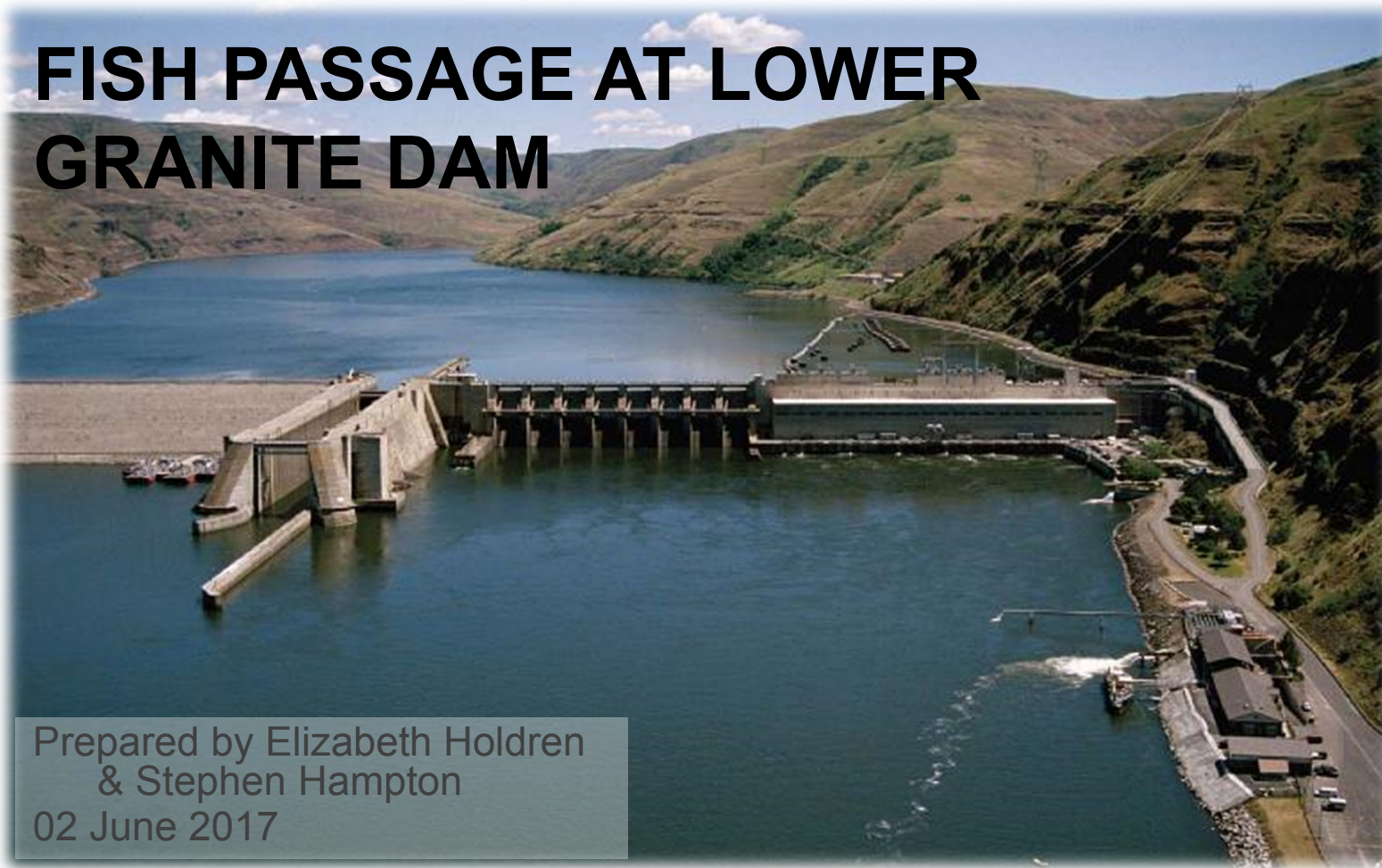


# FISH PASSAGE AT LOWER GRANITE DAM



Prepared by Elizabeth Holdren  
& Stephen Hampton  
02 June 2017

*“The views, opinions and findings contained in this report are those of the author(s) and should not be construed as an official Department of the Army position, policy or decision, unless so designated by other official documentation.”*



# USACE WALLA WALLA DISTRICT MISSIONS

(AS ASSIGNED BY THE UNITED STATES CONGRESS)



Fish Passage



Hydropower



Navigation



Recreation &  
Wildlife



US Army Corps  
of Engineers<sup>®</sup>





# FOUR LOWER SNAKE RIVER DAMS FEATURE

- 6 generating units
- 8 spillbays
- Navigational locks
- Adult fish ladders
- Juvenile fish facilities
  - Bypass
  - Collection
  - Condition sampling



