TRIP REPORT

State of Alaska
Department of Fish and Game

Field Dates:	September 24 – October 2, 2024
Location:	**Fort Knox Water Supply Reservoir & Pond AB**
Objective:	Burbot Population Assessment
Participants:	Chad Bear, Lauren Yancy, Nik Nichols and Chelsea Clawson
Weather:	30°- 45°F, Snow flurries, rain, overcast, variable fall weather
Access:	State truck and motorized skiff

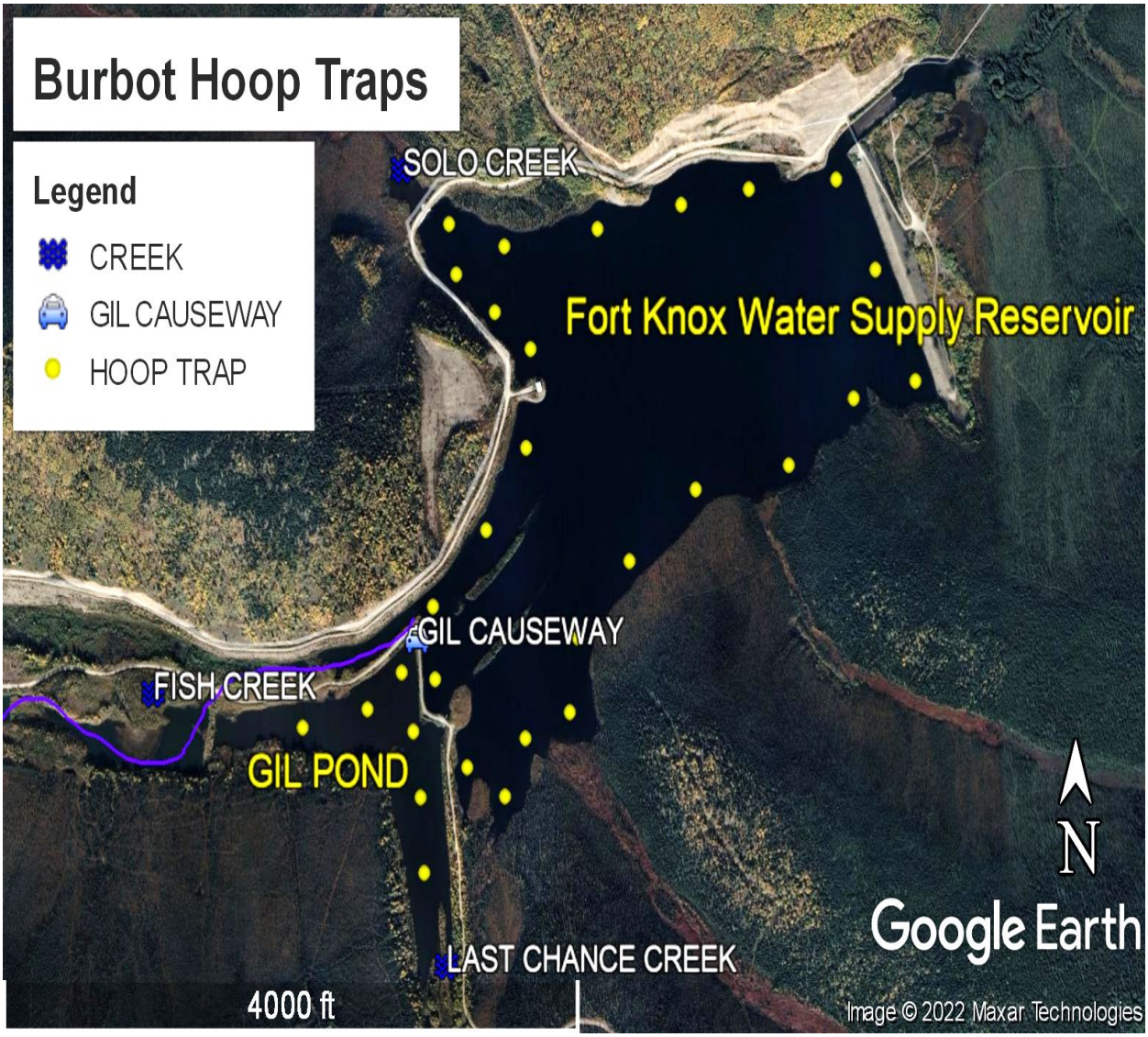

Figure 1. Fort Knox water supply reservoir and Gil Pond annual burbot hoop trap locations.

