

# TRIP REPORT

**State of Alaska  
Department of Fish and Game**

*Field Dates:* June 2 - 9, 2022

*Location:* **Red Dog Mine**

*Objectives:* Spring Arctic grayling and Wulik River Dolly Varden sampling

*Participants:* Chad Bear and Todd Nichols (ADF&G), Bill Morris and Marguerite Tibbles (Owl Ridge), Kevin Brix (EcoTox), James Elphick and Yvonne Lam (Nautilus Environmental)

*Weather:* Mostly sunny, 35°F to 65°F, Ice on Bons Pond, Spring melting

*Access:* Charter to Red Dog, Mine pick-up trucks for Bons and North Fork, AC-135 helicopter to Wulik River

---

On June 2, 2022, Chad Bear and Todd Nichols flew to Red Dog Mine to perform the annual spring biomonitoring. The tasks for 2022 included: 1) capture fish for Bons Pond Arctic grayling population estimate; 2) collect 15 juvenile Arctic grayling between 160 to 180 mm fork length (FL) from Bons Pond for whole body element analysis; 3) capture fish for North Fork Red Dog Creek Arctic grayling population estimate; 4) collect seven adult Dolly Varden from the Wulik River for element analysis in select tissues; 5) assist Owl Ridge in Arctic grayling gamete collection from Bons Pond and Wulik River tributaries; and 6) collect up to 50 Dolly Varden for a genetics and microchemistry study by the ADF&G Division of Sport Fish.



Figure 1. Bons Pond ice coverage near outlet fyke net, June 2, 2022.

On June 2, 2022, ice was still present on Bons Pond and covered 70 percent of the surface area (Figure 1). A lead of water was present at the inlet from Bons Creek, the outlet of Bons Pond, and along the shoreline. The water level had peaked in North Fork Red Dog Creek before we arrived at over 500 cfs and dropped to below 200 cfs when we began fyke netting on June 2. Discharge from snowmelt and runoff continued to decrease during sampling. Discharge in the Wulik River peaked at 8,000 cfs on June 1 and was still near 7,000 cfs when we set fyke nets and began the adult Dolly Varden sampling on June 3 (Figure 2). The Wulik River continued to be more turbid than observed before 2019 during the spring sampling (Figure 3). Ikalukrok Creek was turbid from new seeps that were documented during the summer and fall of 2019 (Figure 4).

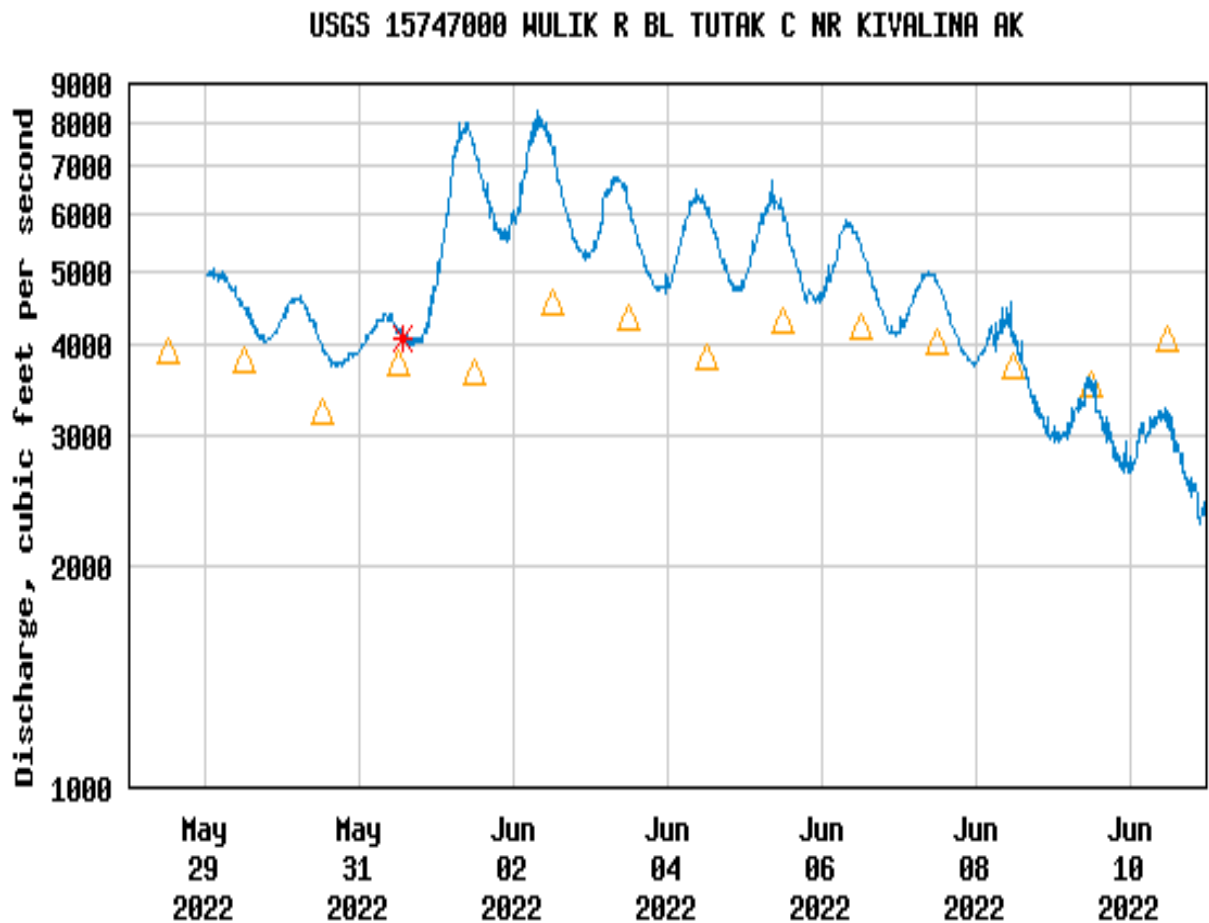


Figure 2. Wulik River discharge (blue line) near Tutak Creek, May 29 to June 10, 2022.



Figure 3. Wulik River turbid June 3, 2022.



Figure 4. Confluence of Ikalukrok Creek and Red Dog Creek, both turbid, June 6, 2022.

