Cabinet Gorge and Noxon Reservoir Fisheries Monitoring

2024 Annual Project Update

Montana Tributary Habitat Acquisition and Recreational Fishery Enhancement Program, Appendix B

June 2025

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Recreational Fishery Enhancement Program
Appendix B

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Introduction

Noxon and Cabinet Gorge reservoirs, the two lowermost hydroelectric impoundments on the Clark Fork River in western Montana (Figures 1–3), have presented numerous and evolving challenges for fisheries management since reservoir construction was completed in the 1950s. Challenges have included blocked upriver access for migratory native species, including adfluvial Bull Trout *Salvelinus confluentus* from Lake Pend Oreille, degraded conditions in the impounded mainstem reaches for native salmonids, introductions of non-native species (authorized and unauthorized), and changes in agency objectives, angler and societal preferences, and reservoir operations. Huston (1985) documented the diversity of fish introductions and management actions from the early 1950s through the mid-1980s, including early efforts to establish cold-water salmonid fisheries in marginal habitats created by the reservoirs. In addition to altered thermal conditions, low water retention time in the two reservoirs (about three weeks in Noxon and one week in Cabinet Gorge), and wide water-level fluctuations historically limited options for developing stable lentic fisheries.

Initial fisheries management efforts to create cold-water salmonid fisheries on the newly formed reservoirs were largely unsuccessful (Huston 1985). Noxon and Cabinet Gorge reservoirs did not emerge as relevant fisheries until the 1980s. At that time, the introduction and establishment of both Largemouth Bass *Micropterus salmoides* and Smallmouth Bass *M. dolomieu* populations, two non-native predatory sportfish, was facilitated by a cooperative agreement between angler groups, Montana Fish, Wildlife and Parks (FWP), and Avista which eliminated large water-level fluctuations (Huston 1985) to facilitate stable bass habitat. The presence of Northern Pike *Esox lucius* was first documented in Noxon Reservoir in 1972 and Cabinet Gorge Reservoir in 1974, stemming from an illegal introduction in Lone Pine Reservoir of the Flathead River drainage in the 1950s (Huston 1985). Since that time, populations of these species as well as native and non-native non-game fish species have become well-established, and annual fishing pressure has increased considerably from about 800 angler days per year on Noxon in 1982 to 39,759 angler days in 2021 (MFWP 2023).

Based on angler mail-in surveys (MFWP 2017, 2019) and a recent creel survey (Blakney et al. 2017), bass remain popular target species, as well as non-native Northern Pike and Yellow Perch *Perca flavescens*. In 2024, bass tournaments were scheduled on five separate weekends on Noxon Reservoir and one during the week on Cabinet Gorge Reservoir. Additionally, one Northern Pike tournament was held on Noxon Reservoir and another on Cabinet Gorge Reservoir.

As early as the 1950s, management effectiveness in the two reservoirs was monitored occasionally by evaluating fish community structure, mainly through gillnetting. Fish community monitoring with gillnets had been standardized by 2000 and has continued to the present time. A quarter century after Huston's (1985) review, Horn and Tholl (2010), and Scarnecchia et al. (2014) used slightly different durations of the historical gillnet data sets to evaluate trends in fish community composition and individual species abundance. Both evaluations documented statistically significant declines in several native fishes such as Peamouth *Mylocheilus caurinus,* Largescale Suckers *Catostomus macrocheilus*, and Northern Pikeminnow *Ptychocheilus oregonensis*, species of little interest to anglers but likely important components of the food web. Contemporaneously, they observed an increase in the frequency of non-native piscivorous fishes (bass, Northern Pike and Walleye *Sander vitreus*), species actively sought by anglers.

Walleye were illegally introduced into Noxon Reservoir, likely several times between the 1980s and 1990s (WWP 1995, Horn and Tholl 2010). Since 2000, the population of Walleye has become self-sustaining and has increased in abundance relative to other species. Stemming from the illegal introduction in Noxon Reservoir, Walleye have since become established in the downriver waterbodies of Cabinet Gorge Reservoir, Lake Pend Oreille (LPO), and the Pend Oreille River through Idaho and into Washington. Based on information obtained during a previous telemetry study (Horn et al. 2009), FWP began spring surveys for Walleye on suspected spawning grounds in 2012 to monitor year-class strength, the spawning population abundance, and collect fish for age and growth estimates. This work has continued through 2024, primarily using jet-boat electrofishing at night. Spring Walleye electrofishing is conducted from late March to early May to coincide with suitable spring spawning temperature and pre-runoff flows, (Willis and Stephen 1987). Efforts occur in two spawning areas in upper Noxon Reservoir directly downstream of Thompson Falls Dam, adjacent to the River's Bend Golf Course and upstream of the Highway 200 bridge (Figure 4).

Current harvest management on the reservoirs includes the use of general regional regulations for all species except for Cutthroat Trout *Oncorhynchus clarki spp.* (catch and release), Largemouth Bass, Smallmouth Bass, and Walleye (MFWP 2025). Special regulations have been enacted on both reservoirs to protect spawning bass. Both species of bass rely on nest-guarding males to protect newly hatched broods and angling during that time may negatively influence recruitment (Suski and Phillip 2004). These protective bass regulations include Noxon and Cabinet Gorge reservoirs and extends from the base of Thompson Falls Dam downstream to the Idaho border (MFWP 2025). This special regulation allows five fish to be harvested daily and in possession of any size, except between June 15 and July 15 when only one fish daily with a minimum length of 559 mm (22 inches) can be kept and in possession. This regulation provides protection by limiting harvest of spawning and nest-guarding bass and prevents tournaments from occurring during this time. Saffel (2003), found age-0 Largemouth Bass in Noxon Reservoir hatched between June 21 and July 3 in both low-water and high-water years. Because incubation of Largemouth Bass eggs is 3–5 days (Scott and Crossman 1973), it was assumed that spawning in Noxon began after June 15 even on low-water years, hence the reasoning behind the June 15 to July 15 exception. The regulation for Walleye is no limit in both Noxon and Cabinet

Gorge Reservoirs, as opposed to the catch, keep and report requirement for the rest of Montana's Western Fishing district. Walleye have become established in both reservoirs following illegal introductions and the keep and report requirements are no longer warranted.

Fish community monitoring continues to be conducted in both Noxon and Cabinet Gorge reservoirs with gillnets to assess trends in fish community composition and species abundance. Monitoring fish lengths and catch composition during bass tournaments remains an important part of the monitoring program as bass have low capture vulnerability in gillnets. Specific objectives of the current reservoir monitoring plan are to:

1) Monitor trends in fish populations in Noxon and Cabinet Gorge reservoirs with emphasis on species of recreational value and potential predators of native salmonids which inhabit the reservoirs.
2) Monitor the overall status of the bass fishery in Noxon Reservoir.
3) Monitor the population of illegally introduced Walleye in Noxon Reservoir.

For a more thorough description of the study area and methods, refer to: Kreiner and Tholl (2013), Kreiner and Tholl (2016), Horn and Tholl (2010), and Scarnecchia et al. 2014.

Study Area

The Clark Fork River is Montana's largest river by discharge. It has its origins near Butte, Montana at the Continental Divide and flows for approximately 380 km before merging with the Flathead River near Paradise, Montana. The Lower Clark Fork River (LCFR) begins at the confluence with the Flathead River and continues northwestward 165 km before entering LPO, a large (380 km^2), deep (350 m) natural lake in the Idaho panhandle.

The LCFR historically was an important migratory corridor for Bull Trout and Westslope Cutthroat Trout *Oncorhynchus lewisi* which spawned in Montana tributaries but matured in LPO (Huston 1985). Other native non-game species also migrated extensively through the LCFR (e.g., Catastomids, Leuciscids). However, in the 20^{th} century, three dams were constructed that have restricted migrations of native fishes and greatly altered the hydrology and habitat of the river. Thompson Falls Dam, the uppermost of the three dams and not a focus of this report, is also the oldest, completed in 1915 by Montana Power (currently owned by NorthWestern Energy). Cabinet Gorge Dam (completed 1952) and Noxon Rapids Dam (completed 1959) are owned and operated by Avista. Noxon Reservoir, the middle reservoir, is the largest LCFR reservoir with a surface area of 3,200 Ha, a maximum depth of greater than 61 meters, and a length of approximately 62 km. Just inside the Idaho border, Cabinet Gorge Dam creates a reservoir that is 1,200 Ha and approximately 31 km long. All three LCFR reservoirs are considered mainstream or run-of-the-river reservoirs (Kalff 2002) and are characterized by their short water retention times. Noxon Reservoir has a water retention time of three weeks during low-water and less than one week during run-off, while Cabinet Gorge Reservoir's retention time is never greater than seven days (Huston 1985). As a result, the reservoirs retain both lotic and lentic characteristics throughout. Many of the narrow upstream channels have visible current, while many bays, flats, and lacustrine areas above the dams are lake-like in appearance.

The run-of-the-river nature of these reservoirs impacts most of the fish species, especially those that evolved in more stable lentic habitats. For example, during larger run-off years, high water levels and cold-water temperatures delay Largemouth Bass spawning and reduce overwinter survival of age-0 Largemouth Bass (Saffel 2000). Additionally, low water retention time associated with high runoff from snow melt across the Clark Fork basin is generally associated with less successful spawning by reservoir-dwelling Walleye, similar to other populations in North America (Willis and Stephens 1987).

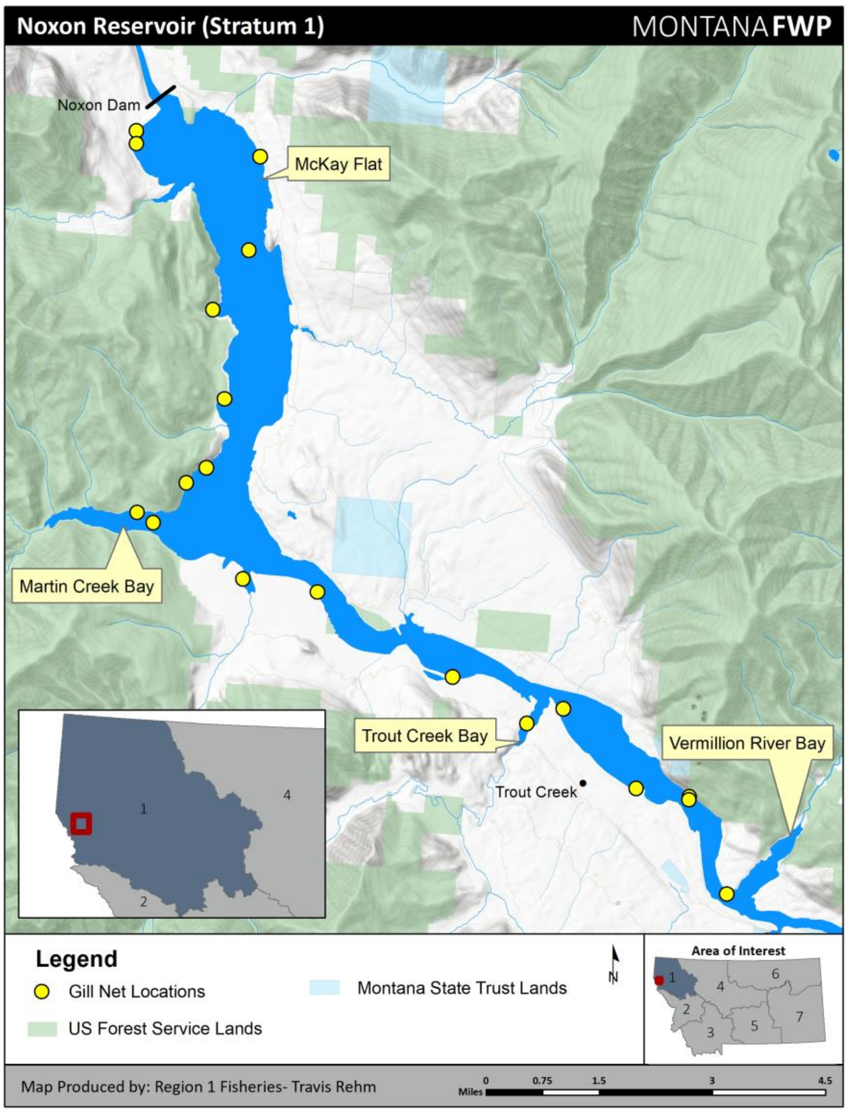

Figure 1. Gill net locations in Noxon Reservoir, Montana (stratum 1).