The annual burbot population assessment in the Fort Knox Water Supply Reservoir (WSR) was performed from September 24 to October 2, 2024. This annual work is performed in the fall because water temperatures are lower, and handling is less stressful to the captured fish. Twenty-four hoop traps were set in the WSR and six in Gil Pond (Figure 1). The Gil Pond is connected to the WSR with a fish passage culvert (FH15-III-0219-A3) allowing movement between the two waterbodies. Hoop traps were set at depths ranging from five to 15 feet and deeper areas were avoided to prevent burbot mortality from low dissolved oxygen. Hoop traps were baited with cut herring and checked every two to three days (Figure 2). From September 30 to October 2 two hoop traps were set in Pond AB to determine if burbot were continuing to inhabit the uppermost water body in the Fish Creek wetlands complex as first documented in 2022. The WSR was ice free for the duration of our trapping efforts and water temperatures ranged between 7.2°C on September 26 to 6.1°C on October 2.

Figure 2. Burbot sampling gear, Fort Knox Water Supply Reservoir, September 2024.

Burbot were measured to total length (nearest mm), inspected for tags, then released. Un-tagged burbot ≥300 mm were marked with a numbered Floy® T-bar internal anchor tag. The abundance of burbot was estimated using Chapman's modification of the Lincoln-Petersen two-sample mark-recapture model.

The 2023 burbot population estimate used 2023 fall hoop trapping as the mark event, and 2024 fall hoop trapping as the recapture event. During September 2023, 107 burbot were captured, 80 were ≥300 mm and tagged, 57 of which were ≥400 mm. In the 2024 capture event, 99 burbot were caught, 55 were ≥300 mm and tagged, of these 30 were ≥400 mm, and 3 were recaptures from the 2023-mark event. In both events, fish from Gil Pond were included in the population estimate as it is connected to the WSR by fish passage culverts.

A post-mining population goal was not established for the burbot within the WSR, however a small population of fish larger than 400 mm has remained present. Because only 3 fish from 2023 were recaptured in 2024, this produced a large variance during the statistical analysis and the population estimate of burbot ≥400 mm was calculated to be between 55 and 1,141 fish (95% confidence interval), with a point estimate of 598 fish. This point estimate is well above any past years' survey results, although statistically, the true population lies within the 54 – 1,141 fish range. Population estimates from 2012 to 2022 have ranged from a low of 80 fish in 2013 to a high of 402 fish in 2018 (Figure 3).

