Fish Passage Issues at Hells Canyon Dam

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Steve R. Brink, Senior Fisheries Biologist

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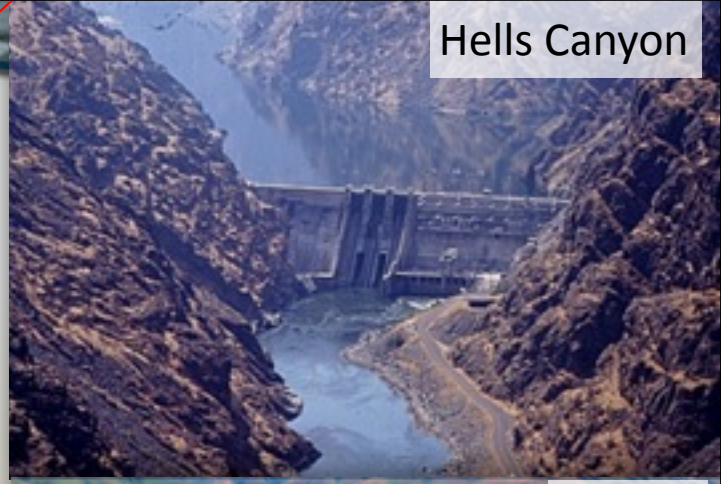
Hells Canyon Complex Relicensing

- License Filed July 21, 2003 ~ 15 yrs of resource studies
- Additional Information Requests
- Declaration by FERC REA
- Federal Power Act – § 4(e), 10(a) &10(j),18
- NEPA - Environmental Impact Statements
- Clean Water Act § 401 certification
- Endangered Species Act - § 7 consultation – Biological Opinion(s)
- New license – Implementation of Mitigation Programs

USFWS - §18 Fishway Prescription

Hells Canyon Complex

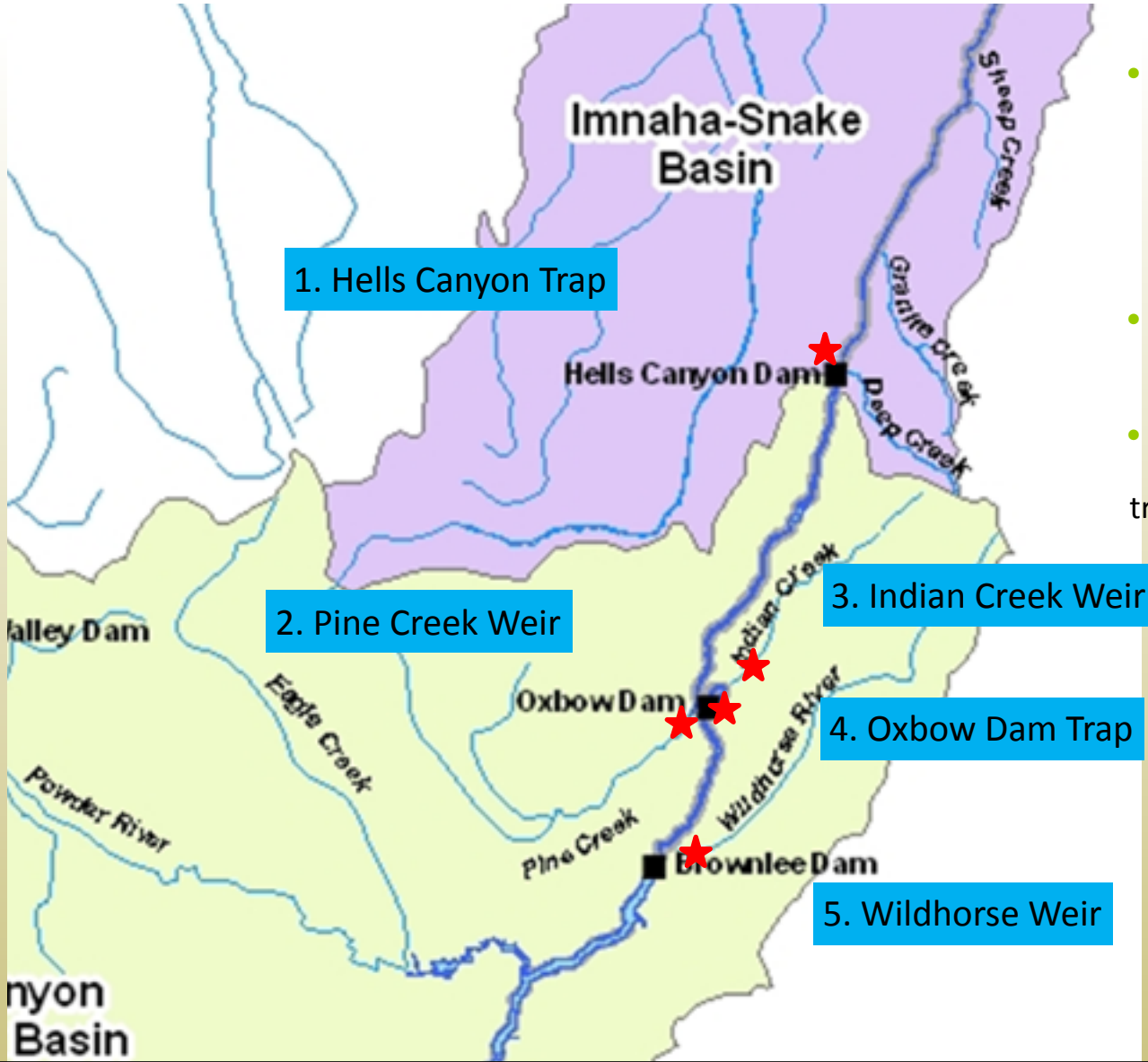
Dam 100m (330 ft) high
Reservoir ~ 40 km long