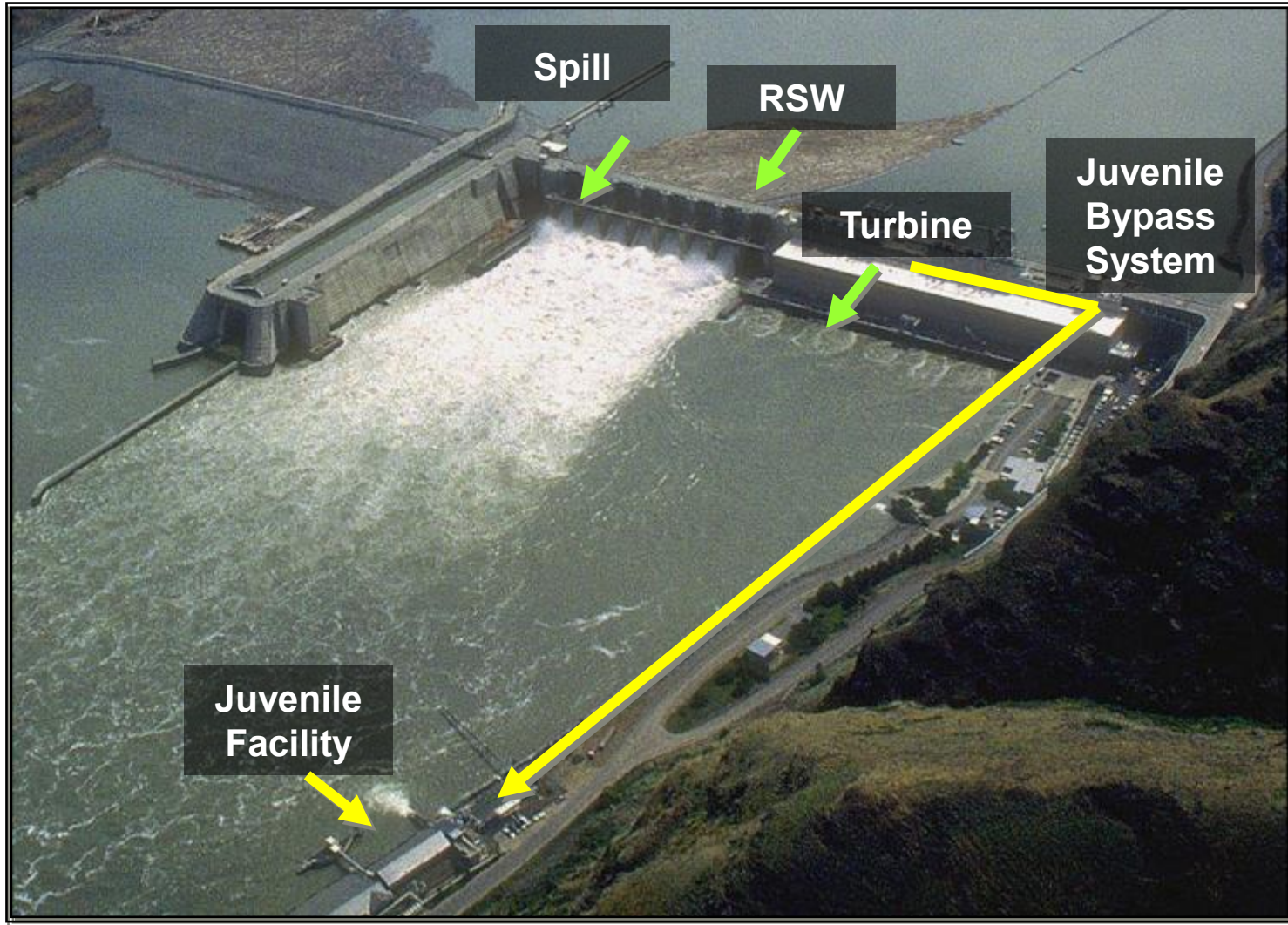
US Army Corps  
of Engineers ®



# LOWER GRANITE DAM



# LOWER GRANITE JUVENILE PASSAGE



US Army Corps  
of Engineers<sup>®</sup>





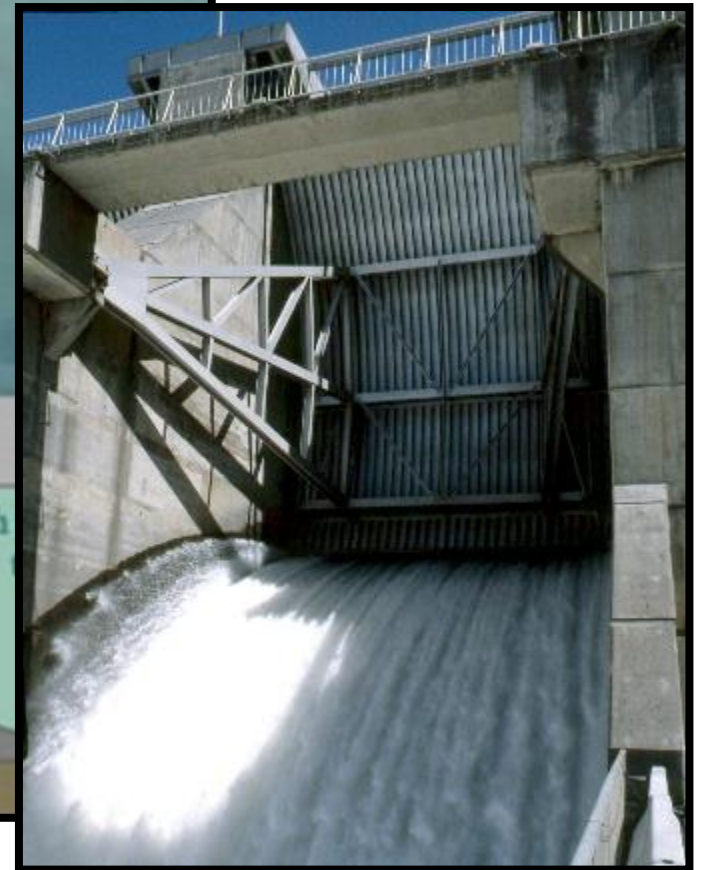
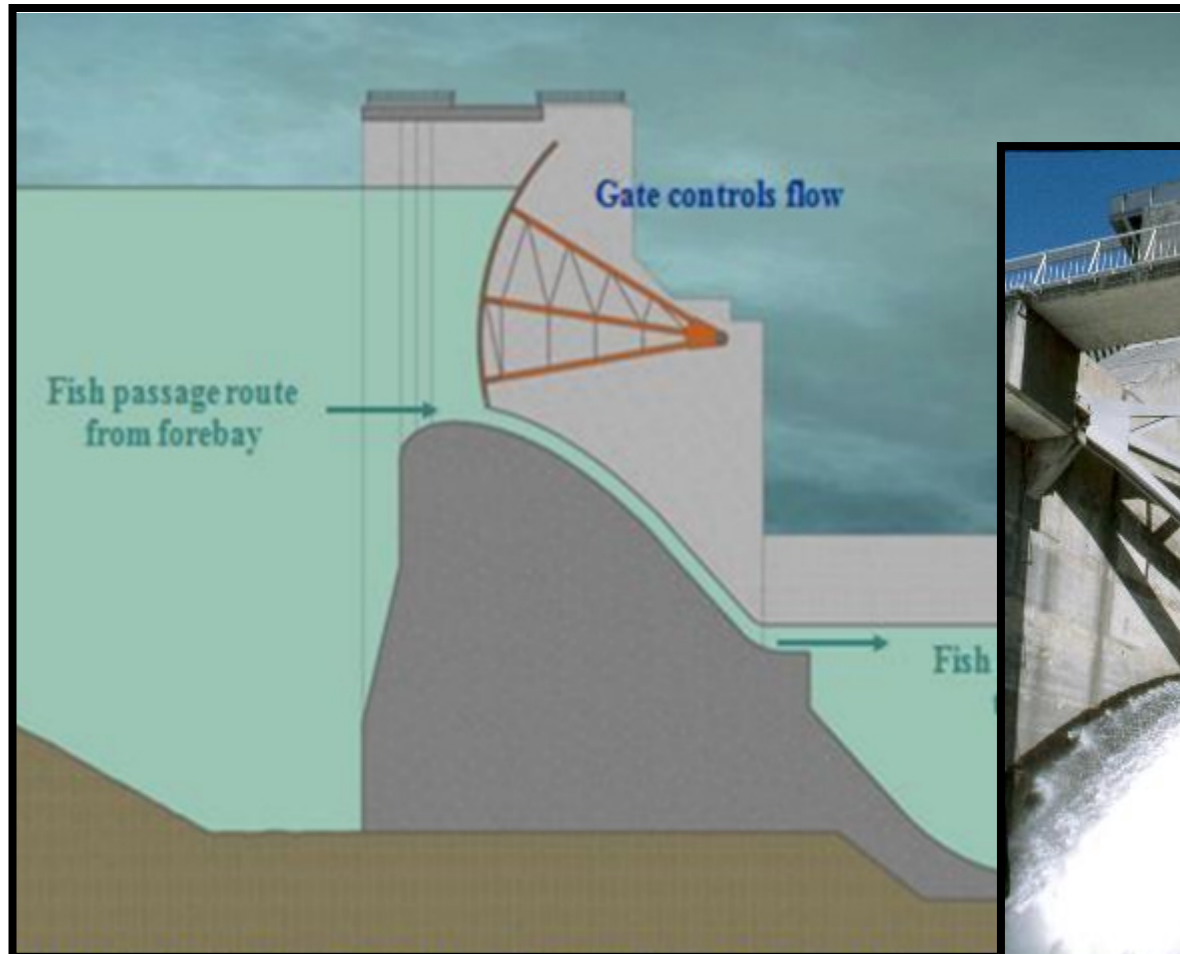
# LOWER GRANITE SPILLWAYS WITH RSW (REMOVABLE SPILLWAY WEIR)