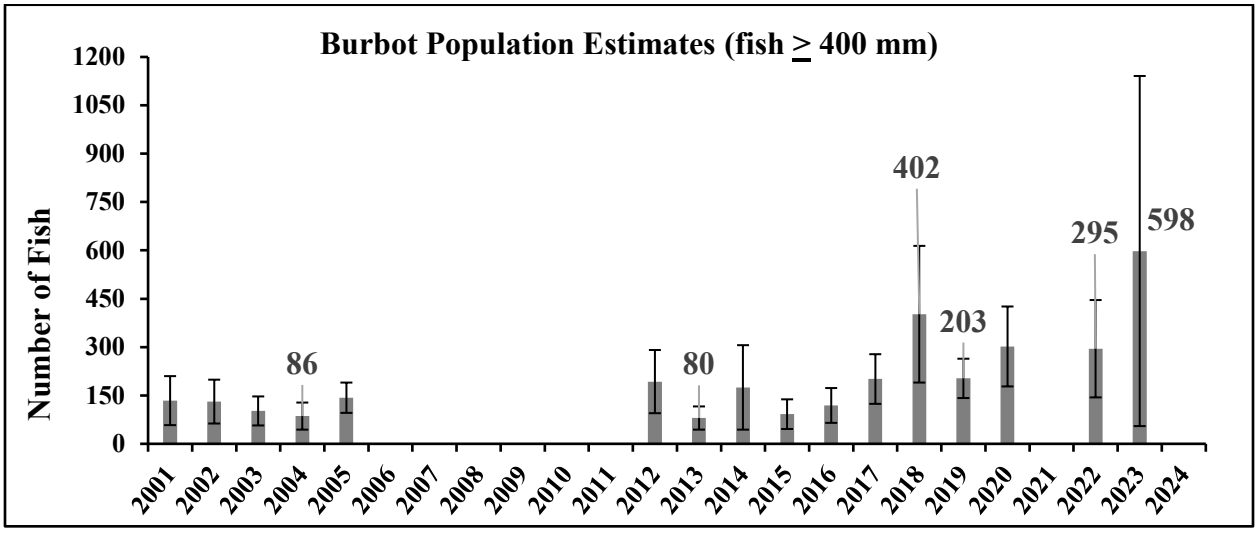

Figure 3. Population estimates of burbot ≥400 mm in the Fort Knox WSR, 2001-2023 (95% Confidence Interval).

CPUE of all burbot captured in 2024 was 0.40 fish per day per trap (Figure 4). This is the same as the CPUE of 2023, but less than half of the CPUE seen in 2018 (1.1 fish per day per trap). The 2024 CPUE is the third lowest since sampling began in 1996. CPUE of burbot over 400 mm decreased from 0.2 fish per day per trap in 2023 to 0.1 in 2024 as fewer large fish were captured in 2024 (Figure 4 and 5).

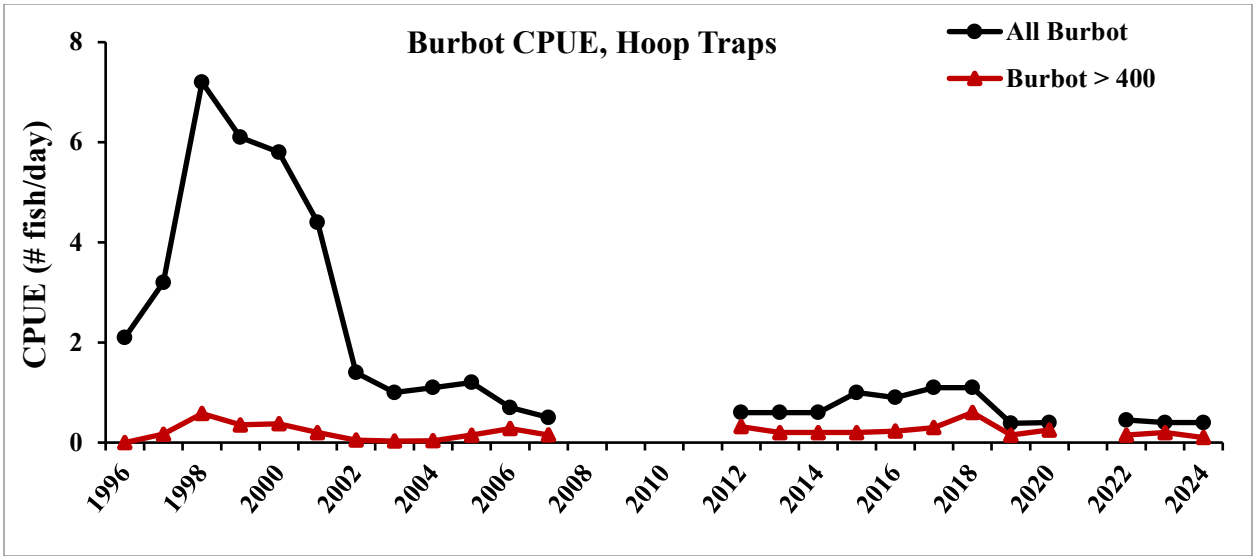

Figure 4. CPUE for burbot in the Fort Knox WSR.

