Mountain Dam (MMD) Fish Passage Project

Fred Goetz

Seattle District

Fish Passage 2016

University of Massachusetts

22 June 2016



Upstream Migrant Trapping Solutions for a Puget Sound Glacial-fed River and Abundant Pink Salmon Runs

Mt Rainier

*White
River*





Seattle

Puget Sound



Pink Salmon

Washington Dept.
Fish and Wildlife



Mud Mountain
Fish Trap

White River

Mt Rainier

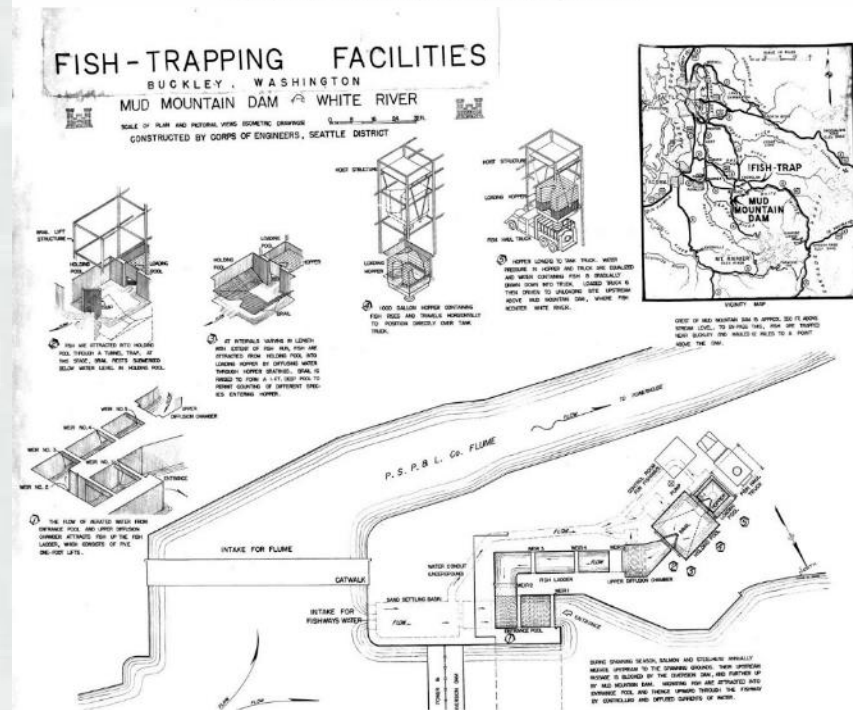
Mud Mountain Dam

- Flood control, > 400 ft high
- Barrier 5-miles downstream built in 1910
- Originally hydropower, now fish barrier
- MMD has one of the oldest traps, 1941, called Buckley style trap
- 3 ESA listed species
- Biological Opinion (BIOP) for new fish passage facility

White River Pre-barrier



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Barrier

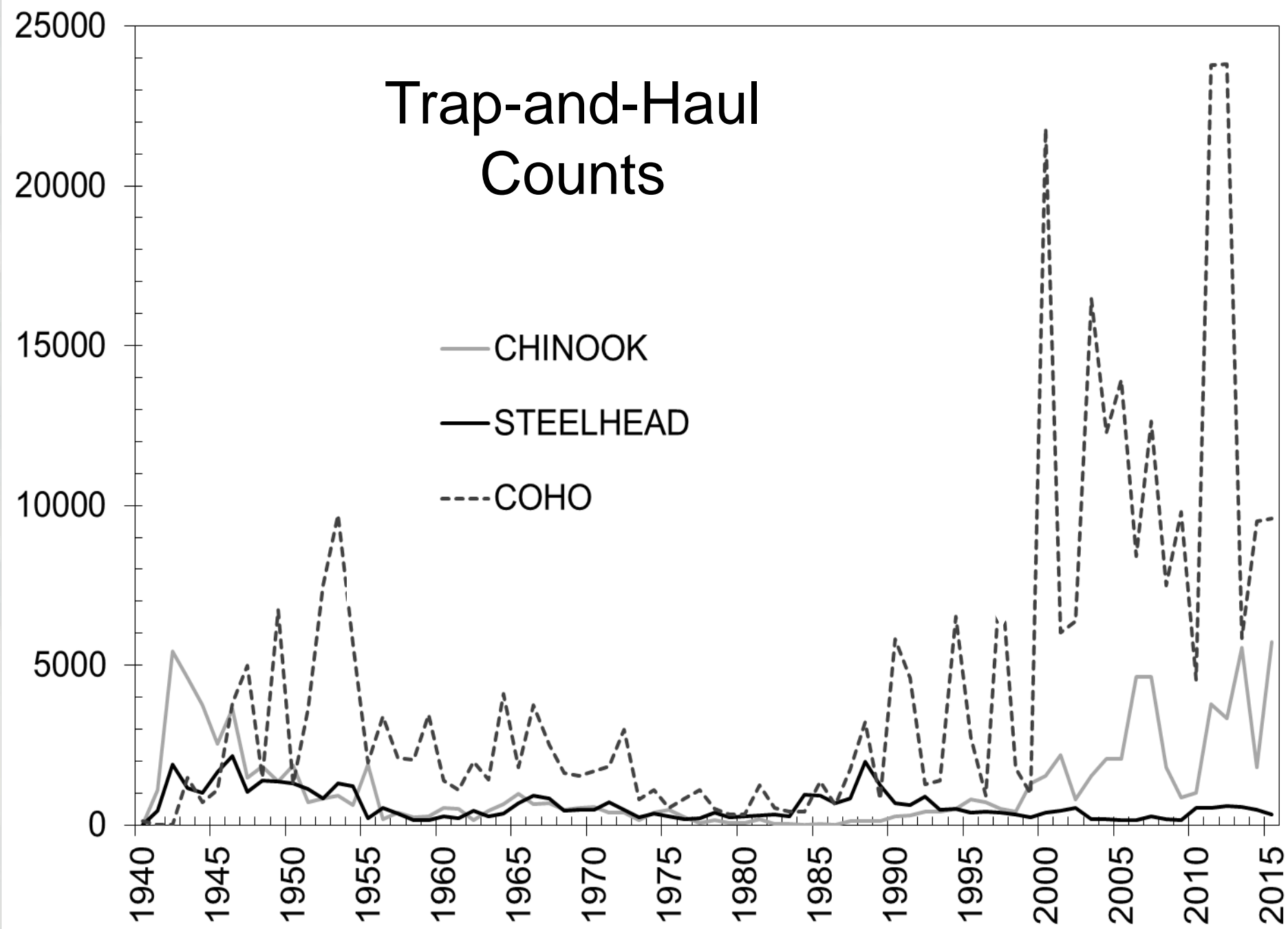
- Flashboard and timber crib
- Breaches/repairs annually
- 352 ft wide (normal river width 120 ft)
- Bedload, suspended sediment, large trees
- Injury and mortality to endangered (ESA) fish