US Army Corps  
of Engineers<sup>®</sup>



# TRADITIONAL SPILL

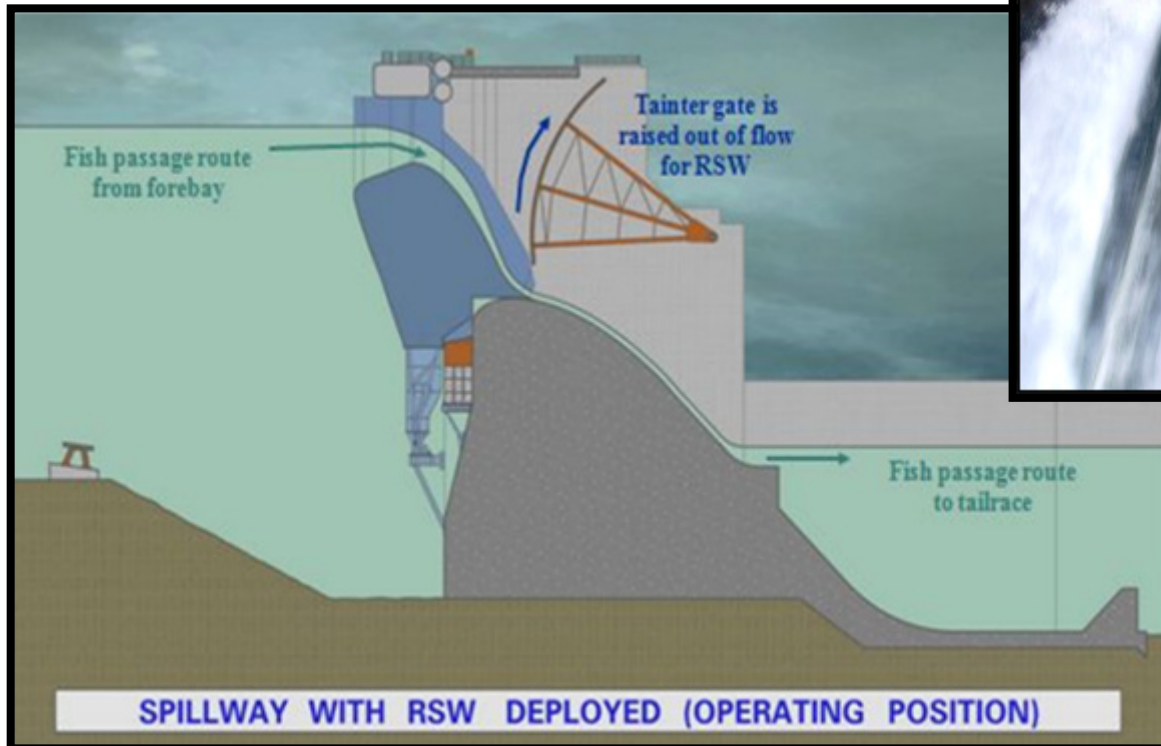


US Army Corps  
of Engineers<sup>®</sup>





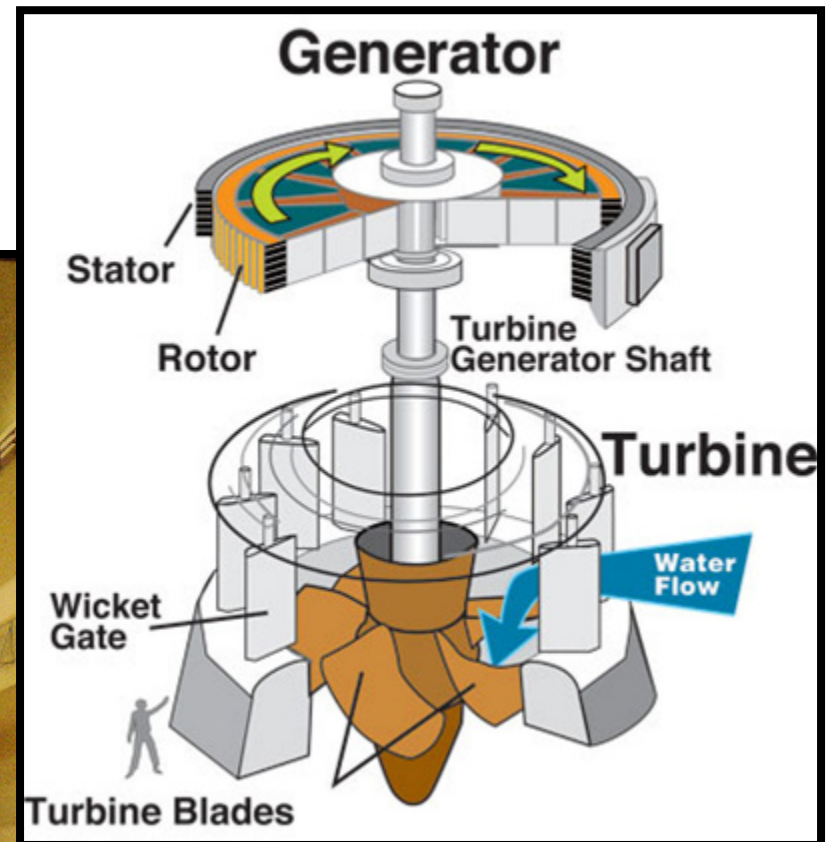
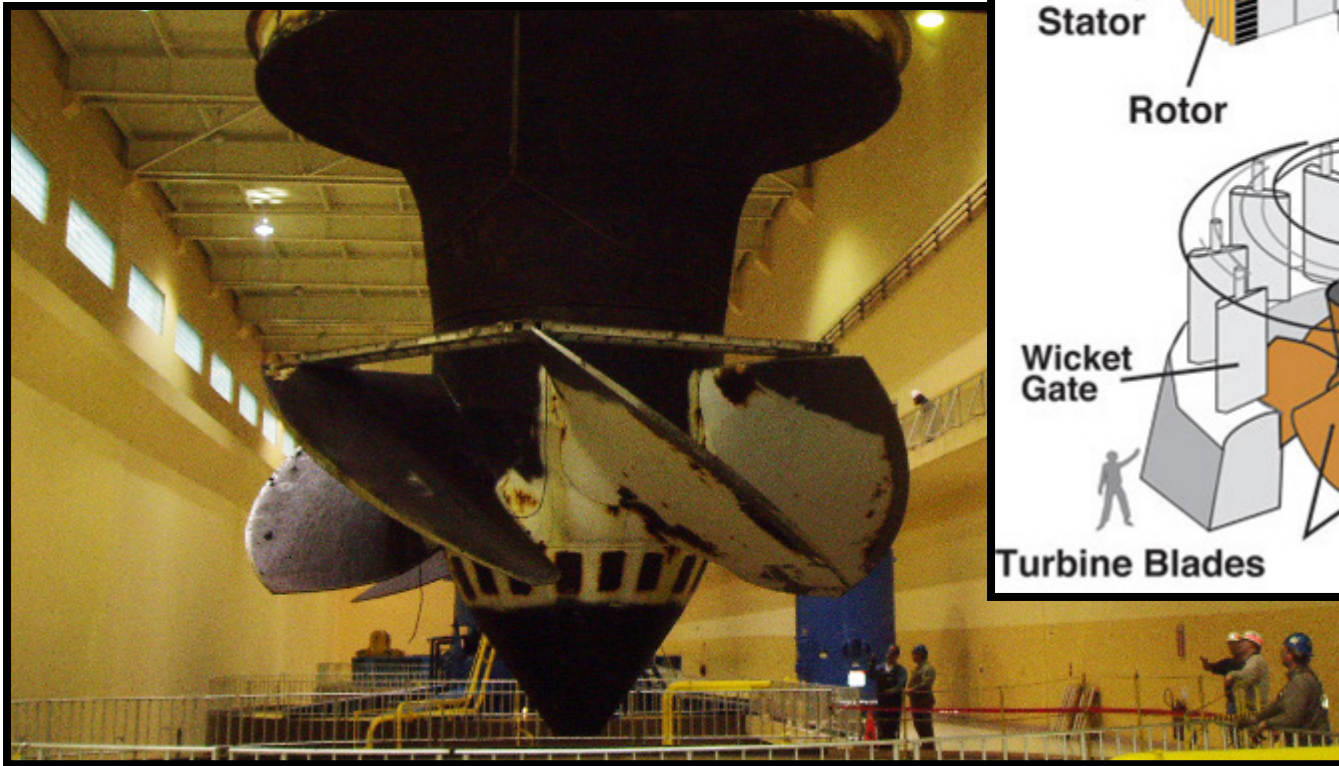
# SURFACE BYPASS: REMOVABLE SPILLWAY WEIR



