

Monitoring Native, Resident Nonsalmonids for the Incidence of Gas Bubble Trauma Downstream of Snake and Columbia River Dams, 2021



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Background

State water quality rule change that increased TDG gas cap to 125% required monitoring native, resident nonsalmonids (NRN) for GBT during the spring spill season

BPA contracted with USGS to conduct this monitoring

Primary objective: monitor NRN fishes for GBT below 3 projects (Ice Harbor, McNary, Bonneville)

Secondary objective: monitor incidentally collected salmonids if NRN targets were reached

Operational triggers

- 1) GBT in unpaired fins or eyes that exceed 15% of sampled fish
- 2) Severe GBT (rank 3 or 4) in unpaired fins or eyes in 5% of sampled fish

Gas bubble trauma rank	Description
0	No Bubbles
1	1–5% of fin or eye is covered with bubbles
2	6–25% of fin or eye is covered with bubbles
3	26–50% of fin or eye is covered with bubbles
4	>50% of fin or eye is covered with bubbles

Methods

Target: 100 fish at each location (50 fish minimum)

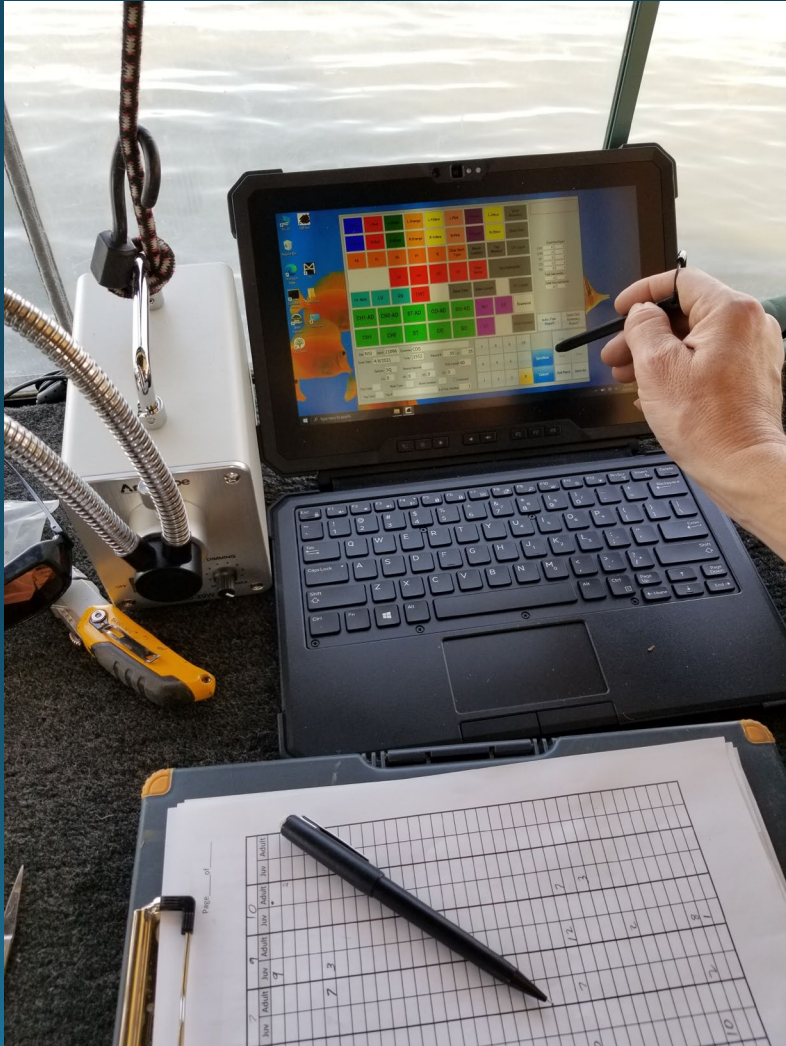
Frequency: One day each week at each project