Spring Chinook Salmon

Trap-and-Haul Counts

— CHINOOK
— STEELHEAD
- - - COHO

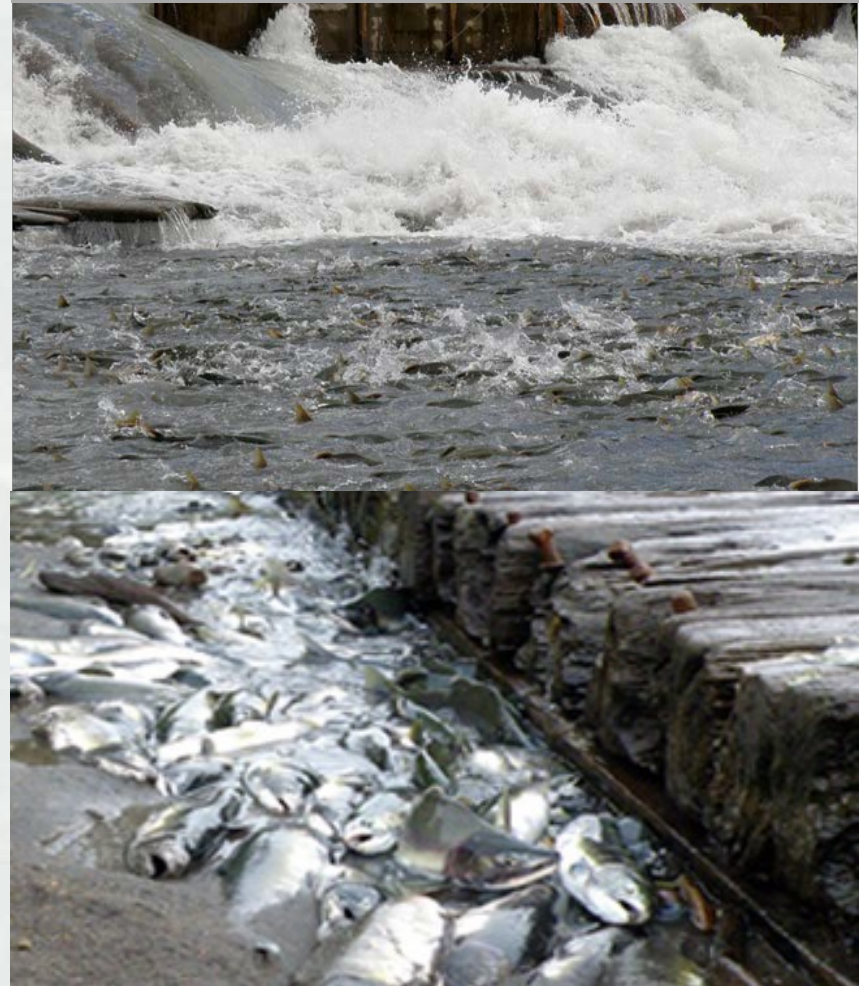


Pink Salmon

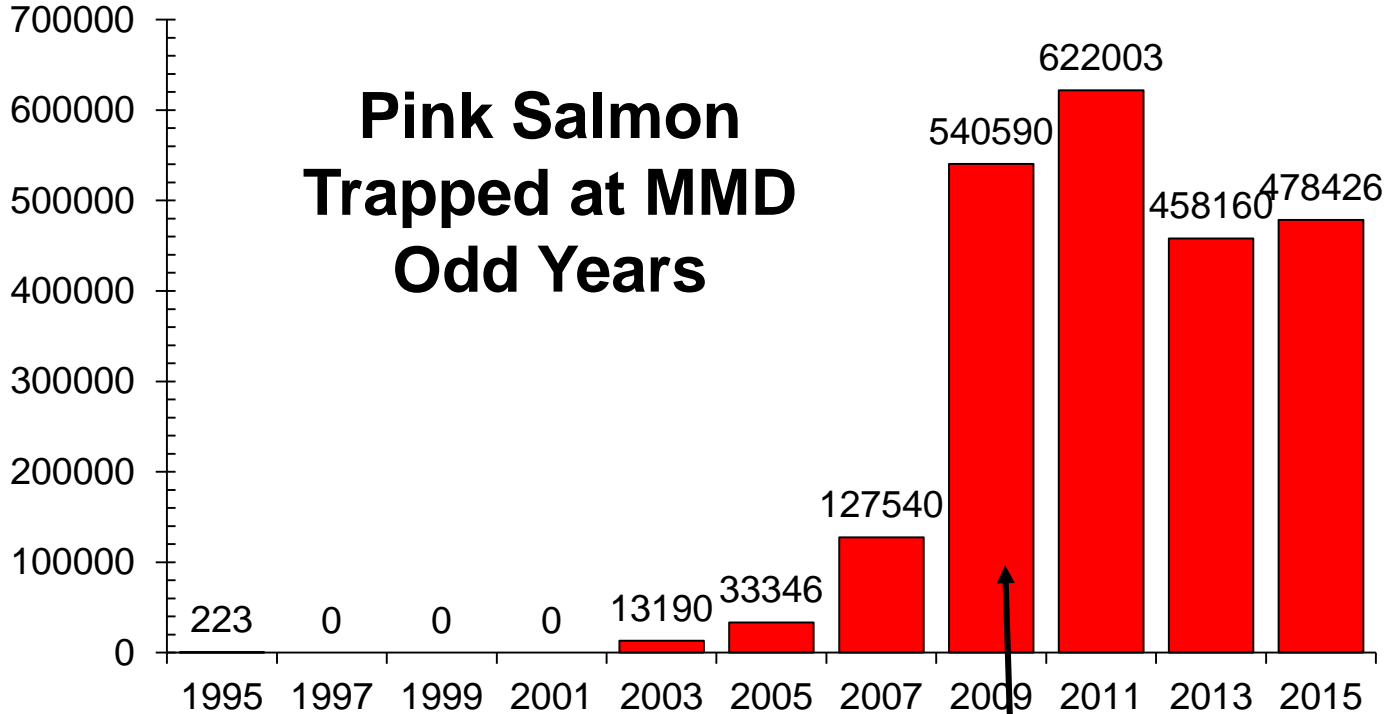
- Most abundant in world
- Schooling, poor homing
- Weaker swimmer (7-13 fps) than Chinook and steelhead
- Prefer ramps vs pool/weir (0.75 ft head-drop)
- Unpredictable behavior
- Changes in water clarity & velocity impact collection
- 1 million at trap in 2009