### Bons Pond / Bons Creek

One fyke net was fished in Bons Creek, a second net was fished in the Bons Pond outlet and a third was fished along Bons Pond's south shoreline near the pump house. Two hundred ninety-four Arctic grayling were captured between the three fyke nets during the six-day sampling period. One hundred Arctic grayling of taggable size ( $\geq 200$  mm FL) were captured, six of these were too small to mark in 2021 and were not included in the populations estimate. Forty-seven new Arctic grayling were captured and tagged; 53 grayling were recaptured from past sampling events. One hundred ninety-one Arctic grayling  $< 200$  mm were captured by the fyke nets with the majority being from the Bons Pond shoreline set. Catch per unit of effort (CPUE) in the Bons Creek net was highest on June 4 and declined during the remainder of the sampling period (Figure 5). CPUE in the Bons Outlet net was similar and highest on June 4 near the beginning of the sampling period (Figure 6).

Water temperature in Bons Creek ranged from 2.8°C to 4.5°C during the sampling period when measured in the morning at approximately the same time each day. The water warmed quickly during the daytime with peaks of 8.5°C in the afternoon. Warm weather during the six days of sampling caused spring melt water to continuously enter the system. Water temperature at the Bons Pond outlet was warmer and ranged from 5.5°C to 7.8°C despite the almost complete ice cover on June 3.

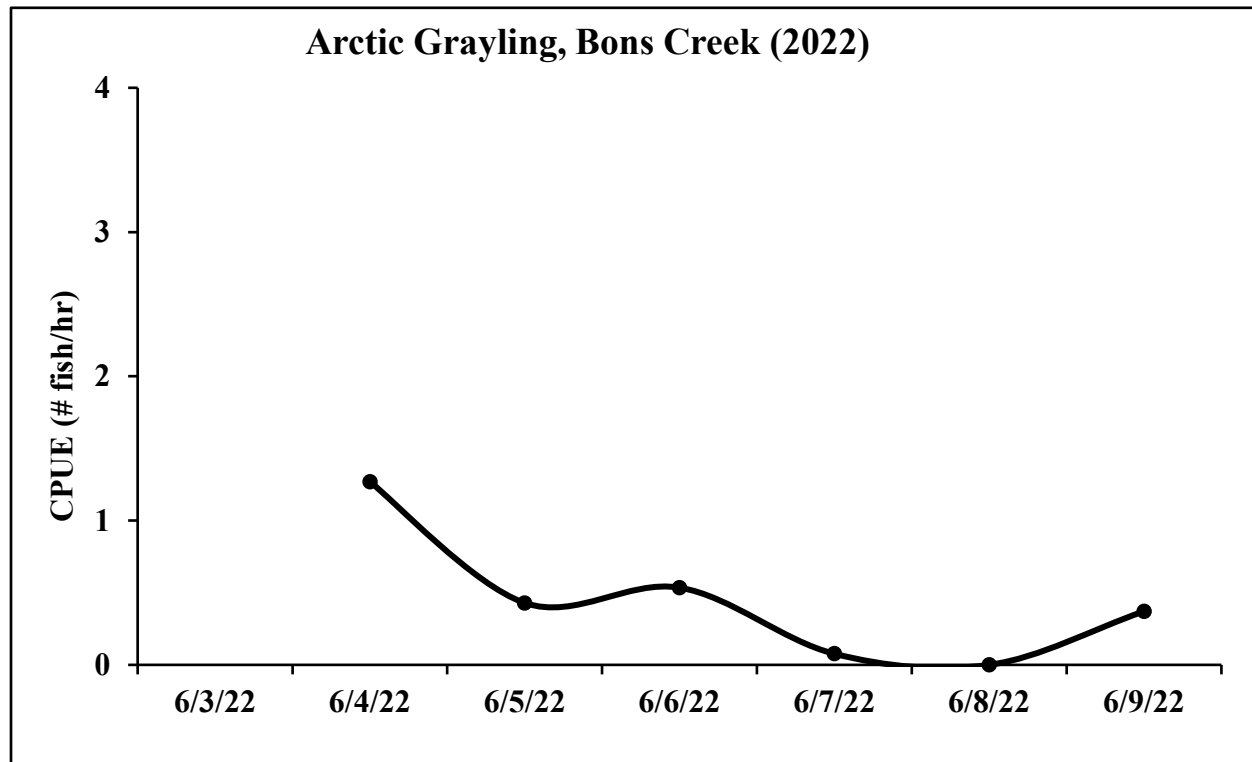


Figure 5. Bons Creek fyke net catch per unit effort (# fish/hr) of Arctic grayling, 2022.

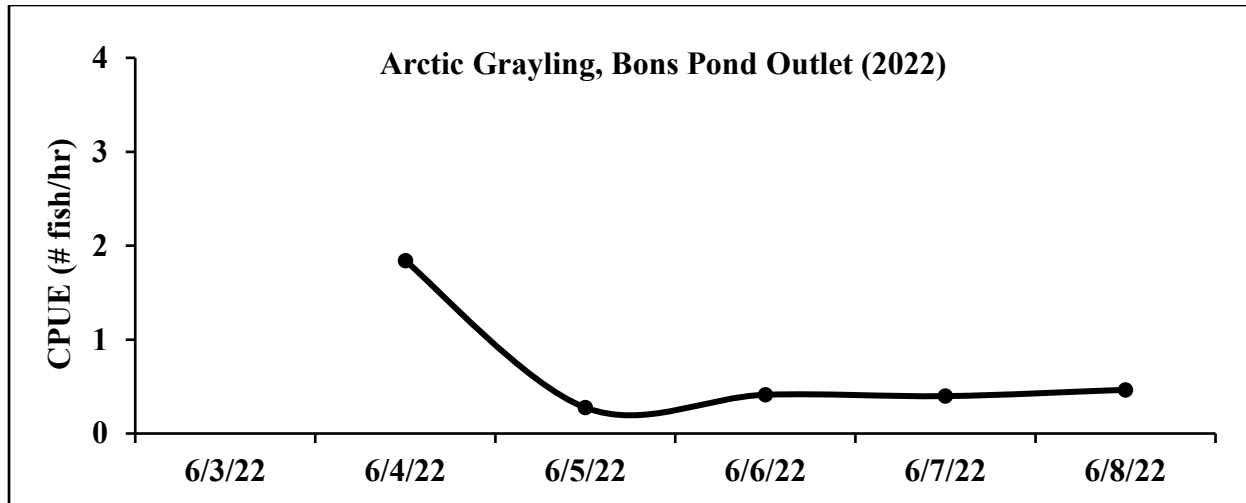


Figure 6. Bons Pond outlet fyke net catch per unit effort (# fish/hr) of Arctic grayling, 2022.

The length frequency of Arctic grayling captured in Bons Pond and Bons Creek was dominated by both age-2 class and large fish > 300 mm (Figure 7). Eleven Arctic grayling were retained between 160 mm and 180 mm, age-2 and age-3 class, for whole body element analysis. In 2022 very few fish were captured in the Bons Creek or Bons Outlet and the majority were captured on June 8 in the Bons Shoreline set.