Dam 64m (209 ft) high
Reservoir ~ 20 km long

Dam 120m (395 ft) high
Reservoir ~ 90 km long

Section § 18 Fishway Prescription
U.S. Fish and Wildlife Service



- § 18 included passage facilities at:
  - HC Dam and Reservoir
  - Oxbow Dam and Reservoir
  - Brownlee Dam and Reservoir not included
- Weirs targeted to collect downstream migrating bull trout in the fall
- Indian Creek, Oxbow Dam, Wildhorse facilities constructed once bull trout population-based triggers met

Implement USFWS - §18 Fishway Prescription

Idaho Power prepare a bull trout passage plan that would include:

- final design plans for the Hells Canyon trap modifications;
- final engineering design plans for the Pine Creek monitoring weir and trap fishway, and construction of the weir and trap fishway within 2 years of license issuance;
- specific protocols for the period of operation, location of release point, and handling of all life-stages of bull trout and other fish captured at these two facilities;
- provisions for transport of bull trout between Pine Creek and Hells Canyon dam;
- an assessment of monitoring necessary to evaluate the potential and risk of introducing deleterious pathogens; and
- a post-construction monitoring plan

Existing Trap at HC Dam

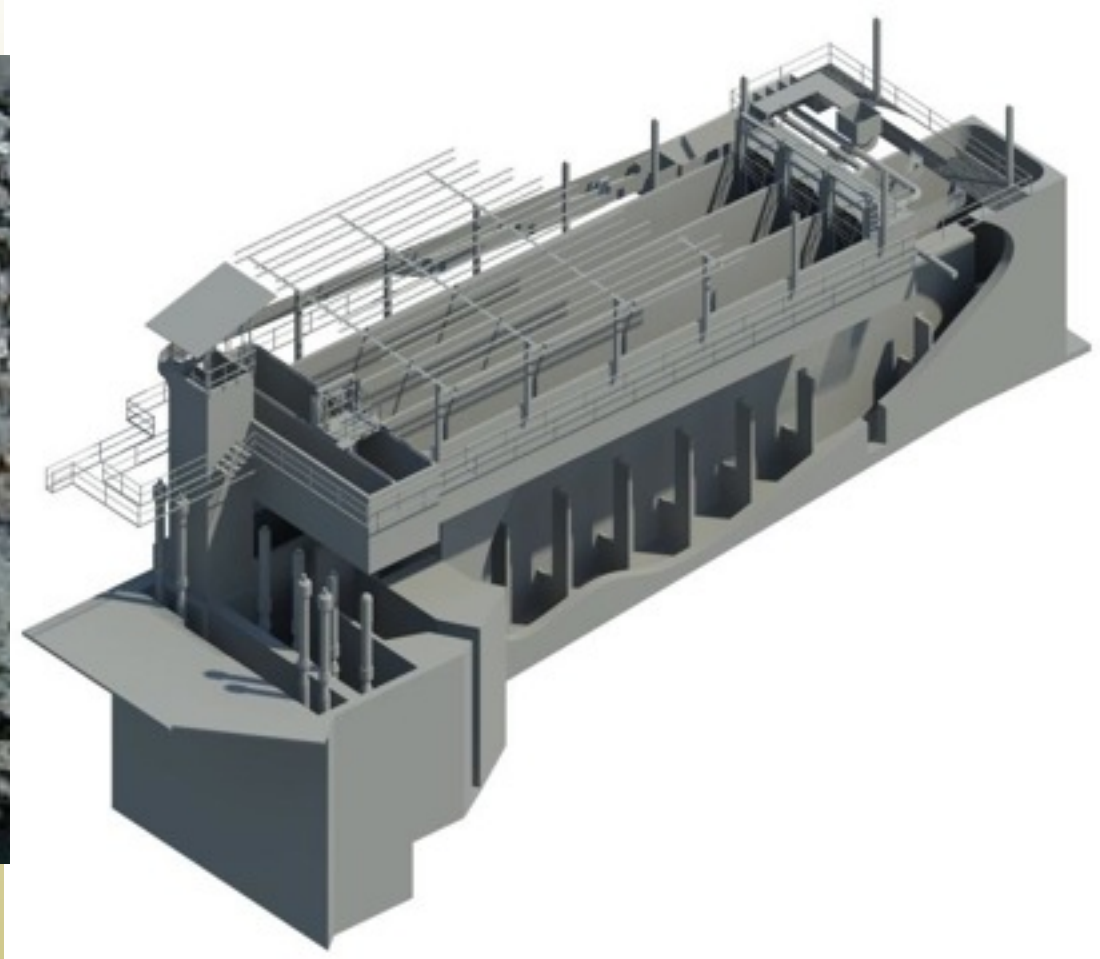
- **Constructed in Fall 1983 Operational in Spring 1984**
- **Historically operated 24 hours/day for multiple days**
- **Daylight only operation in 1994**
  - **increased adult returns**
  - **ESA concerns**
- **Currently operated ~3 days/week until hatchery/fishery goals met**

Required Modifications

FERC AIR directed IPC to design trap modifications as follows:

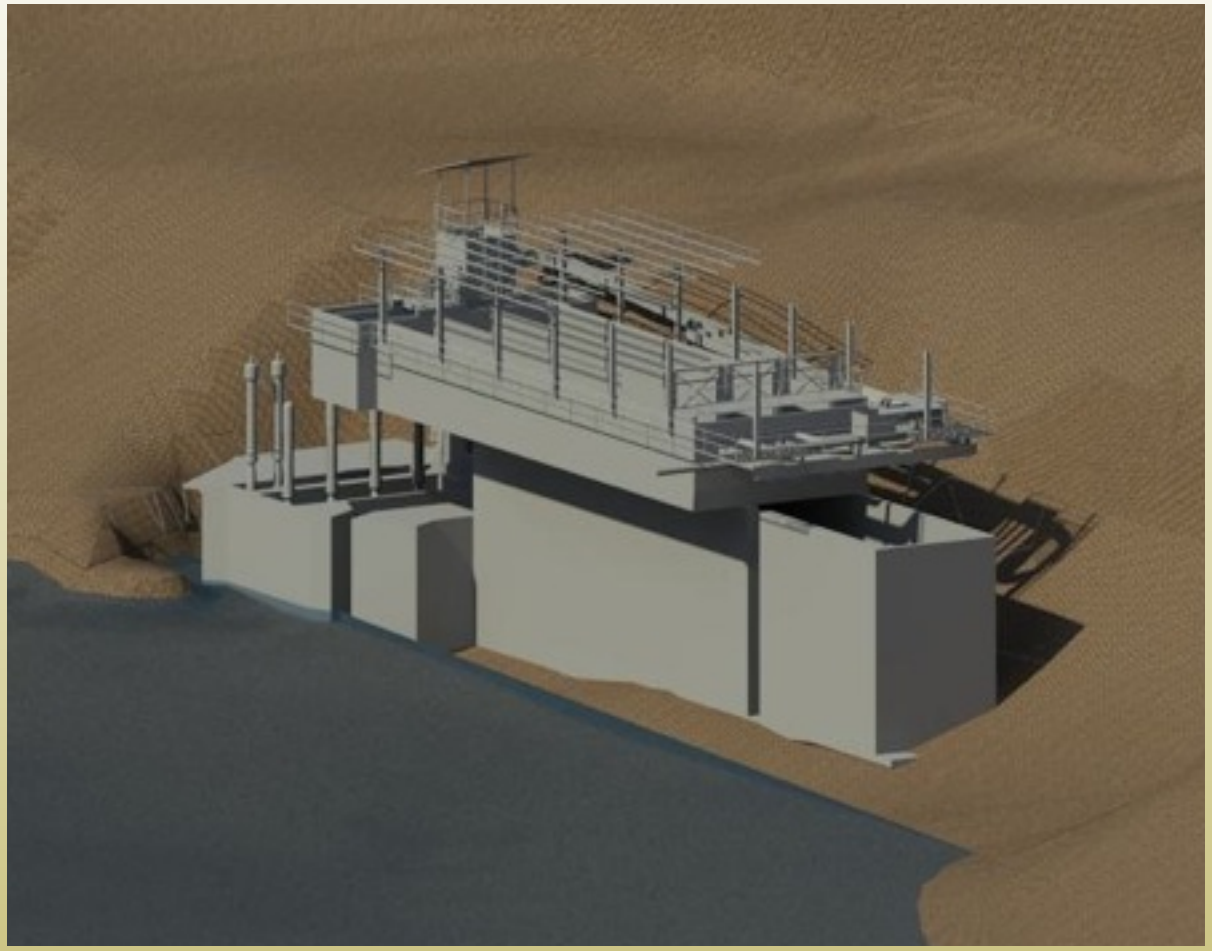
- Allow onsite sorting and holding of adult resident salmonids and anadromous fish
- Provide safe & efficient means of returning wild fish to the river after sorting
- Ability to scan fish for PIT and coded-wire tags
- Provide collection of native resident salmonids

Hells Canyon Trap Modifications Concept



Hells Canyon Trap Modifications Concept

FERC AIR concept report (2005)
Concept updated (2011)



- Two fishway entrances (low/high flow)
- Extend existing fish ladder
- Raised exterior wall for flood protection
- Fish release system in lower ladder
- Pre-lock holding area
- Fish Lock to elevated sorting/holding area
- Fish sampling/research area
- Elevated holding raceways
- Crowding channel and Truck loading
- Modified pumping station

Hells Canyon Trap Concept

- Low flow entrance 5-30 kcfs
- High flow entrance 30-50 kcfs

- Additional pools added to existing fish ladder
Upper ladder leg raised for high flows