US Army Corps  
of Engineers<sup>®</sup>



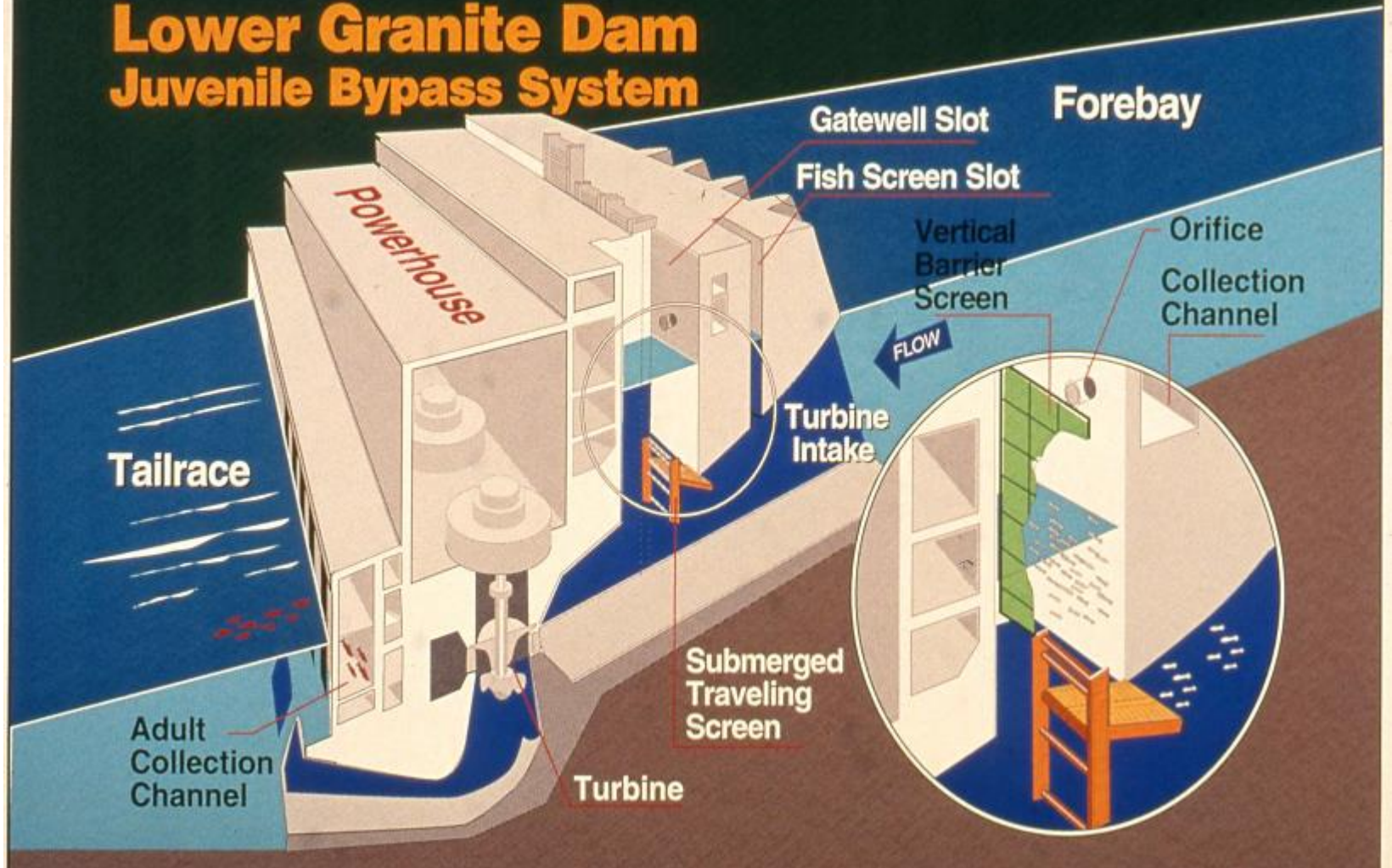
# TURBINE PASSAGE



US Army Corps  
of Engineers<sup>®</sup>



# Lower Granite Dam Juvenile Bypass System



US Army Corps  
of Engineers<sup>®</sup>



# FACILITY COLLECTION

- Secondary bypass
- Sample
- PIT tag interrogation
- Collection for transport
  - Raceways
  - Barge direct load
  - Trucking
- Research





US Army Corps  
of Engineers  
Walla Walla District

# Lower Granite Dam Yearling Chinook Passage & Survival Estimates (2006)



Over 50% of all  
yearling chinook are  
transported to ocean

Spillway  
Passage  
29.2%

Percent Passage Distribution of  
Non-Transported Fish

RSW Passage  
29.7%

Turbine  
Passage  
12%

Bypass  
Passage  
29.2%

Spill  
Survival  
97.6%

RSW  
Survival  
98.2%

Turbine  
Survival  
87.5%

Juvenile  
Transportation  
Survival = 98%

Juvenile  
Bypass  
Survival  
96.6%

BiOp Performance Standard = 96%

Overall Dam Survival = 96.7%



US Army Corps  
of Engineers  
Walla Walla District

# Lower Granite Dam Steelhead Passage & Survival Estimates (2006)



Over 50% of all  
steelhead are  
transported to ocean

Spillway  
Passage  
28.8%

Percent Passage Distribution of  
Non-Transported Fish

RSW Passage  
26.5%

Turbine  
Passage  
6.05%

Bypass  
Passage  
38.7%

Spill  
Survival  
98.7%

RSW  
Survival  
97.5%

Turbine  
Survival  
87.7%

Juvenile  
Transportation  
Survival = 98%

Juvenile  
Bypass  
Survival 97.1%

BiOp Performance Standard = 96%

Overall Dam Survival = 96.7%



US Army Corps  
of Engineers  
Walla Walla District

# Lower Granite Dam Subyearling Chinook Passage & Survival Estimates (2007)



Over 50% of all  
subyearling chinook  
are transported to  
ocean

Spillway  
Passage  
16%

Percent Passage Distribution of  
Non-Transported Fish

RSW Passage  
57.6%

Turbine  
Passage  
27.7%

Bypass  
Passage  
17%

Spill  
Survival  
75%

RSW  
Survival  
92%

Turbine  
Survival  
85.1%

Juvenile  
Transportation  
Survival = 98%

Juvenile  
Bypass  
Survival 85.2%

BiOp Performance Standard = 93%

Overall Dam Survival = 88.1%

# SAMPLING

- Condition
- Species Composition
- Transport Data
- PSMFC GBT monitoring
- LWG JFF 2016 research collection
  - 458,051 smolts
  - 9 research projects
  - 6 agencies