In 2024, 99 burbot were caught in the WSR with hoop traps. Burbot lengths ranged from 58 to 705 mm with thirty-two juvenile burbot <200 mm (n=32) and one burbot >600 mm (n=1). In 2023 fewer juvenile burbot were captured <200 mm (n = 13), but more large burbot >600 mm (n=18). The 2024 length distribution is shifted lower without as many large burbot captured compared to the 2023 distribution (Figure 5). Large burbot captures may have declined as older burbot naturally die out. This would allow more juvenile burbot to survive and rear in the WSR increasing their abundance in 2024.

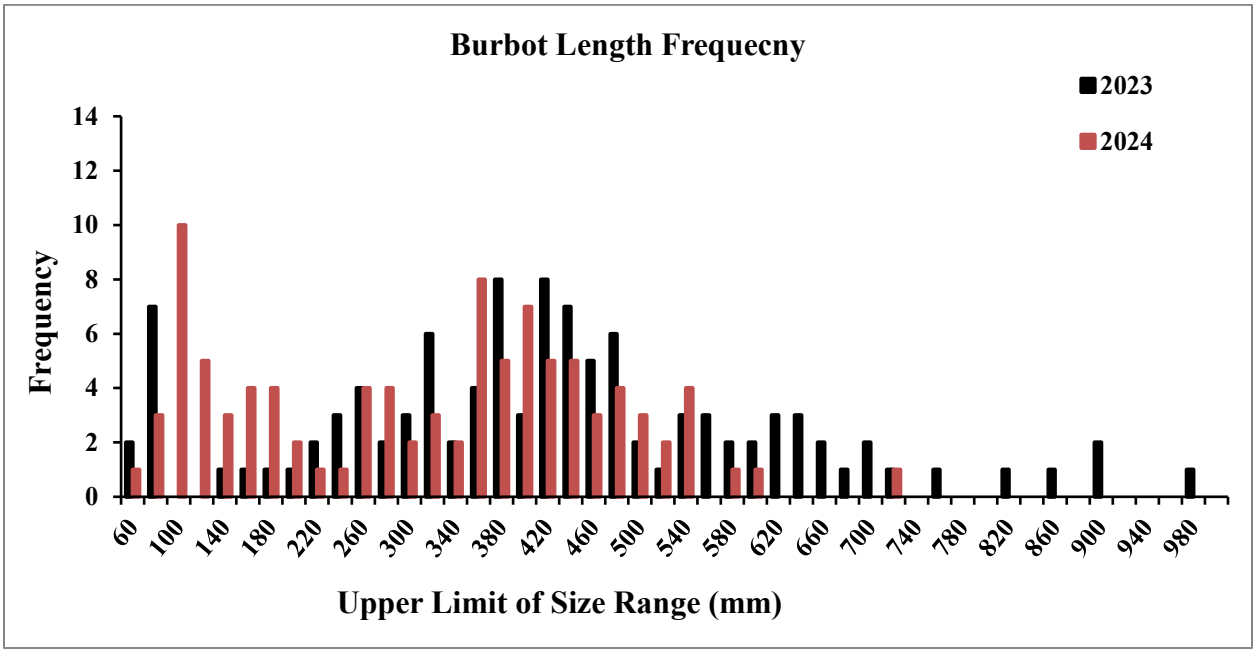

Figure 5. Length-frequency distribution of burbot captured in the Fort Knox WSR, 2023 and 2024.

Annual burbot growth in the WSR has ranged from 24 mm in 2013 to 70 mm in 2016. The 2023 annual growth rate was 34 mm and the average annual growth rate since 2000 was 45 mm (Figure 6).