The large number of age-1 and age-2 Arctic grayling captured in 2019, 2020 and 2021 (Figure 8) were absent and not captured during the 2022 sampling. Fish in this size group may have been in other areas of Bons Pond and thus not captured, however it is more likely that this size class of fish left Bons Pond through the outlet/waterfall. This theory is supported by the fact that Arctic grayling originally tagged in Bons Pond are occasionally captured in other nearby tributaries.

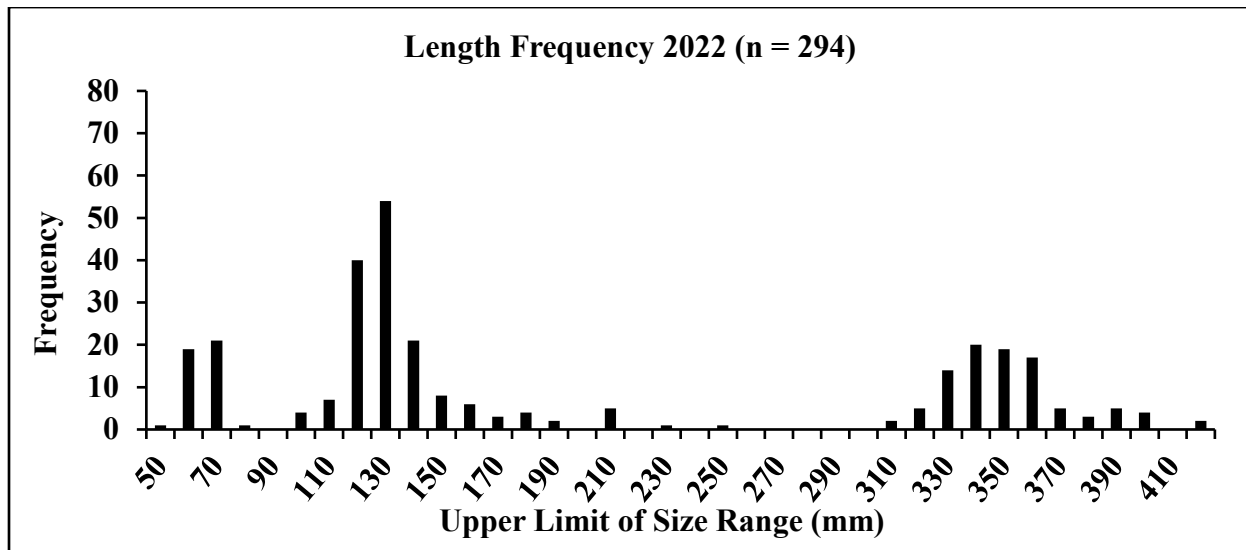


Figure 7. Length frequency distribution of Arctic grayling captured in Bons Pond outlet, Bons Creek, and Bons Pond shoreline fyke nets, June 2022.

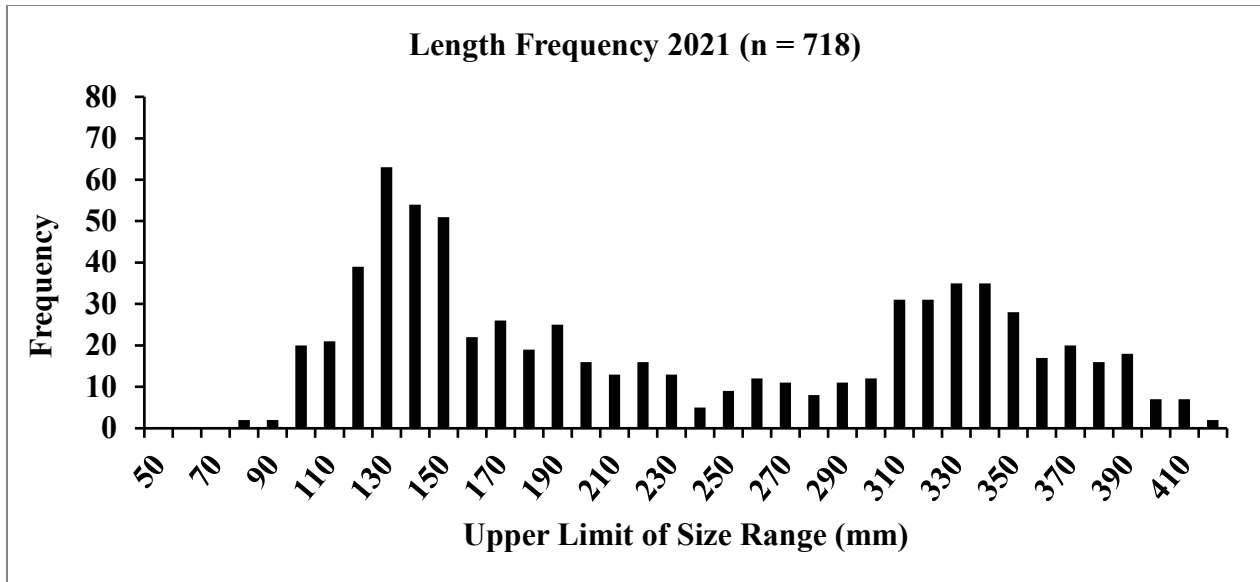


Figure 8. Length frequency distribution of Arctic grayling captured in Bons Creek and Bons Pond, June 2021.

The estimated population of Arctic grayling in Bons Pond, based on the mark event in the spring of 2021 and the recapture event in the spring of 2022, was 747 fish  $\geq 200$  mm (95% CI, 604-890 fish). This is almost identical to the number of fish from the previous 2020 estimate (Figure 9). The population has been relatively stable since 2014 after decreasing from the initial high population from 2003 to 2007. Recruitment of juvenile Arctic grayling increased in 2019, 2020, and 2021, but decreased substantially in 2022 (Figure 10).

