

WILLAMETTE VALLEY INJUNCTION & GREEN PETER DEEP RESERVOIR DRAWDOWN

U.S. Army Corps of Engineers
Portland District
20 November 2023

Green Peter Reservoir, Whitcomb Bridge, El. 782 ft.



Green Peter Reservoir, at El. 782 ft.



US Army Corps
of Engineers®
Portland District



BACKGROUND



2008 BIOP & INJUNCTION REVIEW



- March 2018 - Complaint filed by Plaintiffs alleging violations of the Endangered Species Act (ESA) related to alleged failure to implement Biological Opinion (BiOp) fully
- April 2018 - Corps reinitiated ESA consultation
- **August 2020 - Court rules in favor of Plaintiffs on all claims**
- **September 1, 2021 - Judge issues injunction ordering the Corps to carry out specified measures to improve fish passage and water quality in the Willamette River Basin**
- Judge's injunction has the full effect of the law and its requirements must be met unless the judge grants relief or when new BiOp is issued





INJUNCTION MEASURES



- Complete reinitiated ESA consultation and issue a new BiOp by December 31, 2024
- **Operational measures to improve fish passage and water quality**
 - **Increased spill operations**
 - **Changes to reservoir elevations including delayed refills and deep drawdowns**
- Outplant adult spring Chinook salmon above Green Peter Dam
- Structural Measures
 - Dexter Fish Facility
 - Structural improvements for Big Cliff Dam total dissolved gas reductions
 - Cougar Dam regulating outlet improvements
- Research, Monitoring, & Evaluation
- Follow established maintenance outage schedules and emergency protocols
- Provide biannual status reports detailing progress and compliance with the injunction measures

** Most injunction measures, including the Green Peter Reservoir deep drawdown measure, were ordered by the court based upon input from an expert panel of scientists and biologists.*



DEEP RESERVOIR DRAWDOWNS



What: Deep reservoir drawdowns were ordered at 4 Corps Willamette Valley System Dams:

- Cougar: A 27-foot drawdown to El. 1505 ft., from 15 November – 15 December
- Fall Creek: A 43-foot drawdown to El. 685 ft., from 01 December – 15 January
- Lookout Point: A 75-foot drawdown to El. 750 ft., from 15 November – 15 December
- Green Peter: A 142-foot drawdown to El. 780 ft., from 15 November – 15 December

Why: The Judge ruled that to avoid “irreparable harm to threatened species” interim measures that improve passage and water quality in the WVP were needed.

- The deep reservoir drawdowns are expected to provide immediate improvement to downstream fish passage and survival of ESA-listed fish species, including spring Chinook salmon and winter steelhead.

Duration: Deep drawdowns will be implemented each fall until the injunction is lifted (which should occur at the end of December 2024), and perhaps even longer.

- In the Corps’ DEIS alternatives, operational fish passage is included as an interim or long-term strategy for downstream fish passage improvement depending on the reservoir.
- Deep drawdown operations and structural downstream fish passage are both expected to be included in new BiOp.



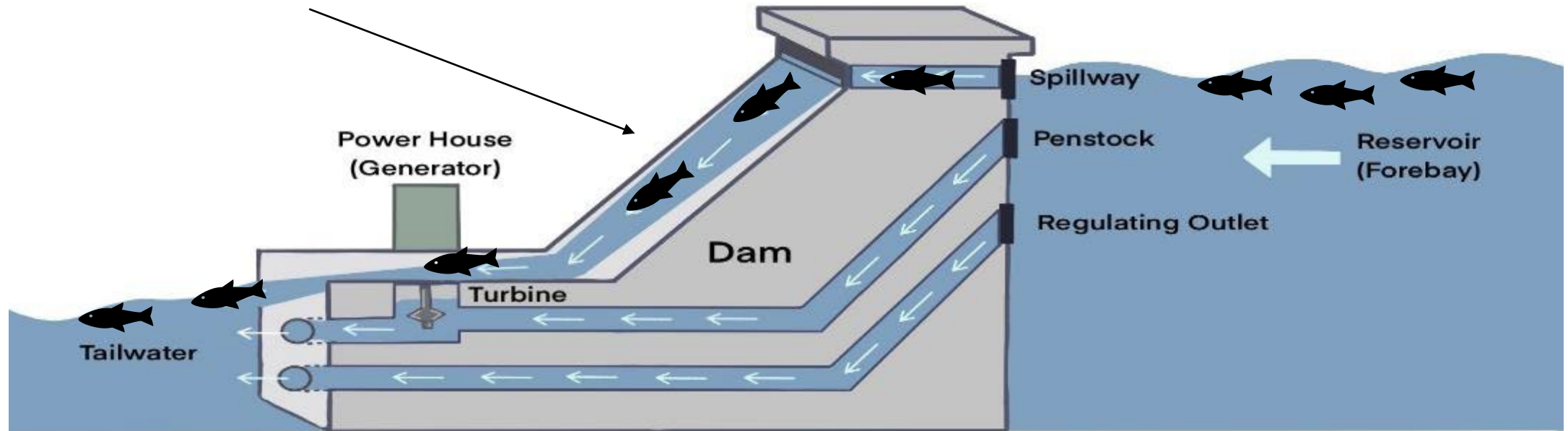
THE MECHANICS OF OPERATIONAL DOWNSTREAM FISH PASSAGE



FISH PASSAGE DURING SPRING/SUMMER DAM & RESERVOIR OPERATIONS

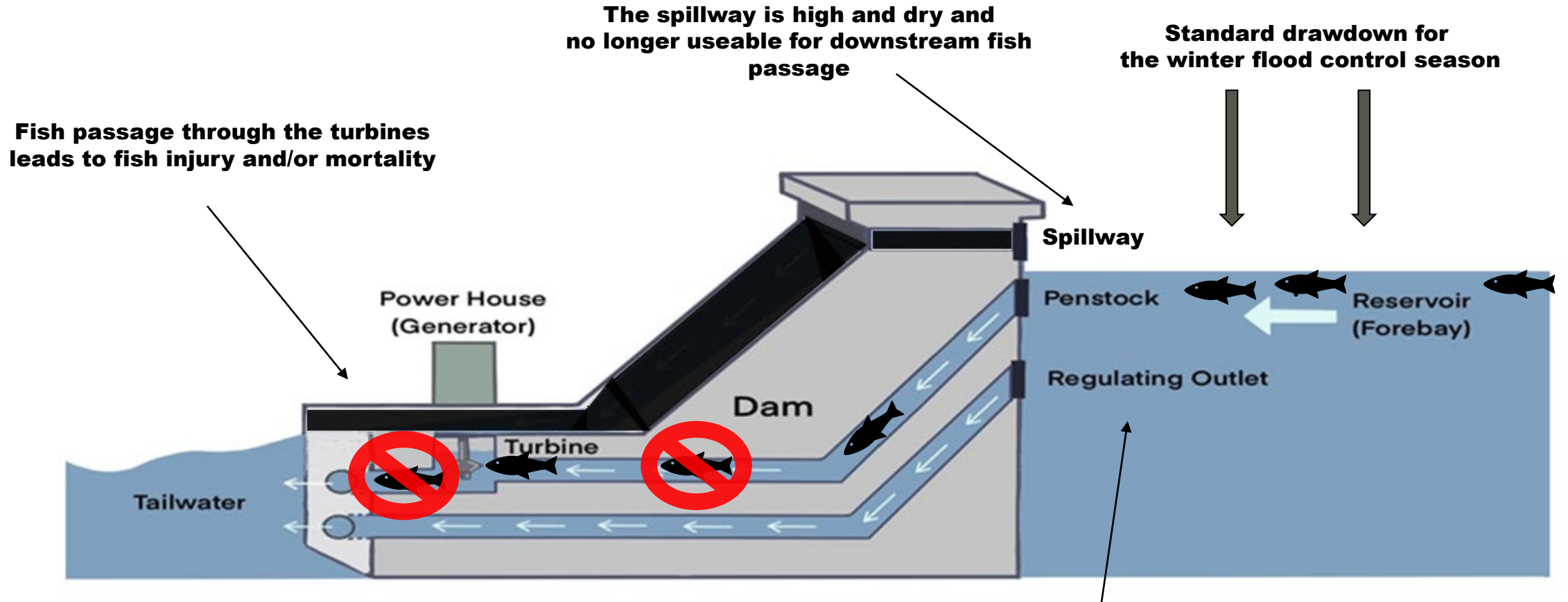


Fish passage through the spillway is relatively effective during the spring and summer when the reservoir is full, and the spillway is available, but not all juvenile Chinook and steelhead will pass so fall passage operations are also needed