- Two false weir return systems to release fish from lower ladder

- Pre-lock holding area with additional sort and release back to river

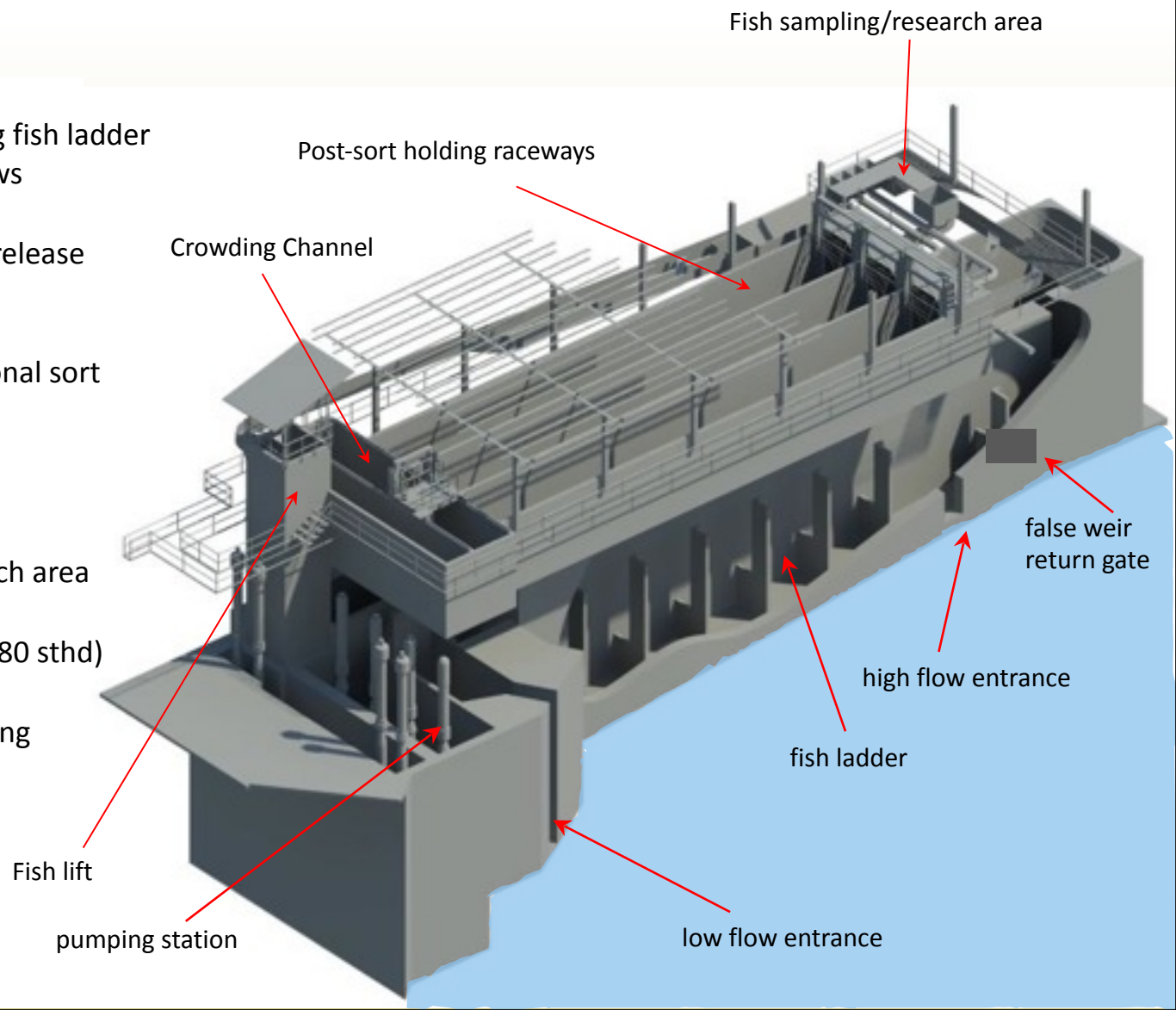
- Fish Lock ~300 fish/cycle

- Fish sorting and sampling/Research area

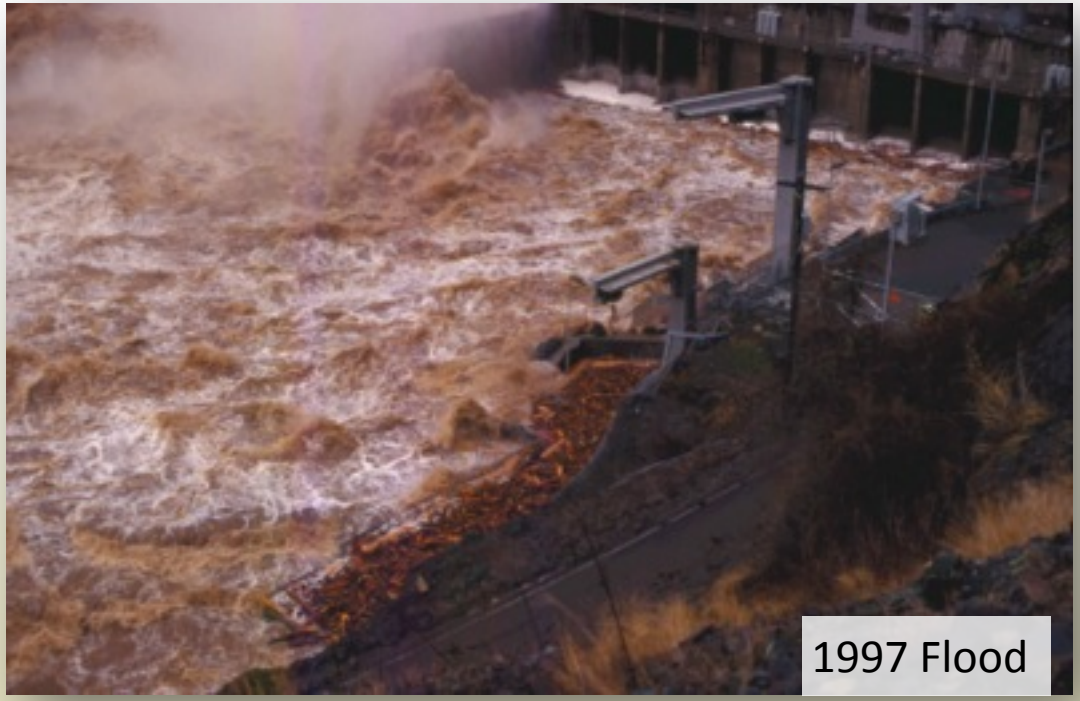
- Capacity of holding raceways (5,280 sthd)