US Army Corps  
of Engineers<sup>®</sup>





# CURRENT JUVENILE FACILITY PROJECTS

- NMFS in-river vs transport smolts into RWs
- NMFS Reach Survival smolts into RWs
- NMFS migration monitoring of wild spring/summer chinook PIT tagged SbyC collection
- IDFG Genetic Stock Identification from SMP sample
- USGS Subyearling Chinook PIT tag Size Detection Efficiency
- CRITFC/NPT Kelt rehabilitation genetic samples, PIT-tag, and transport



US Army Corps  
of Engineers<sup>®</sup>

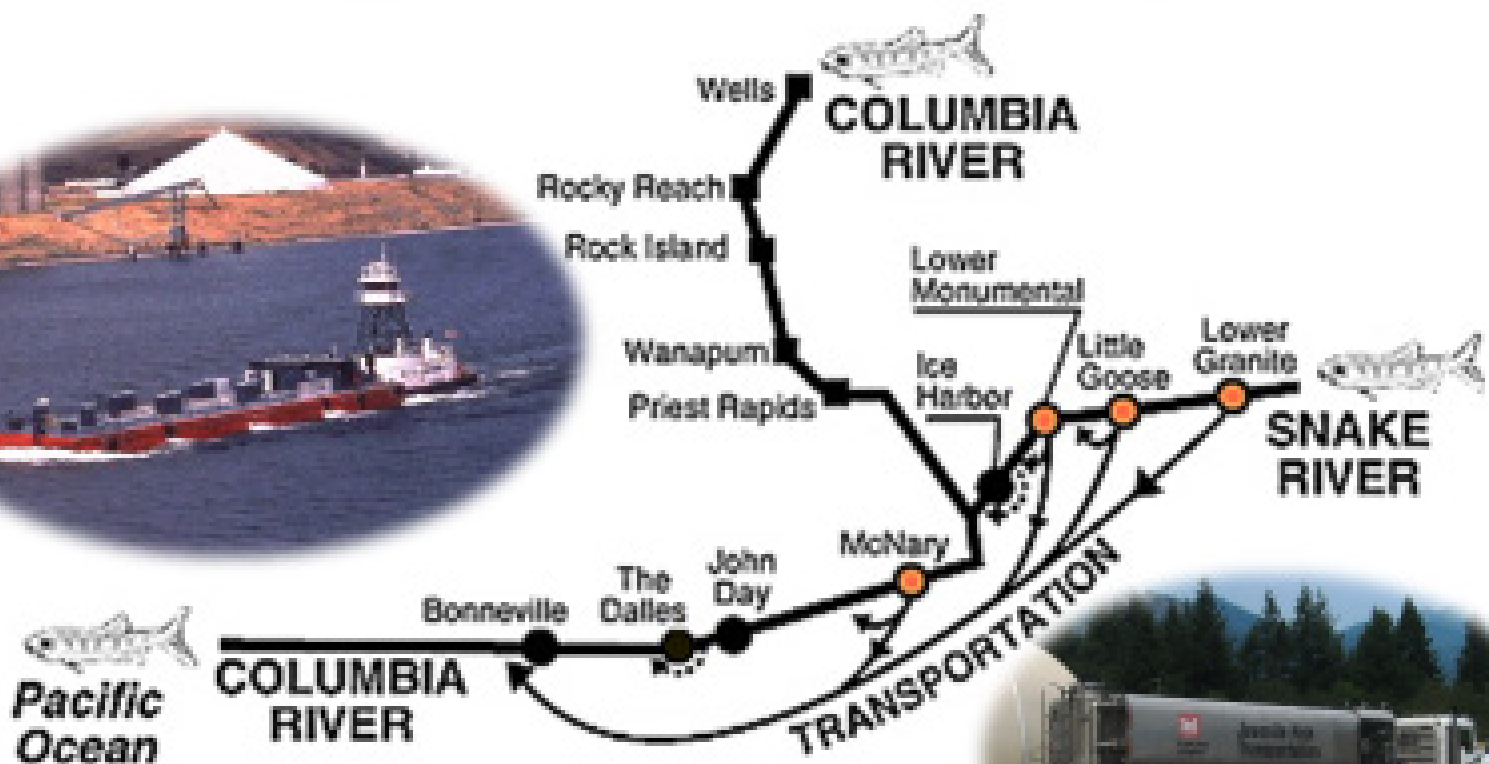


# JUVENILE BYPASS UPGRADE

- Widen collections channel
- Replace 10" with 14" orifices
- Reduces velocity
- Enables visual inspections
- Provides water control
- Operational March 2018



# JUVENILE SALMON TRANSPORTATION



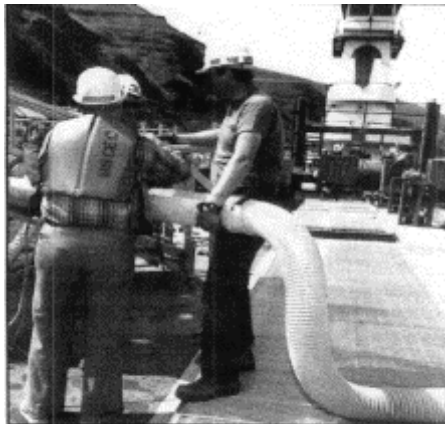
# EARLY TRANSPORTATION EFFORTS



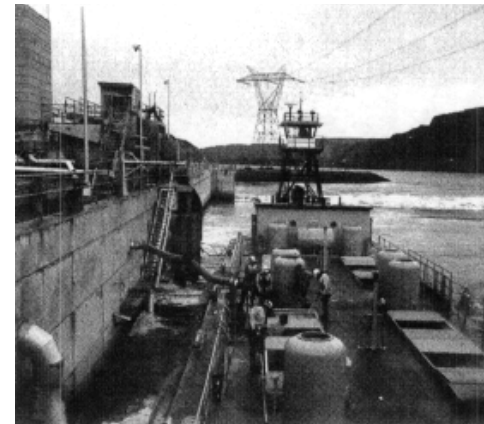
*During the early years of Operation Fish Run, sea planes transported fingerlings downstream. The seaplanes worked well, getting the fingerlings downriver quickly, but proved too costly to continue.*



*Operation Fish Run transportation tanker, 1971.*



*Plastic pipe transports juvenile fish from dam bypass system into fish transportation barge.*



*Fish transportation barge, 1984.*



US Army Corps  
of Engineers <sup>®</sup>



# BARGE AND TRUCK CAPACITIES

## Barge Capacities

Barge Series	Gallons	Inflow (gpm)	Fish (lbs)
2000	85,000	4,600	23,000
4000	100,000	10,000	50,000
8000	150,000	15,000	75,000