FISH PASSAGE DURING TYPICAL FALL/WINTER DAM & RESERVOIR OPERATIONS



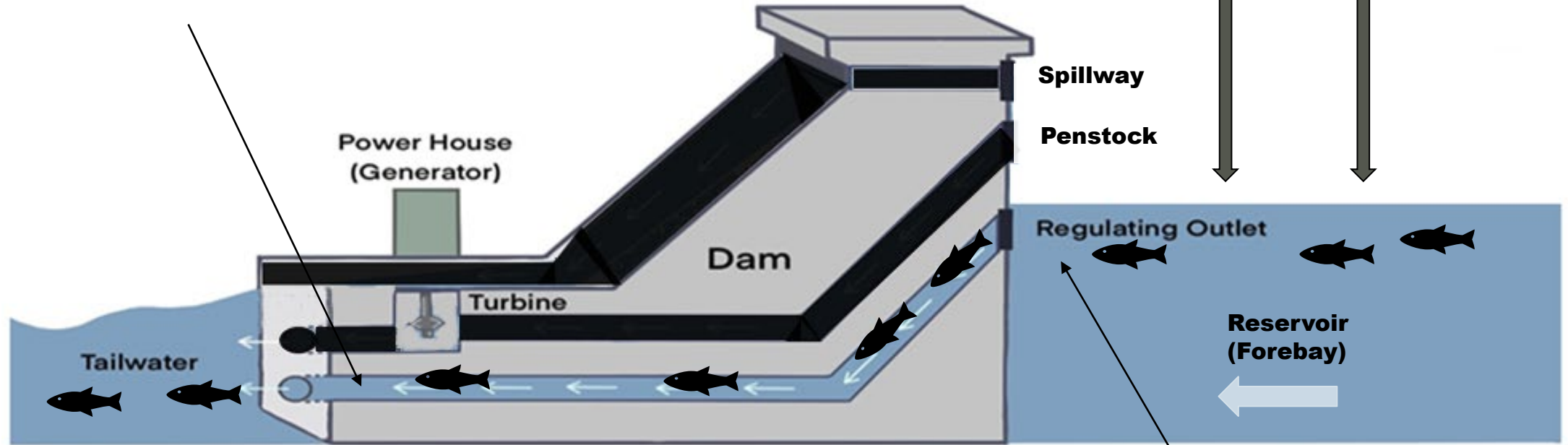


FISH PASSAGE DURING DEEP RESERVOIR DRAWDOWN OPERATIONS



A deep reservoir drawdown to regulating outlets is expected to improve overall juvenile Chinook or steelhead passage and survival

Deep reservoir drawdown for improved fish passage



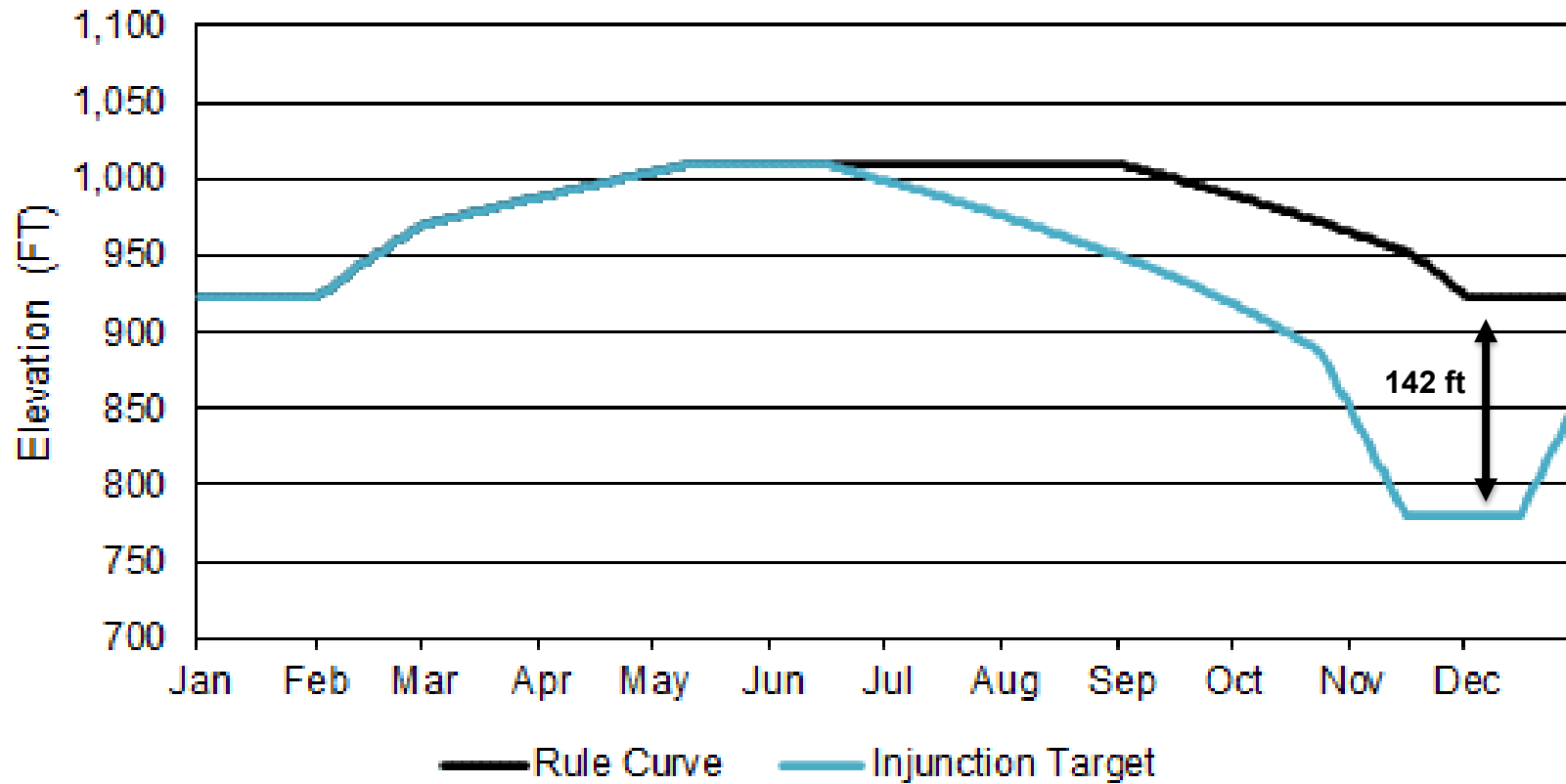
The reservoir is shallow enough for juvenile Chinook or steelhead to find the regulating outlets to pass through