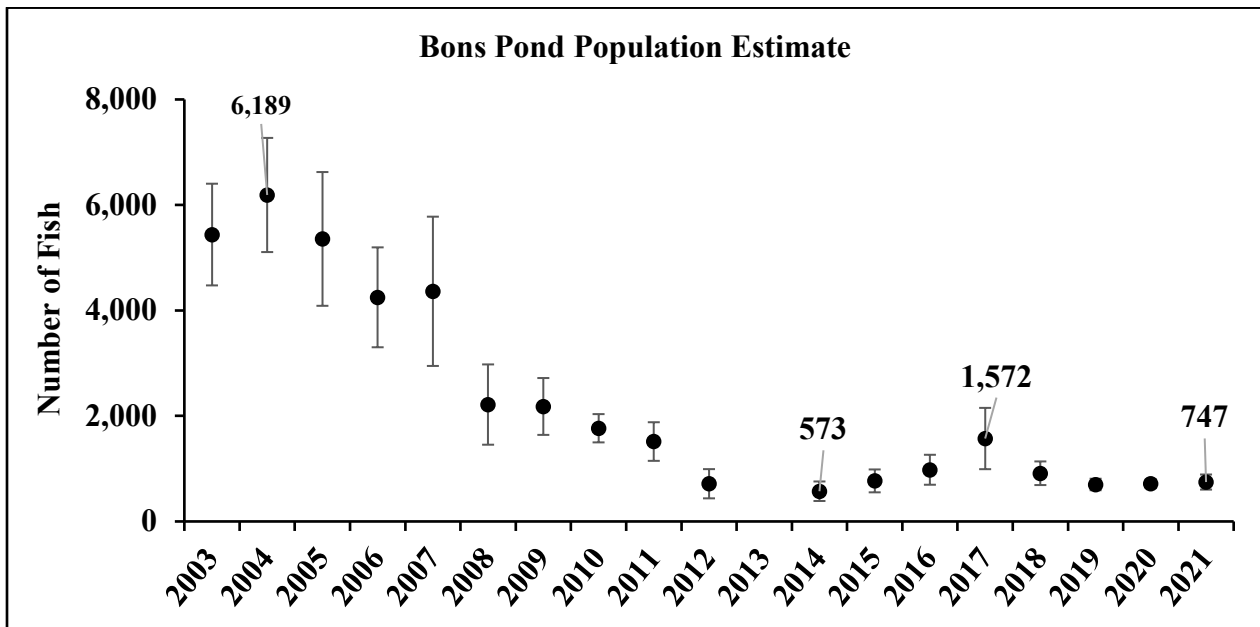


Figure 9. Bons Pond Arctic grayling population estimates (fish  $\geq 200$  mm) with 95% confidence intervals, 2003 – 2021.

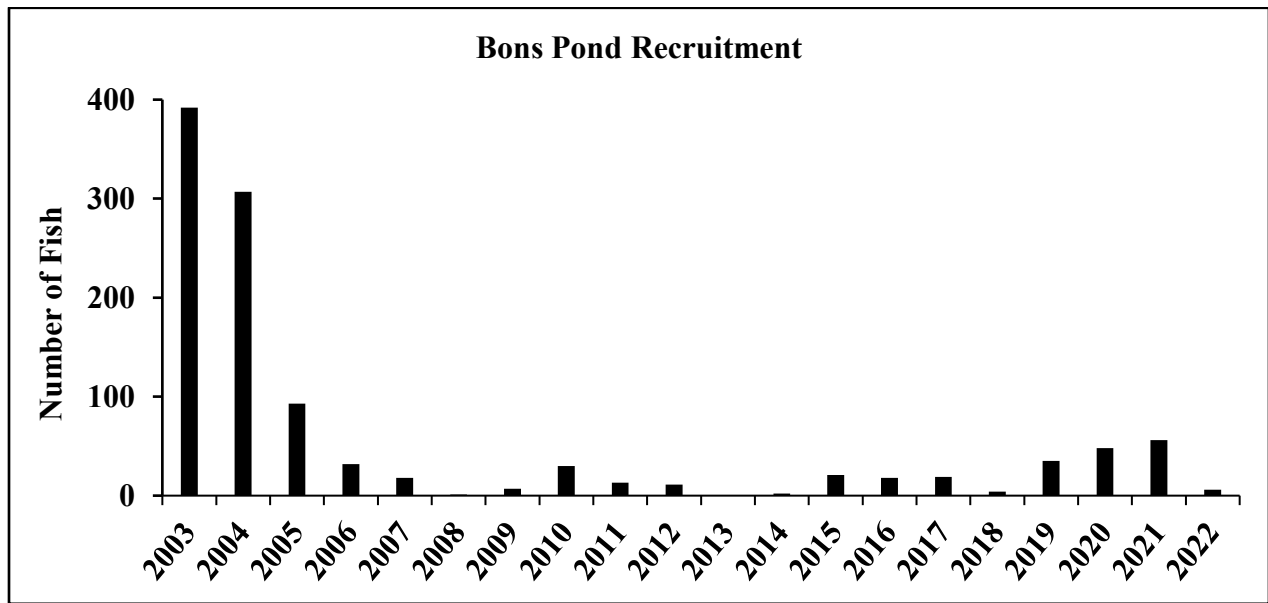


Figure 10. Bons Pond annual juvenile Arctic grayling recruitment, 2003 - 2022.

The 2021 Arctic grayling annual growth was the highest recorded in the data set. Growth was higher when compared to 2003 through 2011 when the Arctic grayling population varied from 5,000 to 6,000 fish in Bons Pond (Figure 11). The population from 2003 to 2011 was comprised of more but smaller Arctic grayling and the annual growth rate was less (Figure 10 and 11). The current population structure of fewer small Arctic grayling has resulted in higher growth rates for all size classes.