- Crowding channel and truck loading

- Pumping station
    105 cfs attraction flow
    8 submerged-style pumps



Operation Issues

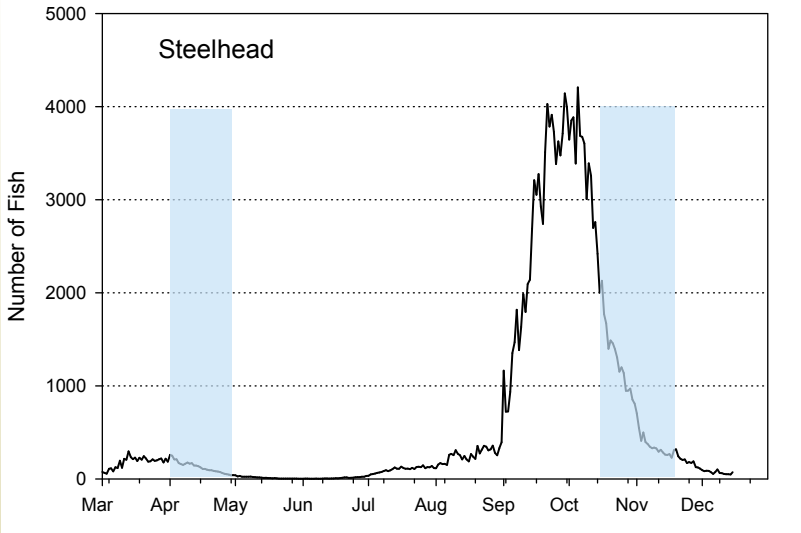


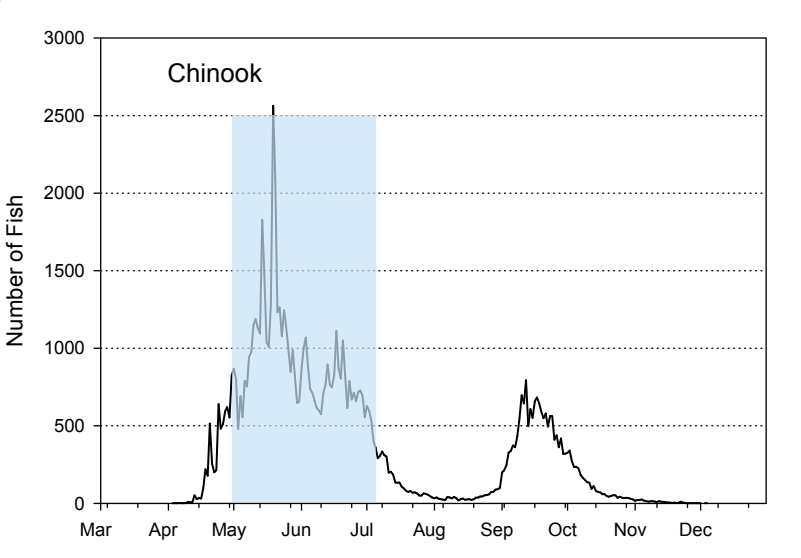
- Operations limited by flow
  - tailwater elevation
  - retaining wall
- Debris issues during spill

Trap Operation

- Steelhead trapping
  - Late Oct – late Nov
  - April
- Spring Chinook trapping
  - May – early July
  - Dictated by flow and run timing
  - No trapping > 72° F
- Trapping stops when hatchery/fishery goals are met
  - Steelhead 750 fish (600 fall / 150 spring)
  - Spring Chinook 400 fish
- Trapping occurs at flows < 40,000 cfs

Lower Granite Dam
10-year Average





Implement USFWS - §18 Fishway Prescription

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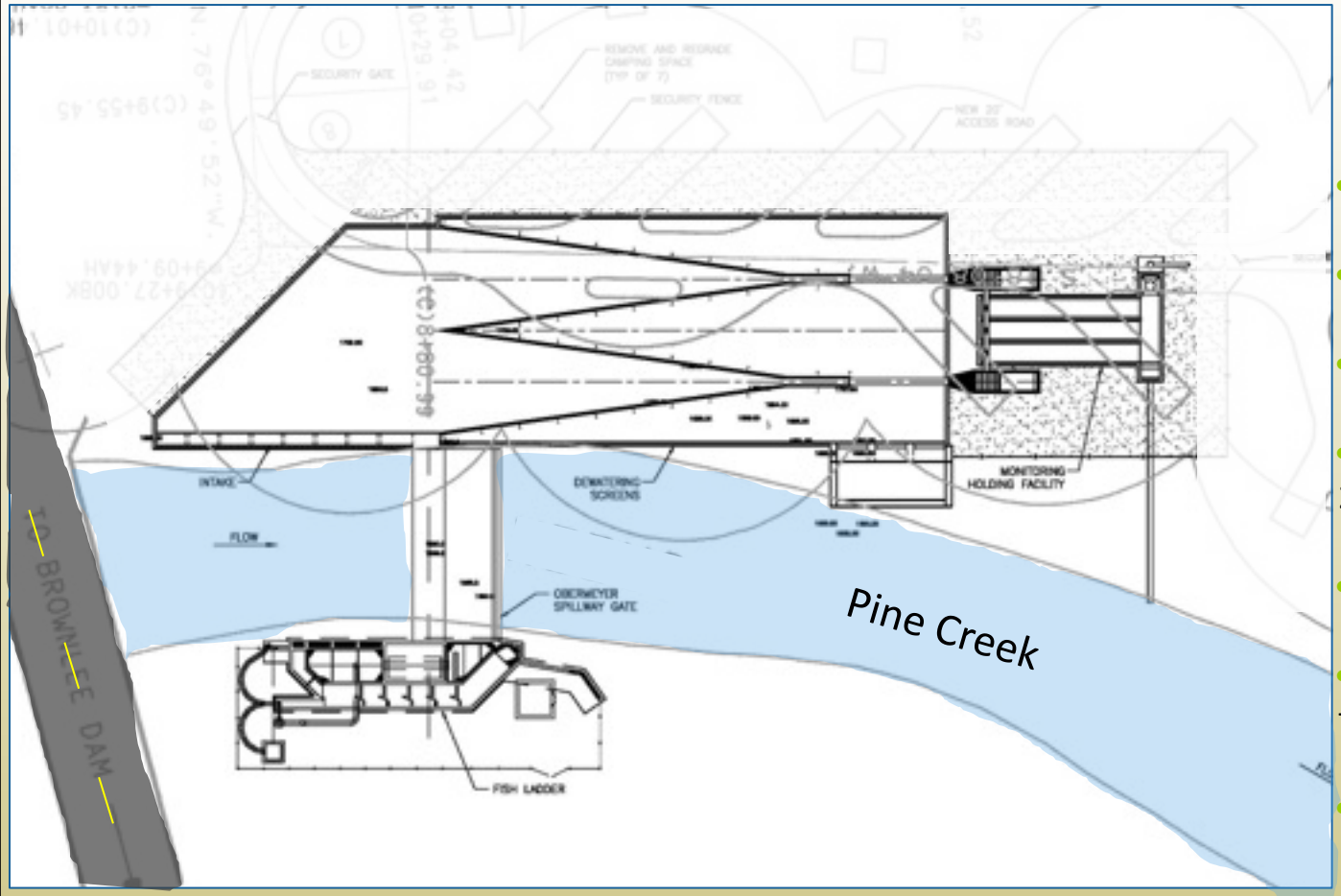
Pine Creek Weir