GREEN PETER DEEP DRAWDOWN ELEVATIONS AS COMPARED TO RULE CURVE



Green Peter Dam

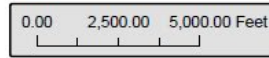
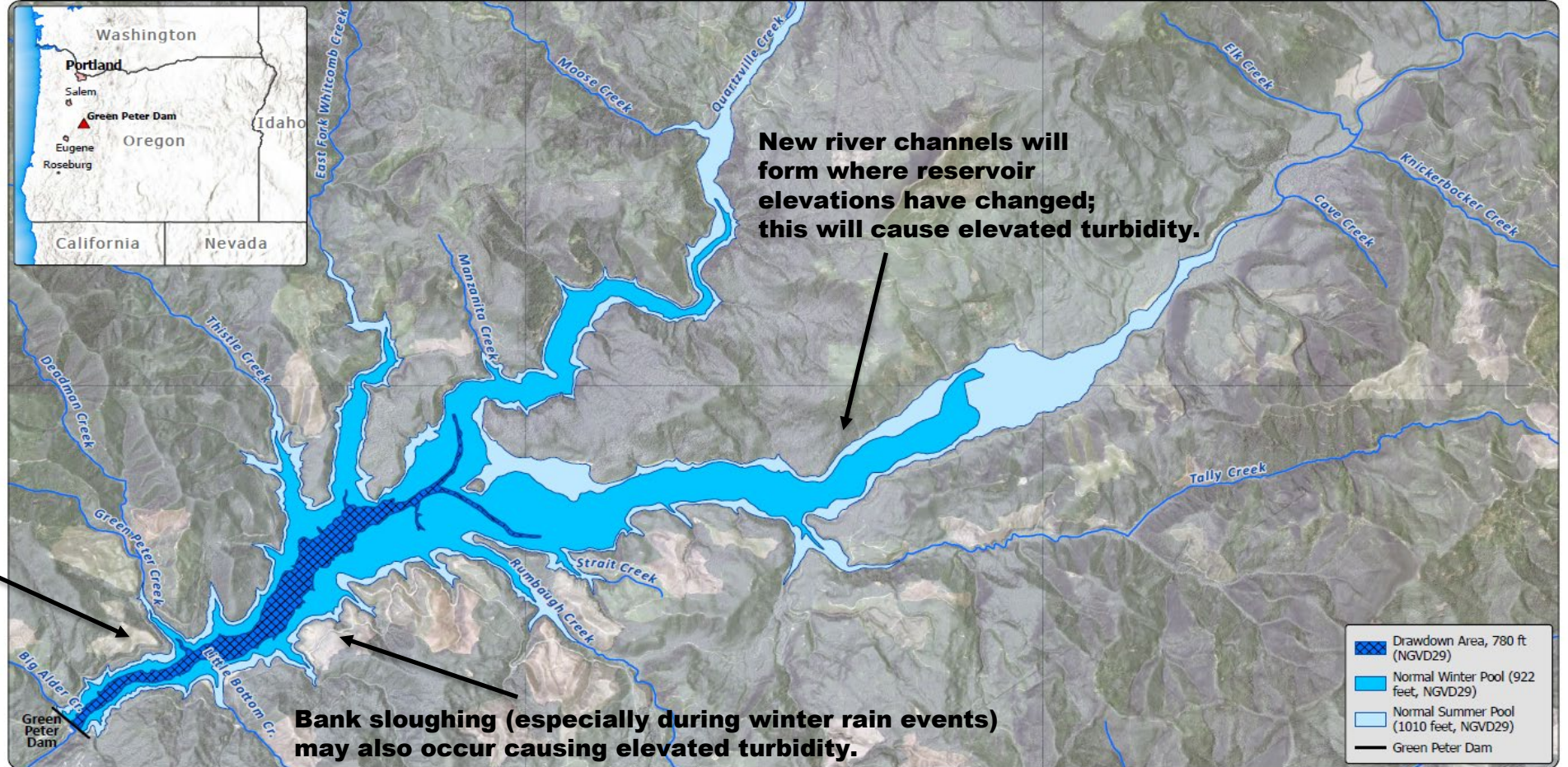




GREEN PETER RESERVOIR ELEVATIONS DURING STANDARD AND DEEP DRAWDOWN OPERATIONS



- (1) Smaller reservoir
- (2) Increased downstream flow signal (more riverine-like conditions)
- (3) Reduced depth over available outlet
- (4) Safer passage route (ROs versus turbines) for fish



Service Layer Credits: OSIP 2018 SL: Oregon Statewide Imagery Program (OSIP) - Oregon Imagery Framework Implementation Team
 World Topographic Map: County of Crook, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA
 World Hillshade: Esri, NASA, NGA, USGS
 World Hillshade: Esri, USGS

Produced by GIS, CADD, Mapping and Central Files Section
 Produced on: 7/19/2022
 Imagery: Oregon State Imagery Program, 2018
 Bathymetry is from Pre-Dam Topographic Mapping dated 1957/1958.