Methods

Fall Gillnetting

Standardized annual fall gillnetting in Noxon and Cabinet Gorge reservoirs provides the most comprehensive index of relative abundance for fish species and fish community composition in both reservoirs. Standard gillnet surveys are conducted annually in Noxon and Cabinet Gorge reservoirs in early October. The surveys have consisted of 45 total overnight gillnet sets, 30 in Noxon Reservoir and 15 in Cabinet Gorge Reservoir (Figures 1–3). In Noxon Reservoir, 19 sites are in the lower portion of the reservoir below Beaver Creek Bay (stratum 1), while the remaining 11 sites are in the upper riverine portion (stratum 2). Standardized (i.e., identical) sites have been sampled annually since 2000. Coldwater sites such as tributary mouths, have been intentionally avoided to reduce Bull Trout bycatch and mortality.

Nylon multifilament experimental sinking gillnets have been used during all gillnetting efforts. The nets are 38 m long and 1.8 m deep with five separate 7.6 m panels consisting of 1.9 cm, 2.5 cm, 3.2 cm, 3.8 cm, and 5.1 cm square mesh. The length and mesh sizes of these nets have been consistent throughout the duration of this monitoring and are the same specifications of standard experimental gillnets used throughout the state by FWP.

Gillnets are set in the afternoon, fished overnight, and retrieved the following morning. Most nets (87%) are set perpendicular to the shoreline with the net stretched just far enough to achieve full vertical extension (1.8 m). The small mesh (1.9 cm) end of each gillnet is set closest to shore for all near-shore net sets. The other six nets (13%) are open-water sets in which the net is set parallel to shore and both the front and back of the net anchored in deep water. Depths of sets has ranged from 1.5 to almost 35 m but has been consistent among locations and between years. Although minor variation has occurred between net-set durations through the years, nets have been set and pulled in an identical order each year, resulting in little annual variation in soak times among nets set at a given site. All gillnet data is summarized as total and species-specific catch per unit effort (i.e., number

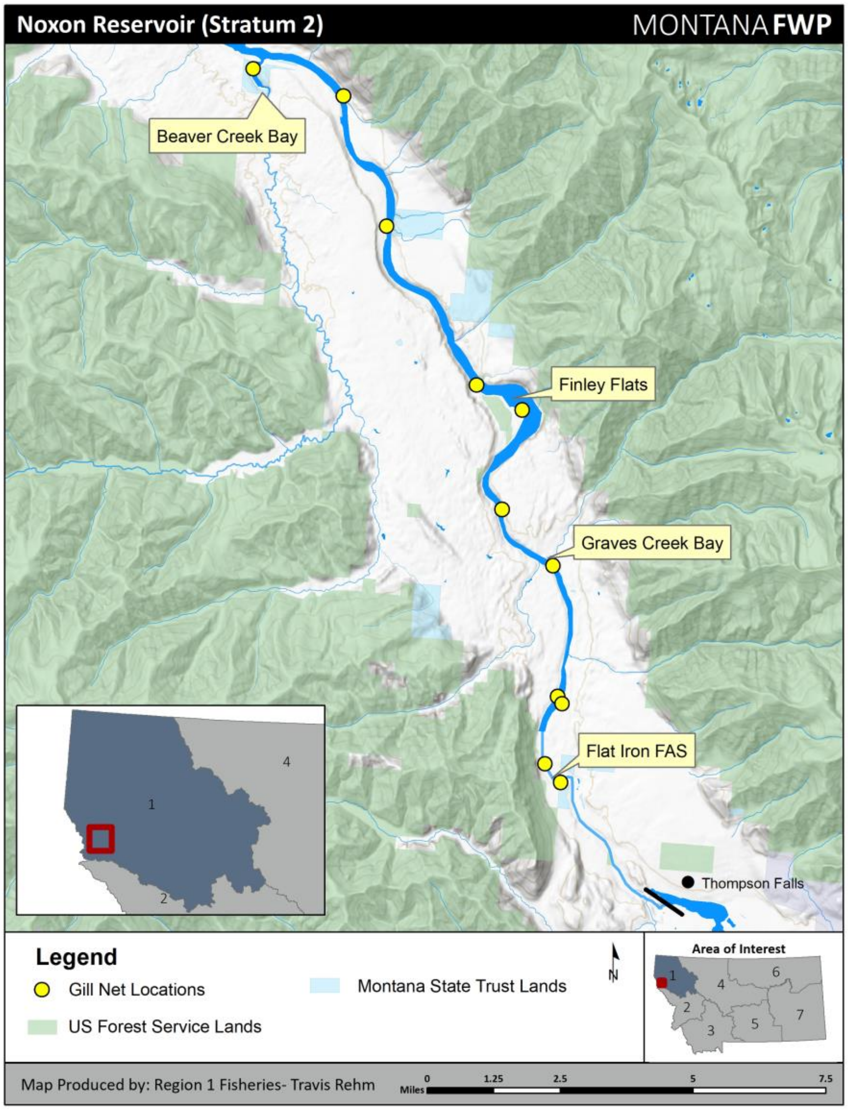

Figure 2. Gill net locations in Noxon Reservoir, Montana (stratum 2).

of fish per gillnet night). Species composition is based on total number of each species captured, as percent of total catch, and as a percent of total weight.

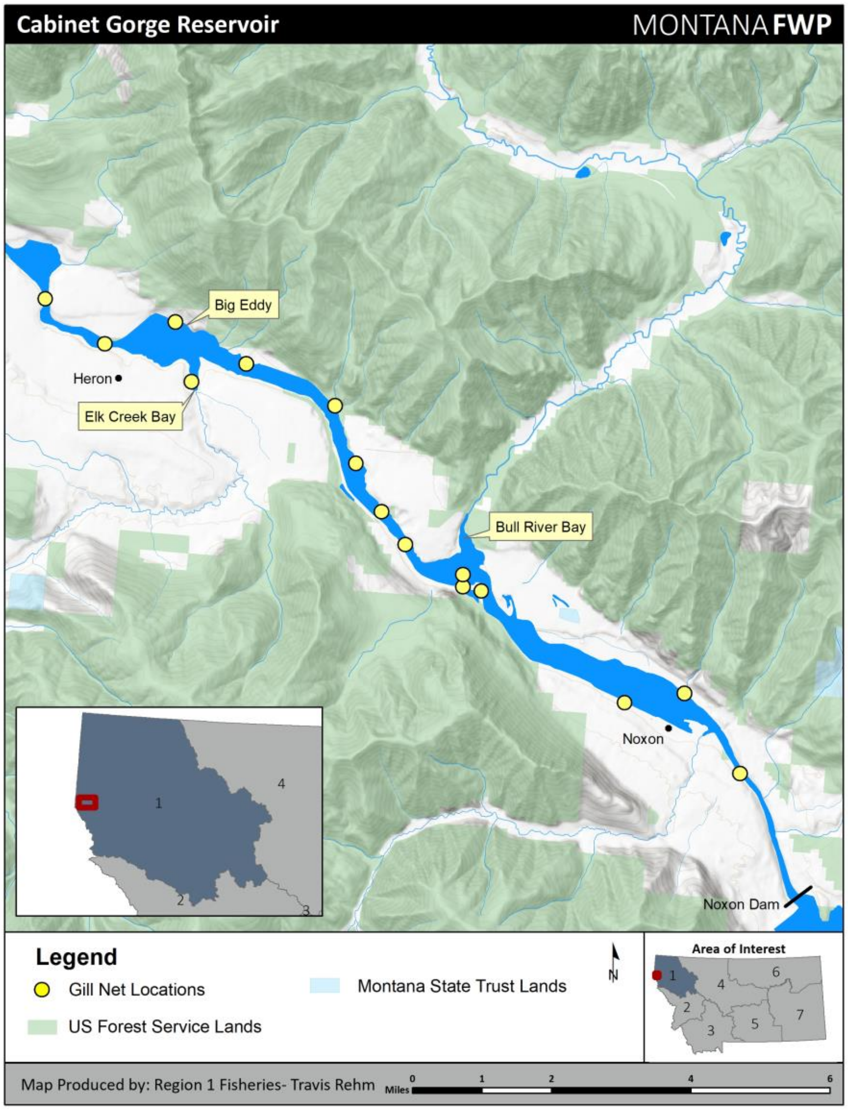

Figure 3. Gillnet locations in Cabinet Gorge Reservoir, Montana.

Retrieved gillnets are shuttled to a shoreline location where fish are removed from the nets and the appropriate data collected and recorded. Since the 1990s, processing of fish and nets has been a cooperative effort among FWP, Avista, and students from University of Idaho Fisheries Management class. Data collected from each fish include its species, total length (TL; mm), and weight (g), identified separately by individual net. Additionally, all Walleye previously marked via dorsal spine removal are scanned for passive integrated transponder (PIT) tags.

Since 2013, all Walleye captured have been identified to sex and their otoliths collected for age determination. Otoliths of walleye were removed using the “up through the gills method” (Stevenson and Campana 1992), embedded in epoxy, and transversely sectioned using a low-speed isometric saw. Sections are then aged independently by two readers and any fish with age discrepancies are aged by a third reader (Quist and Isermann 2017). Using ages derived from otolith analysis, separate growth curves were fitted for male and female Walleye populations (von Bertalanffy 1938). Using catch curve data derived from otolith analysis from 2021-2024, total annual survival rate (S) and instantaneous total mortality rate (Z) were calculated using Chapman-Robson method (Chapman and Robson 1960; Robson and Chapman 1961; Ogle

2016). Longitudinal data from the large 2019 year-class was used due to sporadic recruitment of Walleye in Noxon Reservoir. Otoliths were collected from Northern Pikeminnow, Largescale Sucker, and Peamouth in Noxon and Cabinet Gorge reservoirs during annual gill net surveys in 2022 (Rehm et al. 2023). In 2024, these otoliths were used for age determination using the same methodology described above for Walleye.

Conditions of fishes were calculated as an index, using relative weight (Wr; Wege and Anderson 1978; Pope and Kruse 2007). Size structure was described using proportional size distribution (PSD), where species-specific lengths refer to stock, quality, preferred, memorable, and trophy length fish (Gabelhouse 1984; Neumann et al. 2012). Condition was compared between length groups using one-way ANOVA and Tukey's Honestly Significant Difference (Ogle 2016). Long-term trends in catch per unit effort (CPUE) and condition were investigated using linear regression.

Spring Walleye Monitoring

Additional sampling of Walleye occurs on upper Noxon Reservoir each spring. With varying degrees of effort, Walleye have been monitored using nighttime electrofishing during late March through early May since 2012. The objectives of spring sampling are to monitor year-class strength, the spawning population abundance, and collect fish for age and growth estimates. The primary sampling location was above the Montana state highway 200 bridge near Thompson Falls, based on information obtained from a previous telemetry study (Horn et al. 2009; Figure 4). Additional sampling began near the River's Bend Golf Course across from Flat Iron Fishing Access Site in 2016.

Walleye were collected by jet-boat mounted boom electrofishing during nighttime hours from April 1 to May 1 of 2024. Walleye captured were measured (TL; mm) and weighed (g). A subsample of up to five Walleye of each sex in 25 mm length bins for Walleye up to 500 mm and up to five Walleye of each sex in 50 mm length bins for Walleye greater than 500 mm in length were sacrificed for age analysis. Sex and maturity of Walleye was assessed by visual inspection of gonads of sacrificed fish or manipulating the abdomen following methodology outlined by Duffy et al. (2000). All remaining Walleye were scanned, and if not found to be previously tagged, were implanted with a 12 mm long half-duplex passive integrated transponder (PIT tag), the dorsal spine removed for additional identification, and the fish were released. Otoliths of sacrificed Walleye were removed using the "up through the gills method" (Stevenson and Campana 1992), embedded in epoxy, and transversely sectioned using a low-speed isometric