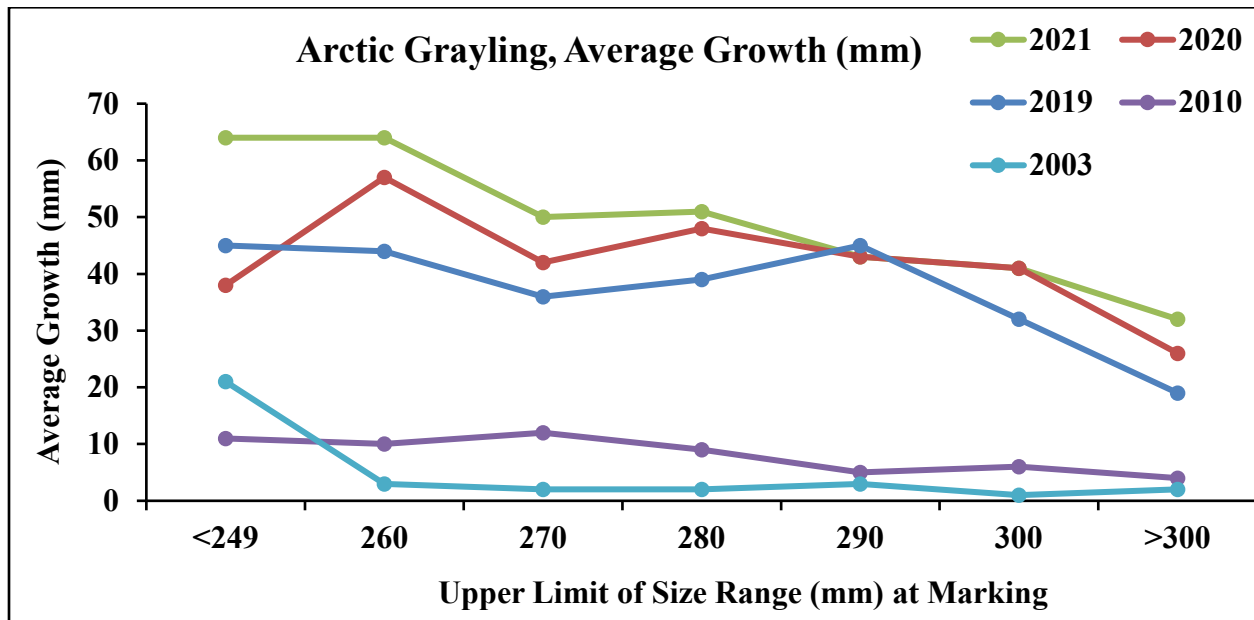


Figure 11. Average annual growth rates for Arctic grayling of various size classes captured in selected years from 2003 to 2021.

### North Fork Red Dog Creek

One fyke net was fished in North Fork Red Dog Creek from June 3 - 9. The fyke net was set just downriver from Station 12 to avoid interfering with the Red Dog operations water sensors (Figure 12). The fyke captured 34 Arctic grayling and seven Dolly Varden moving upriver during the six-day sampling period. The 2022 Arctic grayling catches were higher than the 2021 (27) and 2020 (22), but lower than 2019 (86) and 2018 (87). CPUE peaked at the end of the sampling period on June 9 at 0.4 fish/hr (Figure 13). Most of the captured Arctic grayling were  $\geq 325$  mm (Figure 14). No fish were retained for selenium concentration analysis.

North Fork Red Dog Creek was about 150 cfs on June 3 when the nets were installed and gradually dropped to under 100 cfs by June 9. Water conditions were appropriate for sampling and the fyke net remained fish tight during the sampling period. Water temperature ranged from 1.3°C to 2.9°C with the coolest temperatures in the morning and warmer temperatures in the late afternoon. Water was turbid on June 3 and gradually cleared as flows decreased. However, a milky white and reddish-brown precipitate was present in the water and on streambed surfaces.



Figure 12. North Fork Red Dog Creek fyke net, June 5, 2022.



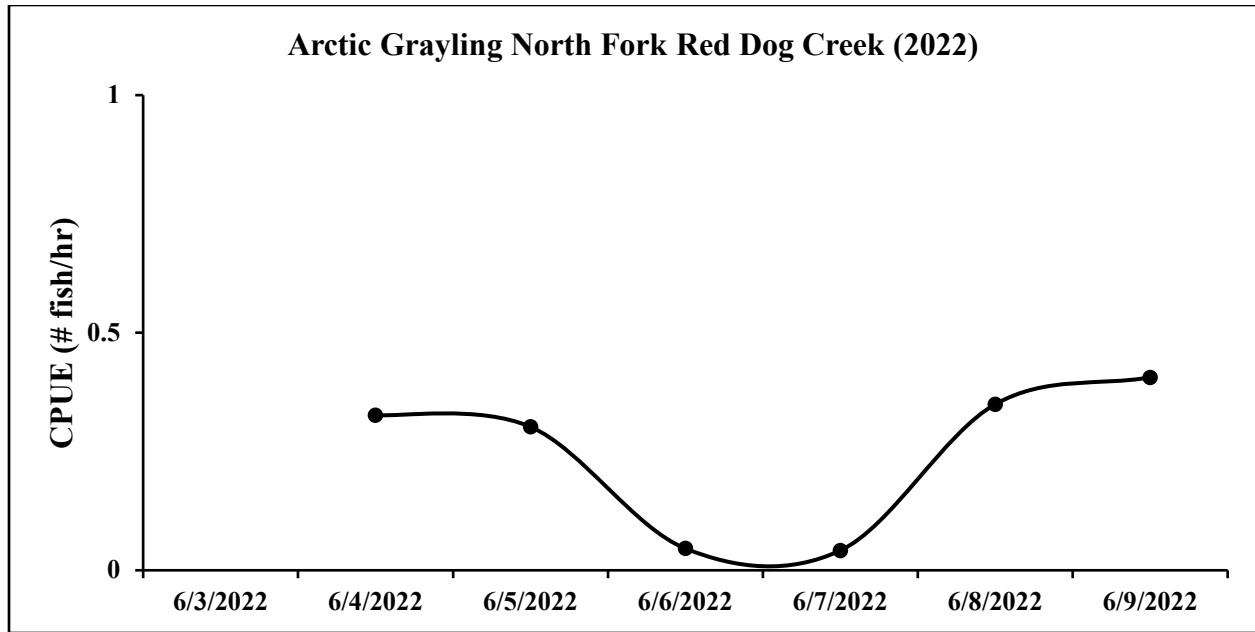


Figure 13. The catch per unit effort (#fish/hr) of Arctic grayling in the fyke net fishing in North Fork Red Dog Creek, June 2022.

