

Whooshh Innovations

Fish Transport Solutions



Technology overview - transport

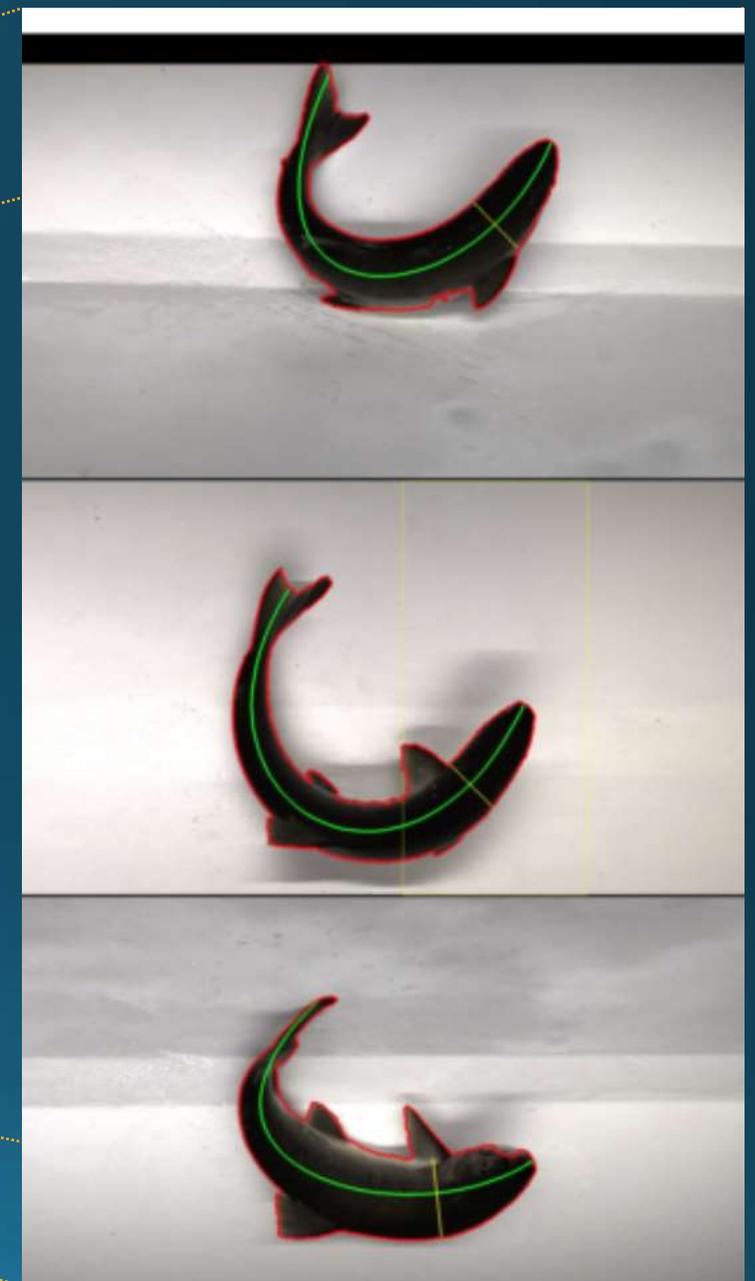


Technology overview

–scan/sort



Show	Length	Diameter	Diameter deviation
Image 1	---	---	---
Image 2	513.0 mm	67.6 mm	0.8 mm
Image 3	470.7 mm	75.2 mm	0.9 mm
Image 4	---	---	---
Image 5	478.5 mm	84.6 mm	0.7 mm
Image 6	533.7 mm	75.7 mm	0.8 mm