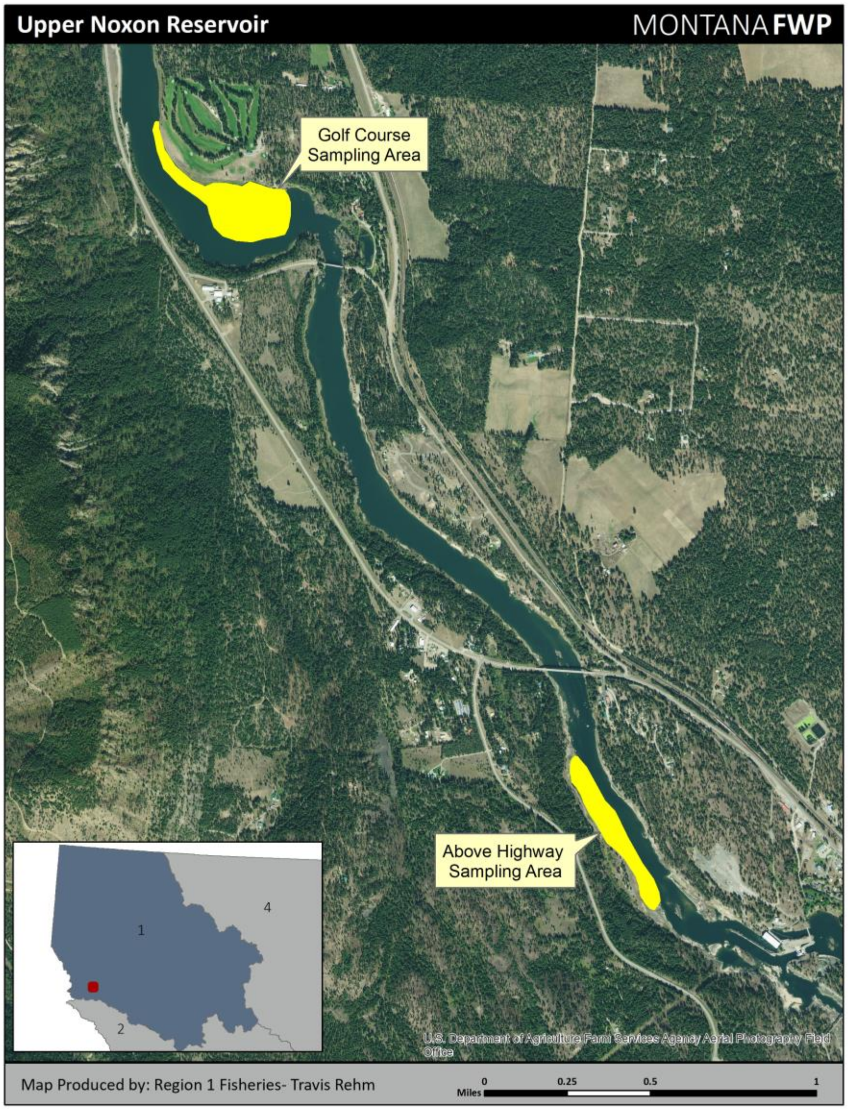

Figure 4. Map of two spring Walleye sampling locations in upper Noxon Reservoir, Montana.

saw. Sections were then aged independently by two readers and any fish with age discrepancies were aged by a third reader (Quist and Isermann 2017).

Ages derived from otolith analysis were used to construct age-length keys using Fisheries Stock Assessment (FSA) v0.8.12; R v3.3.2 (Ogle 2010; R Core Team 2020). Age-length keys were constructed for both female and male Walleye using 10 mm length bins and ages were assigned to all unaged fish based on the corresponding age-length keys (Isermann and Knight 2005; Ogle 2016). Using ages derived from otolith analysis we also fitted separate growth curves for male and female Walleye spawning populations (von Bertalanffy 1938).

Bass Tournament Monitoring

The status of adult Largemouth and Smallmouth bass populations has been assessed annually since 1997 by monitoring bass tournaments on Noxon Reservoir. In most years, between five and seven two-day bass tournaments occurred on Noxon Reservoir. Recently, two to three bass tournaments have been monitored per year. In 2024, one bass tournament was also held on Cabinet Gorge Reservoir and was also monitored to assess the status of adult Largemouth and Smallmouth bass populations.

Lower Clark Fork Reservoir bass tournaments require that bass have a minimum length of 305 mm (12 inches) to be weighed in. Therefore, only bass this size or larger were monitored at tournaments. Indices collected at tournaments since the 1990s include the percentage of quality fish weighed in (fish greater than 380 mm or 15 inches; Gabelhouse 1984), mean length of fish weighed in (>305 mm), and proportion of species brought to weigh-in (Smallmouth versus Largemouth Bass). All tournaments held on Lower Clark Fork Reservoirs allow high-grading or culling (i.e., the replacement of smaller fish captured with larger fish after a 5-fish limit was attained) so catch rates cannot be accurately estimated.

Results and Discussion

Fall Gillnetting

Noxon Reservoir
Gill netting was conducted in Noxon Reservoir October 13-15, 2024. A total of 1,069 fish representing 11 species were captured (Table 1). Catch per unit effort trends are shown as a function of mean fish/net in Appendix B for commonly captured fish species 2000–2024. The catch rate of 35.6 fish/net was up from recent years and near the historic average (2000–2023 mean catch 34.2 fish/net). Yellow Perch were the most abundant species captured representing over 50.9% of the total catch (n = 544). The mean number of Yellow Perch captured in 2024 was 18.1 fish/net which is substantially greater than the mean 2000-2023 catch of 13.1 fish/net (Figure 5). Pumpkinseed *Lepomis gibbosus* were the second most abundant fish species caught and comprised 24.2% of the total catch (n = 259). The mean catch rate for Pumpkinseed was 8.6 fish/net in 2024, which was almost double the 2000-2023 mean of 4.7 fish/net and was near the highest abundance observed since standardized netting began in 2000 (Figure 5). Pumpkinseed abundance has increased over time (linear regression, $r^2 = 0.34$, $p = 0.004$) in Noxon Reservoir. The mean number of Lake Whitefish *Coregonus clupeaformis* captured in 2024 was 1.4 fish/net which is substantially greater than the mean 2000-2023 catch of 0.8 fish/net. Lake Whitefish abundance has also increased over the sampling period (linear regression, $r^2 = 0.35$, $p = 0.002$), representing over 3.9% of the total catch (n= 42) in 2024.

Yellow Perch, Pumpkinseed, and Lake Whitefish are likely an important prey base for the top four predators (i.e., Largemouth Bass, Smallmouth Bass, Northern Pike, and Walleye) in Noxon Reservoir. Close monitoring of these prey populations and their relative abundance over time is important to inform management decisions in this predator-heavy system (Scarnecchia et al. 2014; Scarnecchia and Lim 2016).

Table 1. Mean catch rates (fish/net night), total number caught, percentage of total species composition by number and biomass (percent of total weight), mean weight, weight range, mean length, and length range for species captured in Noxon Reservoir during gill netting surveys conducted in 2024. Species abbreviations are specified in Appendix A.

Species	Mean fish/net (STDEV)	Total # caught	Species Comp. (%)	Percent of Total Weight (%)	Mean Weight (g)	Weight Range (g)	Mean Length (mm)	Length Range (mm)
YP	18.1 (18.1)	544	50.9%	16.0%	100.5	20–310	196.0	96–283
PUMP	8.6 (12.2)	259	24.2%	4.9%	64.4	8–165	137.8	90–193
NP	2.4 (2.2)	71	6.6%	34.2%	1623.8	75–5480	594.1	235–905
SMB	2.0 (3.7)	60	5.6%	7.8%	436.6	35–1860	286.8	141–465
LWF	1.4 (2.2)	42	3.9%	14.6%	1176.1	735–1560	485.6	390–555
WE	1.2 (1.7)	36	3.4%	11.0%	1027.5	115–3425	452.5	245–679
NPMN	0.9 (1.2)	26	2.4%	7.1%	917.9	100–2235	422.8	144–600
YLBH	0.5 (0.9)	16	1.5%	1.5%	317.8	125–530	267.2	147–320
LMB	0.3 (0.5)	10	0.9%	0.8%	277.0	35–850	236.7	135–349
LSSU	0.1 (0.4)	4	0.4%	2.1%	1752.5	1420–2130	527.8	500–561
RB	0.0 (0.2)	1	0.1%	0.0%	-	-	280.0	280–280

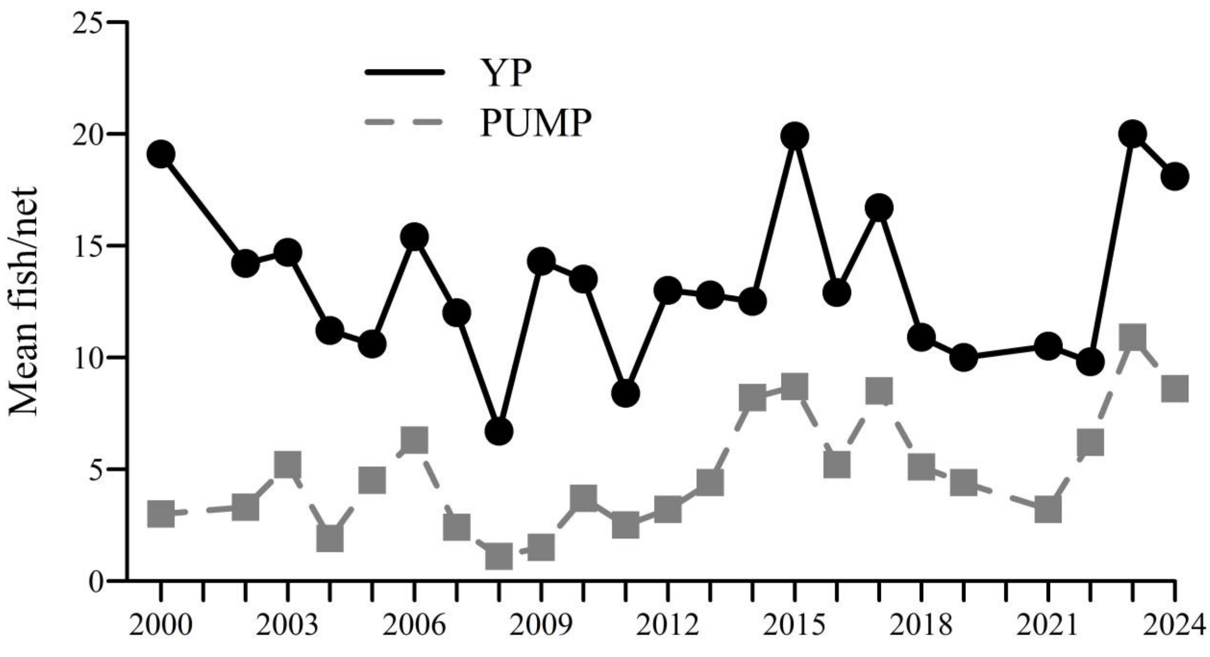

Figure 5. Mean number of fish per net for Yellow Perch and Pumpkinseed 2000–2024 in Noxon Reservoir during annual fall gill netting.

Gillnets are an effective method to monitor relative abundance of Walleye and Northern Pike, two of the four top predators in Noxon Reservoir. In general, bass are not susceptible to being captured in gillnets when compared to most other species in the reservoirs. Smallmouth Bass are captured at a higher rate than Largemouth Bass, but both species are underrepresented to an unknown degree in relation to their abundance in the fish community.

Walleye were the third most abundant top predator species captured representing 3.4% of the total catch (n = 36), which is substantially down from 2021 when the highest number since standardized netting began in 2000 was recorded (n = 96). However, Walleye abundance has increased over time (linear regression, $r^2 = 0.69$, $p < 0.001$), and the mean catch rate was 1.2 fish/net in 2024, which was near the mean 2000–2023 catch rate of 1.1 fish/net (Figure 10). All Walleye captured during fall gill netting efforts had sex determined (Table 2). The majority of Walleye captured were comprised of year-classes 2021 (57%) and 2019 (22.9%; Table 2; Figure 6). The once dominant 2015 year-class has shown signs of decline representing only 5.7% of Walleye captured in 2024 (5.8% in 2023, 10.6% in 2022; 19.8% in 2021). This was the third year in a row the strong 2021 year-class was detected during gill netting efforts. Male Walleye from the 2021 year-class recruited to the spawning population for the first time this year and were sampled during spring electrofishing. Based on past sampling, we expect females from the 2021 year-class to fully recruit to the spawning populations in 2026.

Table 2. Mean length-at-age of fall caught Walleye from Noxon Reservoir in 2024.