**Green Peter Lake
 Deep Drawdown to
 780 Feet (NGVD29)**

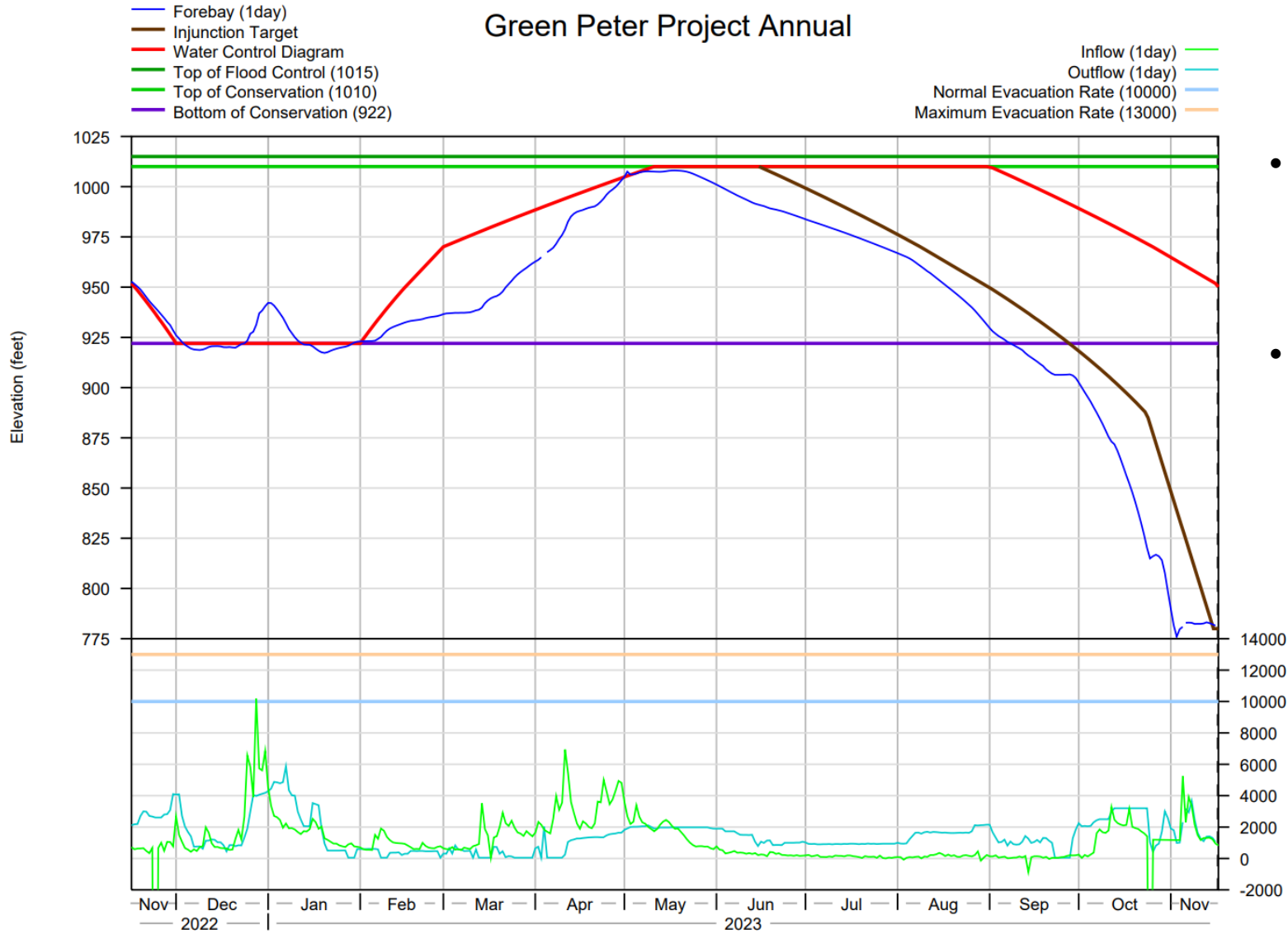




RESERVOIR DRAWDOWN AND REFILL SCHEDULE



2023 GREEN PETER RESERVOIR OPERATIONS

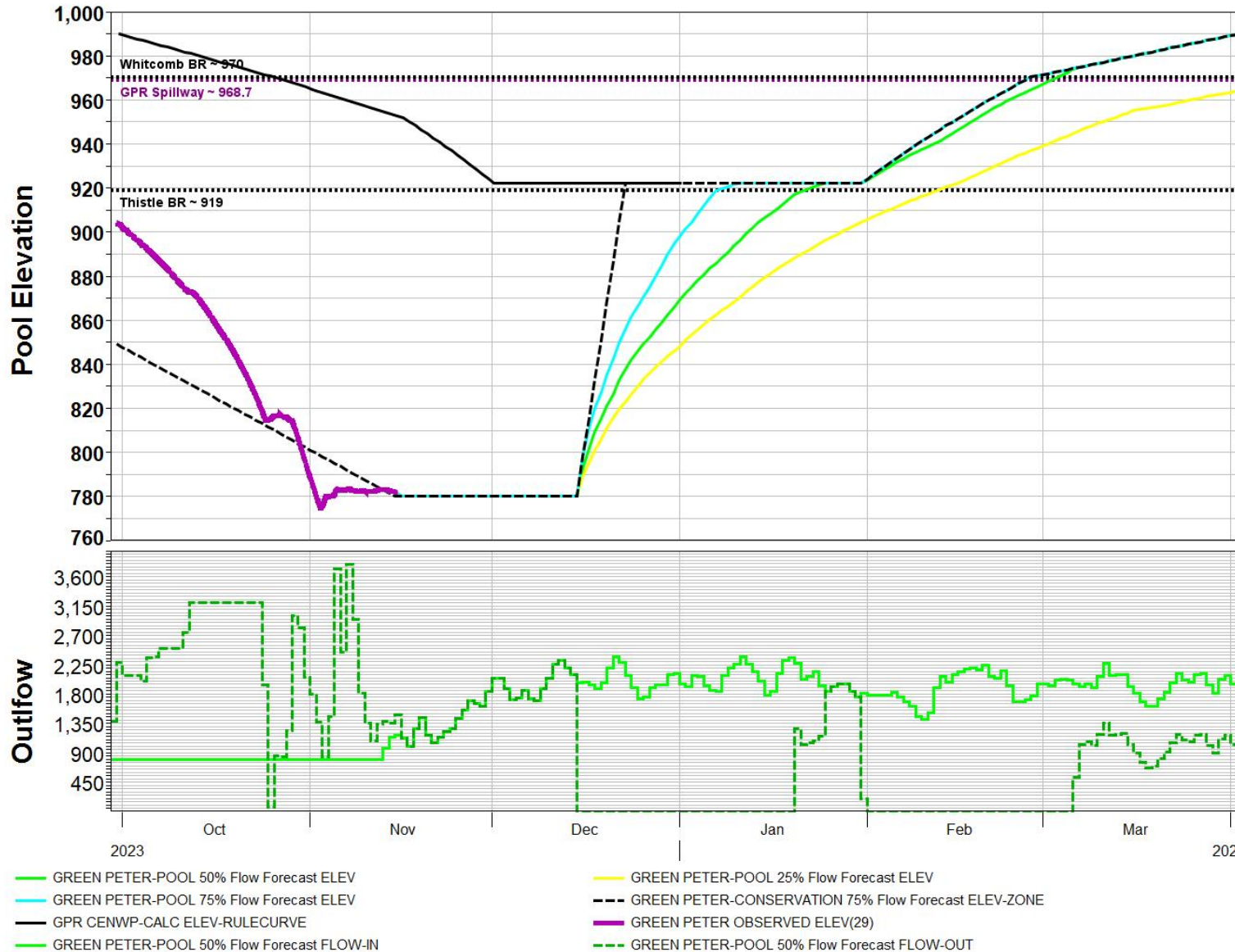


- Drawdown start date and rate of drawdown may vary annually.
- Injunction requirement to be at elevation 780 ft on 15 November – 15 December.

18 Nov 2023 10:34:00



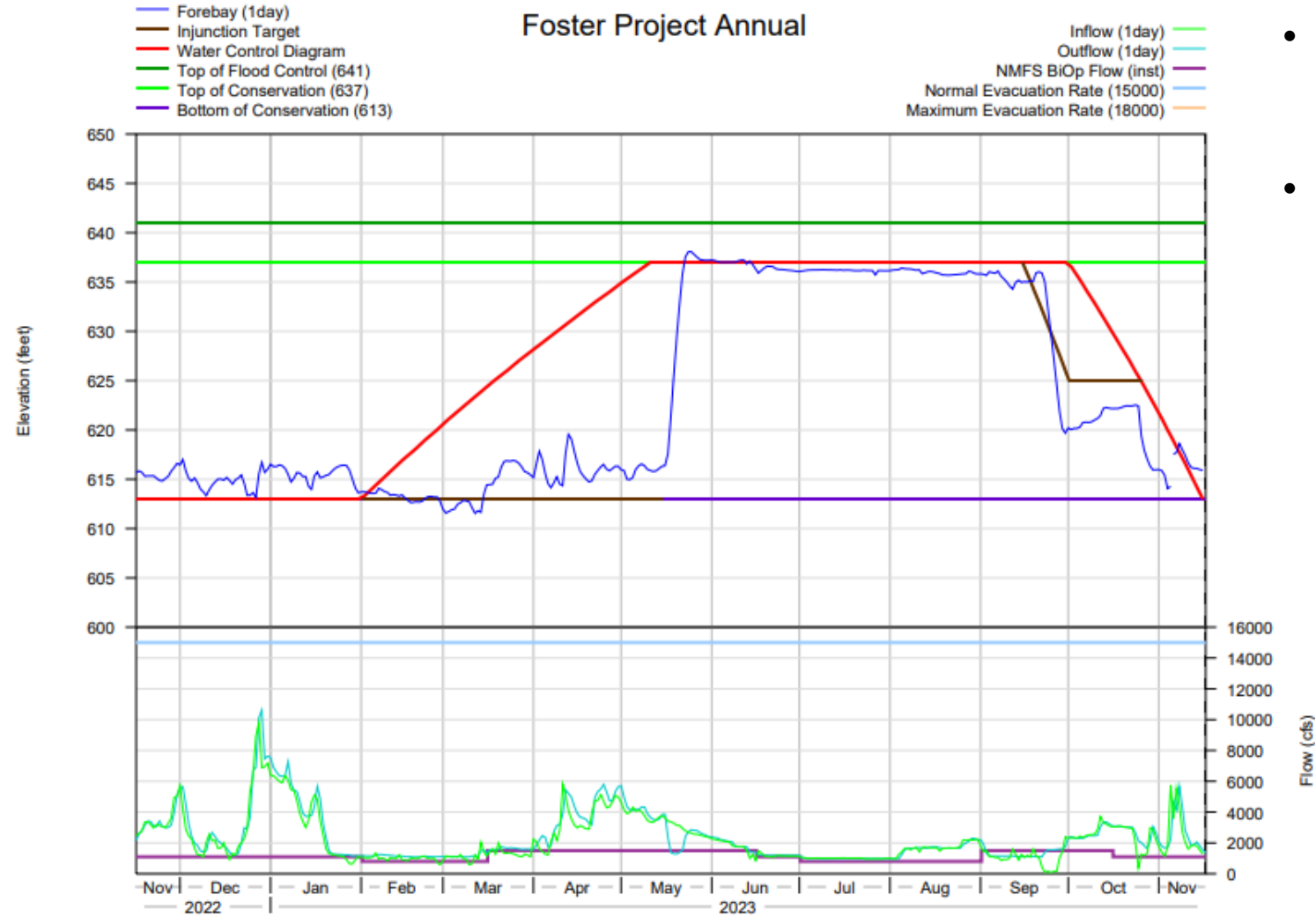
GREEN PETER REFILL FORECAST



- Reservoir models suggest; drawdown has little to no impact on refill.
- Refill will begin 16 December to “normal” winter pool (922 ft).
- Model results indicate that Green Peter Reservoir should refill back to “normal” winter reservoir elevations by early February.
- Refill will resume as “normal” as hydrology allows.
- Refill is important for spring spillway operations, which are also part of the injunction to improve downstream fish passage.



2023 FOSTER OPERATIONS AND 2024 FORECAST



- 2024 operations will mimic 2023 operations.
- Foster full mid-May thru mid-September.