Species moved to date



Pink salmon
Rainbow Trout
Chinook salmon
Sockeye salmon
Coho salmon
Steelhead



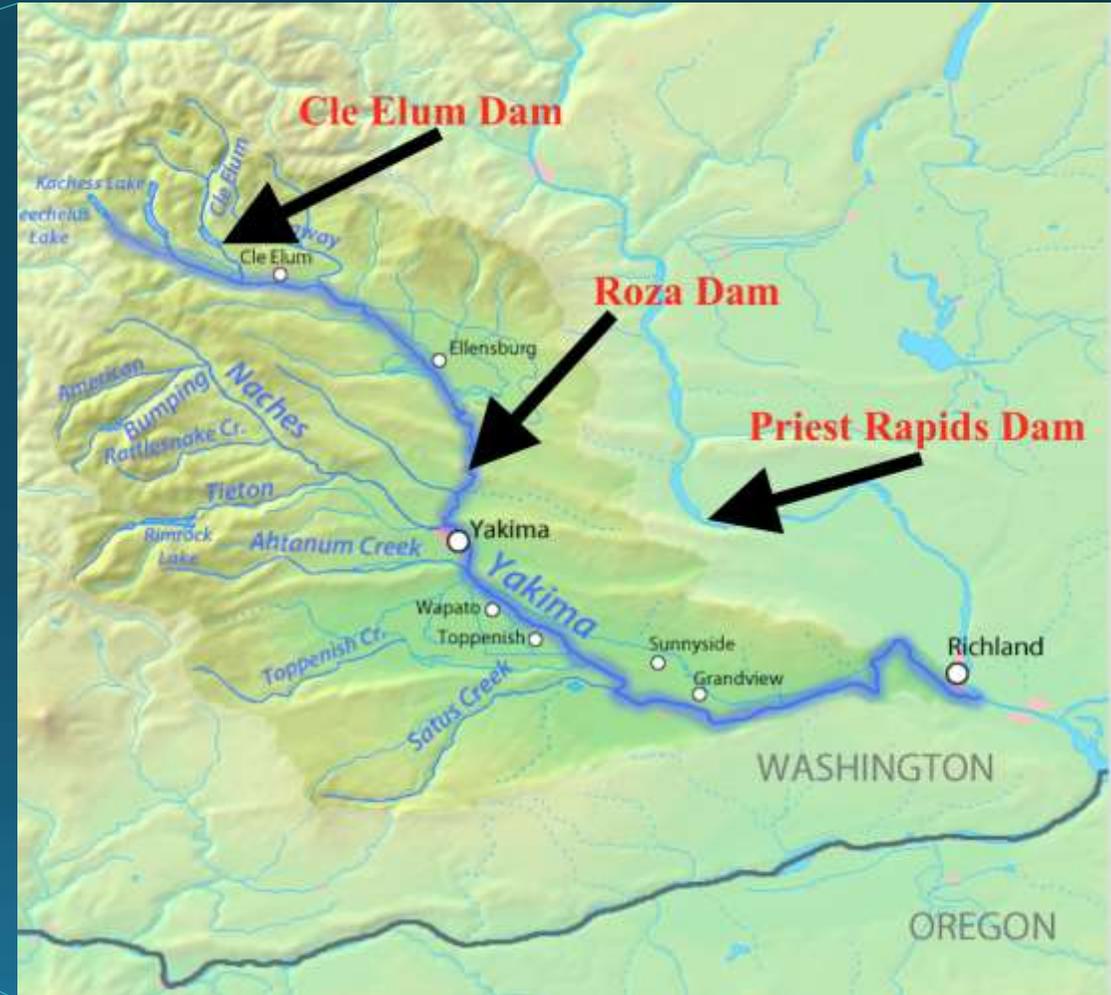
Atlantic salmon
Lake Sturgeon
Asian Carp
Common Carp
Steelhead
Brown Trout

New:

Gizzard Shad
American Shad
Large Mouth Bass
Northern Pike
Common White Sucker
Longnose Sucker
Walleye