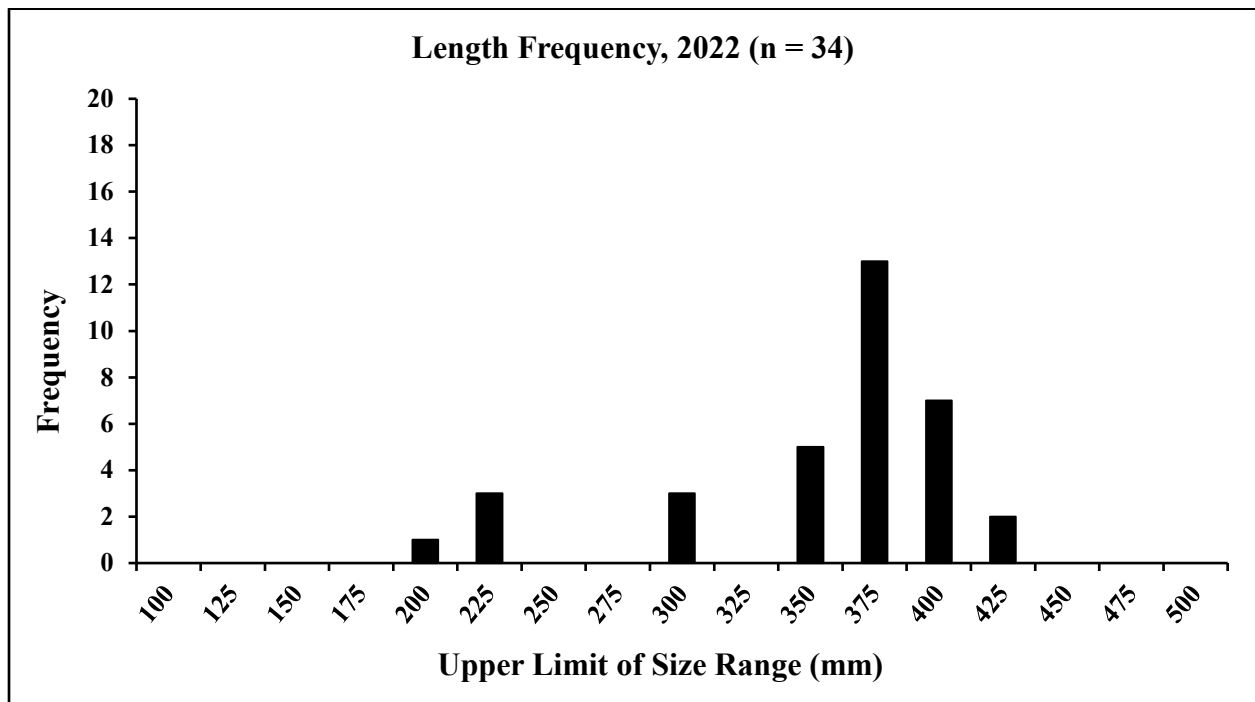


Figure 14. Length frequency distribution of Arctic grayling in North Fork Red Dog Creek, June 2022.

None of the Arctic grayling captured in North Fork Red Dog Creek in 2022 were recaptures from the 2021 sampling event, therefore a population estimate could not be generated. Three Arctic grayling were recaptured from a past sampling event, one from 2018, 2019 and 2020.

### **Bons Pond and Wulik River Arctic Grayling Gamete Collection**

On June 3, Chad Bear and Todd Nichols assisted staff from Owl Ridge, Nautilus Environmental, and EcoTox in collection of spawning Arctic grayling for an egg fertilization study. The goal of the research is to understand the effects of increased turbidity on egg fertilization and embryonic development. EcoTox and Nautilus were responsible for running the lab experiments to determine sperm motility, fertilization rates, and embryo development.

Adult Arctic grayling were collected from the ADF&G fyke nets in North Fork Red Dog Creek, Bons Creek, and Bons Lake. Owl Ridge placed a fyke net in Little Creek (Figure 15), a tributary of Tutak Creek to capture more Arctic grayling for the study. Adult Arctic grayling were examined, and gametes were collected from ripe individuals (Figure 16). Once gametes are collected there is a limited time they remain viable for fertilization. Gametes were collected each day and were immediately used in the on-site lab run by EcoTox and Nautilus Environmental. After successful fertilization, developing embryos will be transported to Nautilus Environmental's lab for further observation and study to assess the effects of increased turbidity/elements in background water quality conditions in Ikalukrok Creek and Wulik River.

The Little Creek fyke net captured 151 Arctic grayling and 29 Dolly Varden moving upriver during the six-day sampling period. Two ninespine stickleback and three slimy sculpins were captured. The length frequency distribution of Arctic grayling was evenly distributed with all size classes represented (Figure 17). Between the 4 fyke nets enough sexually mature grayling in ripe condition were captured to provide adequate sample size for the egg fertilization study.

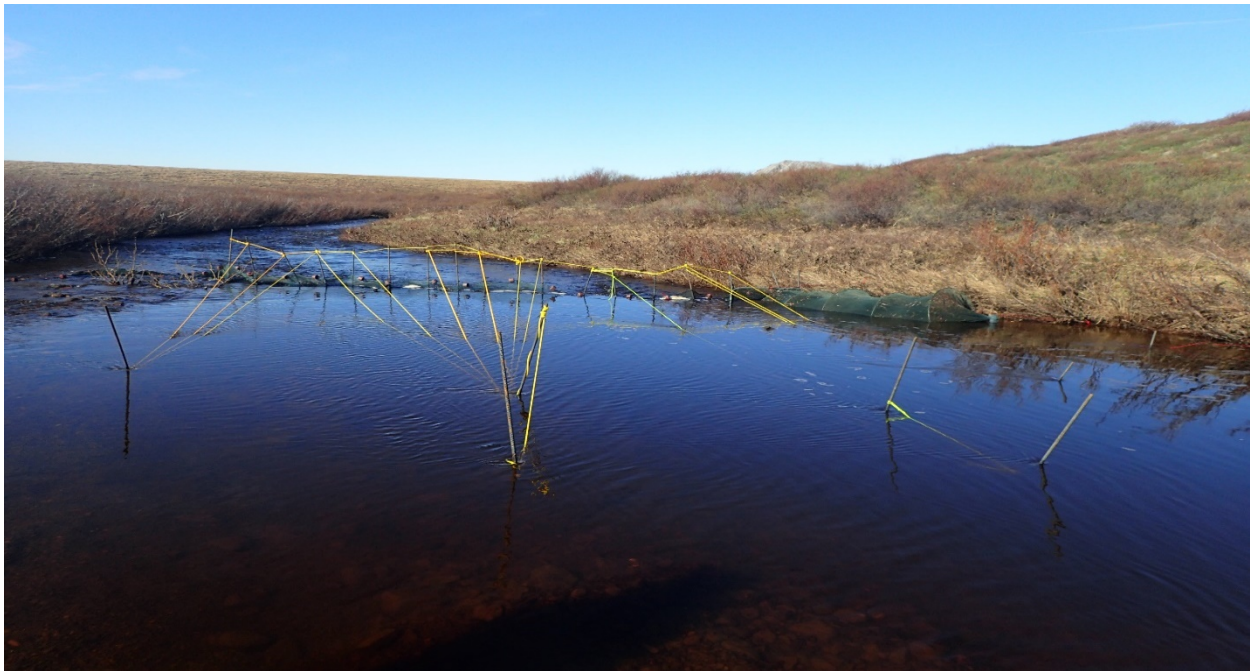


Figure 15. Little Creek fyke net, June 5, 2022.