- FERC recommended a weir designed to provide effective downstream passage over range of flows (90% in average water year or 1,500-2,000 cfs)

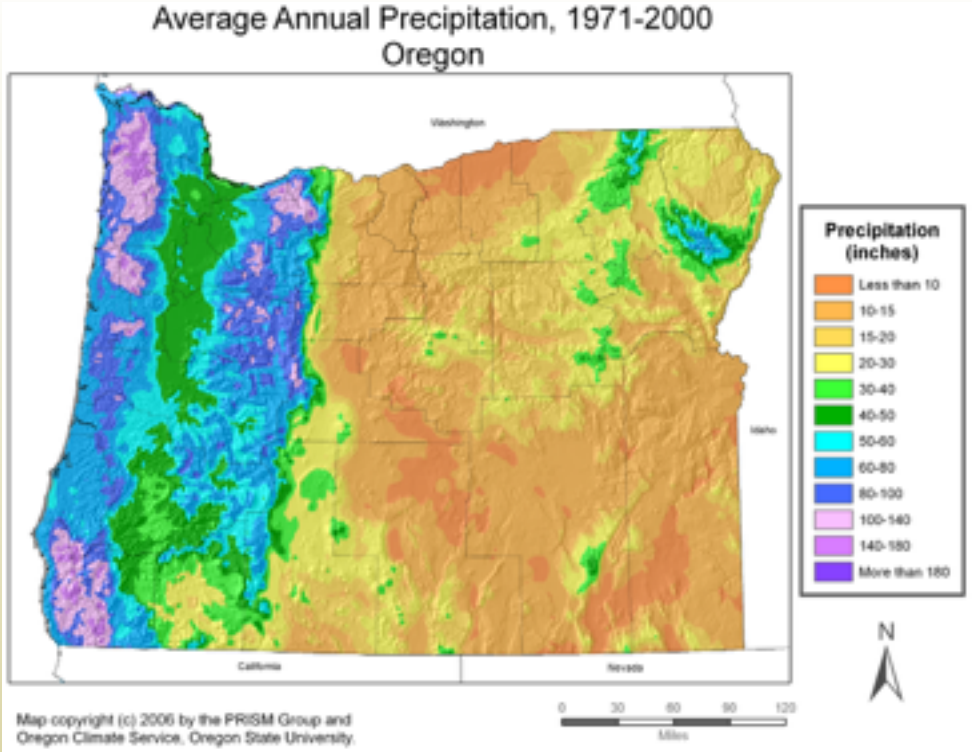
- FERC recommended using the larger-sized weir to evaluate the potential reintroduction of steelhead and spring Chinook into Pine Creek

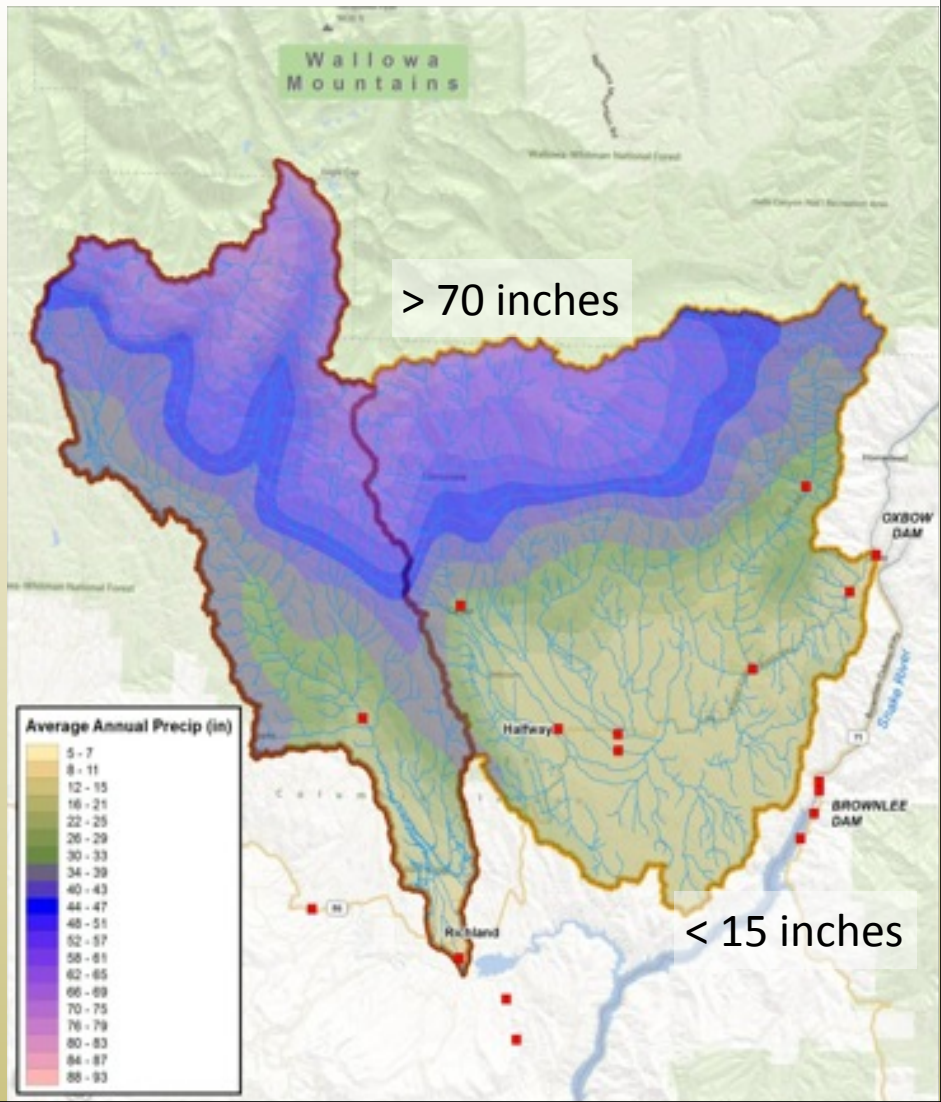
Downstream Migrant Tributary Collection
Pine Creek Weir Concept