Cle Elum Project 2017

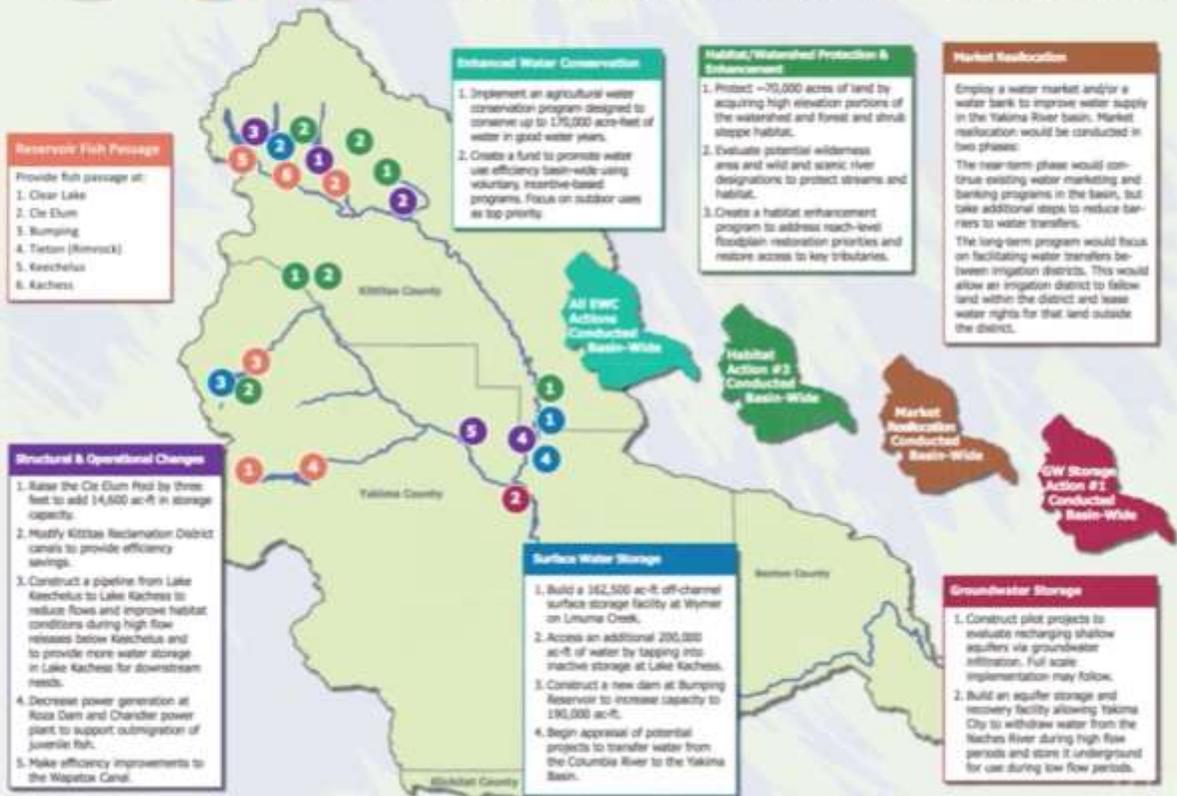
Project Area





BUILDING A FUTURE FOR WATER, WILDLIFE AND WORKING LANDS

YAKIMA RIVER BASIN INTEGRATED WATER RESOURCE MANAGEMENT PLAN





BUILDING A FUTURE FOR WATER, WILDLIFE AND WORKING LANDS

YAKIMA RIVER BASIN INTEGRATED WATER RESOURCE MANAGEMENT PLAN

Reservoir Fish Passage

Provide fish passage at:

1. Clear Lake
2. Cle Elum
3. Bumping
4. Tieton (Rimrock)
5. Keechelus
6. Kachess

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Structural & Operational Changes

1. Raise the Cle Elum Dam by three feet to add 14,000 ac-ft in storage capacity.
2. Modify Kittitas Reclamation District canals to provide efficiency savings.
3. Construct a pipeline from Lake Keechelus to Lake Kachess to reduce flows and improve habitat conditions during high flow releases below Keechelus and to provide more water storage in Lake Kachess for downstream needs.
4. Decrease power generation at Ross Dam and Chandler power plant to support adjuvination of juvenile fish.
5. Make efficiency improvements to the Wapato Canal.