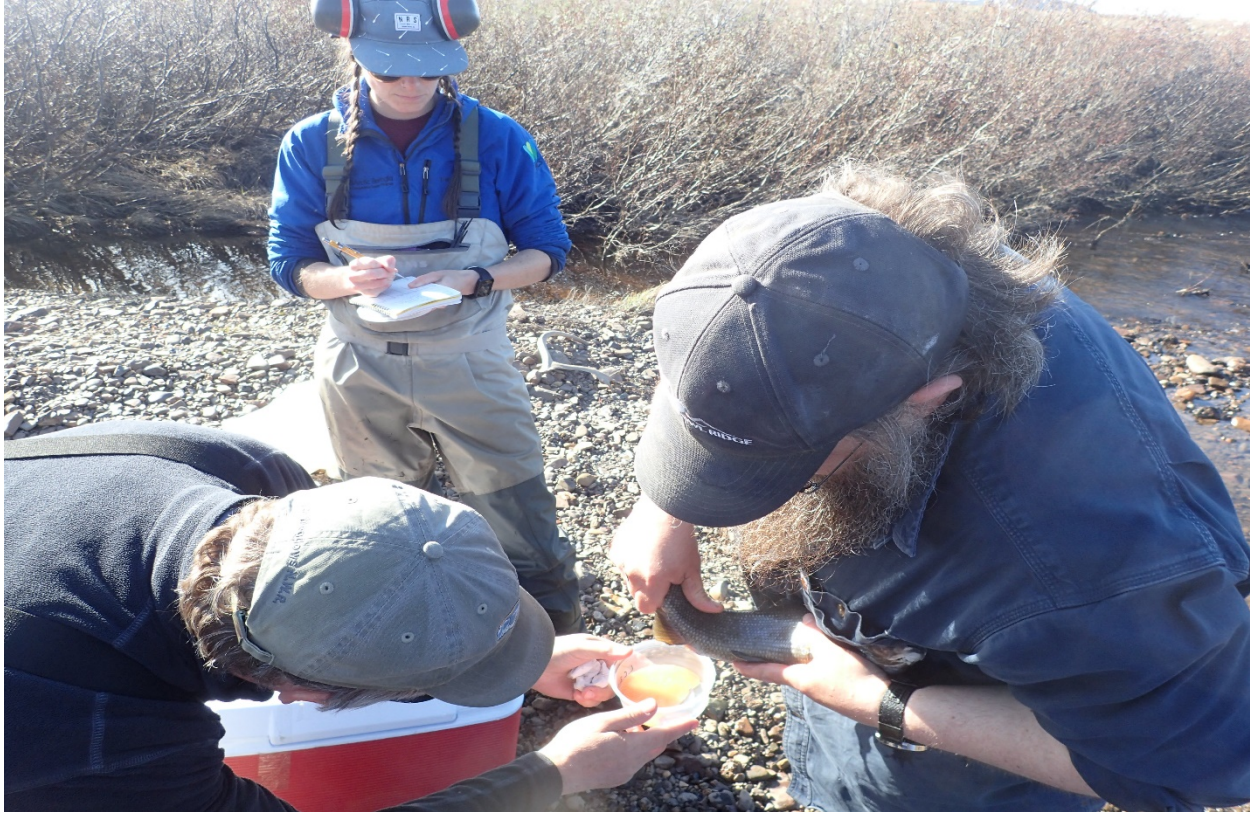


Figure 16. Arctic grayling gamete collection, June 5, 2022.

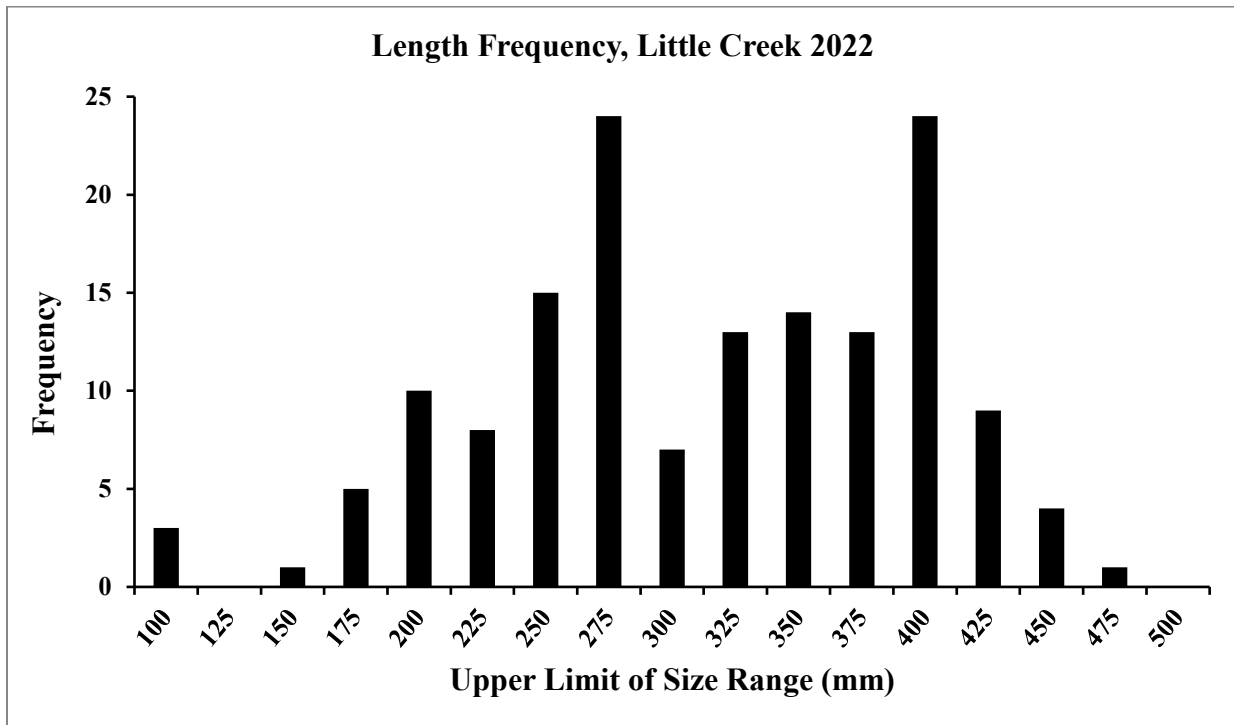


Figure 17. Length frequency distribution of Arctic grayling in Little Creek, June 2022.

### Wulik River Dolly Varden

Adult Dolly Varden were sampled using hook and line gear in the Wulik River near the mouth of Tutak creek. Eight Dolly Varden were retained (Figure 18). These fish were individually bagged and frozen, then transported back to Fairbanks where they were stored in a -15°F freezer to be dissected and analyzed for element concentrations. Forty-two total man hours of hook and line effort was conducted from June 3 - 8. Tutak Creek was clear and had normal water levels but unlike most years, Dolly Varden were not present near the creek mouth, only two were captured. One tagged Arctic grayling was captured during the fishing efforts. It was originally tagged in Little Creek during 2017.