- Obermeyer Gate across Pine Cr
- Fish Ladder
- Intake Gate Structure
- Fish Screen designed for Q of 2000-2500 cfs
- Tailrace Channel w/ fish barrier
- Sorting, monitoring, & holding facility
- Truck loading/transport facility

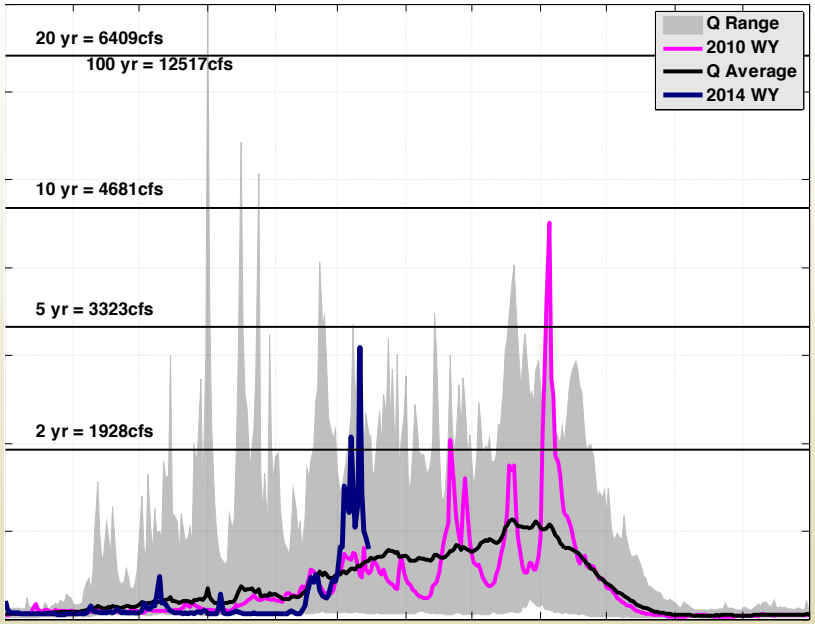
Pine Creek Hydrology

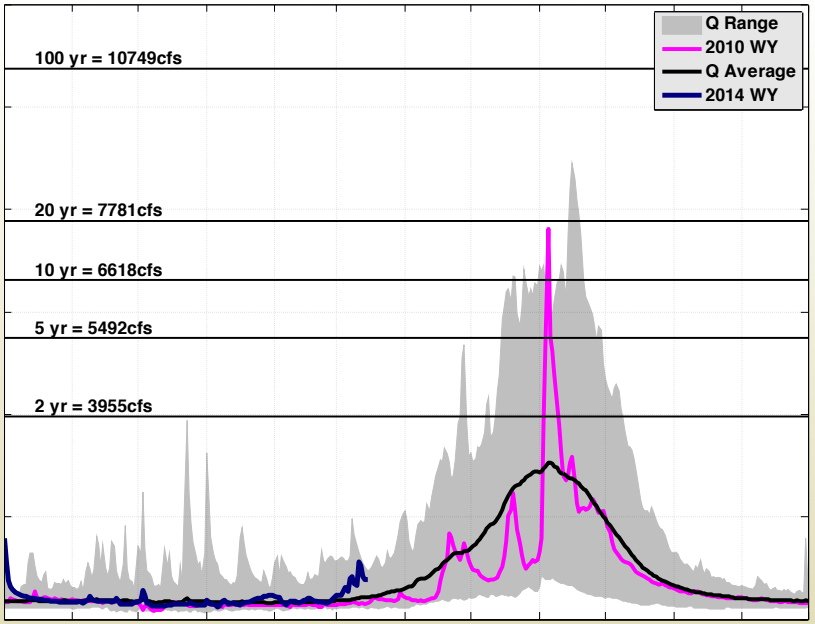




- Moderate sized basin - 300 mi^2
- Elevation ranges from 9,560 to 1700 ft
- Annual precipitation ranges from <15 - >70 in

Pine Creek Discharge





Date	Discharge (cfs)
10 March 2014	3,110*
5 June 2010	4,510
19 May 2008	4,030
1 Jan 1997	7,000
16 Jan 1974	5,430
24 Jan 1970	5,070
21 Feb 1968	4,060

*4,400 cfs 15-min

- Rain-on-snow events common Nov-June
- Extremely flashy compared to snowmelt stream
- Flows over bankfull (1,933 cfs) are common
- 10 events over 2,000 cfs since 2010

Pine Creek Weir
Engineering Issues/Risks

- Obermeyer Gate
- Fish Ladder
- Intake Gate
- Fish Screen
- Tailrace Channel
- Fish Sorting, Monitoring, & Holding Facility

- Bedload Movement/accumulation
- Large Debris/Bedload Impact
- Maintenance Access
- Ice Operation
- Bladder structure