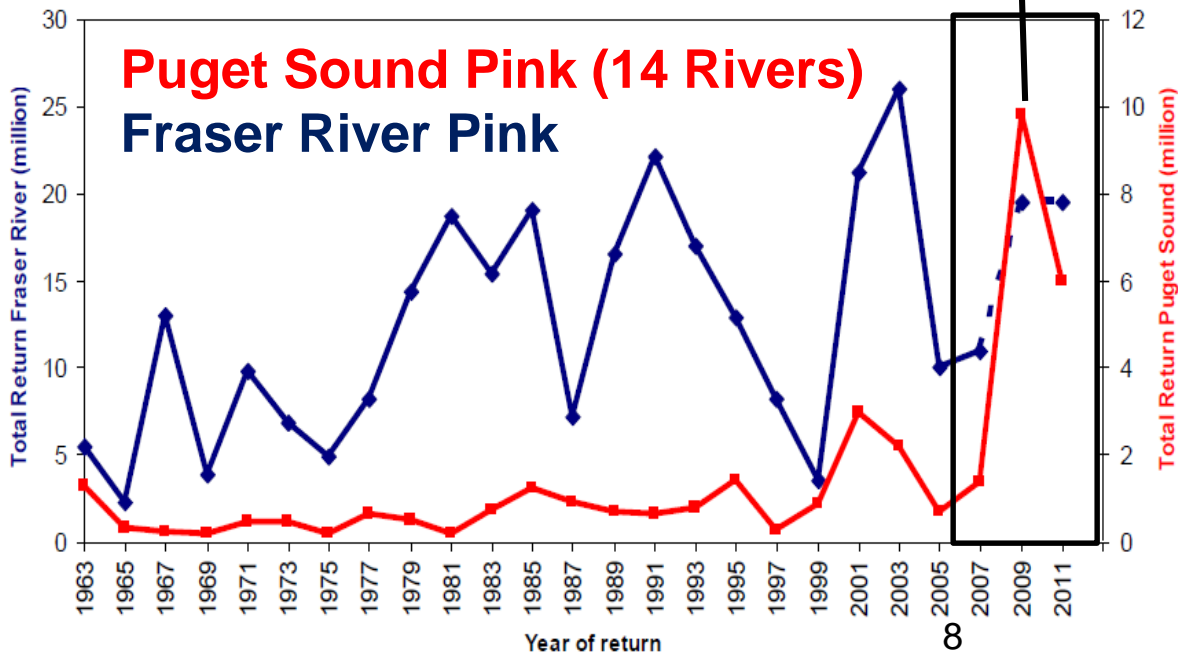
2009 - Pinks below Barrier:
500k not transported



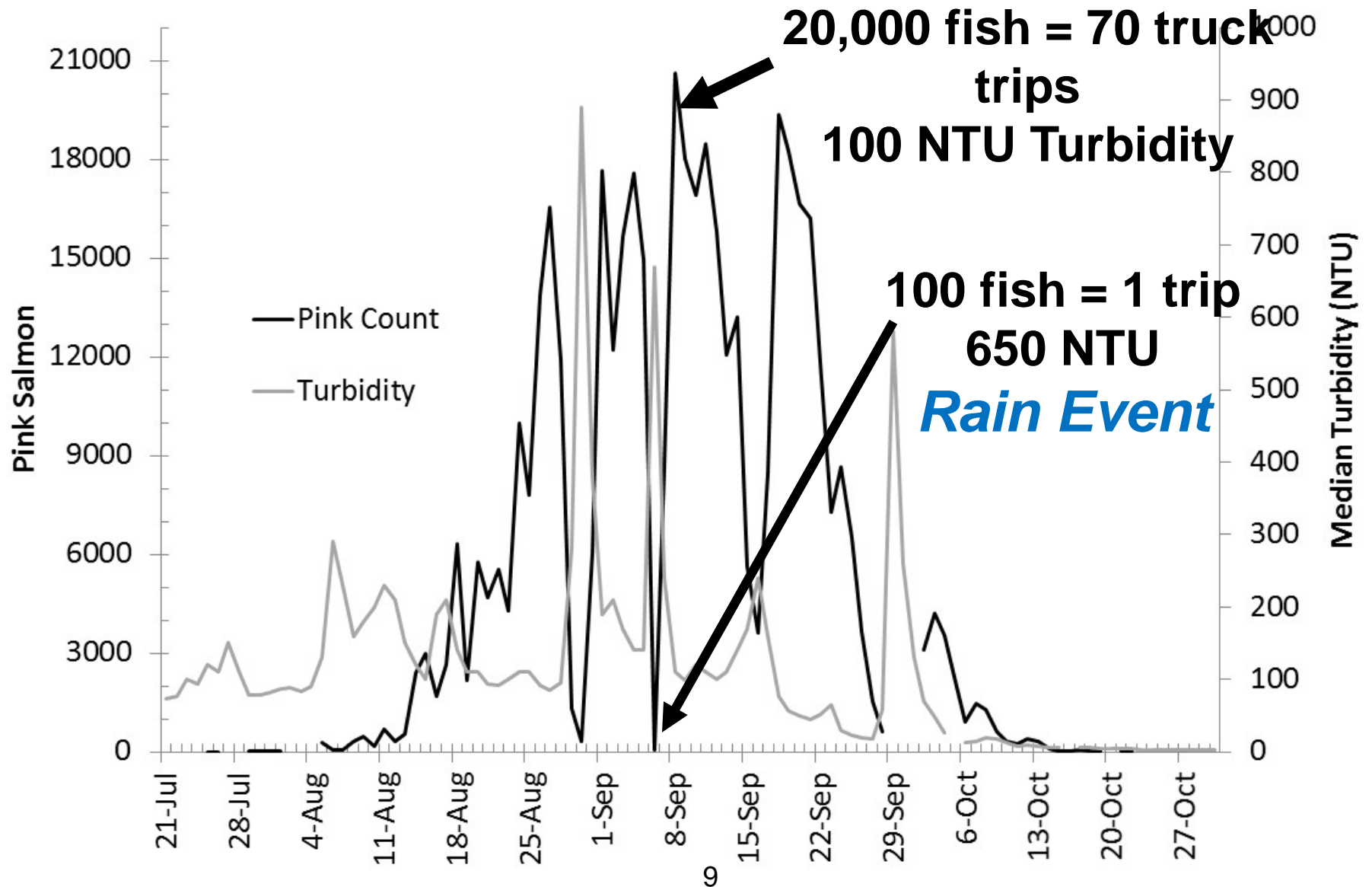
Pink Salmon Trapped at MMD Odd Years



Number of Trucks
2001 = 1
2011 = 4



Pink Salmon Daily Transport and Turbidity (2013)



BIOP Design Criteria

- 95% attraction to facility, 98% survival through facility
- 1,250,000 fish annual capacity (98% from Aug-early Oct)
- 60,000 fish daily transport – minimum 3000-3500 fish/hr
- Maximum 24-hr holding
- Design flow range 360-3600 cfs (5-95%)
- Fishway flow 220-400 cfs (5-10% of high design flow)
- Research, monitoring and evaluation facility (RME)

Barrier Design and Operational challenges

Sediment Load

- 500,000 tons sand/gravel per year, can include boulders
- Suspended load at barrier ~ 1.5 million tons/year
- Winter - high velocities, high depths, and large volumes of fast-moving sand, gravel, and boulders
- Summer – glacial melt with deposition and high turbidity

Fish Passage

- Provide Water Supply, Vertical/Velocity barrier, far-field attraction, flush sediment away from intake and fish entrance

