PASSAGE PILOT FOR SOCKEYE REINTRODUCTION AT CLE ELUM
USING THE WHOOSHH FISH TRANSPORT SYSTEM
Reservoir Fish Passage

Provide fish passage at:
1. Clear Lake
2. Cle Elum
3. Bumping
4. Tieton (Rimrock)
5. Keechelus
6. Kachess
Cle Elum Dam - 1,100’ X 165’
Cle Elum and Reintroduction

- Cle Elum Dam
  - USBR irrigation dam
  - Blockage to anadromous fish since early 1900s
- Yakama Nations reintroduction program
  - 5 species planned, sockeye first
  - Lake seeded with adults for several years
  - New “helix” for downstream
  - Ladder estimate $50M+
  - New sorting/handling facility planned
  - At dam rap and transport planned
**Goals for Whooshh Passage Study**

Can we get fish safely over a dam this size?
- Distance
- Height/grade
- Survival

Can we get fish to volitionally pass Cle Elum? Will Whooshh technology scale to this size challenge?
SITE CHALLENGES

1. Technical
   • Two roads
   • Height and length
     ✓ 1100' furthest accomplished before this test
     ✓ ~100' highest to date
   • Grade
     ✓ Low overall
     ✓ 35% at steepest point near road crossing
   • Forebay fluctuation
     ✓ 70' drop during test period
   • Tailrace variability
     ✓ 5-10' rise during test period
SITE CHALLENGES

2. Biological

• Available population
  ✓ No ESA listed so no NMFS delay
  ✓ Low return numbers from program
    No prior in-river fish (all trapped and trucked from Rosa)
  ✓ Introduced fish Wenatchee or Okanagan origin

• Temperature
  ✓ Ambient temperature 45-95 degrees

• Attraction flows
  ✓ Limited site placement choices given timing and temporary nature
Key components
- Steep pass for returning fish
- Flume/pipe for trucked fish
- Observation/holding tank
- False Weir
- Autonomous scanner
- Sorter
- Accelerator
- Bypass tank
TUBE ROUTING AND LENGTH

Total length 1700’
Rise 175’
35% maximum angle
Routing
  • Under road 1 (existing bridge over spillway)
  • Over road 2 (dam crest road)
Cooling jacket
Continuous misting
TUBE ROUTING

Under......

....over
EXIT CONFIGURATION

Floating platform
  • Accommodate forebay fluctuation
  • Anchor/winches

Deflector
  • Angle fish for ideal lake entry after tube exit

Booster station before dam crest
  • Provide speed control prior to fish exit
  • Increase throughput of system
WHAT ACTUALLY HAPPENED

System setup in less than 90 days
  • Probably a first for high head dam fish passage
Worst sockeye return on Columbia for 10 years
Fish considerably smaller than 2016 Priest Rapids migration study test
Only ~100 total fish available for Whooshh
  • None of Cle Elum origin
  • All trucked from Priest Rapids
    ✓ Okanagan or Wenatchee origin
RESULTS

Caveats

- Not yet published
- Very limited sample size
- All non-native fish

Both controls and test fish “fell back” in significant numbers

- Multiple detections below the dam

“System shakedown” fish not distinguished from test fish
Initial Observations

• Needed more fish
• Yes, fish can be successfully transported this distance
• After 2-3 days of tuning, survival performance was equal for both population groups
  ✓ Bodes well for adaptive management
• Once system fully operational, no significant differences from prior tests
CONSIDERATIONS FOR PERMANENT HIGH HEAD SOLUTIONS

Entrance placement
- Consider fish behavior
- Floating option
- Flexibility to change based on results

Ancillary components – place in building

Tube routing
- Permanent enclosure for protection

Exit
- Enclose barge end/permanent shore exit to accommodate wave conditions
SAFE SURVIVAL, REPRODUCTION, INJURY, BEHAVIOR, DISEASE TRANSMISSION

TIMELY & EFFICIENT VOLITONAL SELECTIVE PASSAGE TIME ENERGY RESERVES TRAVEL TIME DISTANCE

EFFECTIVE MIGRATION HOMING DURABLE
## How High Can We Go?

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- **Dworshak**: ~640' vs 717'
- **Grand Coulee**: ~400' vs 550'
- **Chief Joseph**: ~180' vs 236'

![Diagram showing tube length, tailrace to crest, and angle.]
**Key Takeaways**

- Capital costs typically <20%
- O&M costs <50%
- Deploy in months not years
- Transit in seconds not hours/days
  - ✓ Low energy consumption for fish

**PLUS**
- Scanning enables selective passage (keep invasive species out of the system)
- Low water usage -> increased power/irrigation options
Autonomous, Volitional, Selective, Adult Fish Passage
Questions?

That Was Awesome!

Can we go again?

I Feel Good