Pine Creek Weir
Engineering Issues/Risks

- Obermeyer Gate
- Fish Ladder
- Intake Gate
- Fish Screen
- Tailrace Channel
- Fish Sorting, Monitoring, & Holding Facility

- Sediment accumulation
- Attraction during high flows

Pine Creek Weir
Engineering Issues/Risks

- Obermeyer Gate
- Fish Ladder
- Intake Gate
- Fish Screen
- Tailrace Channel
- Fish Sorting, Monitoring, & Holding Facility

- Operation through design flow range
- Debris operation

Pine Creek Weir
Engineering Issues/Risks

- Obermeyer Gate
- Fish Ladder
- Intake Gate
- Fish Screen
- Tailrace Channel
- Fish Sorting, Monitoring, & Holding Facili

- Operation through design flow range
- Sediment accumulation
- Fish Holding
- Screen Cleaning effectiveness
- Ice operations

Pine Creek Weir
Engineering Issues/Risks

- Obermeyer Gate
- Fish Ladder
- Intake Gate
- Fish Screen
- Tailrace Channel
- Fish Sorting, Monitoring, & Holding Facilit

- False attraction for upstream migrants
- Flood protection

Pine Creek Weir
Engineering Issues/Risks

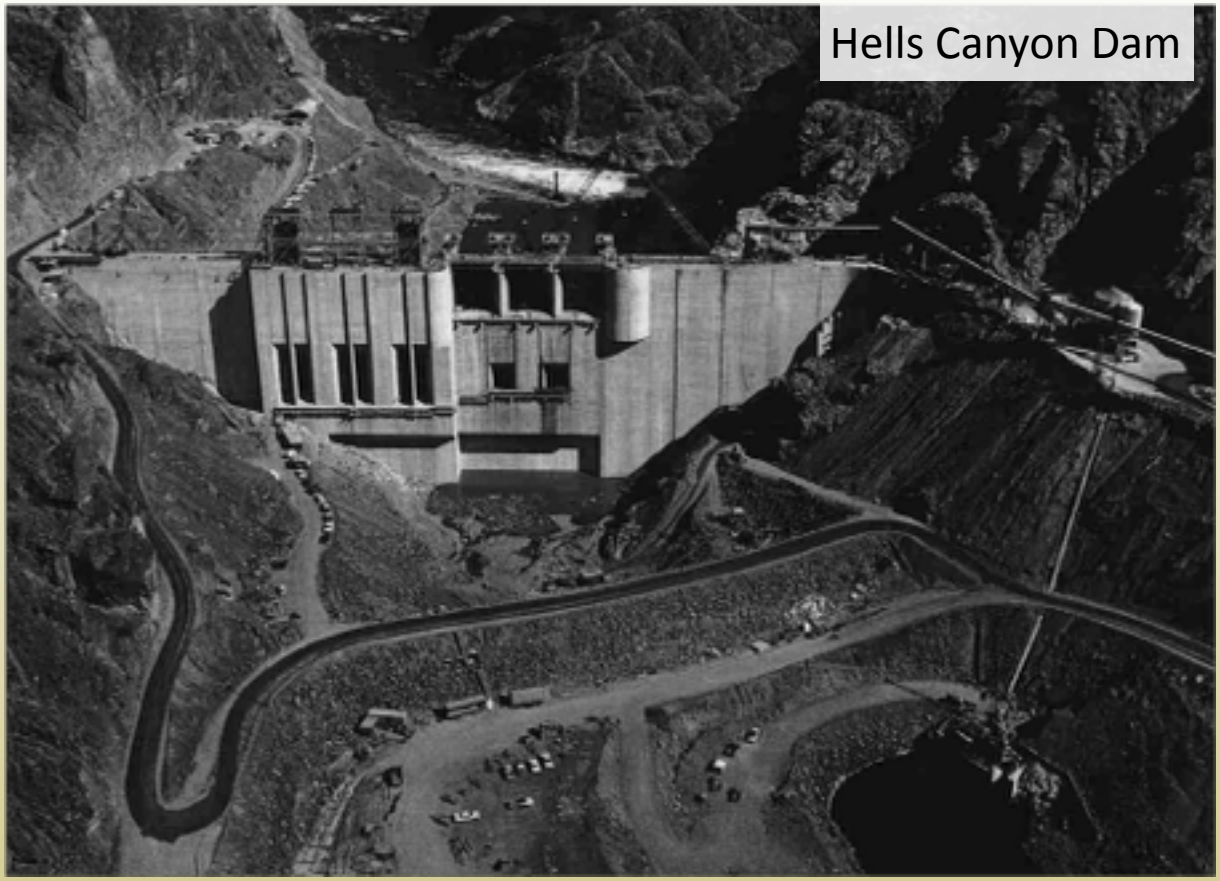
- Obermeyer Gate
- Fish Ladder
- Intake Gate
- Fish Screen
- Tailrace Channel
- Fish Sorting, Monitoring, & Holding Facility

- Debris accumulation
- Operation during high turbidity periods

Risk Analysis

- Flood events of 2008 and 2010 prompted risk analysis
- Significant risks associated with each major component
- Potential issues/risks would affect the long term viability of collection weir
- Limited ability to collect downstream migrants at expected migration time
- High operation/maintenance costs to repair each component
- Tributary collection of downstream migrants not feasible in Pine Creek
- Collection in mainstem Snake River more feasible

Downstream Migrants
Mainstem Snake Collection Concept



- Steel structure extending existing penstock intakes
- Extended intake structure would house extended screens
- Downstream migrants screened and directed to floating holding/sorting facility
- Fish held in raceways could be lifted with hopper, loaded on truck, released downstream
- Surface collection of fish up to 30,000 cfs (plant capacity)
- Collection during spill is unknown