Existing Lay-out



**New
Trap
Location**

Right Bank

**Barrier 352 ft
width**

**Regional
Water Supply**

Thalweg

**Existing
Trap**

Left Bank

Out-line of New Facility

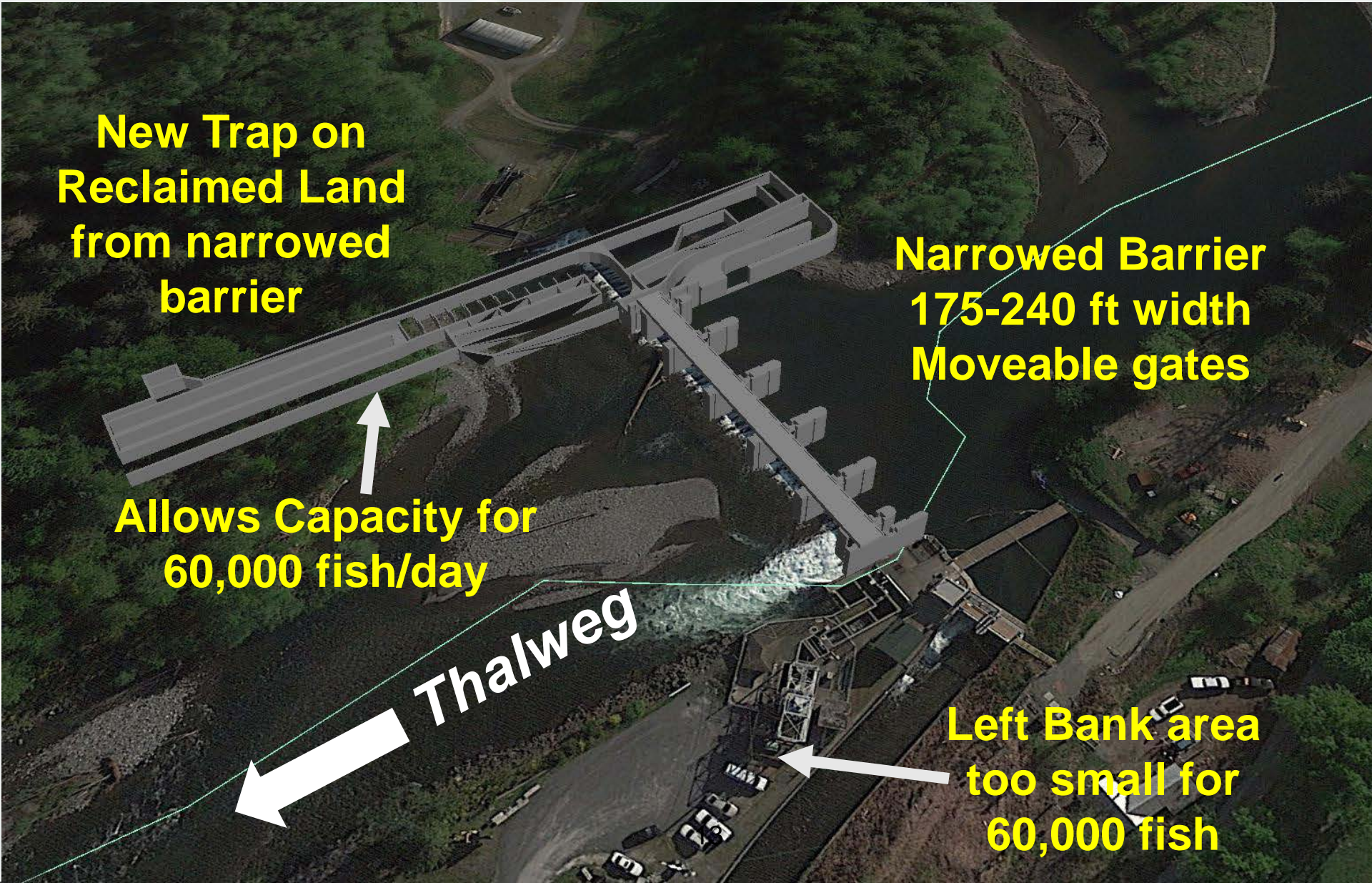
New Trap on Reclaimed Land from narrowed barrier