	Males			Females			Total		
Age	n	Mean Length (mm)	SD	n	Mean Length (mm)	SD	n	Mean Length (mm)	SD
1	1	245	-	-	-	-	1	245	-
2	-	-	-	2	343	24.7	2	343	24.7
3	15	405	43.4	5	414	44.5	20	407	42.6
4	1	530	-	1	514	-	2	522	11.3
5	4	534	25.1	4	591	16.5	8	562	36.6
6	-	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-
9	1	632	-	1	679	-	2	656	33.2

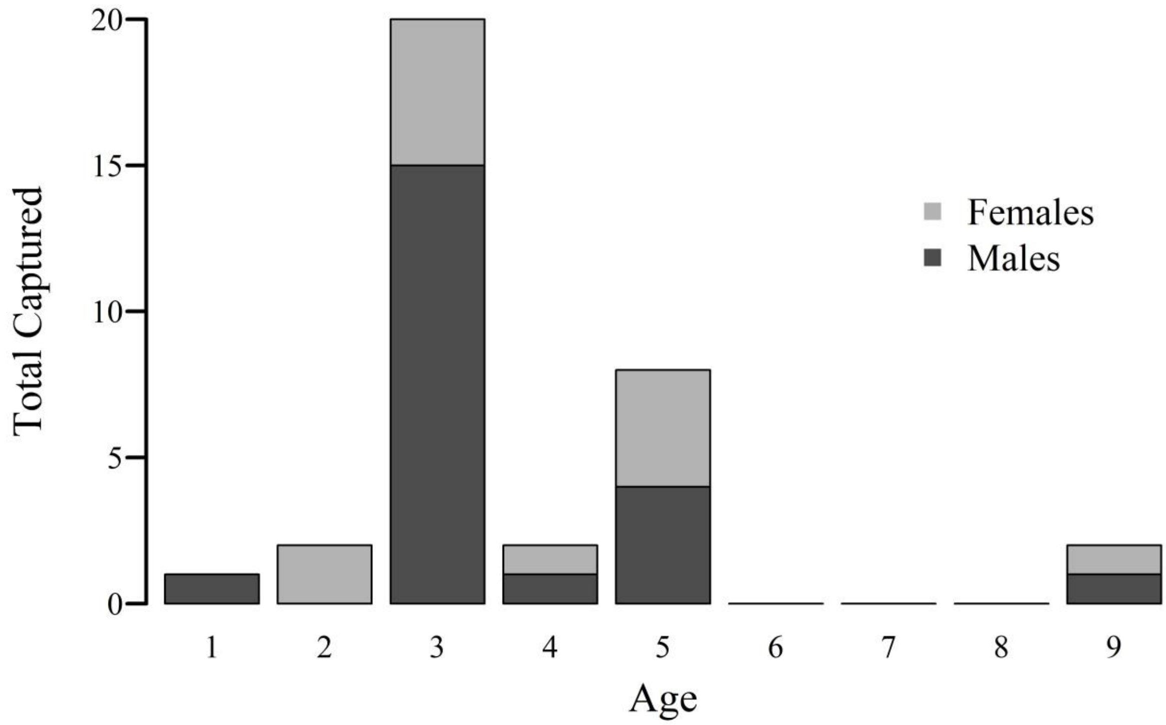

Figure 6. Age frequency distribution of fall caught Walleye from Noxon Reservoir in 2024.

Mean Wr for Walleye was 85.4 in 2024, which is less than the 2002–2023 mean (Wr = 96; Figure 7). A significant decline in mean Wr of Walleye has occurred since 2000 (linear regression, $r^2 = 0.63$, $p < 0.001$; Figure 9). However, smaller Walleye length groups are less and larger Walley length groups are greater than average condition when compared to Walleye caught using standardized gill nets in large standing waters in North America (Figure 7). We expect Walleye condition to decline if predator populations continue to grow and competition for prey increases. Condition of male Walleye (Wr = 84.5) was slightly higher than females (Wr = 80.9).

Proportional size distribution for Walleye captured during fall of 2024 (80) points to a relatively large size structure within Noxon that likely represents sporadic recruitment and moderate to low levels of mortality for adults (Anderson and Weithman 1978). Walleye of preferred ($p < 0.001$) and memorable ($p = 0.02$) length were in significantly better condition than those of stock length. Walleye of preferred length were also in significantly better condition than those of quality length ($p = 0.02$). Walleye condition among other length groups showed no statistically significant difference (Figure 7; stock = 165–213 mm, quality = 297–338 mm, preferred = 371–455 mm, and memorable = 488–528 mm). Similar to recent years, the trend of decreasing condition within Walleye in Noxon Reservoir were observed.

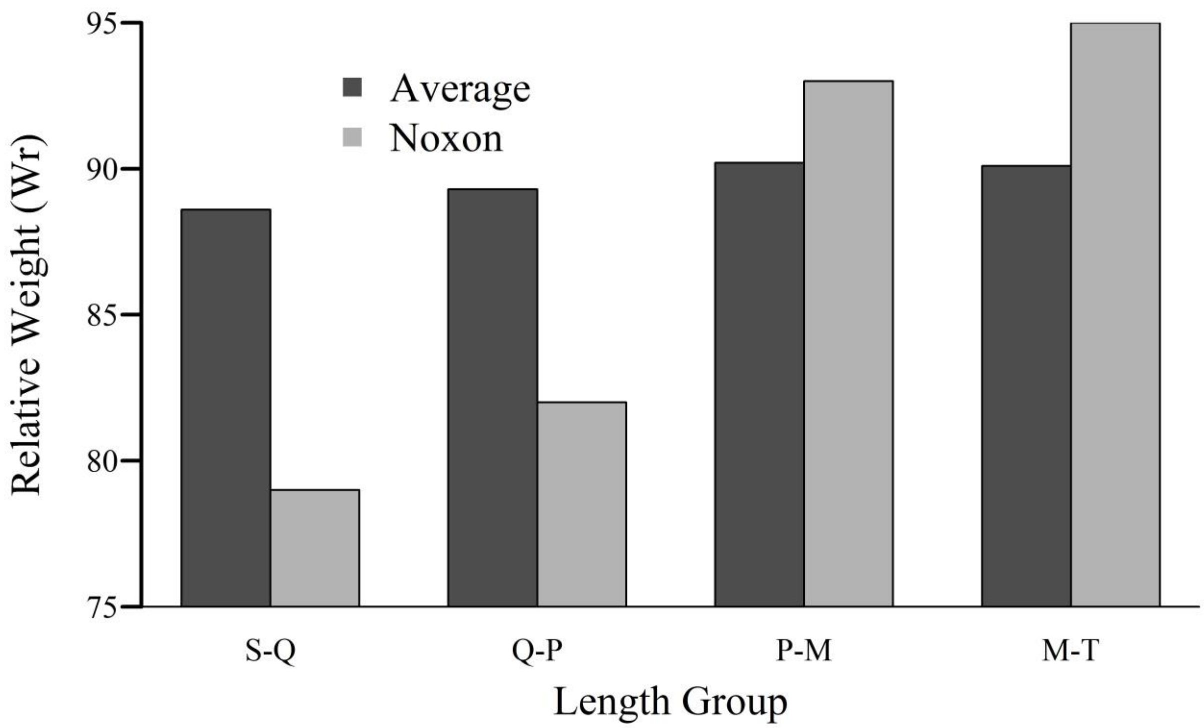

Figure 7. Average condition of Walleye caught using standardized gill nets in large standing waters in North America (Bonar et al. 2009) and average condition of fall caught Walleye from Noxon Rapids Reservoir in 2024. S = stock, Q = quality, P = preferred, M = memorable, and T = Trophy (Gabelhouse 1984).

Growth curves and parameters (Appendix D) were calculated for both males and females using the 35 Walleye used for age analysis (Table 2). Of those fish, 22 were male and 13 were female. Supporting reported mean length-at-age data, female Walleye growth rates were greater than males. Total annual survival rate for Walleye was calculated at 42.7% with 95% confidence intervals (36.1–49.4). Instantaneous total mortality rate was calculated at 0.84 with 95% confidence intervals (0.62–1.06).

During 2024 gill netting, only two Walleye were recaptured that had previously been tagged during spring Walleye electrofishing (Table 3). These fish had been tagged in the spring of 2024 and recaptured after one growing season. Recapture rate for fish PIT tagged in 2024 was approximately 1%.

Table 3. Mean yearly growth of recaptured Walleye sampled during fall 2024.

PIT Tag Number	Initial Capture Date	Initial Capture Length (mm)	Recapture Date	Recapture Length (mm)	Sex	Mean Yearly Growth (mm)
982091070216480	4/17/2024	360	10/14/2024	410	Male	-
982091070216748	5/1/2024	315	10/14/2024	361	Male	-

Northern Pike comprised 6.6% of the netted fish and were the most abundant predator species sampled within Noxon Reservoir. Northern Pike also represented the highest amount of biomass at 34.2% of total weight of captured fish. Mean catch rate for Northern Pike in 2024 was 2.4 fish/net (Table 1), which is substantially higher than the 2000–2023 mean catch rate (1.4 fish/net). Northern Pike abundance has increased significantly since standardized gillnetting began (linear regression, $r^2 = 0.54$, $p < 0.001$; Figure 10). Mean Wr for Northern Pike in 2024 was 97.5 which continues a significant decline since 2000 (linear regression, $r^2 = 0.76$, $p < 0.001$). While mean Wr in Northern Pike has declined from the 2000–2023 mean (Wr = 108.2; Figure 9), Northern Pike condition is still considered near the 50th percentile for large standing waters of North America (Figure 8; Bonar et al. 2009).

Trends of increasing abundance and decreasing condition continue to be observed in Northern Pike in Noxon Reservoir. Proportional size distribution for Northern Pike captured during fall of 2023 (79) still points to a large size structure within Noxon Reservoir that represents high mortality of young fish and moderate to low levels of mortality for adults (Anderson and Weithman 1978). Northern Pike of quality length were in significantly better condition than those of stock length ($p = 0.007$). Northern Pike condition among other length groups showed no statistically significant difference (sub-stock = <350 mm, stock = 350–529 mm, quality = 530–709 mm, preferred = 710–859 mm, and memorable = 860–1119 mm).

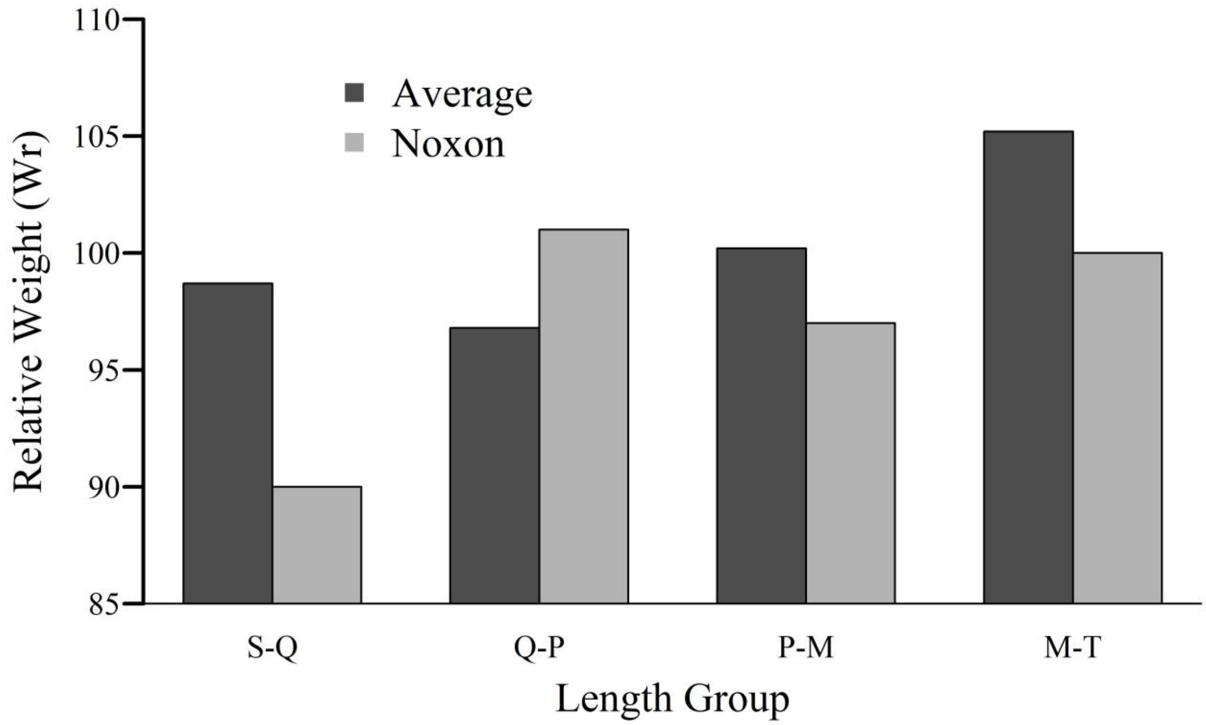

Figure 8. Average condition of Northern Pike caught using standardized gill nets in large standing waters in North America (Bonar et al. 2009) and average condition of fall caught Northern Pike from Noxon Reservoir in 2024. S = stock, Q = quality, P = preferred, M = memorable, and T = Trophy (Gabelhouse 1984).