## Truck Capacities

Truck type	Gallons	Fish (lbs)
Semi-truck	3,500	1,750
Midi-tank	300	150
Mini-tank	150	75



US Army Corps  
of Engineers<sup>®</sup>

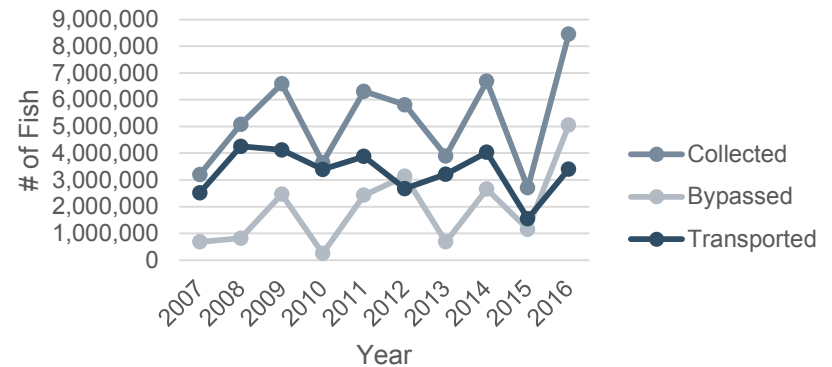


# TRANSPORTATION

## 2016 Collection

- Collected
- Bypassed 5,048,063
- Barged 3,379,603
- Trucked 22,529
- Fallbacks 7,091

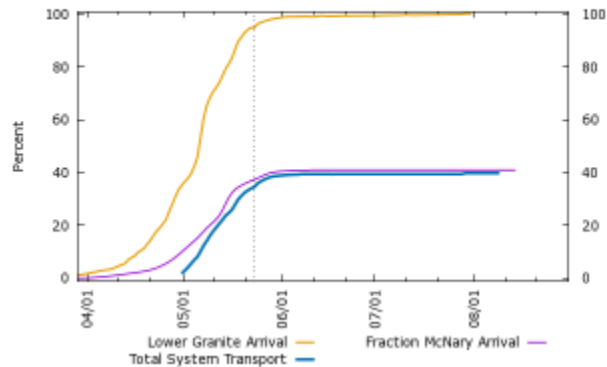
## LWG Juvenile Facility Ten Year Averages