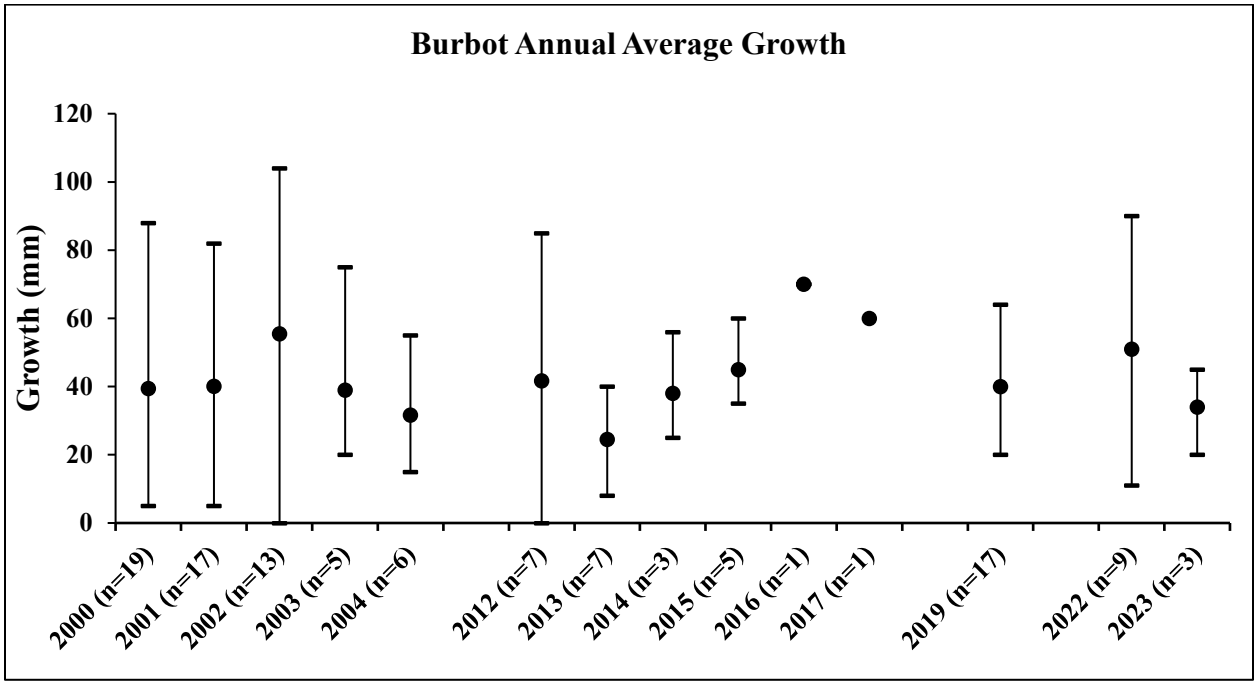

Figure 6. Average annual burbot growth rate in the WSR 2000-2023.

During the WSR sampling one burbot hoop trap came loose from its buoy rope and was lost. A spring-loaded carabiner clip did not fully close allowing the trap to slip off. The trap is located near the eastern end of the South Island in approximately 15 feet of water (Figure 1). Removal attempts were made to snag the trap with grappling hooks and weighted fishing lures, but it was not recovered. The mesh used in hoop traps is biodegradable but will take several years to weaken and collapse. Traps do not have a built-in escape hatch like personal use crab or shrimp pots. Fish that are trapped can escape out the funnel entrance, but some may not find the opening in time and perish. Traps are black in color and blend into the dark bottom of the WSR in this location. During the two days of removal attempts in September, wind and overcast conditions did not allow us to visually locate the trap. During summer of 2025 additional removal efforts will be made during bright sunlight days with snorkel masks to help look in the murky water.