Projects to transfer water from the Columbia River to the Yakima Basin.

Water Marketing

Develop a water market and/or a set of banks to improve water supply in the Yakima River Basin. Market development would be conducted in phases:

- Near-term phase would continue existing water marketing and trading programs in the basin, but with additional steps to reduce barriers to water transfers.
- Long-term program would focus on facilitating water transfers between irrigation districts. This would be an irrigation district to follow within the district and lease or rights for that land outside district.

GW Storage Action #1 Conducted Basin-Wide

Groundwater Storage

Construct pilot projects to evaluate recharging shallow aquifers via groundwater flowback. Full scale implementation may follow.

Build an aquifer storage and recovery facility allowing Yakima County to withdraw water from the Kachess River during high flow periods and store it underground for use during low flow periods.

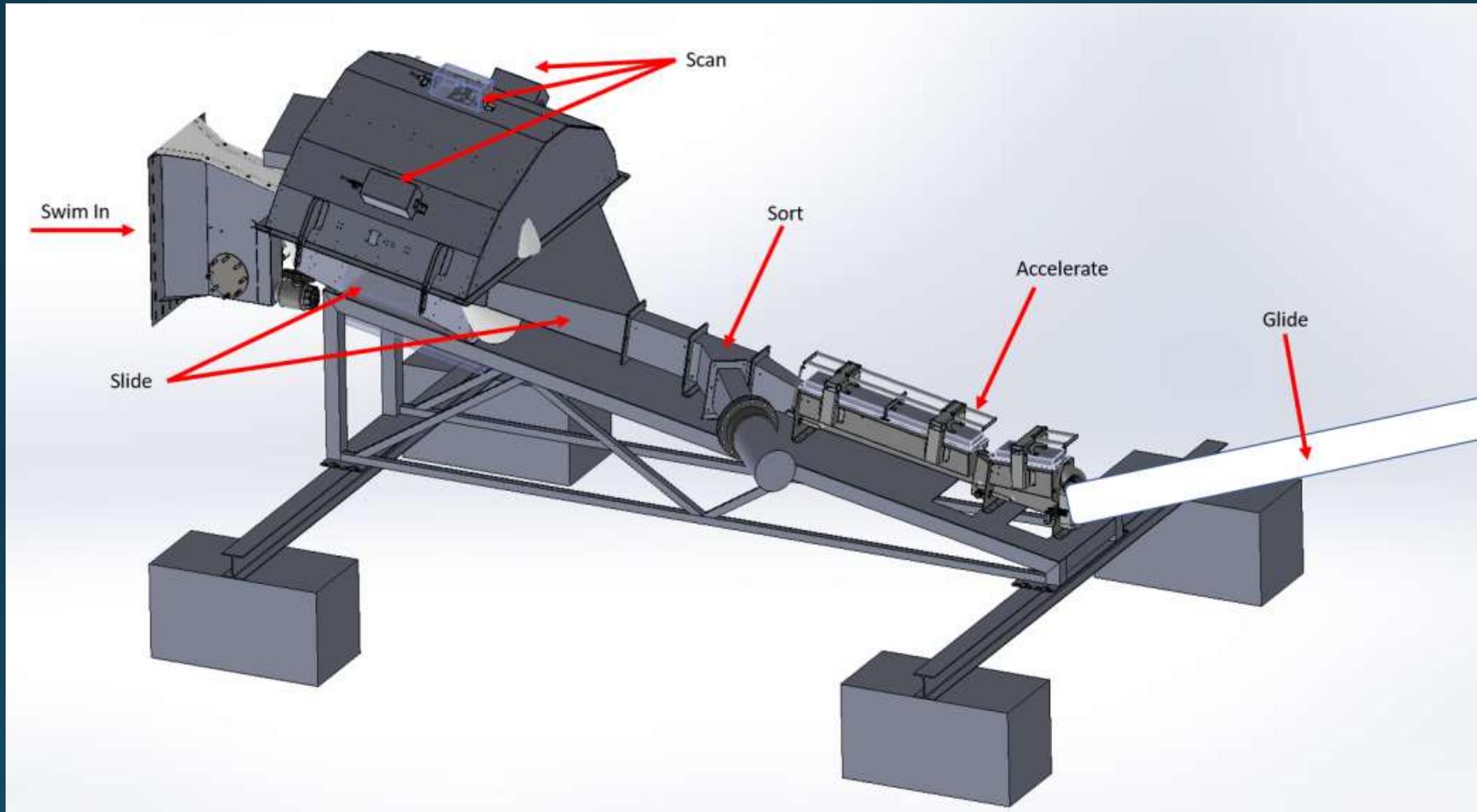
Cle Elum Project

- 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+
- 1100' from tailrace to crest
- 500' from crest to lake late July
- 165' crest height from tailrace

Cle Elum Dam – 1,700' X 165'



Entry Layout for Cle Elum