### Snake River Passage and Transport Summary

for Wild Migrant Steelhead  
Data thru 5/24/2017

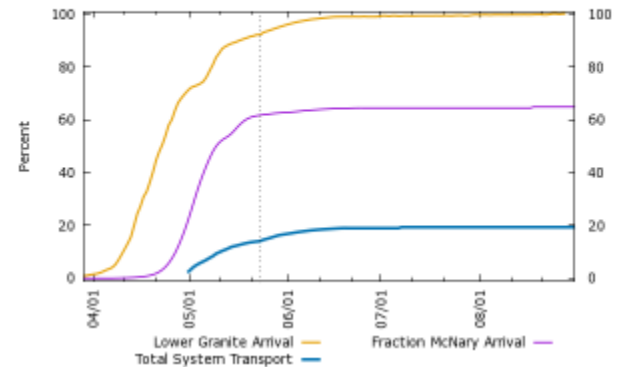
Current Transport Prediction: 34%



### Snake River Passage and Transport Summary

for PIT-Tagged Wild Run-At-Large Yearling Chinook  
Data thru 5/24/2017

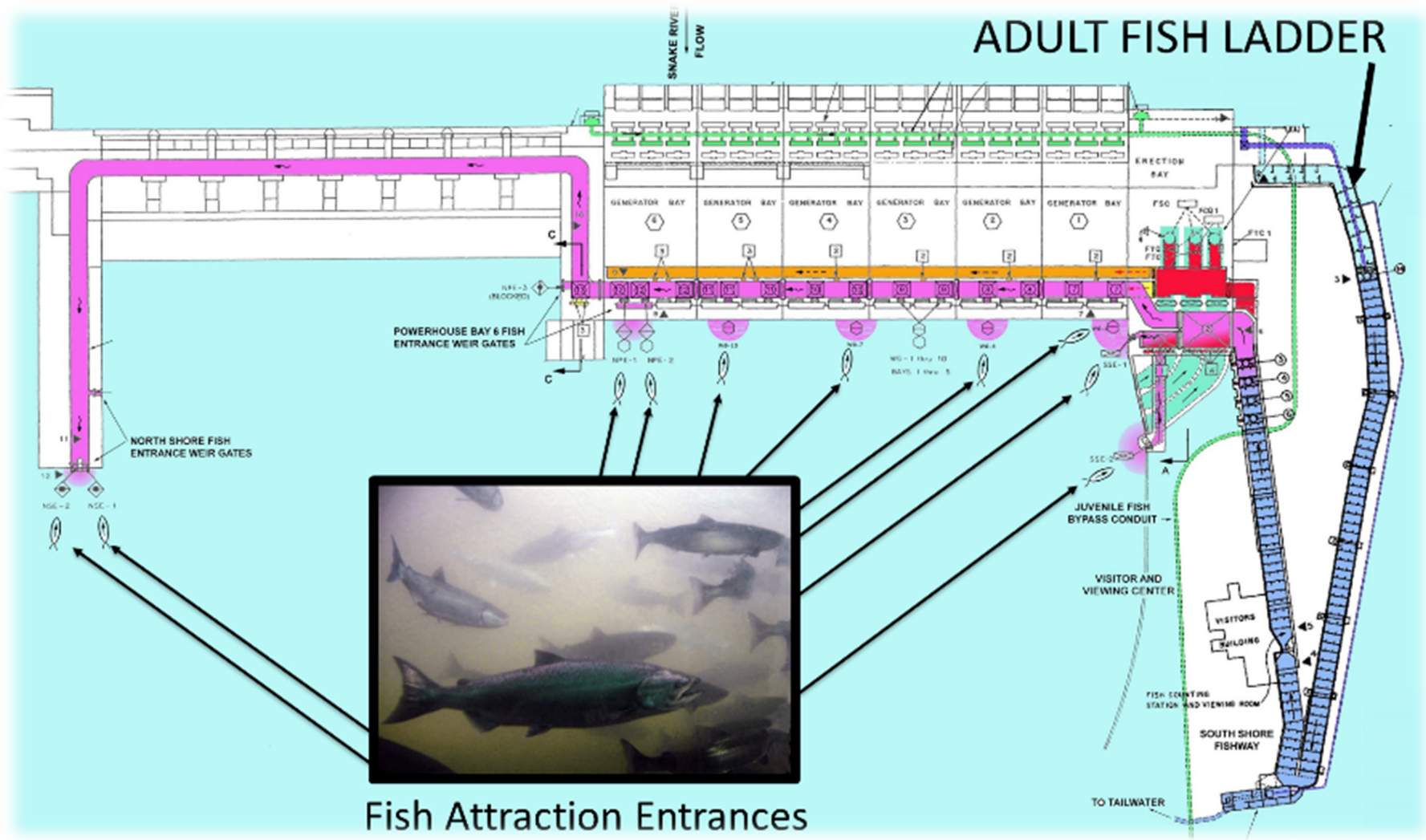
Current Transport Prediction: 14%



US Army Corps  
of Engineers®

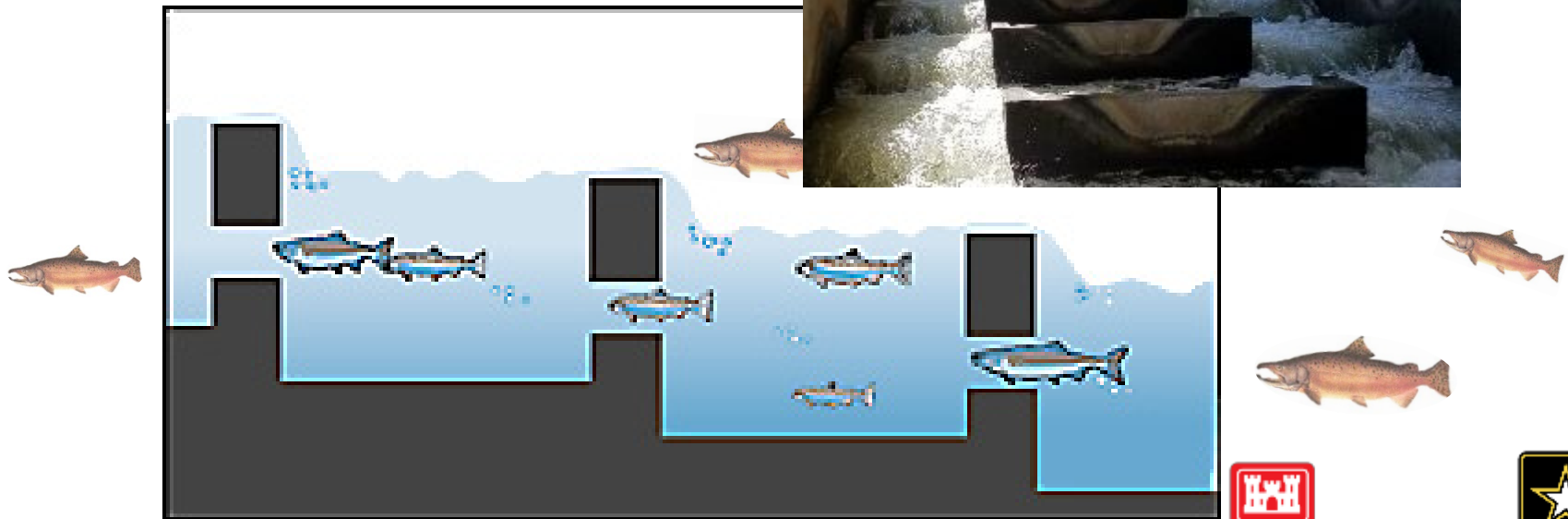


# LOWER GRANITE DAM



# ADULT PASSAGE

- Adult fish count station
- Pit tag detection
- Adult fish trap
- Lamprey modification
- Research
  - Influence of noise and vibration on passage
  - Influence temperature control system



US Army Corps  
of Engineers<sup>®</sup>

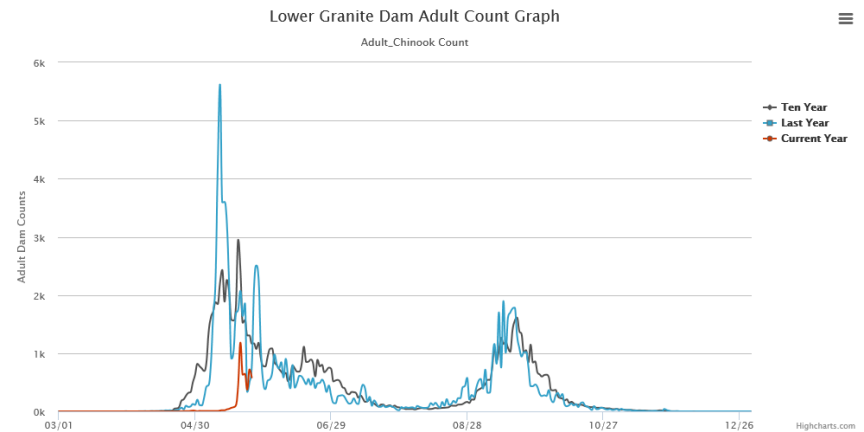
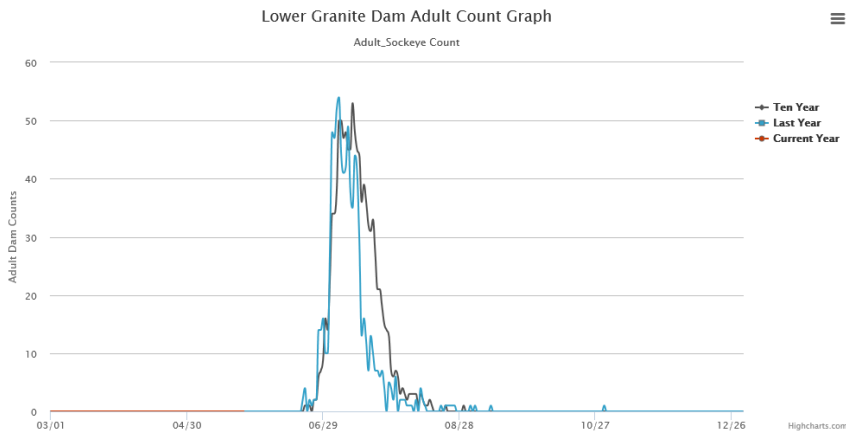
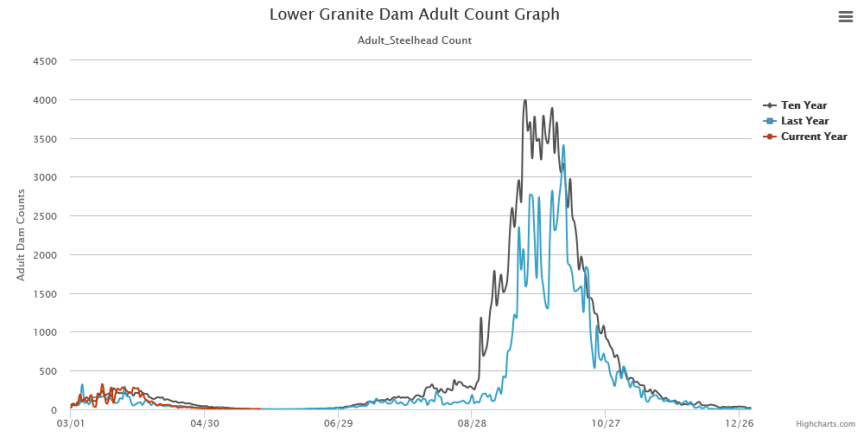




# ADULT FISH PASSAGE

## LWG Adult fish count schedule

- Daily Apr 1-Oct 31
- Nighttime Jun 1- Sep 31
- Video Mar 1-31 and Nov 1-Dec 31
- Annual maintenance January 2- February 13





Pump Intake  
Extension  
Chimney



Semi-circular spray at top  
of fish ladder  
spray at top of fish ladder



Supplemental  
Water Intake  
Chimney



US Army Corps  
of Engineers<sup>®</sup>



# FISH LADDER EXIT TEMPERATURE CONTROL



File Name



US Army Corps  
of Engineers<sup>®</sup>



# ADULT TRAP COLLECTION

2016 total collection *45,265 fish*

- IDFG collected/sampled
  - 20,325 steelhead
  - 14,470 spring/summer Chinook
  - 205 Sockeye (genetic sample only)
- WDFW Aug 18-Oct 11
  - 2,603 Fall Chinook transported to Lyons Ferry Hatchery
- NPT Sep 22-Nov 4
  - 960 Fall Chinook transported to Cherry Lane Hatchery