The Wulik River was very turbid, and lures were not effective at any main stem locations until water dropped on June 8. Ikalukrok Creek was turbid and the typical fishing location at its confluence with the Wulik River could not be fished successfully. We fished upstream of the mouth of Ikalukrok Creek to the confluence of the East and West Fork Wulik and captured one Dolly Varden. We fished below the confluence of Ikalukrok Creek and captured the remaining five Dolly Varden in a pool along the north riverbank below Driver's Camp.



Figure 18. Wulik River Dolly Varden retained for whole body element analyses. June 8, 2022.

### Wulik River Genetics and Microchemistry Study

The ADF&G Division of Sport Fish is conducting a Dolly Varden genetics and microchemistry study to better understand distribution and movements in northwest drainages. Dolly Varden are an important subsistence fish resource in northwestern Alaska. Previous research indicates that Dolly Varden in this region display complex movements among rivers for spawning and overwintering, however the frequency and extent of these inter-drainage movements remain unknown. Assessment of seaward migration frequency and overwintering-site fidelity has remained difficult due to the remoteness of the area and the high cost and logistical challenges associated with conventional tracking studies. Sport Fish are using the strontium (Sr) concentrations and  $^{87}\text{Sr}/^{86}\text{Sr}$  isotope signatures in otoliths collected from Dolly Varden captured in major spawning rivers and subsistence fisheries in the region to evaluate the frequency of seaward and inter-drainage migrations, which may help identify spawning populations and life history strategies that are encountered more frequently in harvests and elucidate the poorly understood interchanges between feeding, overwintering, and spawning areas.

Wayne Hall and Amanda Sage from Red Dog environmental community relations reached out to the residents of Kivalina requesting Dolly Varden samples from the subsistence harvest. A resident had recently set a gill net and had the needed fish heads and carcasses (Figure 19). On June 7, Chad Bear flew to Kivalina and collected 50 Dolly Varden carcasses. The carcasses were measured, and the heads individually labeled and bagged. The heads were frozen on June 7 and returned to Fairbanks with ADF&G staff.



Figure 19. Dolly Varden drying rack in Kivalina from subsistence harvest, June 7, 2022.

### **Bons Pond Outlet and Water Intake Structure**

The outlet of Bons Pond flows down a waterfall into a plunge pool (Figure 20). Arctic Grayling can exit Bons Pond into Anxiety Creek and Ikalukrok Creek drainage but cannot return to Bons Pond. The plunge pool has coarse rock substrate and is connected to a scour pool with a water pump intake. During this visit, all water that was exiting the plunge pool was flowing subsurface into the water intake pool (Figure 21). No water was flowing over the surface of the ground. Arctic grayling that exit Bons Pond would be trapped in the plunge pool unless a high-water event allowed them to travel into the water intake pool and then further downstream into the Ikalukrok Creek drainage. During this early June visit the spring snow melt and runoff into Bons Pond was high and fish were still not able to exit the plunge pool. A channel with a low water equipment crossing could be constructed to allow fish to travel between the plunge pool and the pump intake pool at all water levels. A shallow drainage ditch lined by an imperviable layer then topped with small gravel would facilitate this connection channel.



Figure 20. Waterfall and plunge pool exiting Bons Pond into Ikalukrok Creek drainage.



Figure 21. Plunge pool water going sub-surface before entering pump intake pool June 9, 2022.

Arctic grayling were observed swimming in the pump intake pool during this visit. The pump intake has a screened box as required by a Fish Habitat Permit. The screened box has a 24-to-36-inch hole in it and is not in compliance with permit stipulations (Figure 22). The screened intake box needs to be repaired to prevent Arctic grayling residing in the pump intake pool and exiting from Bons Pond from being drawn into the intake hose during pumping (Figure 22). This hole in the screening was last noted in an ADF&G Trip Report from August 2018.

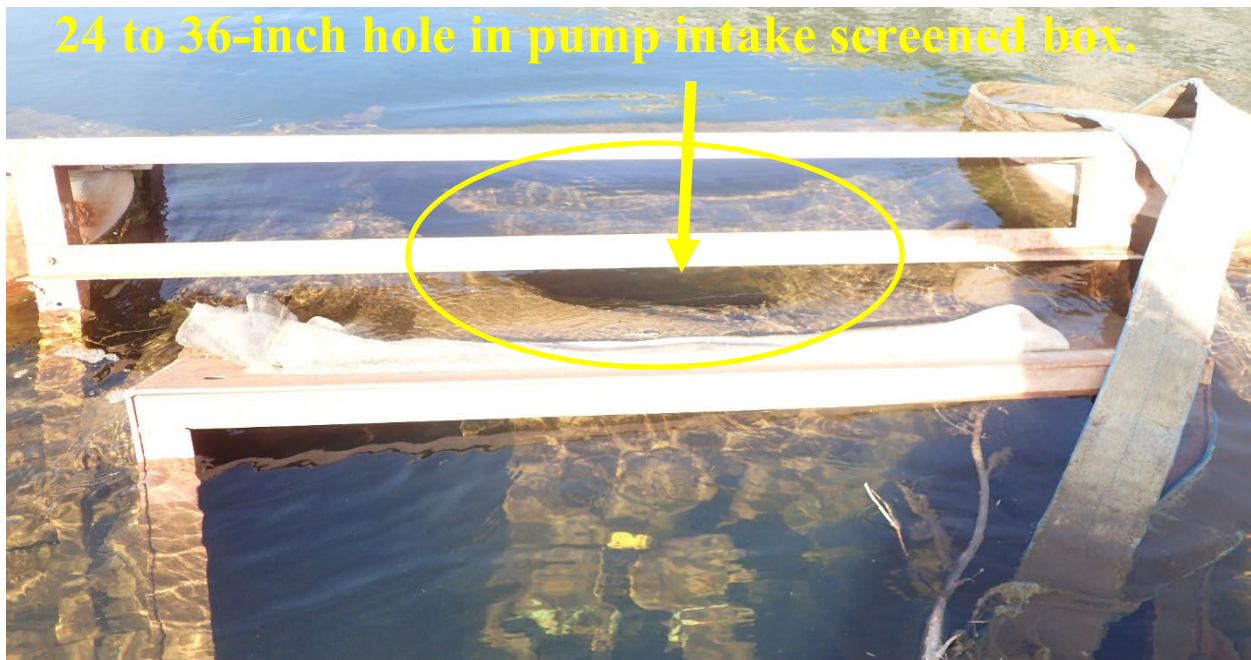


Figure 22. Hole in pump intake screened box, June 9, 2022.