Smallmouth Bass were the second most abundant top predator species captured within Noxon Reservoir, representing 5.6% of the total catch (n = 60; Table 1). Mean catch rate for Smallmouth Bass in 2024 was 2.0 fish/net (Table 1), which was nearly double the 2000–2023 mean catch rate (1.1 fish/net). Since an increase in Smallmouth Bass abundance was observed in 2021, abundance has remained at or near historic high for the species. Smallmouth Bass abundance has increased significantly since standardized gillnetting began (linear regression, r^2 = 0.45, $p < 0.001$; Figure 10). Condition of Smallmouth Bass captured within Noxon Reservoir was similar to historic mean values in 2024 (Wr = 93.4). Smallmouth Bass mean Wr has ranged from a low of 84.1 (n = 11) in 2008 to a high of 102.9 (n = 63) in 2013 (Figure 9). No decline has been detected over the sampled period (linear regression, $p = 0.82$).

As stated earlier, the downward trends in Walleye and Northern Pike Wr may be indicative of increasing competition for prey resources and habitat among top predators in this complex ecosystem (Figure 10). The authors hypothesize that the ability to exploit the abundant Signal Crayfish *Pacifastacus leniusculus* and Virile Crayfish *Faxonius virilis* populations within Noxon Reservoir has allowed Smallmouth Bass condition to remain stable as the population grows (Clady 1974; Frey et al. 2003: Olson and Young 2003). While it is very likely that recent increases in Smallmouth Bass catch are indicative of increases in the overall population, it is still less clear how representative gill net data is of the actual population, given the notable difficulty catching the species in gillnets. Future efforts should be made to evaluate the potential for taking "snapshots" of the Noxon food web using stable isotopes and diet analysis which may provide a better understand of interactions among predators, prey, and environmental conditions in the reservoir.

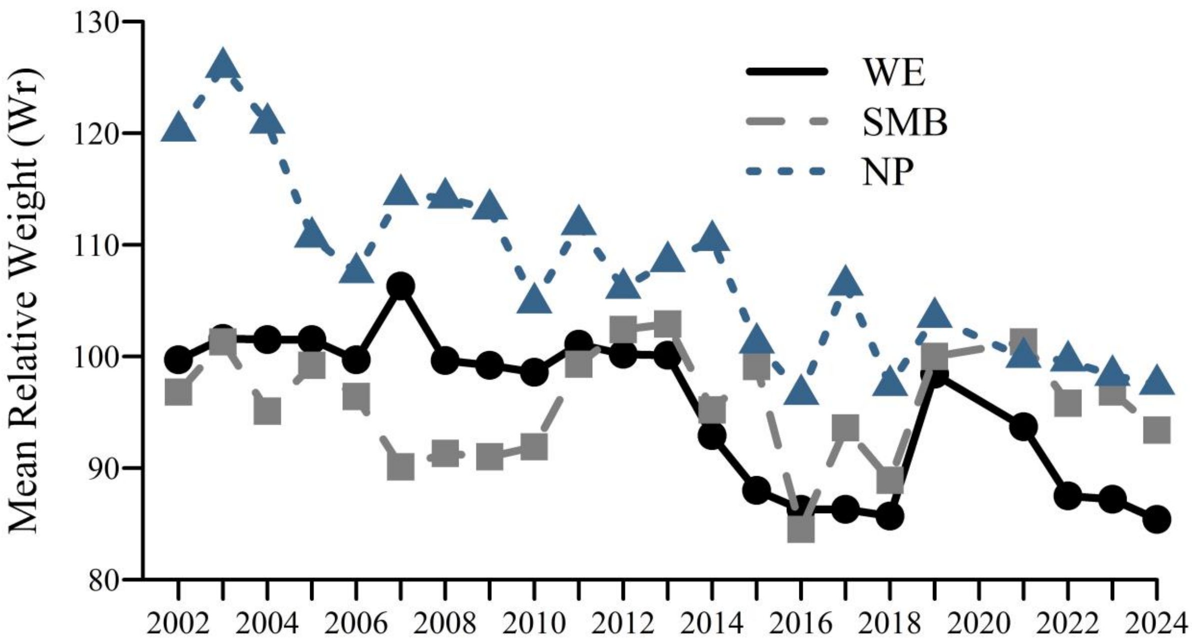

Figure 9. Mean relative weight of fall-captured Northern Pike, Smallmouth Bass and Walleye over time in Noxon Reservoir.

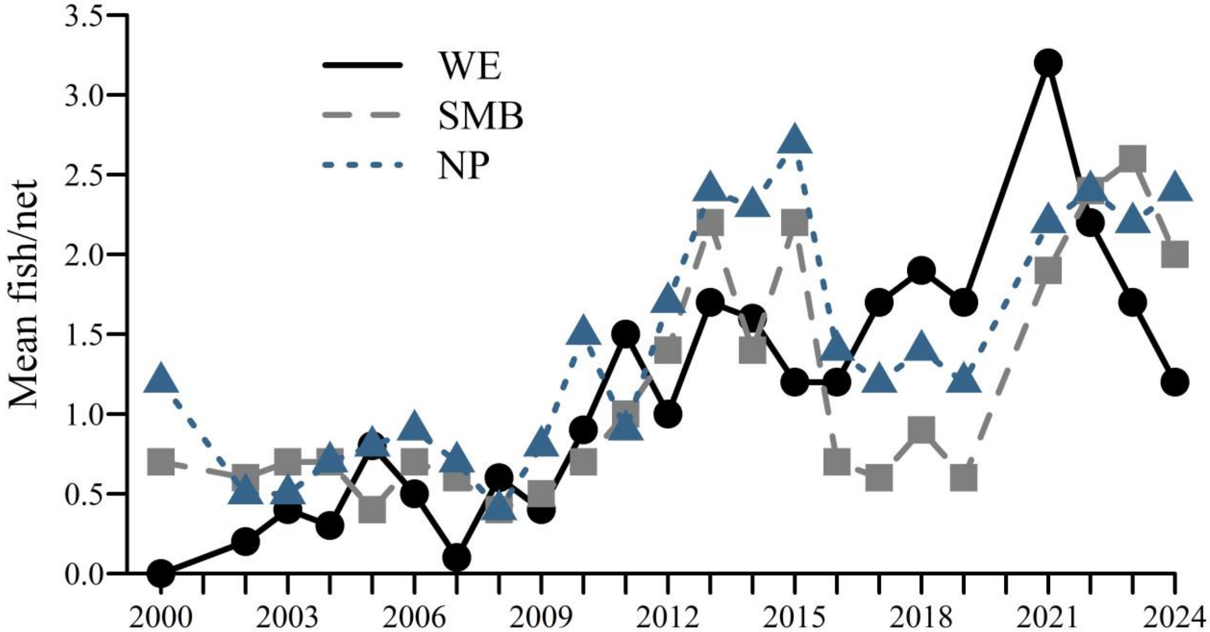

Figure 10. Mean number of fish per net for Walleye, Smallmouth Bass, and Northern Pike 2000–2024 in Noxon Reservoir during annual fall gill netting.

Native non-gamefish species such as Northern Pikeminnow, Peamouth, and Largescale Suckers continue to be captured at low levels. In 2024, 26 Northern Pikeminnow were captured comprising 2.4% of the sample (Table 1). A significant decline in the species has been documented since 2000 (linear regression, $r^2 = 0.93$, $p < 0.001$), where 6.1 fish/net was documented in 2000 (n = 178) and 2.7 fish/net in 2012 (n =78), compared to 0.9 fish/net in 2024 (n = 26; Appendix B; Figure 11).

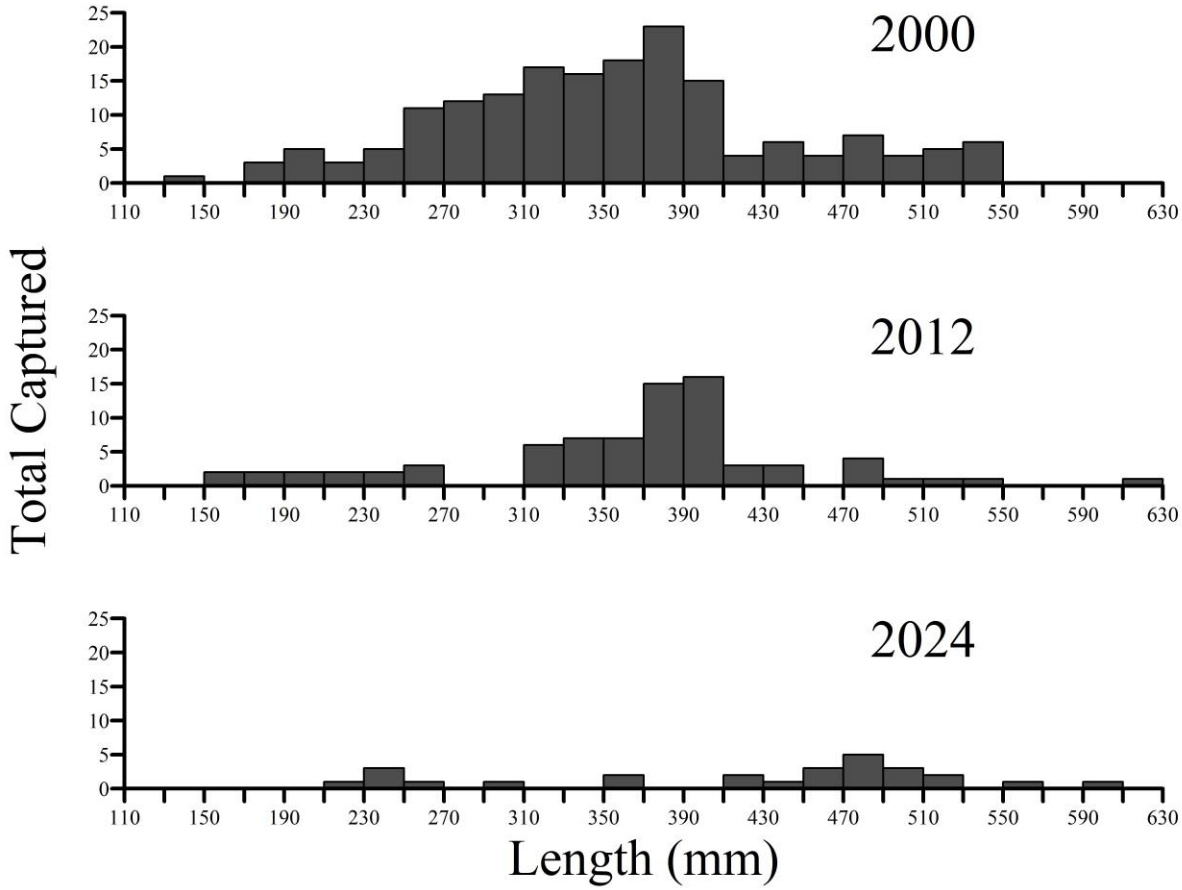

Figure 11. Length Frequency distribution of fall caught Northern Pikeminnow during annual gillnet monitoring in Noxon Reservoir in 2000 (n = 178), 2012 (n = 78), and 2024 (n = 26).

Four Largescale Suckers were captured in 2024 (0.3 fish/net), compared to 25 fish in 2012 (0.9 fish/net), and 56 fish in 2000 (1.9 fish/net; Table 1; Figure 12). Largescale Suckers have also shown a significant decline since standardized gillnetting began (linear regression, $r^2 = 0.79$, $p < 0.001$; Appendix B).