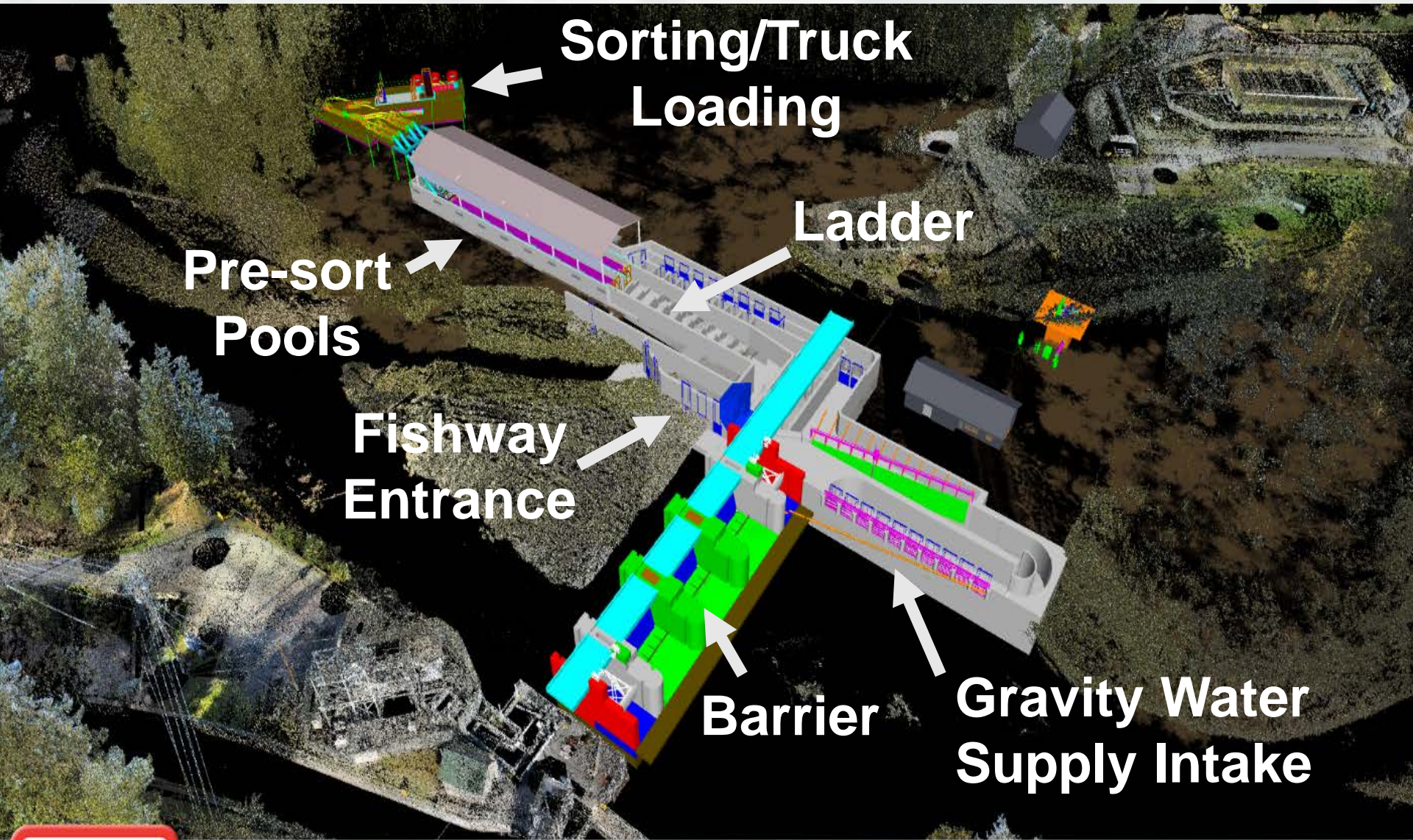
Allows Capacity for 60,000 fish/day

Narrowed Barrier 175-240 ft width Moveable gates

Thalweg

Left Bank area too small for 60,000 fish





Sorting/Truck Loading

Ladder

Pre-sort Pools

Fishway Entrance

Barrier

Gravity Water Supply Intake



MUD MOUNTAIN DAM FISH PASSAGE FACILITY

COMPLETE FACILITY

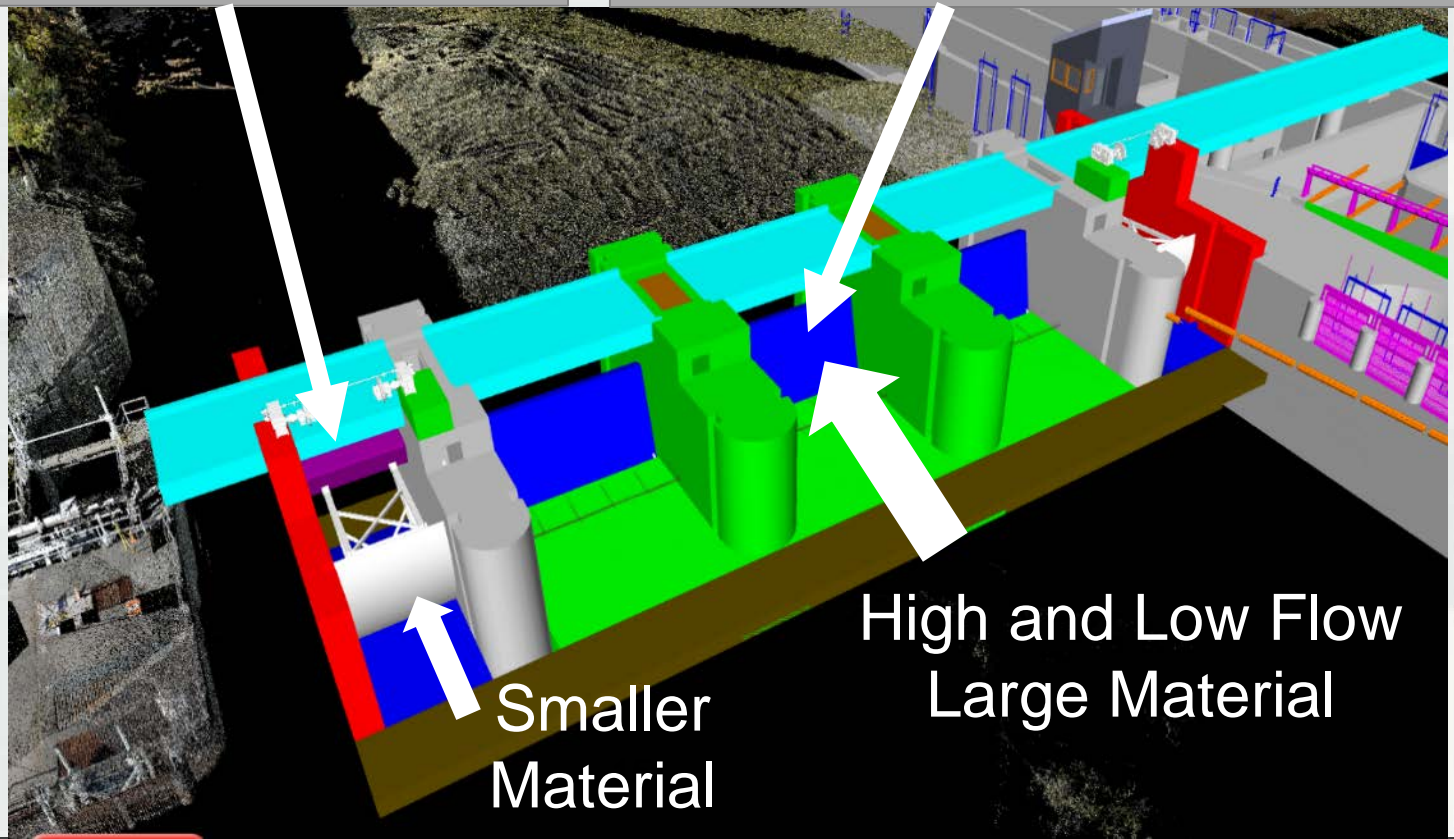


2 Sluice-Tainter Gates
15-ft wide, each end of barrier