Pond AB Burbot

Burbot were first documented in Pond AB during 2022 when seven fish were captured during the fall sampling. During the 2023 sampling event, twenty-five burbot were captured in the Pond AB hoop traps. In 2024 three burbot were captured but sampling time and effort was decreased from 2023. Burbot lengths ranged from 295 to 355 mm with an average of 306 mm. One of the captured burbot in 2024 was tagged in Pond AB during the 2023 sampling and is the first documented recapture in Pond AB. The 2023 Pond AB population estimate for burbot ≥300 mm is 22 fish (95% CI: 8 to 35 fish). It is likely that the fish captured in 2024 were part of the same isolated population of burbot that were residing in Pond AB in 2022 and 2023. The RO Channel connecting Pond AB to the WSR has numerous beaver dams that may prevent fish passage at typical water levels as no Arctic grayling or burbot tagged in the WSR have been captured in Pond AB. These burbot were not included in the WSR burbot population estimate and a separate population estimate will be performed until fish movement between the two water bodies is observed.

Larval *Diplostomulum* of the Eye

Ninety- nine total burbot were captured during the September 2024 WSR sampling. Thirty-five of the captured burbot had a milky appearance to one or both of their eye pupils (Figure 7). Burbot pupils are typically black with yellow or golden colored irises (Figure 8). In some burbot the eyes were bulging or protruding from the head more than is typical for the species appearance. During past WSR and Fish Creek wetlands sampling events one or two burbot with similar conditions have been observed, but not in a large of a percentage of the population. Milky eyes were previously contributed to physical trauma to the fish's head, or to eye cataracts that develop in old age, and no special diagnostic testing was performed. During the July 2024 Stilling Basin field work fifteen of the twenty-two burbot captured had the same eye condition and five whole body burbot samples were collected and sent to the ADF&G Fish Pathology Laboratory in Anchorage (Bear 2024). Two additional burbot were collected in September during the WSR sampling and was submitted for diagnostic testing. Preliminary results from these burbot samples were received on November 1, 2024, from the laboratory. Each fish sample submitted was found to have larval *Diplostomulum* of the Eye (Eye Fluke). Each fish had between 5 - 25 flukes occupying various regions of the eye resulting in partial or complete blindness. Another parasite in the myxozoan family was found in the gills of two fish and is unrelated to eye fluke but is potentially important

to the health of the fish. The ADF&G technical report summarizing the 2024 sampling season will contain the final fish pathology diagnostics results and more information.

Figure 7. Two of the 35 burbot captured with milky pupils, WSR, October 2024.

Figure 8. Burbot with normal pupils captured during the September 2023 WSR burbot sampling.

In the Diseases of Wild and Cultured Fishes in Alaska Field Guide published by the ADF&G Pathology Laboratory, Larval *Diplostomulum* of the Eye, known as Eye Fluke, is caused by digenean larval trematodes of the genus *Diplostomulum* that parasitize the eye of many

freshwater fish species found in Alaska. A common trematode found in the lens is *D. spathaceum* while others are found in the vitreous chamber (pupil) of the eye. The parasite can remain in the eye for a long period of time often resulting in cataracts and blindness in the host (Meyers 2019). Fish become parasitized through the water from infested snails. The invasive cercariae from a snail penetrate the fish skin and migrate to the eye where the larva matures. The host fish is consumed by a piscivorous bird (Sea Gull) where the larval fluke matures into an adult while in the intestinal tract. It releases eggs into the water through expelled bird feces. Eggs mature into miracidium and infest snails in the water. The cycle is complete when the snails release free swimming cercaria into the water and parasitize fish again (Meyers 2019).

Glaucous-Winged gull, Glaucous gull and the Herring gull (gulls) are common in Alaska and up to twelve gulls were nesting this summer on the rock face near the WSR spillway and Stilling Basin (Bear 2024). These birds can be the host for other parasites, bacteria, viruses, and fungi that can infect resident fish.

Reports Cited:

Bear, C.E. 2024. 8-2-24; Bear; Fort Knox Stilling Basin Trip Report. Alaska Department of Fish and Game Habitat Section, Fairbanks, Alaska.

Meyers, T., T. Burton, C. Bentz, J. Ferguson, D. Stewart, and N. Starkey. 2019. Diseases of Wild and Cultured Fishes in Alaska. Alaska Department of Fish and Game Fish Pathology Laboratory, Anchorage, Alaska.