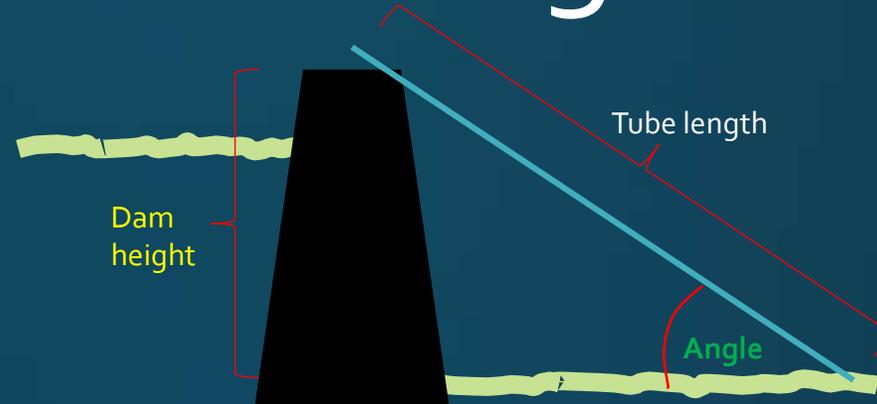


- Sockeye salmon run July/Aug
- Volitional entry from river
 - Steep pass, observation tank
 - Trucked fish option
- Floating exit system
- Laser sensing for velocity control and transit confirmation
- 1750' transit, <60 seconds
- Radio&PIT tag tracking(USGS)

Cle Elum Dam Project (USBR 2017)



Implication for Barrier Heights



	Angle				
Tube length (ft)	0°	10°	20°	30°	40°
100	0.0	17.4	34.2	50.0	64.3
250	0.0	43.4	85.5	125.0	160.7
500	0.0	86.8	171.0	250.0	321.4
750	0.0	130.2	256.5	375.0	482.1
1000	0.0	173.6	342.0	500.0	642.8
1250	0.0	217.1	427.5	625.0	803.5
1500	0.0	260.5	513.0	750.0	964.2
1750	0.0	303.9	598.5	875.0	1124.9

Example:

Tallest in US Oroville 770'. (615' hydraulic)

- Cle Elum tube at 40° has 500' "extra" for entry and exit flexibility

Salmon River Hatchery OR

- Wild and hatchery fish diverted to hatchery raceways from river
 - Seasonal diversion barrier in place
- ESA coho need returning to river
- Wild chinook also returned to river
- Current solution – wetted pipe + gravity
 - Slow delivery
 - Some fish turn around
 - Stressful

Whooshh demonstration project September 2017

Salmon River Demonstration





Questions?

At Whooshh, We are Serious About Moving Live Fish