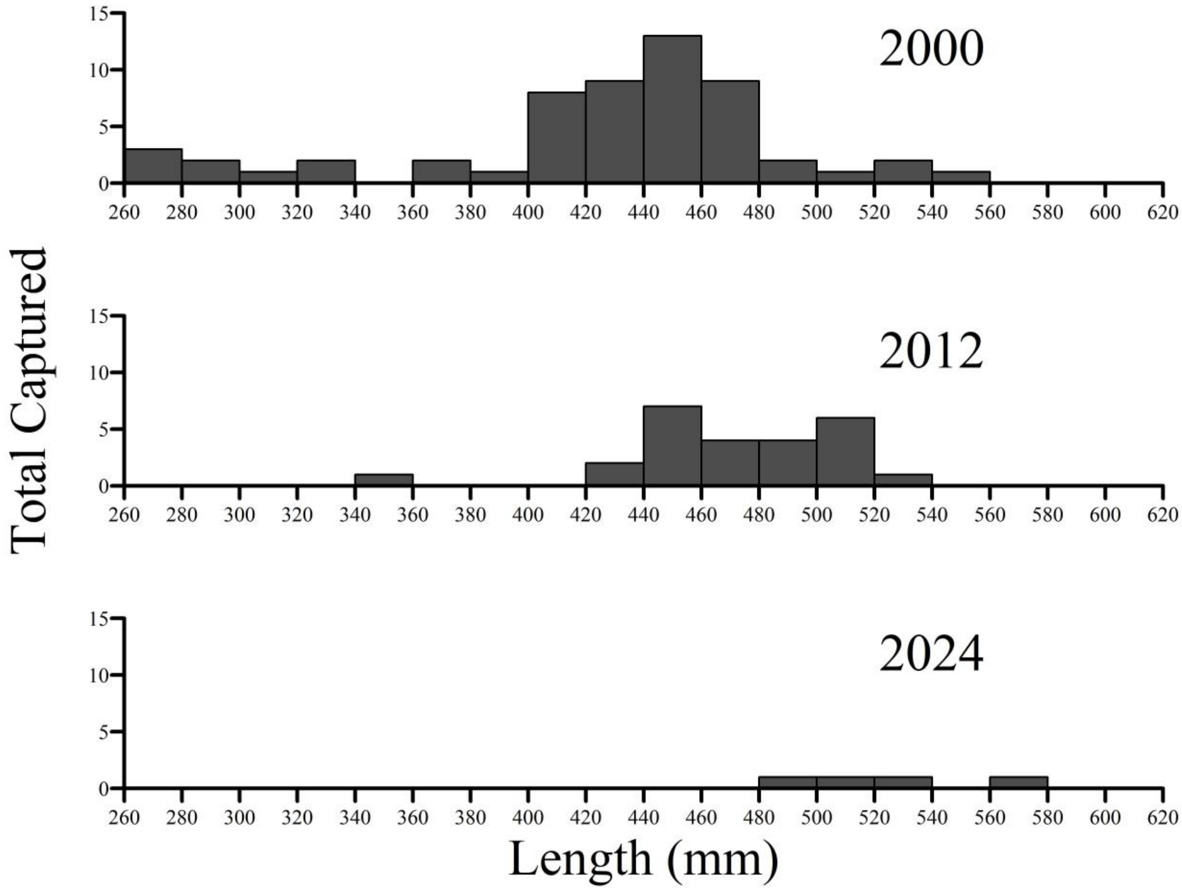

Figure 12. Length Frequency distributions of fall caught Largescale Suckers during annual gillnet monitoring in Noxon Reservoir in 2000 (n = 56), 2012 (n = 25), and 2024 (n = 4).

The most dramatic decline has been observed in Peamouth (linear regression, $r^2 = 0.90$, $p < 0.001$) where a mean catch of 11.6 fish/net (n = 338) was recorded in 2000 and 2.3 fish/net (n = 69) in 2012, compared to 0 fish/net in 2024 (Appendix B). This is the first year in which no Peamouth have been captured during fall gillnet surveys in Noxon Reservoir. This is likely signaling that Peamouth have now been functionally extirpated from both impoundments on the LCFR (Rehm et al. 2022). Size structure of Northern Pikeminnow and Largescale Sucker populations, which have likely served as an important prey resource for gamefish species, indicate little if any successful recruitment in recent years. Northern Pikeminnow, Largescale Sucker, and Peamouth captured in Noxon Reservoir during 2022 gill net surveys (Rehm et al. 2023) were aged in 2024. These ages provide additional evidence of recruitment failure for the native sucker and minnow species. The mean age of Northern Pikeminnow (n = 29) was 16.6 years (range = 2–38; Figure 13). The mean age of Largescale Sucker (n =1 4) was 16.4 years (range = 9–27; Figure 13). The mean age of Peamouth (n = 4) was 11.5 years (range = 10–15; Figure 13). These populations generally appear to be comprised of historically low numbers of large, old individuals and are in danger of local extirpation.

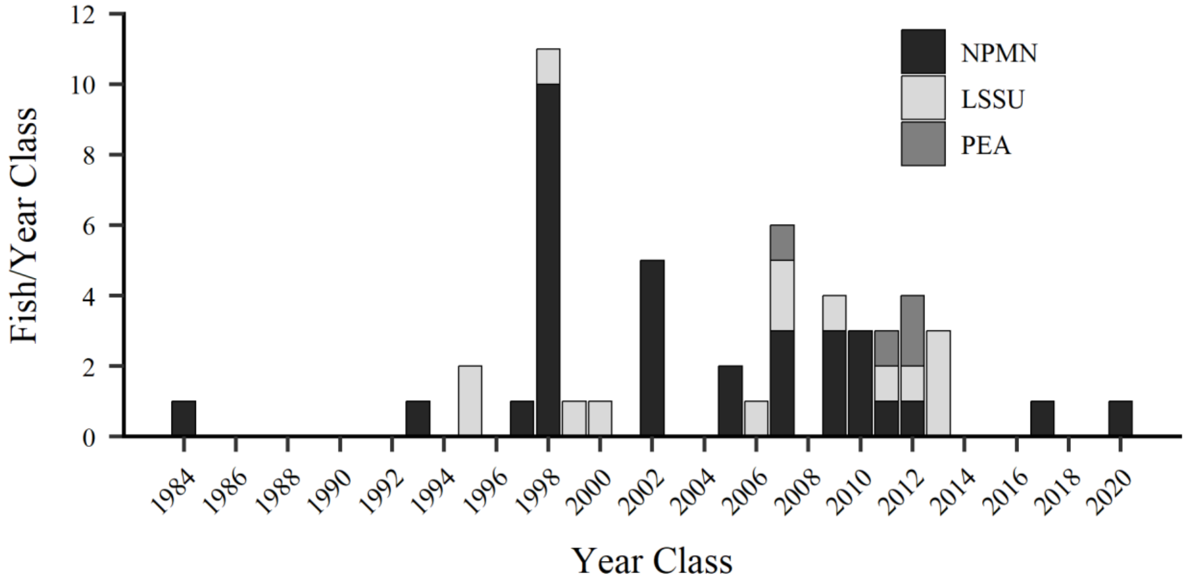

Figure 13. Year class distribution of Northern Pikeminnow, Largescale Sucker, and Peamouth collected in Noxon Reservoir during annual fall gill netting during 2022 (Rehm et al. 2023).

Cabinet Gorge Reservoir

Gill netting was conducted in Cabinet Gorge Reservoir October 13–14, 2024 and produced a total of 251 fish representing 11 species (Table 4). Catch per unit effort trends are shown as a function of mean fish/net in Appendix C for commonly captured fish species 2000–2024. The catch rate of 16.7 fish/net is up from recent years and above the historic average (2000–2023 mean catch 13.4 fish/net). Yellow Perch were the most abundant species captured in 2024, representing 43.8% of the total catch (n = 110). The mean number of Yellow Perch captured in 2024 was 7.3 fish/net, which is more than the 2000–2023 mean catch of 4 fish/net and was near the highest abundance observed since standardized netting began in 2000 (Figure 14; Table 4). Pumpkinseed were the second most abundant fish species caught and comprised 12.4% of the total catch (n = 31). The mean catch rate for Pumpkinseed was 2.1 fish/net in 2024, which was greater than double the 2000-2023 mean of 0.6 fish/net and the highest abundance observed since standardized netting began in 2000 (Figure 14; Table 4). The mean number of Lake Whitefish captured in 2024 was 0.7 fish/net which is more than the mean 2000-2023 catch of 0.4 fish/net (Table 4).

Table 4. Catch rates (fish/net), total number caught, percentage of total species composition by number and biomass (percent of total weight), mean weight, weight range, mean length and length range for species captured in Cabinet Gorge Reservoir during gill netting surveys conducted in 2024. Species abbreviations are specified in Appendix A.

Species	Mean fish/net (STDEV)	Total # caught	Species Comp. (%)	Percent of Total Weight (%)	Mean Weight (g)	Weight Range (g)	Mean Length (mm)	Length Range (mm)
YP	7.3 (10.8)	110	43.8	8.9%	100.8	30–275	197.4	116–263
PUMP	2.1 (4.5)	31	12.4	1.5%	55.5	20–75	125.8	93–150
NP	2.0 (3.3)	30	12.0	26.5%	1042.0	265–2235	528.5	355–697
LSSU	1.7 (1.8)	26	10.4	25.4%	1196.2	725–1830	469.8	430–532
SMB	1.4 (3.3)	21	8.4	8.6%	483.8	80–1220	309.1	190–424
LWF	0.7 (1.3)	10	4.0	8.9%	1046.5	760–1580	481.8	448–538
NPMN	0.7 (0.8)	10	4.0	10.4%	1221.5	195–1765	452.0	188–530
WE	0.3 (0.5)	5	2.0	4.8%	1124.0	270–2605	464.4	307–637
LL	0.3 (0.5)	4	1.6	3.4%	988.8	50–1740	441.5	180–602
LMB	0.1 (0.4)	2	0.8	0.5%	315.0	40–590	237.0	145–329
LNSU	0.1 (0.5)	2	0.8	1.2%	695.0	495–895	387.0	350–424

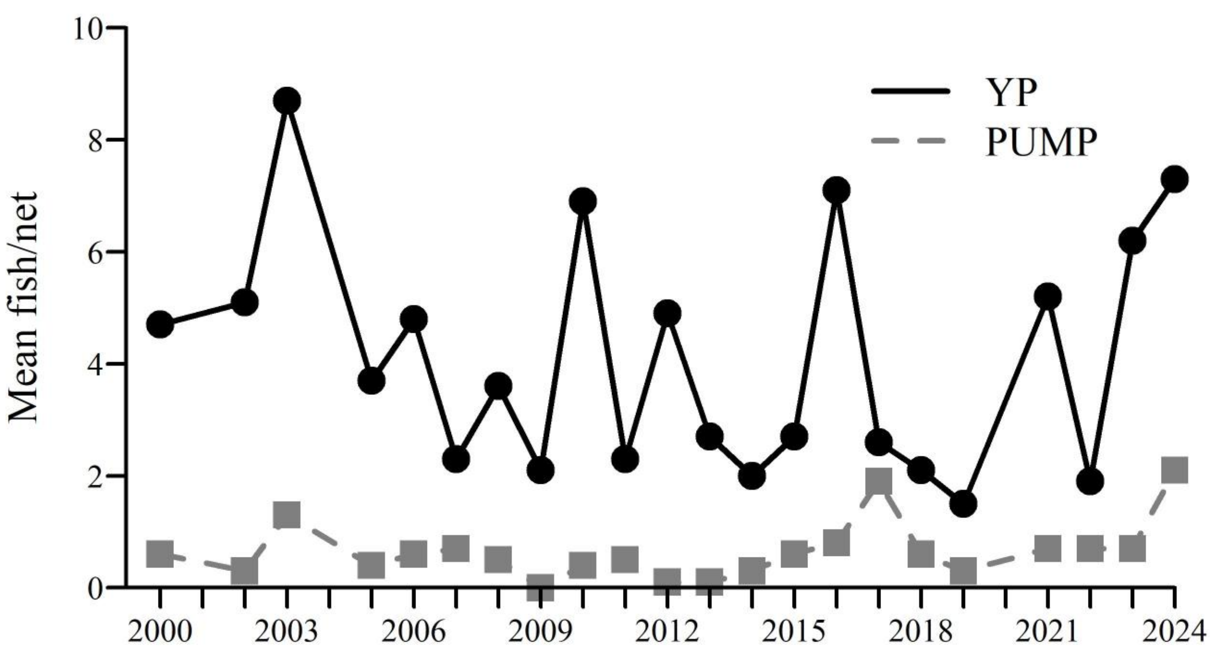

Figure 14. Mean number of fish per net for Yellow Perch and Pumpkinseed 2000–2024 in Cabinet Gorge Reservoir during annual fall gill netting.

Similar to Noxon Reservoir, gillnets are an effective method to monitor relative abundance of Walleye and Northern Pike. In general, bass are not susceptible to being captured in gillnets when compared to most other species in the reservoirs. Smallmouth Bass are captured at a higher rate than Largemouth Bass, but both species are underrepresented to an unknown degree in relation to their abundance in the fish community.

Northern Pike were the most abundant top predator species captured within Cabinet Gorge Reservoir, representing 12.0% of the total catch (n = 30; Table 4), which was the highest number since standardized netting began in 2000 (Figure 15). Mean catch was 2.0 fish/net, which was over double the historic average (2000–2023 mean catch 0.7 fish/net; Appendix C). Northern Pike abundance has shown a significant increase since standardized gillnetting began (linear regression, $r^2 = 0.58$, $p < 0.001$). Mean Wr for Northern Pike was 96.6 in 2024, which continues a significant decline since 2000 (linear regression, $r^2 = 0.37$, $p = 0.003$; Figure 15). While Wr in Northern Pike has declined from the 2000–2023 mean (111.1), Northern Pike condition is still considered greater than the 50th percentile in large standing waters of North America (Figure 16; Bonar et al. 2009).