Gear: Beach seining and backpack electrofishing



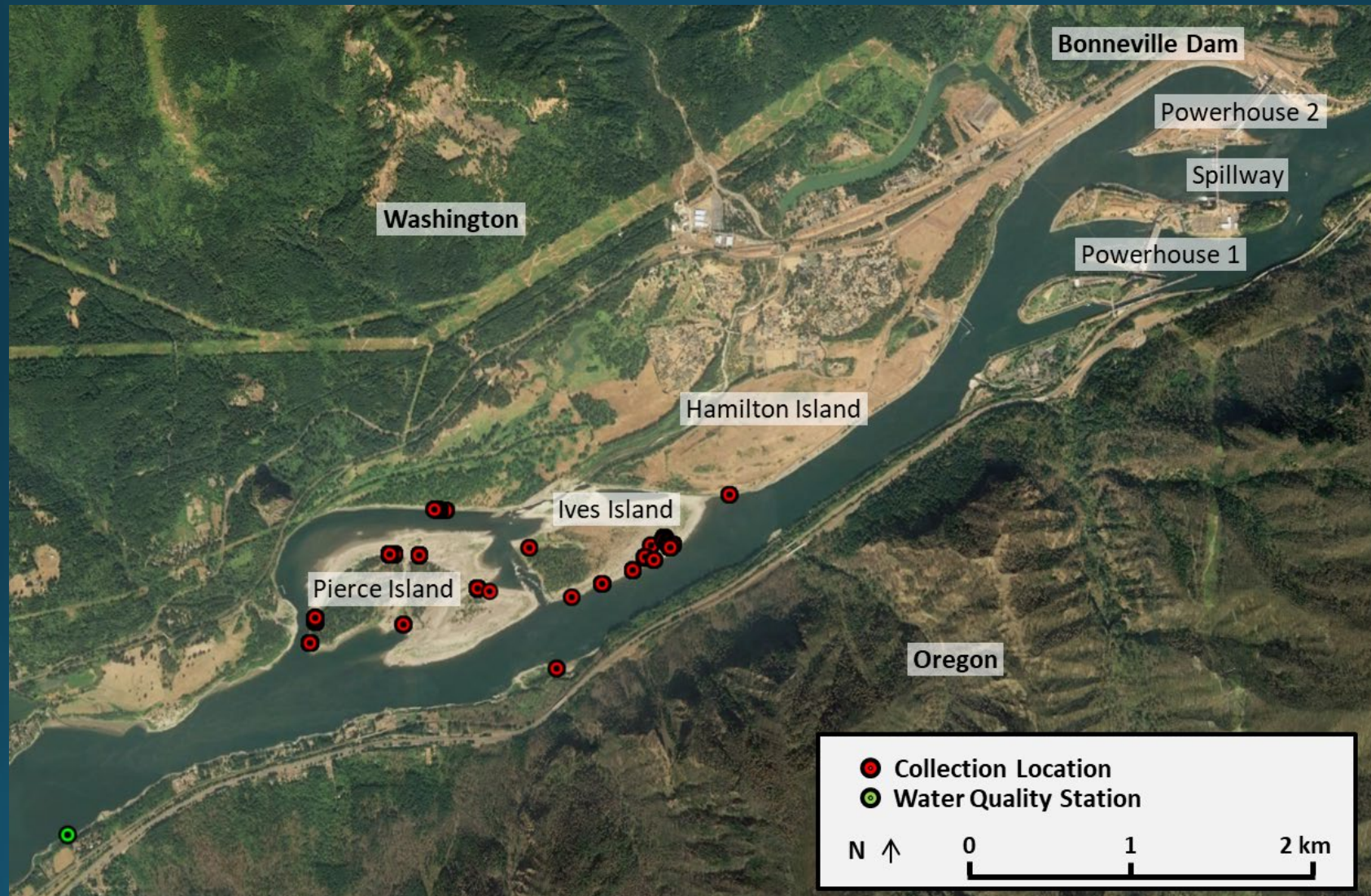
Exams: In the field using SMP protocol