<https://www.nwd-wc.usace.army.mil/nwp/teacup/willamette/>



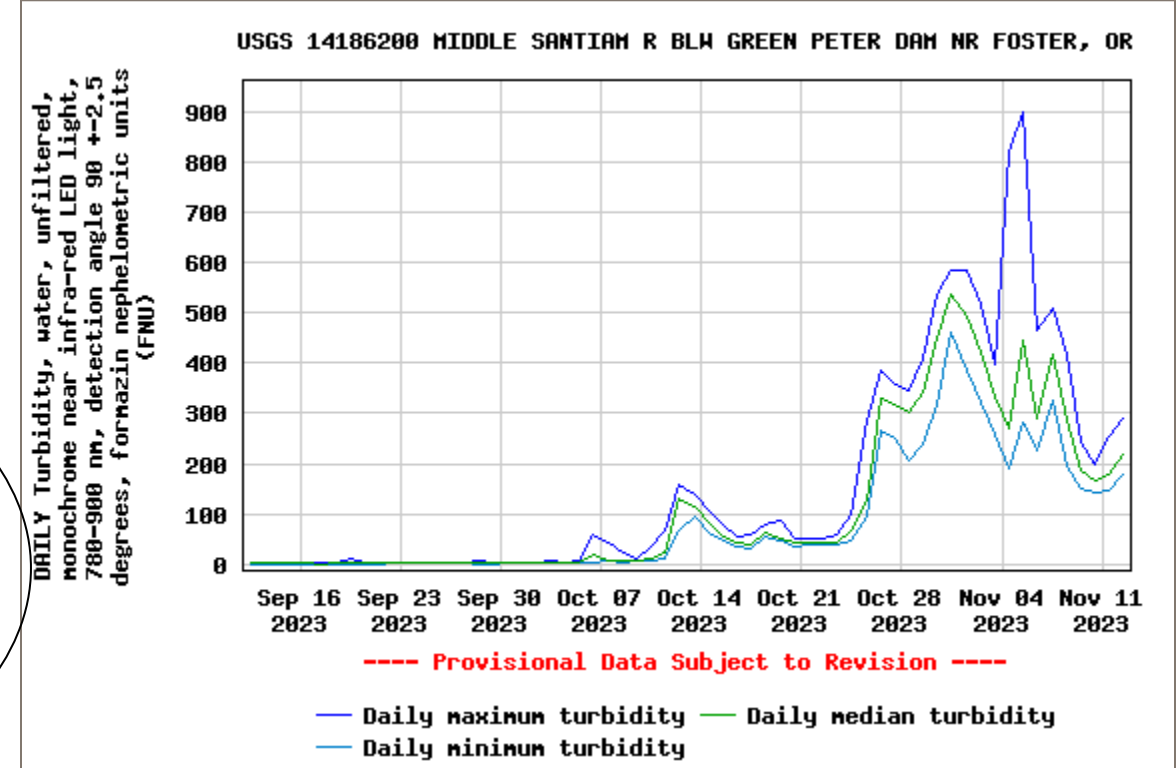
TURBIDITY & TEMPERATURE MONITORING



REAL-TIME TURBIDITY MONITORING



Site Number	Site Name	USGS Station Number	Site Objective
1	Middle Fork Willamette below Lookout Point Reservoir	14149011	Monitor turbidity and DO below reservoir outlet
2	Fall Creek below Winbery Creek, Near Fall Creek, Oregon	14151000	Monitor turbidity and DO below Fall Creek Lake
3	Middle Fork Willamette River at Jasper, Oregon	14152000	Monitor turbidity and DO downstream signal attenuation
4	Middle Santiam River below Green Peter Dam near Foster, Oregon	14186200	Monitor turbidity and DO below Green Peter Dam
5	South Santiam River near Foster, Oregon	14187200	Monitor turbidity and DO below Foster Dam
6	South Santiam River at Waterloo, Oregon	14187500	Monitor turbidity and DO downstream signal attenuation
7	Foster Lake at Foster, Oregon	442453122394900	Monitor turbidity and DO just upstream of Foster Dam, near the Sweet Home water supply intake



<https://maps.waterdata.usgs.gov/mapper/index.html>

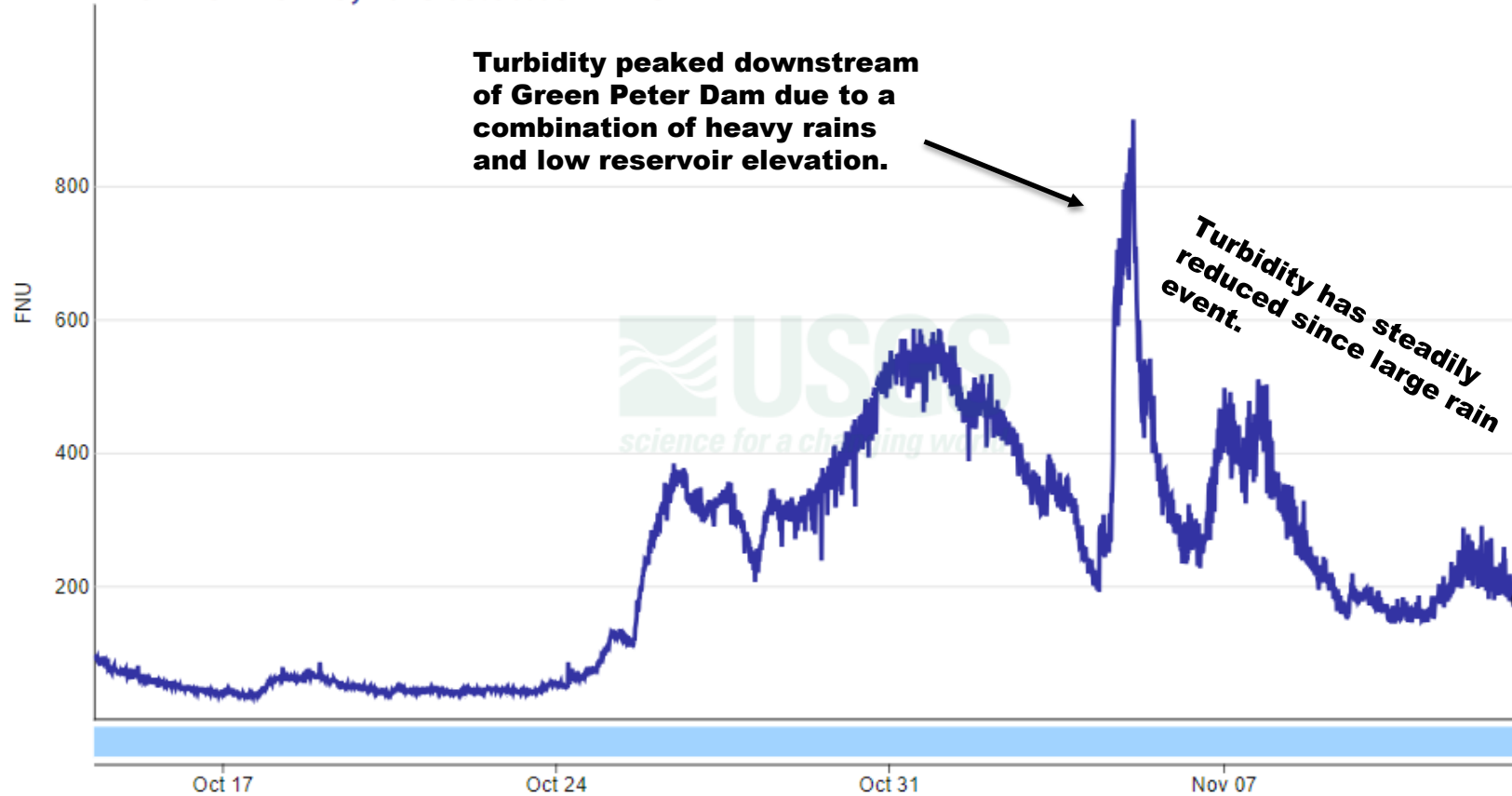


Middle Santiam R Blw Green Peter Dam NR Foster, OR - 14186200

October 14, 2023 - November 13, 2023

Turbidity, water, unfiltered, monochrome near infra-red LED light, 780-900 nm, detection angle 90 +/-2.5 degrees, formazin nephelometric units (FNU)