3 Crest Gates
40-ft wide, center of barrier

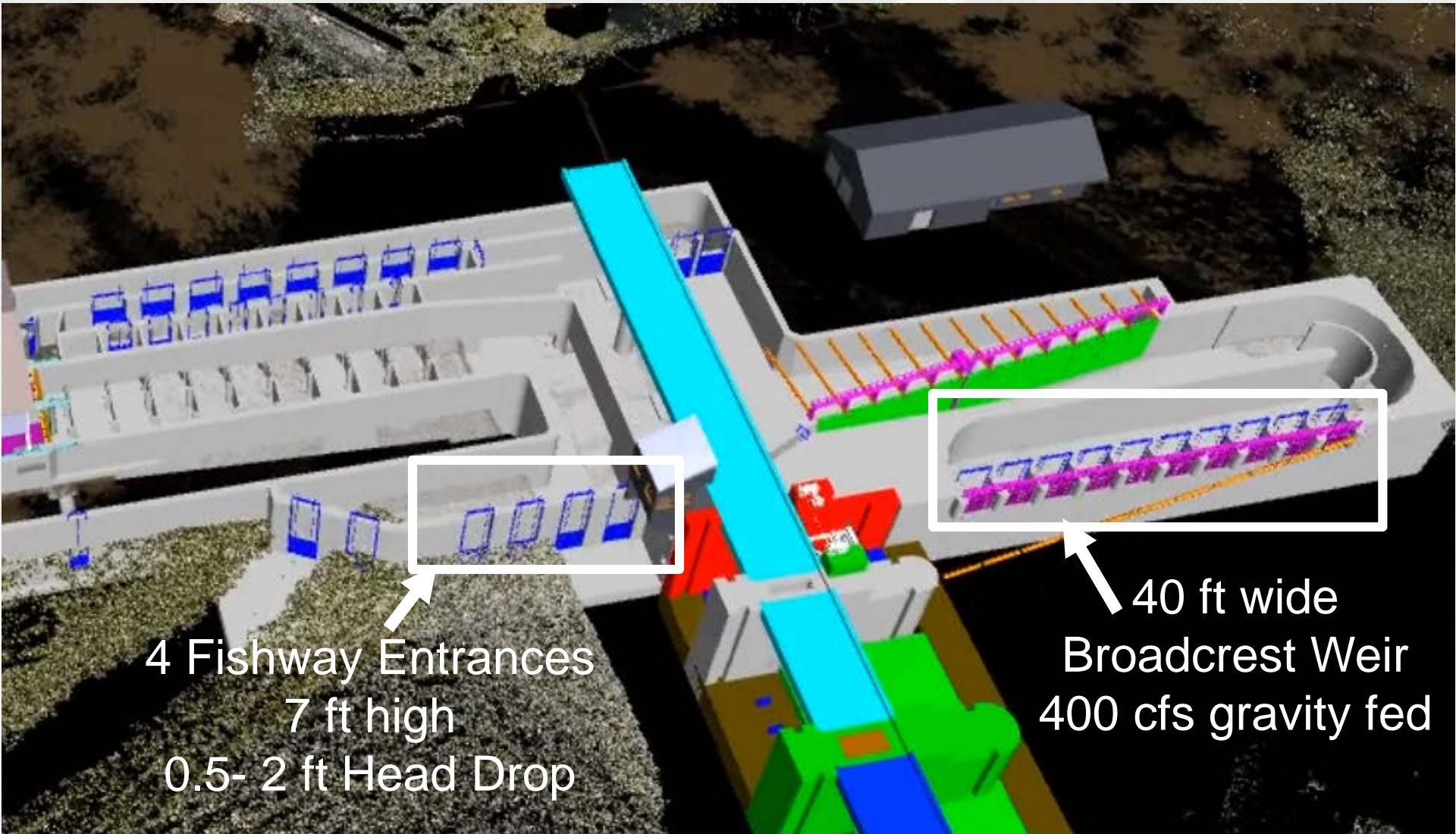
Barrier



Smaller
Material

High and Low Flow
Large Material

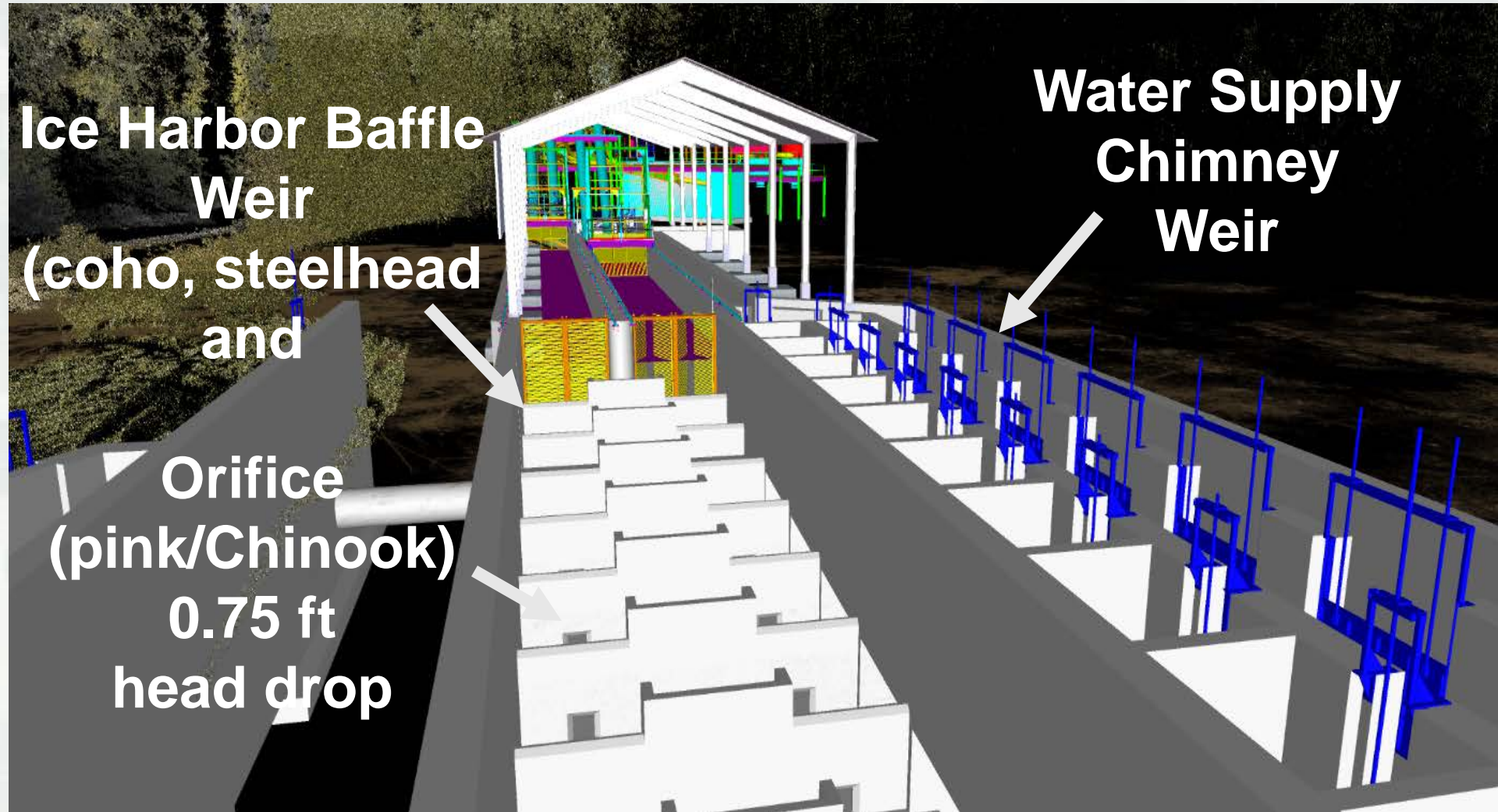
Fishway Entrance and Water Supply Intake



4 Fishway Entrances
7 ft high
0.5- 2 ft Head Drop

40 ft wide
Broadcrest Weir
400 cfs gravity fed

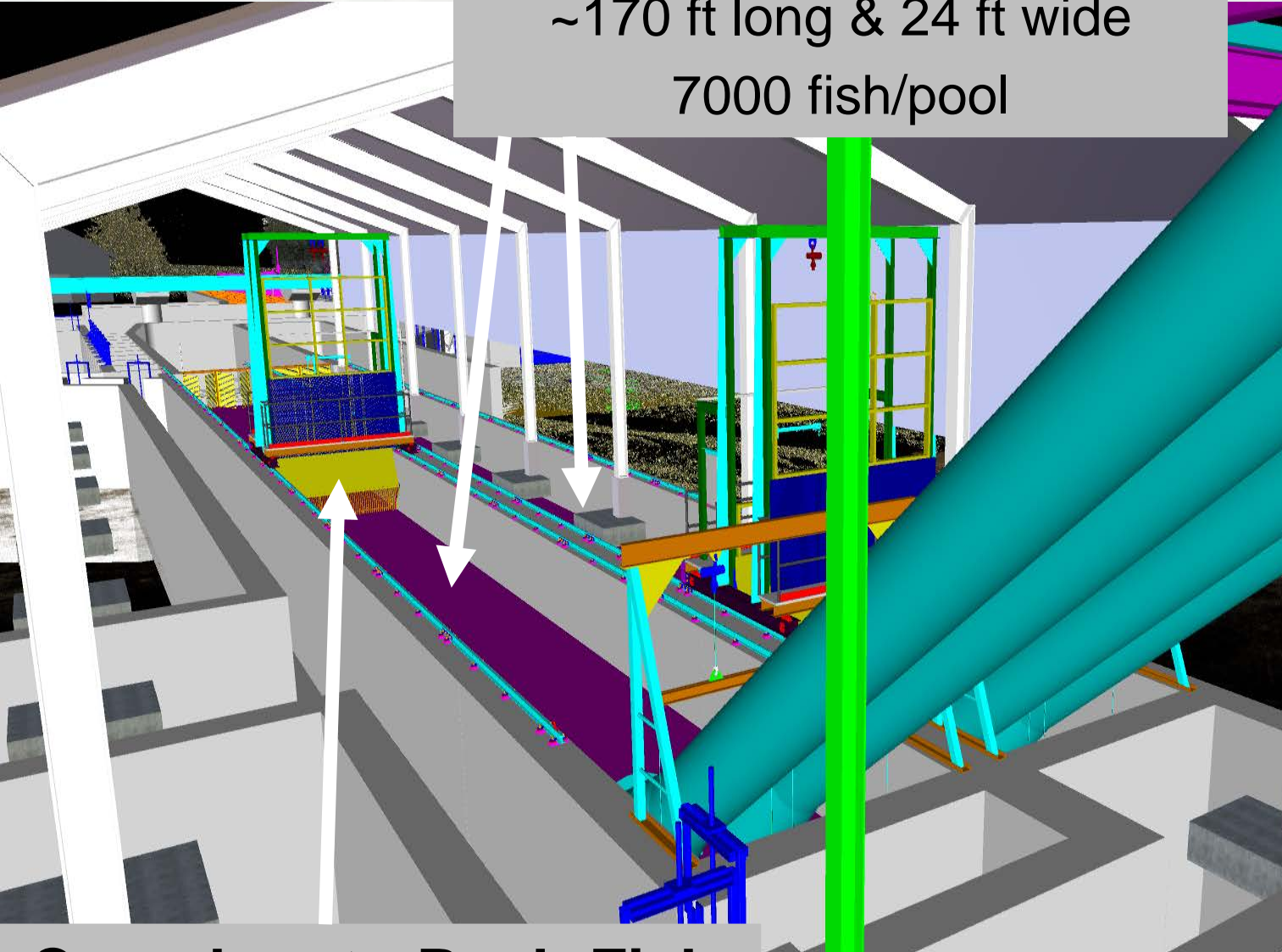
Fish Ladder to Presort Pool and Water Supply