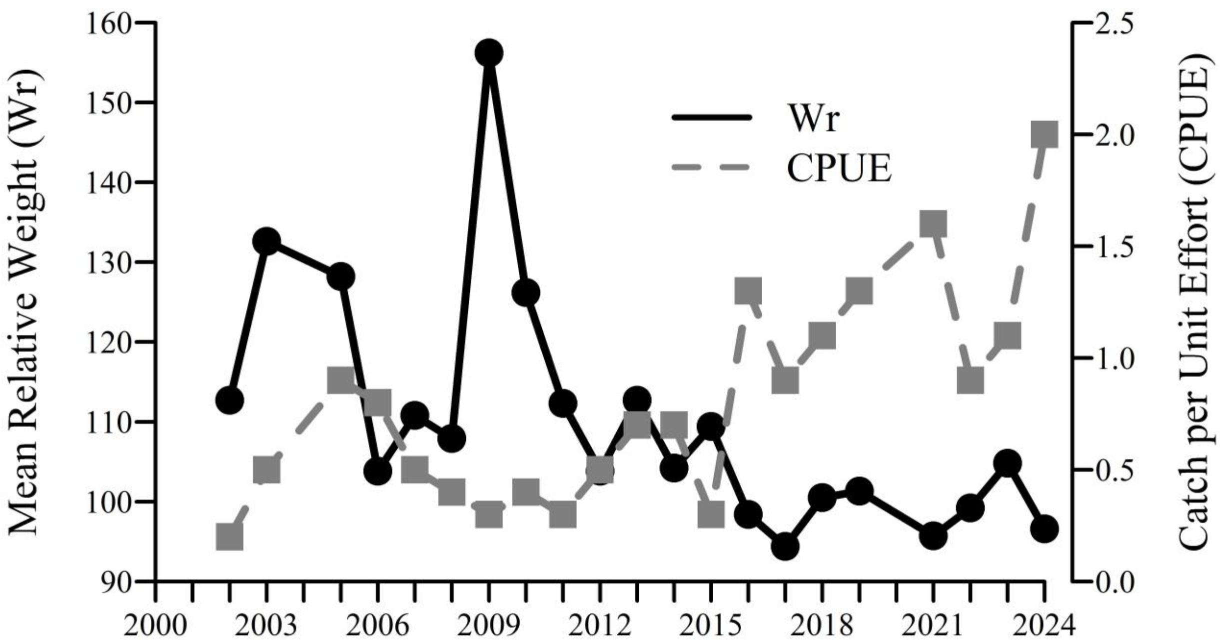

Figure 15. Mean relative weight and number of fish per net of fall-captured Northern Pike over time in Cabinet Gorge Reservoir.

Proportional size distribution for Northern Pike captured during fall of 2024 was 46. This recent decrease can likely be attributed to the increase in the Northern Pike population. This represents slowing of growth and increased mortality as resources become more limited (Neumann and

Allen 2007). The population also may be maintained and/or supplemented by immigration from upstream sources as opposed to spawning within Cabinet Gorge Reservoir (Bernall and Moran 2005). Length groups showed no statistically significant difference (sub-stock = <350 mm stock = 350–529 mm, quality = 530–709 mm, preferred = 710–859 mm, and memorable = 860–1,119 mm). Trends of increasing abundance and decreasing condition observed in Northern Pike were similar to those observed in Noxon Reservoir.

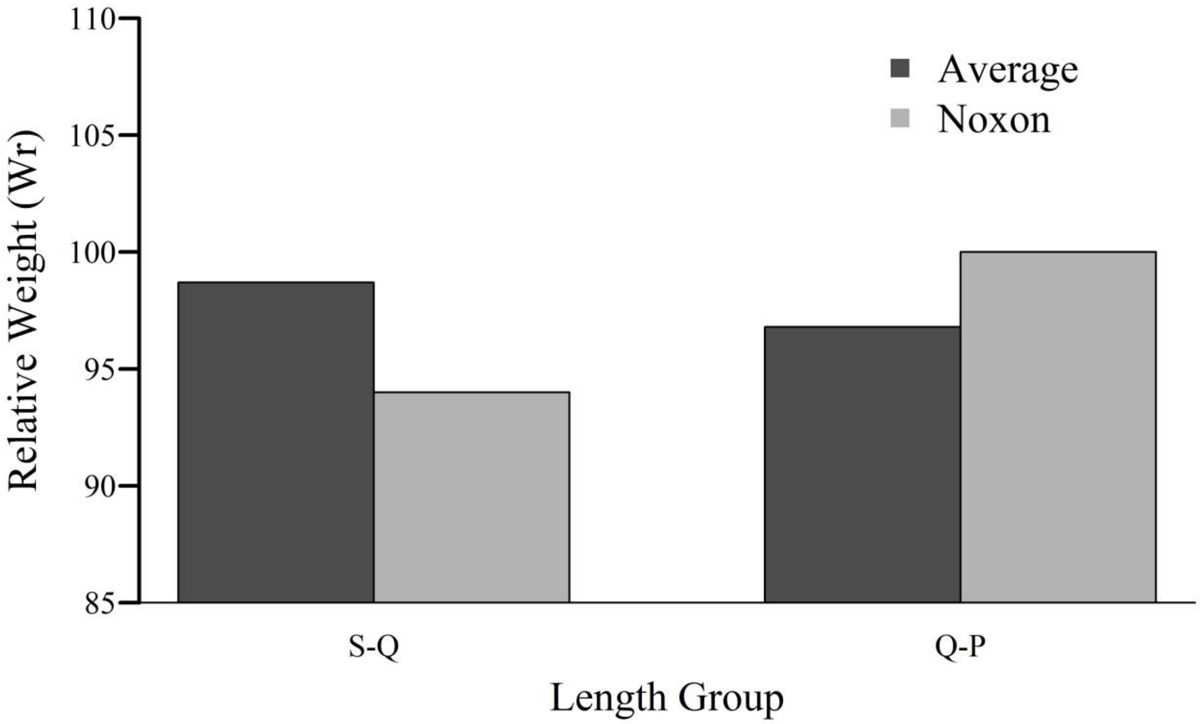

Figure 16. Average condition of Northern Pike caught using standardized gill nets in large standing waters in North America (Bonar et al. 2009) and average condition of fall caught Northern Pike from Cabinet Gorge Reservoir in 2024. S = stock, Q = quality, and P = preferred (Gabelhouse 1984).

Walleye were the third most abundant top predator species captured, within Cabinet Gorge Reservoir, representing 2% of the total catch (n = 5). Mean catch was 0.3 fish/net, which was near the mean 2000–2023 catch rate of 0.2 fish/net. All Walleye captured during fall gill netting efforts had sex determined (2 Males and 3 Females). Walleye captured in 2024 were comprised of the 2021 (40%), 2019 (40%), and 2013 (20%) year-classes. Similar to Noxon Reservoir, the 2021 and 2019 year-classes represent the majority of Walleye captured. However, we have not observed the same increases in the Cabinet Gorge Walleye population as those in Noxon Reservoir. This is likely due to the lower water residence time in Cabinet Gorge and the inability of Walleye to recruit within the reservoir. We suspect many of the Walleye captured within Cabinet Gorge are spawned and subsequently washing down from Noxon Reservoir. Beginning in 2023 submersible Biomark antenna systems were deployed in Cabinet Gorge Reservoir directly below Noxon Dam as part of the of the Fish Passage/Native Salmonid Restoration Plan (Appendix C), *Upstream Fish Passage Program*. One Walleye tagged in 2022 during spring Walleye sampling above Noxon Dam was detected on these submersible PIT tag arrays in 2024. A total of three Walleye tagged in Noxon Reservoir have been detected in Cabinet Gorge Reservoir directly below Noxon Dam since 2023. These detections provide evidence that entrainment in Cabinet Gorge Reservoir could be affecting some proportion of the adult Walleye population in Noxon Reservoir.

Smallmouth Bass were the second most abundant top predator species captured, representing 8.4% of the total catch (n = 21; Table 4). Mean catch rate for Smallmouth Bass in 2024 was 1.4 fish/net (Table 1), which is substantially higher than the 2000–2023 mean catch rate (0.6 fish/net). Since an increase in Smallmouth Bass abundance was observed in 2022, abundance has remained at or near historic high for the species. Condition of Smallmouth Bass captured within Cabinet Gorge Reservoir continues to be high with a mean Wr of 93.7 in 2024. Smallmouth Bass mean Wr has ranged from a low of 88.6 (n = 3) in 2017 to a high of 112.4 (n = 8) in 2000 and no decline has been detected over the sampled period (linear regression, $p = 0.21$). The downward trend in Northern Pike Wr may be indicative of increasing competition for prey resources and habitat among top predators in this complex ecosystem. Similar to Noxon Reservoir, the authors hypothesize that the ability to exploit the abundant Signal Crayfish and Virile Crayfish populations within Cabinet Gorge Reservoir have allowed Smallmouth Bass condition to remain stable as predator populations grow (Clady 1974; Frey et al. 2003: Olson and Young 2003). While it is very likely that recent increases in Smallmouth Bass catch are indicative of increases in the overall population, it is still less clear how representative gill net data is of the actual population, given the notable difficulty catching the species in gillnets. Future efforts should be made to evaluate the potential for taking “snapshots” of the Cabinet Gorge Reservoir food web using stable isotopes and diet analysis which may help to provide a better understand of interactions among predators, prey, and environmental conditions in the reservoir.

Native non-gamefish species such as Northern Pikeminnow and Largescale Sucker continue to be captured at low levels in Cabinet Gorge. In 2024, 10 Northern Pikeminnow were captured comprising 10.4% of the total fish community (Table 4). A significant decline in the species has been documented since 2000 (linear regression, $r^2 = 0.77$, $p < 0.001$), when 7.1 fish/net in 2000 (n = 100) and 4.1 fish/net were documented in 2012 (n = 62), compared to 0.7 fish/net in 2024 (n = 10; Figure 17).

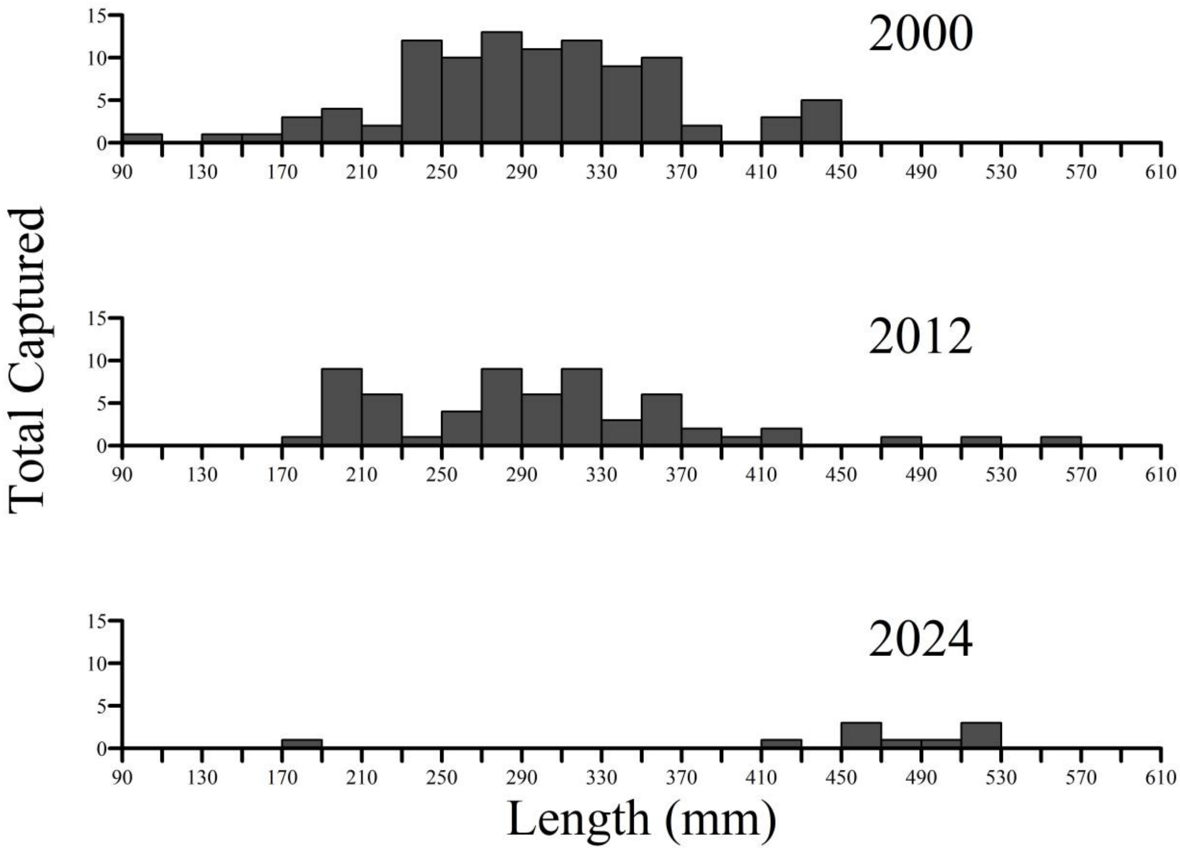

Figure 17. Length Frequency distribution of fall caught Northern Pikeminnow during annual gillnet monitoring in Cabinet Gorge Reservoir in 2000 (n = 100), 2012 (n = 62), and 2024 (n = 10).