179 FNU - Nov 13, 2023 05:00:00 AM PST



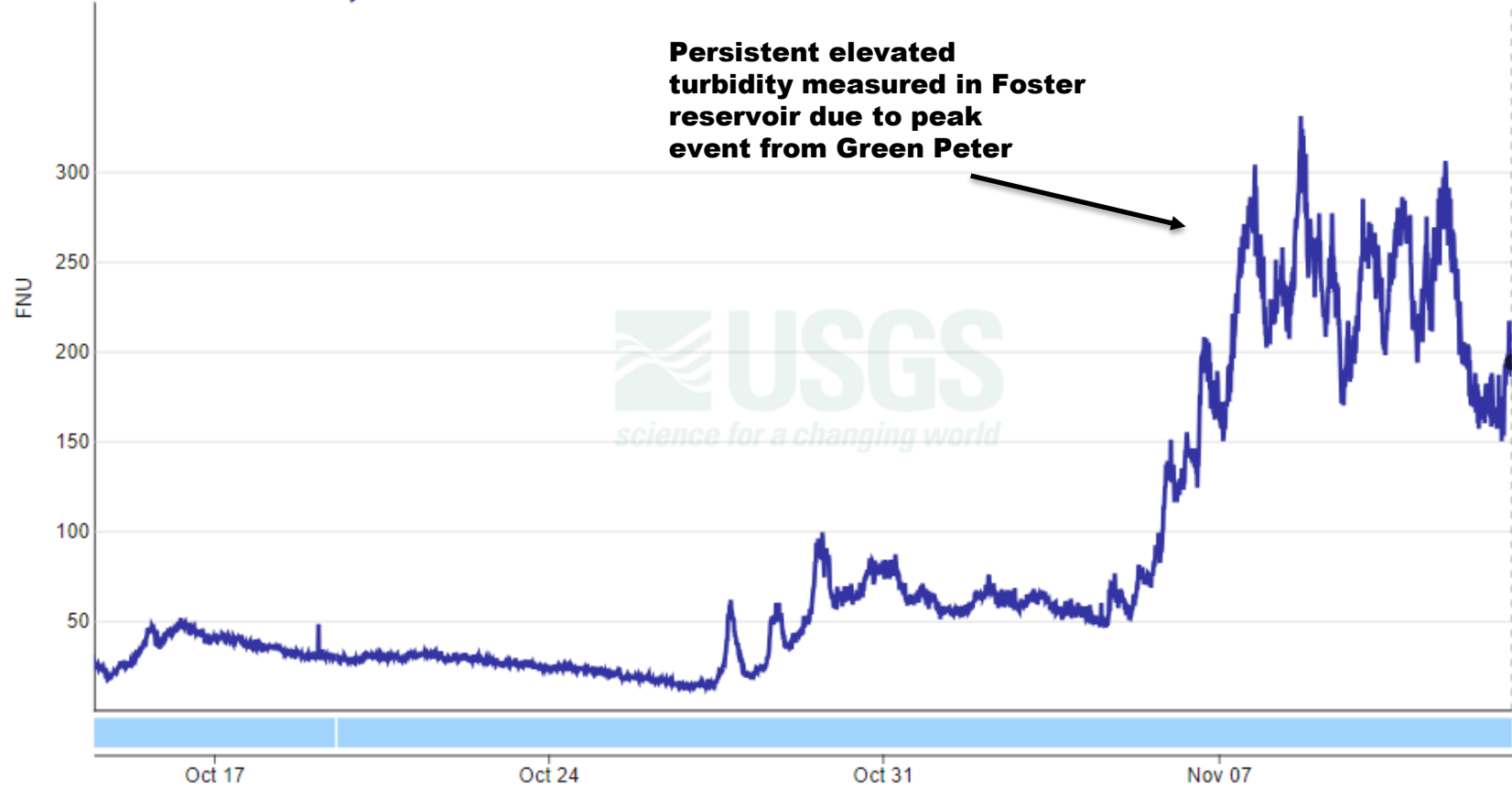


South Santiam River Near Foster, OR - 14187200

October 14, 2023 - November 13, 2023

Turbidity, water, unfiltered, monochrome near infra-red LED light, 780-900 nm, detection angle 90 +/-2.5 degrees, formazin nephelometric units (FNU)

194 FNU - Nov 13, 2023 03:30:00 AM PST





FALL CREEK DRAWDOWN

- Fall Creek (Middle For Willamette) drawdown to streambed since 2011.
- Left Photos: 2020 winter streambed drawdown (upstream and downstream).
- Right Photos: 2020 summer refilled (upstream and downstream).



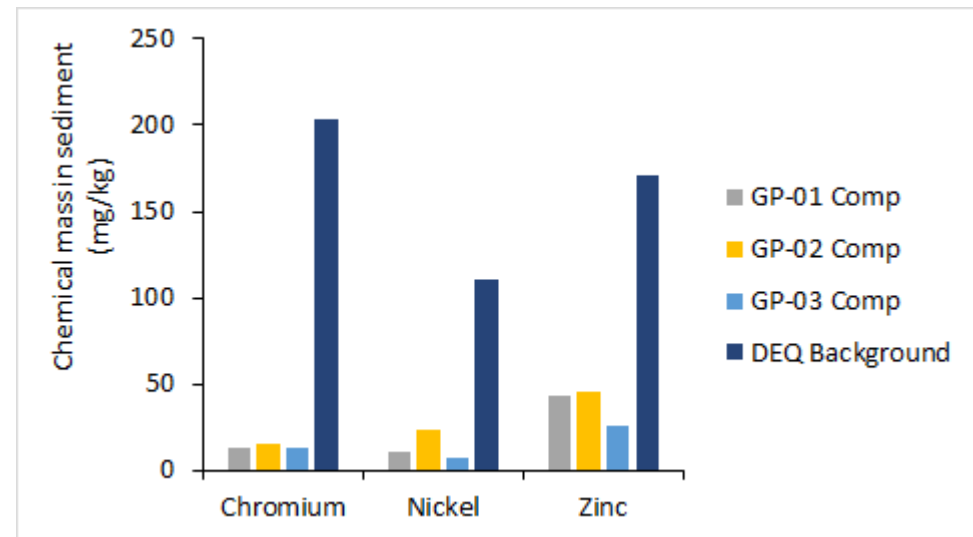
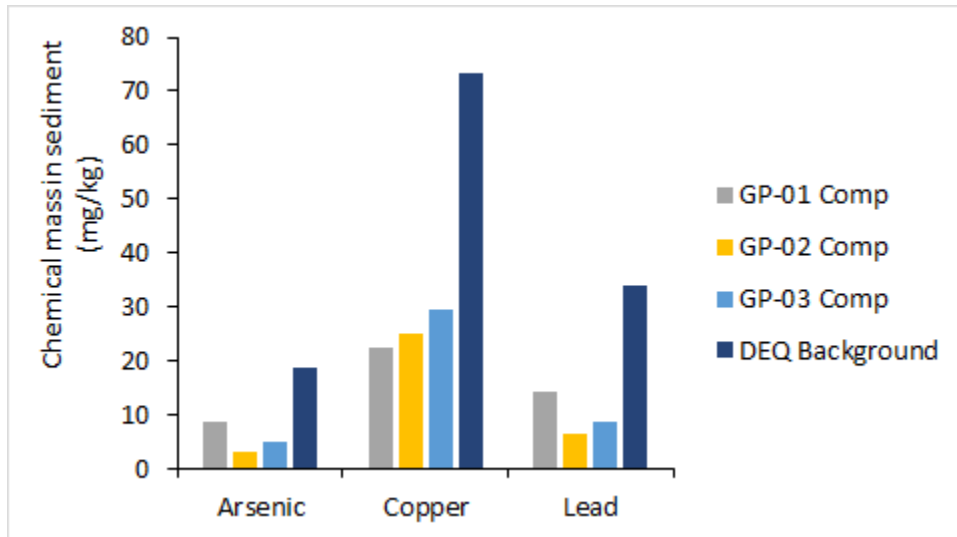
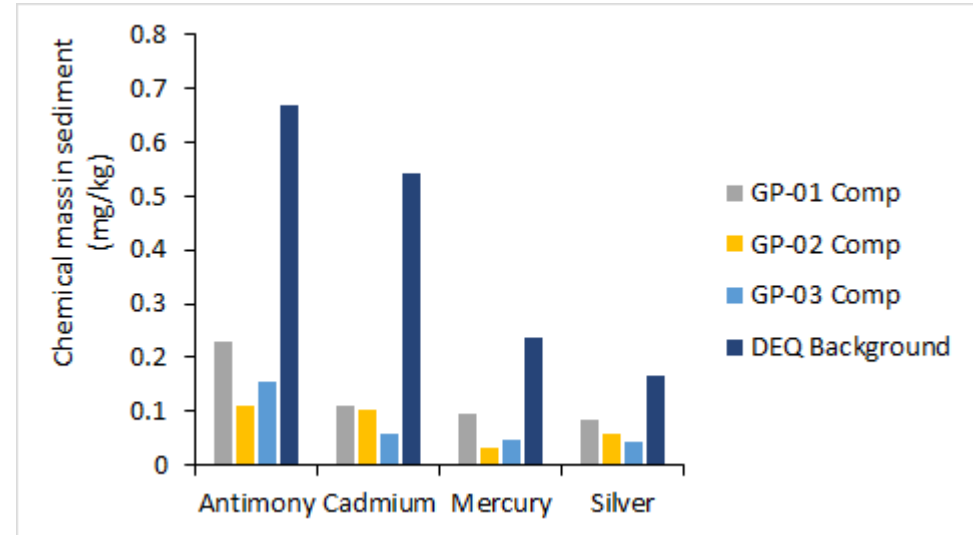


GREEN PETER RESERVOIR SEDIMENT QUALITY DATA (2013)



Takeaways:

- Sediment samples were collected from Green Peter Reservoir and analyzed in 2013.
- Metals detected in the samples are naturally occurring and below what the Dept. of Environmental Quality considers “background levels”.