## Emergency Transport Operation

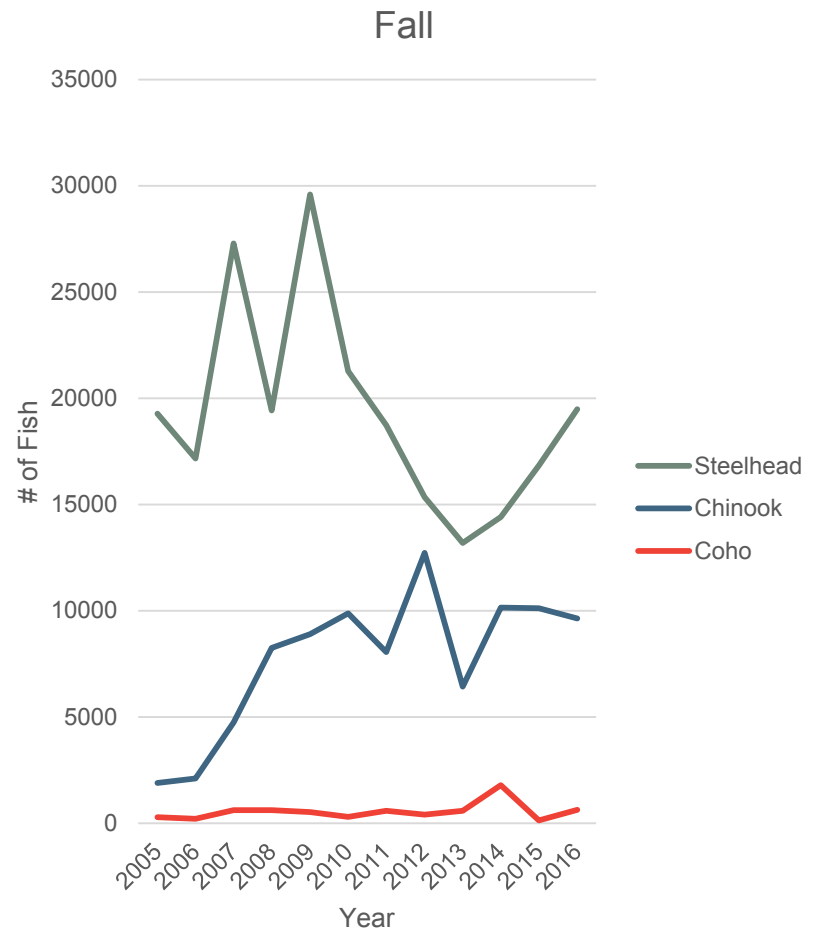
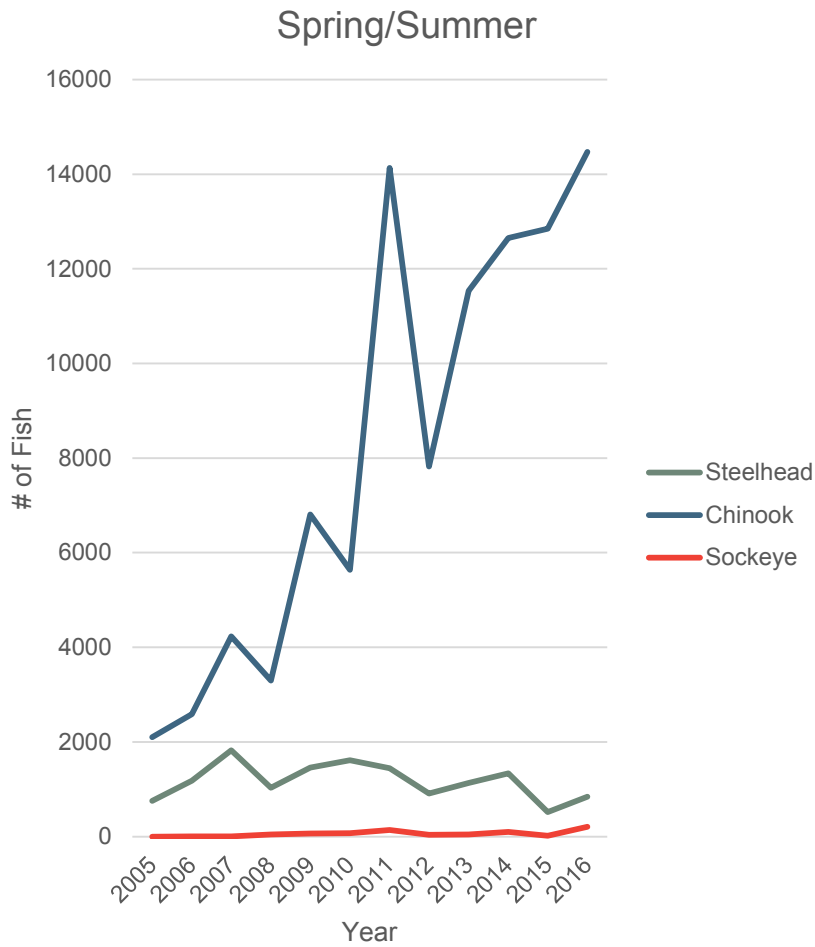
- IDFG Sockeye collection in 2015
- NPT Coho collection 2015 and 2016



US Army Corps  
of Engineers<sup>®</sup>



# ADULT TRAP SAMPLING TOTALS



# FALL CHINOOK BROOD STOCK HAULED

	LFH	NPTH	Total Hauled	Released	Total Handled
2009	3396	1968	5364	3530	8894
2010	2789	1040	3829	6044	9873
2011	2302	584	2886	5171	8057
2012	5057	939	5996	6721	12717
2013	1817	506	2323	4111	6434
2014	3025	885	3910	6244	10154
2015	2222	866	3088	7037	10125



US Army Corps  
of Engineers<sup>®</sup>



# LOWER GRANITE FISH TRAP

## 16 adult fish trap projects 2017

- NOAA Fisheries
- Idaho Dept. Fish and Game
- Washington Dept. Fish and Wildlife
- Nez Perce Tribe
- Oregon Dept. Fish and Wildlife
- Biomark
- US Army Corp of Engineers
- Bonneville Power Administration



US Army Corps  
of Engineers<sup>®</sup>





# QUESTIONS



US Army Corps  
of Engineers<sup>®</sup>





# DATA COLLECTION

- 16 adult fish trap projects 2017:
  - Integrated Status and Effectiveness Monitoring (ISEMP)
  - Fall Chinook Brood-stock Collection (WDFW and NPT)
  - Fall Chinook Run Reconstruction
  - Steelhead Monitoring and Evaluation Studies
  - Idaho Natural Production Monitoring and Evaluation
  - Chinook and Steelhead Genetic Stock Identification (GSI) at LGR
  - Snake River Chinook and Steelhead Parental Based Tagging (PBT)
  - Lemhi Intensively Monitored Watershed
  - B-run Steelhead Supplementation Evaluation
  - Snake River fall Chinook salmon fidelity and fall-back
  - Imnaha River Steelhead Status Monitoring
  - Snake River fall Chinook SARs under alternative transport and dam operational strategies.



US Army Corps  
of Engineers<sup>®</sup>