2 Presort Holding Pools

~170 ft long & 24 ft wide

7000 fish/pool

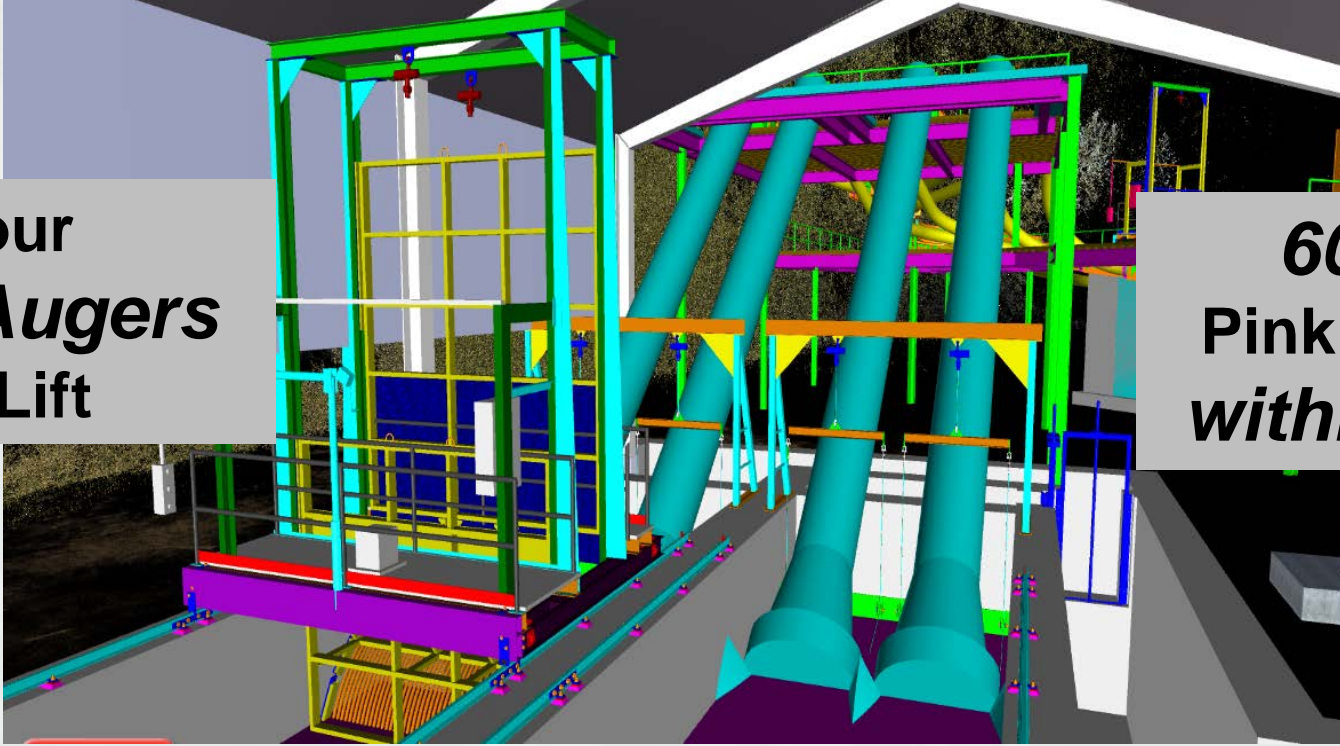


**Crowders to Push Fish
to Fish Lift**

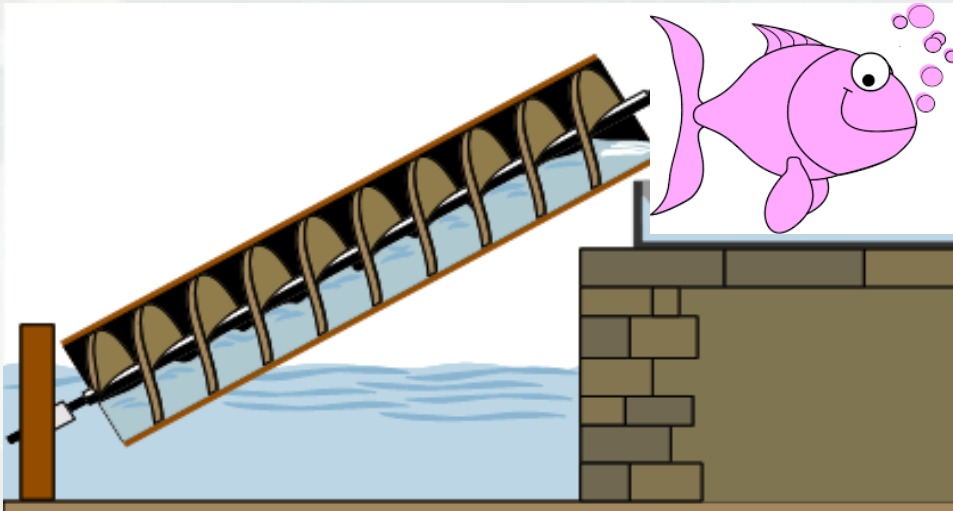
***What's
This?***



**Four
Fish Augers
to Lift**



**60,000
Pink Salmon
within 24-hr**

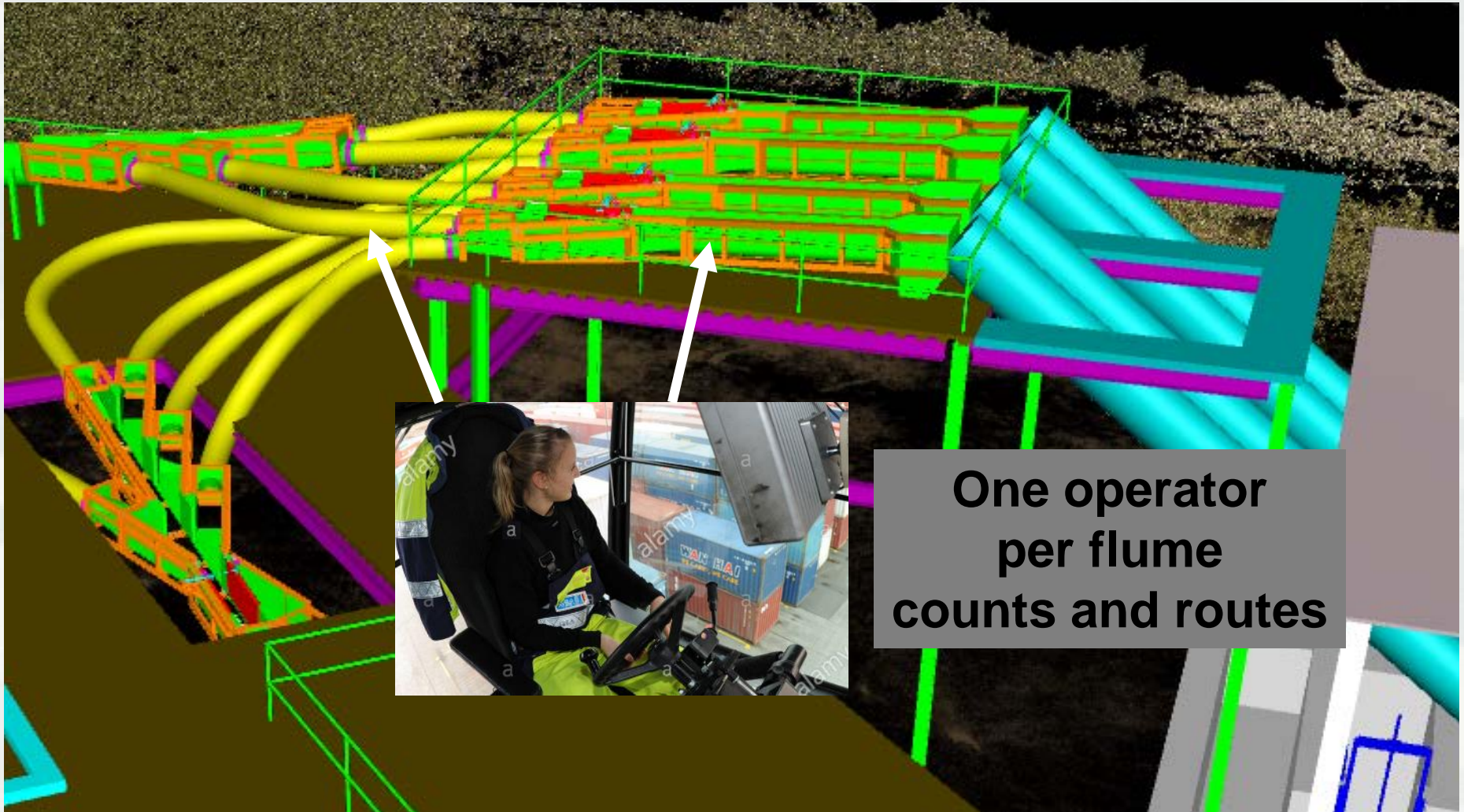


**Archimedes Screw
Lifts Water + Fish**



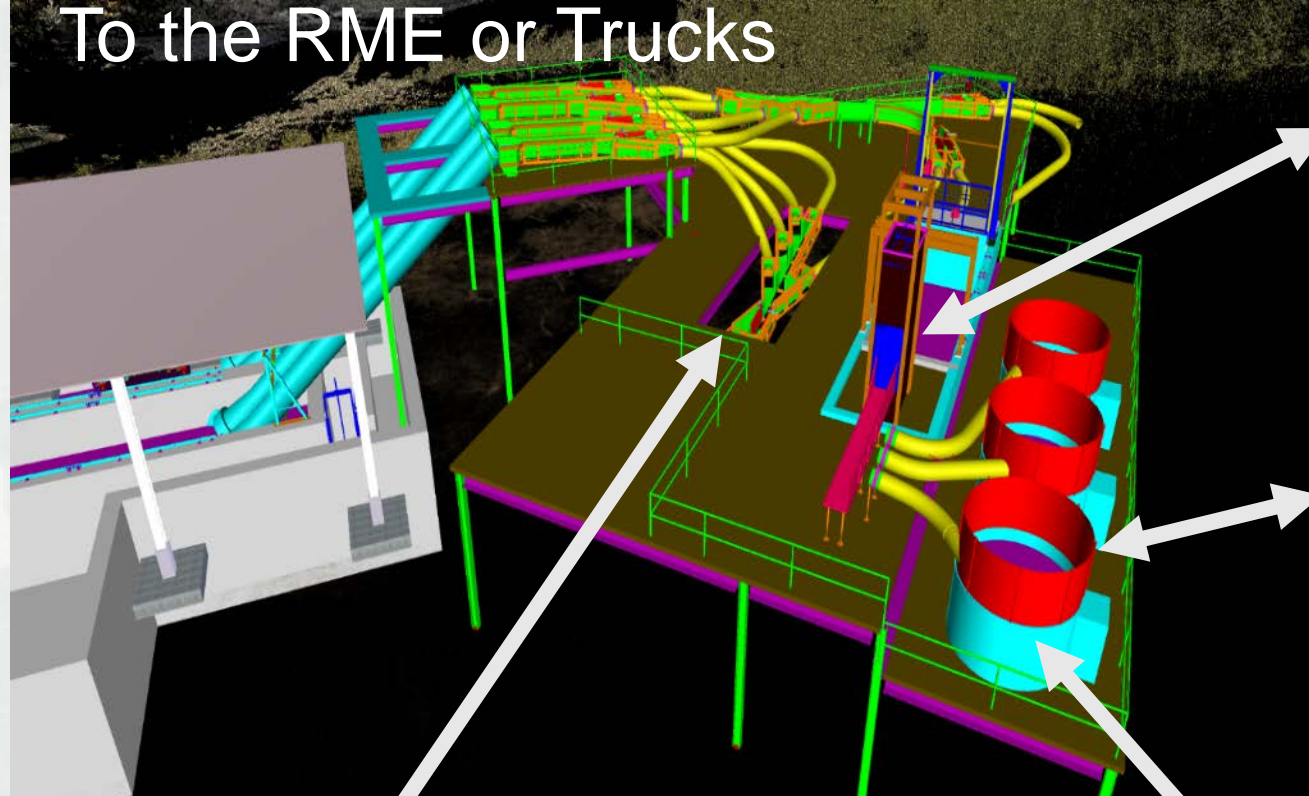
**Fish Auger Nisqually River
moves 10,000 fish/day 12-hr**

Directing Fish with Flumes



**One operator
per flume
counts and routes**

To the RME or Trucks



**RME
Facility**

**Post Sort
Pools**



**Pinks Direct to Semi-truck
holds 1000 fish**



**ESA Sorted from Pinks
RME to Truck (1200 g)**

Summary

- Largest fish trap in North America?
- Daily capacity near historic peak day for Columbia River (for all salmon)
- Requires 24-hr non-stop fish transport with 4 fish augers and 8 trucks
- 5 gates for flow, debris and sediment control
- Now at 30% design, 100% by Feb 2017
- Must be operational by December 2020



Thank You

- Seattle District Staff
- ERDC – Physical Model
- Portland District
- Walla Walla District
- Tetrattech and R2 Resource Consultants
- National Marine Fisheries Service
 - ▶ (Ed Meyer)