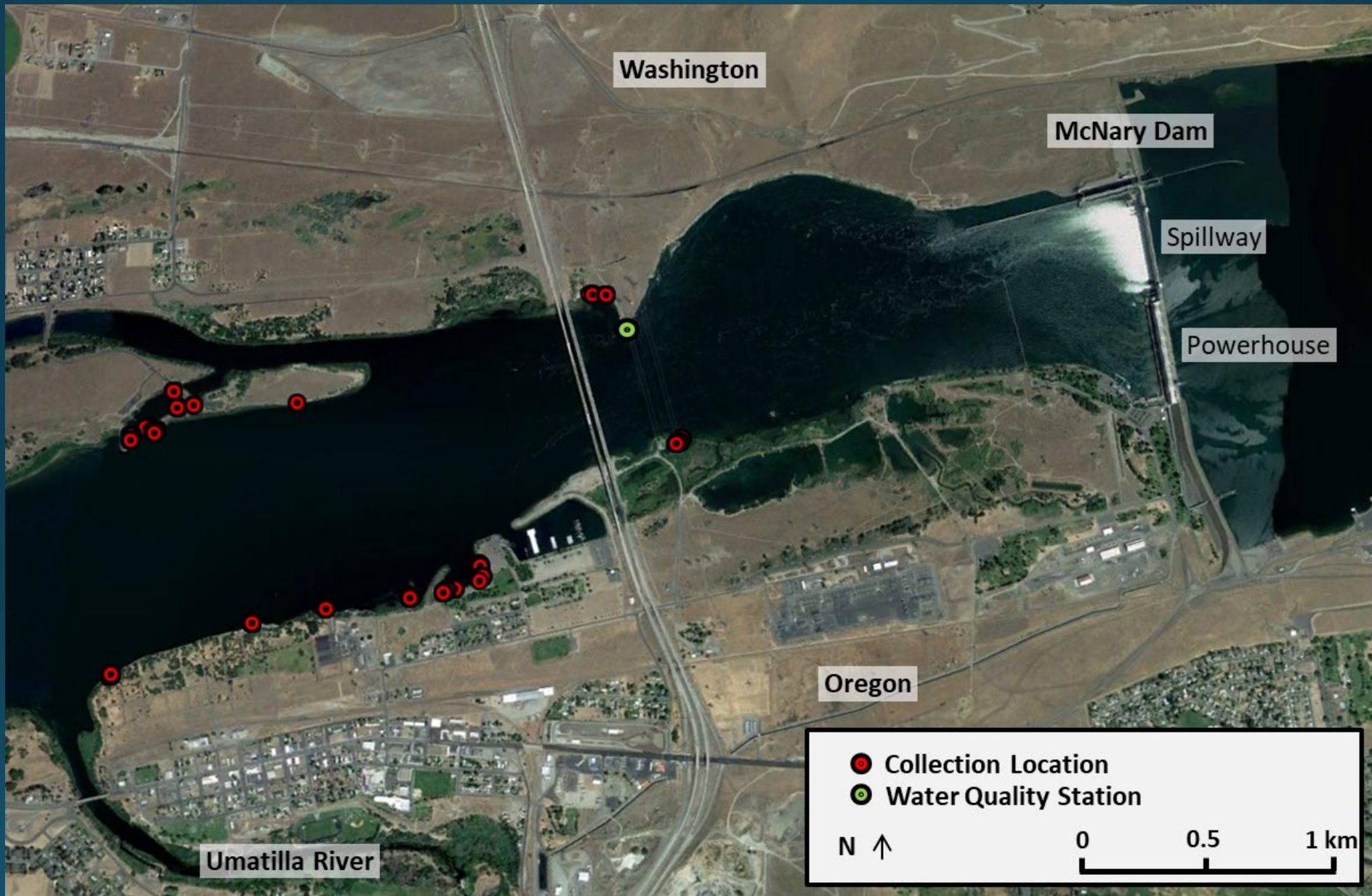
Data: Uploaded daily to FPC



Results

Sites sampled: 50 @ Bonneville, 60 @ McNary, 78 @ Ice Harbor







Species sampled:

12 NRN, but mainly sculpin, northern pikeminnow, and three-spined stickleback. Most were juveniles except for sculpin



Sculpin



Three-spine stickleback



Northern pikeminnow



Redside shiner



Sucker



Mountain whitefish



Peamouth



Speckled dace



Lamprey

Species sampled:

12 NRN, but mainly sculpin, northern pikeminnow, and three-spined stickleback. Most were juveniles except for sculpin

>2,500 subyearling fall Chinook seined below Bonneville; few salmonids elsewhere

Few salmonids seen electrofishing below Bonneville; none below McNary and Ice Harbor

50 fish minimum was achieved every week

100 fish target was achieved in 7 out of 10 weeks at Bonneville, 4 out of 10 weeks at McNary, and 10 out of 11 weeks at Ice Harbor

GBT incidence:

GBT mainly observed in sculpin. Only 1 three-spined stickleback had GBT.

Bonneville

Only 1 three-spined stickleback showed GBT according to SMP criteria (rate: 1% weekly; 0.1% season-wide)

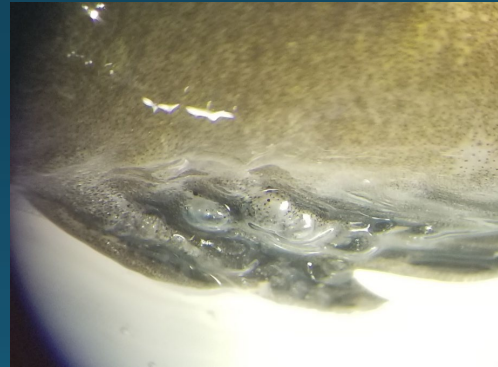
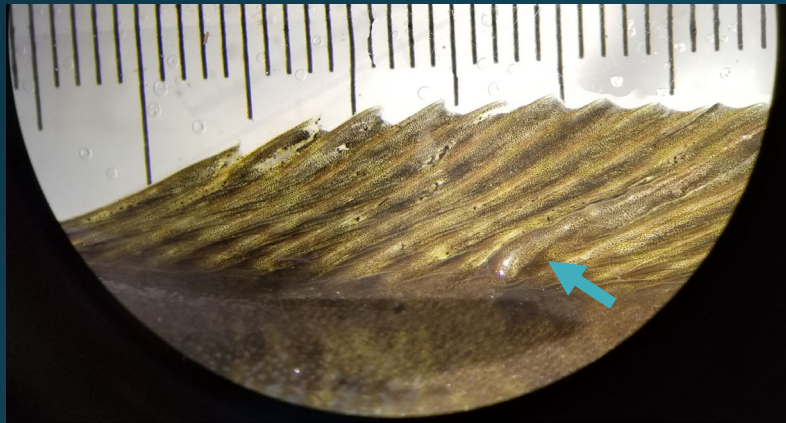
9 sculpin showed GBT outside of SMP criteria (rate combined w/all fish: 0–4.3% weekly; 1.0% season-wide)



McNary

27 sculpin showed GBT according to SMP criteria (rate: 0–6.2% weekly; 3.0% season-wide)

54 sculpin showed GBT outside of SMP criteria (rate combined w/all fish: 0–15.4% weekly; 7.7% season-wide)