GREEN PETER RESERVOIR SEDIMENT QUALITY



DATA (2013)

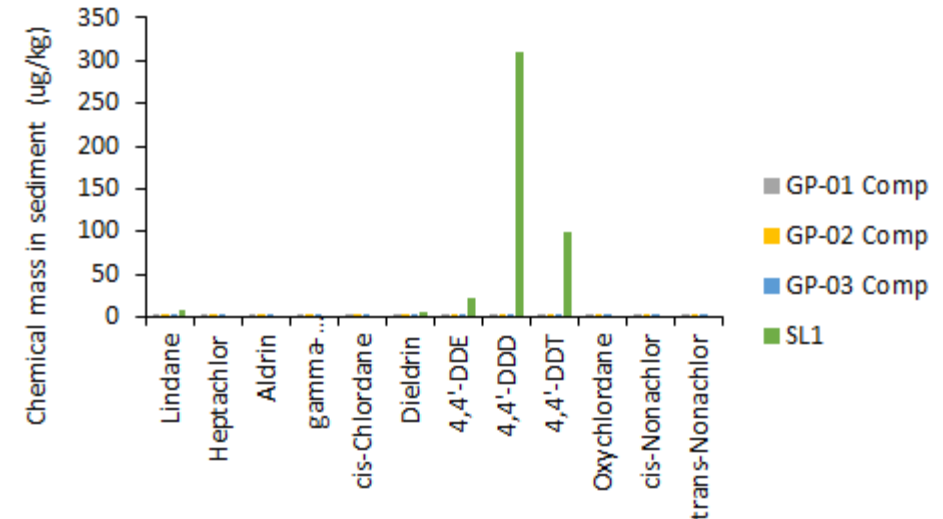
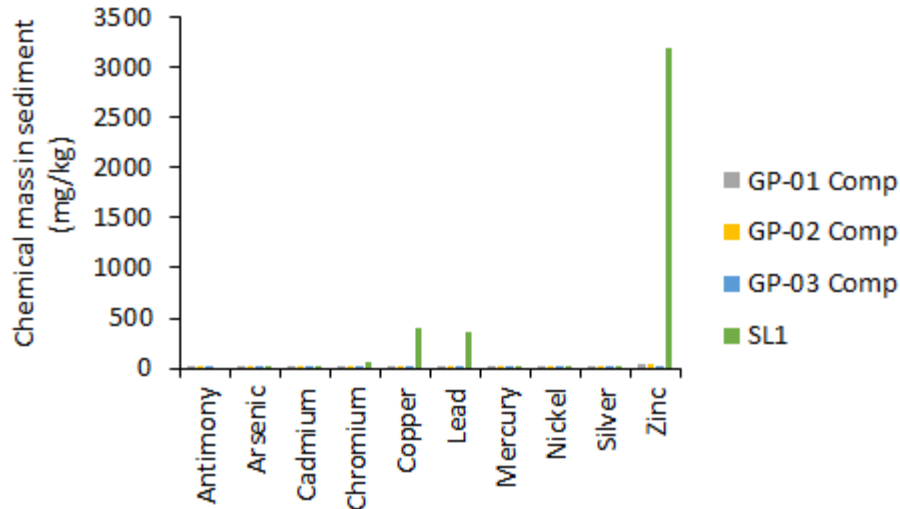
Takeaway: All sediment samples are below SEF toxicity screening levels for metals and pesticides.

Pesticides

Parameter	Unit	GP-01 Comp	GP-02 Comp	GP-03 Comp	SL1
Lindane	ug/kg	0.25	0.25	0.25	7.2
Heptachlor	ug/kg	0.25	0.25	0.25	—
Aldrin	ug/kg	0.25	0.25	0.25	—
gamma-Chlordane	ug/kg	0.25	0.25	0.25	—
cis-Chlordane	ug/kg	0.25	0.25	0.25	—
Dieldrin	ug/kg	0.4	0.4	0.4	4.9
4,4'-DDE	ug/kg	0.25	0.087	0.25	21
4,4'-DDD	ug/kg	0.25	0.25	0.25	310
4,4'-DDT	ug/kg	0.25	0.25	0.25	100
Oxychlordane	ug/kg	0.68	0.68	0.68	—
cis-Nonachlor	ug/kg	0.68	0.68	0.68	—
trans-Nonachlor	ug/kg	0.68	0.68	0.68	—

Metals

Parameter	Unit	GP-01 Comp	GP-02 Comp	GP-03 Comp	DEQ
Antimony	mg/kg	0.228	0.111	0.157	—
Arsenic	mg/kg	8.82	2.97	4.92	14
Cadmium	mg/kg	0.112	0.102	0.06	2.1
Chromium	mg/kg	13.1	15.2	13.1	72
Copper	mg/kg	22.3	25	29.5	400
Lead	mg/kg	14.1	6.53	8.57	360
Mercury	mg/kg	0.097	0.033	0.046	0.66
Nickel	mg/kg	10.4	23.3	6.81	26
Silver	mg/kg	0.085	0.059	0.043	0.57
Zinc	mg/kg	42.7	45.4	25.7	3200