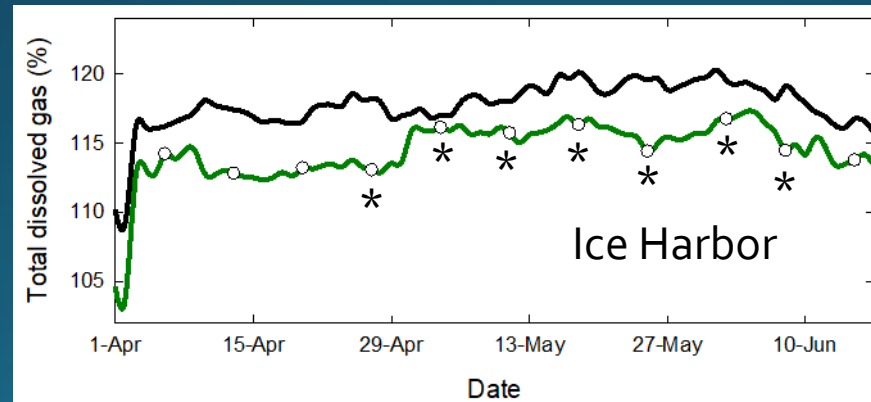
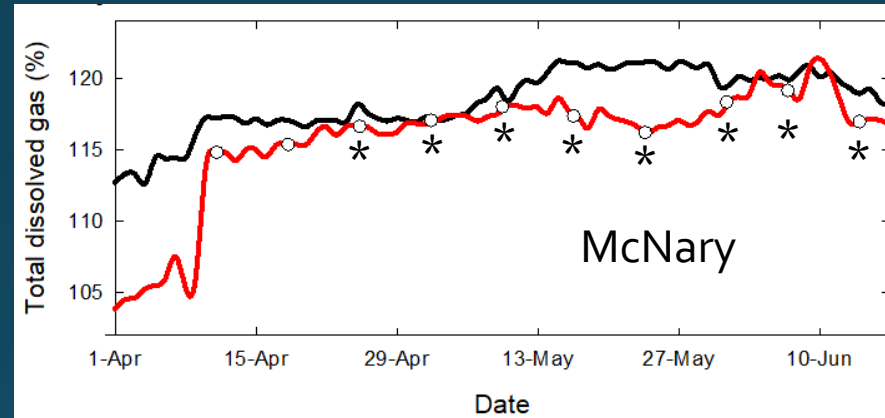
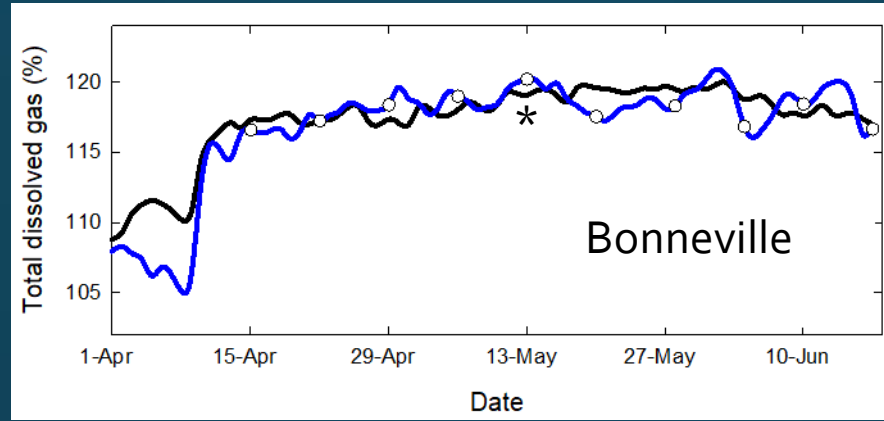


Ice Harbor

6 sculpin showed GBT according to SMP criteria (rate: 0–1.9% weekly; 0.5% season-wide)

12 sculpin showed GBT outside of SMP criteria (rate combined w/all fish: 0–4.7% weekly; 1.3% season-wide)

TDG measured at WQ stations below each project (black lines) and at sample sites (colored lines). Open circles are sample days. Asterisks denote dates when GBT was observed.



Conclusions

TDG did not reach the 125% gas cap in 2021 at our sample sites

Using SMP GBT monitoring criteria, incidence of GBT was low in 2021 and did not exceed levels that would have triggered changes to the spill program

Sculpin showed GBT in areas on the body and paired fins as well as in the unpaired fins and eyes

Sculpin appear to be more sensitive to GBT than other species sampled

Backpack electrofishing was an effective gear and impacts to salmonids were minimal

Frequent high winds below McNary often reduced sampling efficiency

2022 Plans

Will sample below Lower Granite Dam as well as Ice Harbor, McNary, and Bonneville

Laboratory experiments to examine electrofishing effects on GBT

Laboratory experiments to examine GBT progression and mortality in most common species