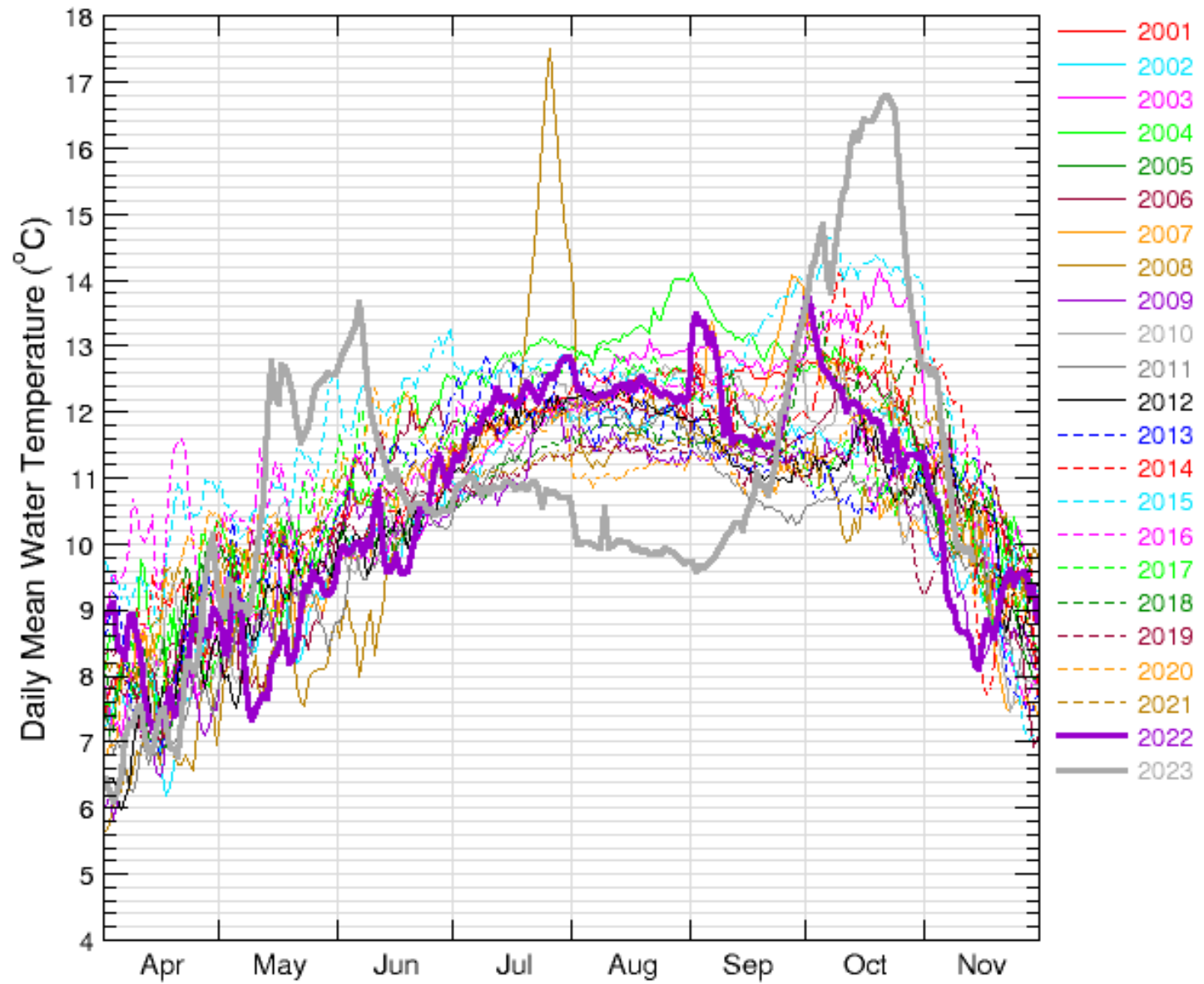


*SL = Sediment Evaluation Framework Benthic Toxicity Screening Level for Freshwater

*SL = Sediment Evaluation Framework Benthic Toxicity Screening Level for Freshwater

South Santiam River near Foster, OR (14187200)

Data from U.S. Geological Survey





BIOLOGICAL MONITORING

- Operations to improve flows, water quality, or fish passage for ESA listed fish always have **IMPACTS** and **BENEFITS**
- Trade-offs are required between species, life histories, authorized purposes.

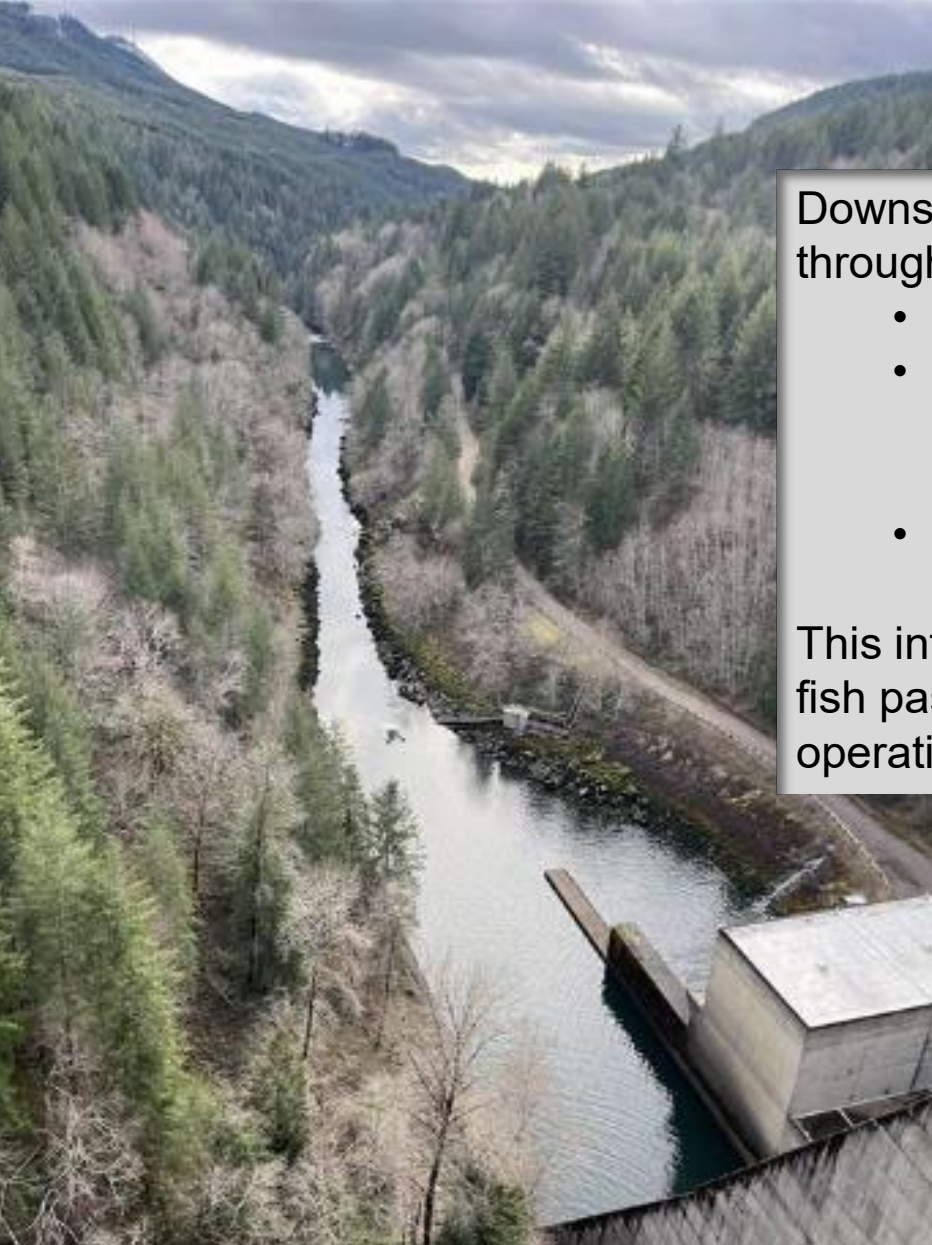


DOWNSTREAM FISH PASSAGE MONITORING

Downstream fish passage is being monitored through a series of studies:

- Fish distribution in reservoirs
- Timing and relative abundance of juvenile migrating downstream into reservoir and below dams
- Passage behavior, injury and survival at dams

This information will be used to evaluate changes in fish passage from the spill and deep drawdown operations. compared to previous operations.





IMPACTS TO RESIDENT AND NON-NATIVE FISH



- Suspended sediment can affect fish by altering their physiology, behavior, and habitat.
- Both positive (nutrient enrichment and habitat formation) and negative effects (physiological stress or reduced survival rates) can occur.
- Direct effects to fish will vary depending on fish developmental stage, and the magnitude and duration of exposure.
- Deep drawdowns at Fall Creek and Cougar dams, resulted in high levels of suspended sediment downstream (up to 814 FNU below Fall Creek). Short-term effects included reductions in dissolved oxygen levels immediately downstream as the reservoir water level approached streambed but did not appear to harm fishes (Hamilton et al. 2022).
- Fish held at the South Santiam Hatchery are being monitored and could experience increased stress and disease which could lead to mortality.
- Sedimentation of downstream habitats is of concern. Sediment transport and deposition patterns that will result from the deep drawdown are being evaluated.



SUMMARY



- The Corps is under a court-order to drawdown Green Peter Reservoir for improved downstream fish passage. Elevations will be held low until 16-December.
 - Based on research (and drawdowns in other subbasins), deep drawdowns are expected to provide improved downstream fish passage for ESA listed fish.
 - Biological and other information is being collected to better understand the impacts of the drawdowns.
- Deep drawdowns have resulted in elevated turbidity.
 - In-reservoir sediment sampling indicates sediment is clean and below toxicity screening levels.
 - Drawdowns have been conducted at Fall Creek and Cougar Reservoirs in the past; turbidity did not result in fish kills.
 - Fall Creek and Cougar Reservoirs cleared of turbid conditions once reservoir refill began.
- Refill of the reservoir back to typical winter elevations is expected by early February.
 - Green Peter Reservoir will continue to be refilled according to rule curve back to typical summer reservoir levels for summer recreation and other uses. Foster will be refilled by Memorial Day Weekend.



NEXT STEPS



NEXT STEPS



- The Green Peter Reservoir deep drawdown (and the other injunction measures) were developed by the judge with input from an expert panel of scientists and biologists.
- The drawdown operation at Green Peter is new and the Corps, other agencies, and the Tribes are carefully monitoring the biological effectiveness of this operation for the ESA-listed fish, as well as other impacts.
- Every six months, the Corps provides information about our implementation of injunction measures, and the results/impacts, to the court in a bi-annual status report (next one is due 28 February 2024).