Twenty-six Largescale Suckers, comprising 10.4% of the total fish community, were captured in 2024 (1.7 fish/net), compared to 23 fish in 2012 (1.5 fish/net) and 31 fish in 2000 (2.1 fish/net; Table 4; Figure 18). Declines in the Cabinet Gorge Reservoir Largescale Sucker population have not been as prominent as other native non-gamefish species. However, length-frequency histograms still show a size structure that continues to increase, suggesting an aging population with limited recruitment (Figure 18).

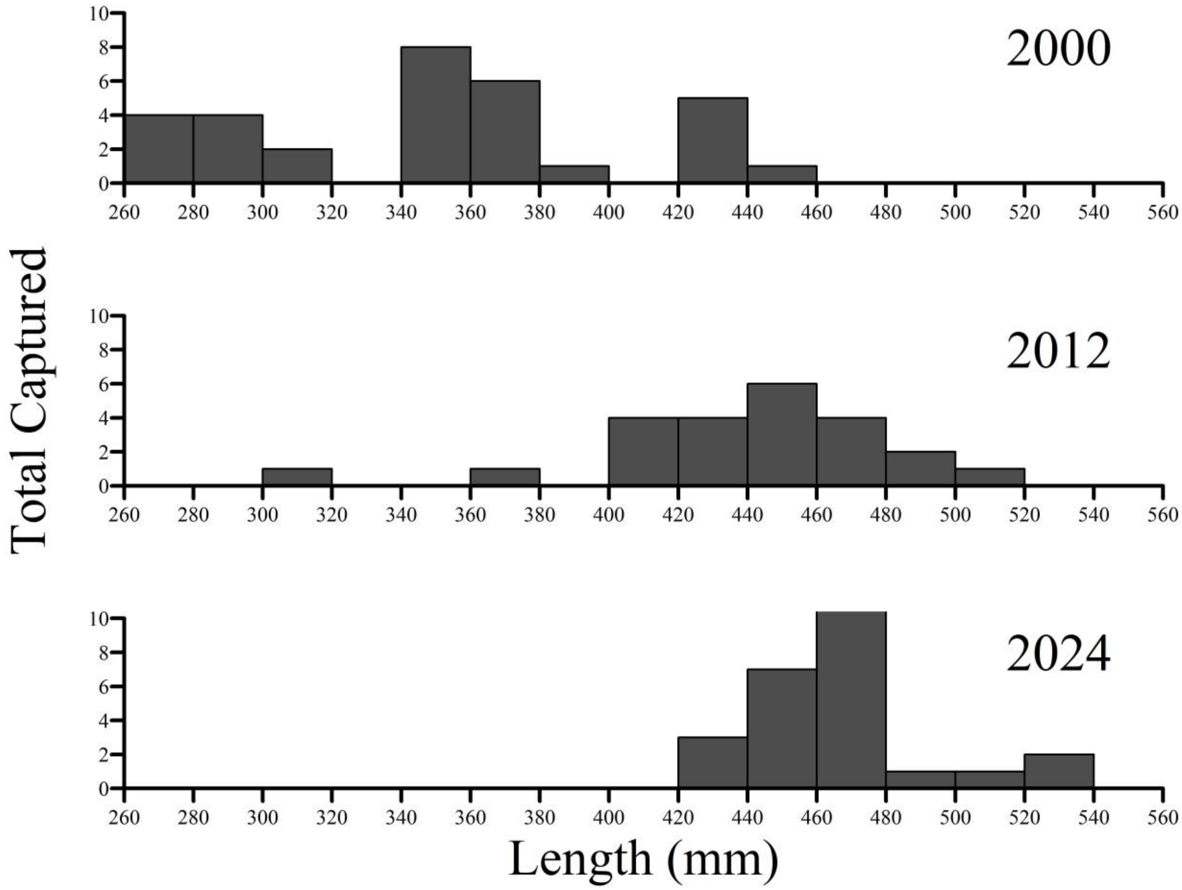

Figure 18. Length Frequency distribution of fall caught Largescale Sucker during annual gillnet monitoring in Cabinet Gorge Reservoir in 2000 (n = 31), 2012 (n = 23), and 2024 (n = 26).

For the seventh consecutive year, no Peamouth were captured in Cabinet Gorge Reservoir. It appears that Peamouth have been functionally extirpated from Cabinet Gorge Reservoir. Size structure of Northern Pikeminnow and Largescale Sucker populations, which have likely served as an important prey resource for gamefish species, indicate little if any successful recruitment in recent years. Northern Pikeminnow, Largescale Sucker, and Peamouth captured in Cabinet Gorge Reservoir during 2022 gill net surveys (Rehm et al. 2023) were aged in 2024. These ages provide additional evidence of recruitment failure for the native sucker and minnow species. The mean age of Northern Pikeminnow (n = 19) was 16.8 years (range = 8–26; Figure 19). The mean age of Largescale Sucker (n = 12) was 22.1 years (range = 13–27; Figure 19). These populations generally appear to be comprised of historically low numbers of large, old individuals and are in danger of local extirpation.

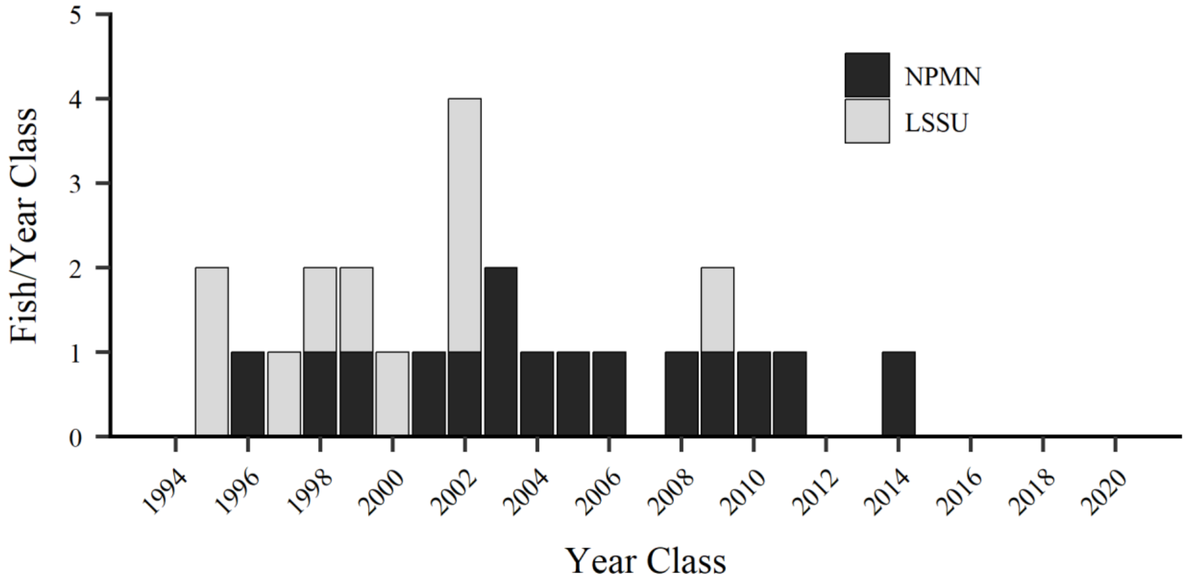

Figure 19. Year class distribution of Northern Pikeminnow (NPMN) and Largescale Sucker (LSSU) collected in Cabinet Gorge Reservoir during annual fall gill netting during 2022 (Rehm et al. 2023).

Over the past decade, the major fish community change in Noxon and Cabinet Gorge reservoirs has been the result of establishment and continued increase of Walleye and to a less degree continued increases in Northern Pike abundance (Kreiner and Tholl 2016; Kreiner et al. 2020; Rehm et al. 2022). Concurrently, abundance of native sucker and minnow species has declined. Recent declines in condition of Walleye and Northern Pike, also indicate that the increase in total piscivores has ultimately resulted in a substantial decrease of forage fishes. If trends in condition, growth, and prey abundance continue on this trajectory, both the native species and quality of angling for non-native predators could suffer. The continued monitoring of the fish community and population of Walleye in Noxon Reservoir and Cabinet Gorge Reservoir will be paramount to informing management decisions into the future.

Spring Walleye Sampling

Montana Fish, Wildlife and Parks electrofished upper Noxon Reservoir for Walleye on nine separate occasions during the spring of 2024. Sampling effort and dates were affected by boat ramp accessibility due to low reservoir levels in spring. Sampling time was split between the area above the Highway 200 bridge (88%) and the area adjacent to the River's Bend Golf Course (12%; Figure 4). A total of 337 sexually mature fish were captured, of which 59 (18%) were females and 278 (82%) were males (Figure 20). Of the 337 fish captured, 79 (23%) were sacrificed for age analysis.

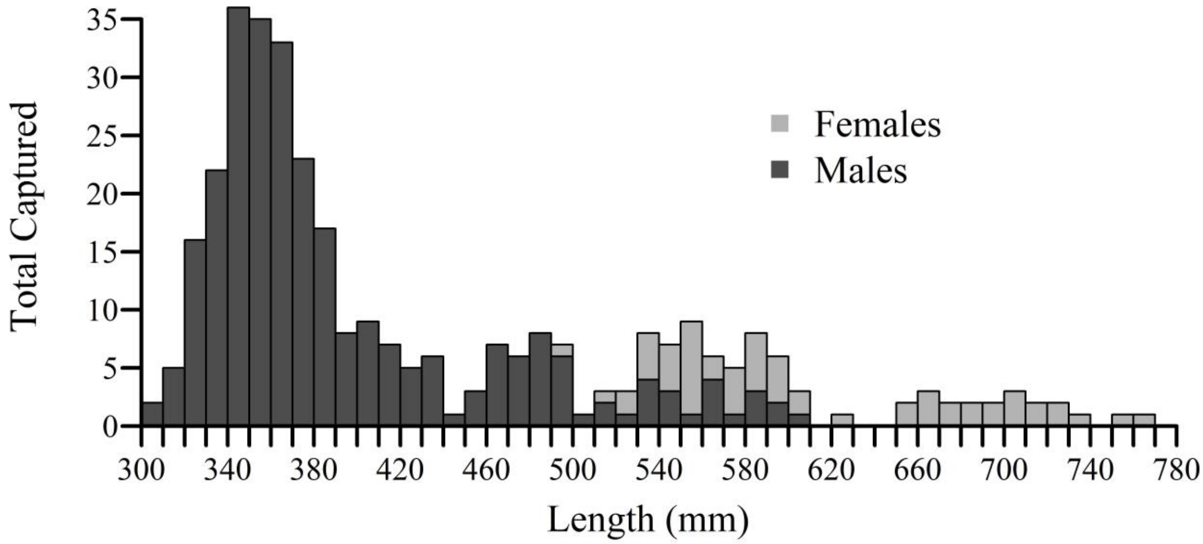

Figure 20. Length frequency distribution of spring caught walleye from Noxon Reservoir in 2024.

A strong 2019 year-class was first detected during 2021 fall gill netting efforts (Rehm et al. 2022). This year-class has continued to be observed in both fall gill netting efforts and spring Walleye sampling in 2022 and 2023 (Rehm et al. 2023; Rehm et al. 2024). As predicted, the majority of females of the 2019 year-class recruited to the spawning population in 2023. A strong 2021 year-class was also first detected during 2023 fall gill netting efforts (Rehm et al. 2024). This year-class was observed in both fall gill netting efforts and spring Walleye sampling in 2024. As predicted, males of the 2021 year-class have begun to recruit to the spawning population. However, females have yet to mature and are expected to recruit to the spawning population during the spring of 2025 and 2026. Males were represented primarily by the 2021 year-class (60%) followed next by the 2019 year-class (23%), the 2020 year-class (10%), and the 2015 year-class (5%; Figure 21). Females' most abundant year-class is 2019 (61%) followed next by the 2015 year-class (27%; Figure 21). Mature males and females were captured from eleven different year-classes (Table 5). Spring Walleye sampling in 2024 showed a spawning population dominated by the 2021, 2019, and 2015 year-classes (age 3, 5, and 9; Figure 21). Past monitoring has shown that even moderate year classes can make noticeable contributions to the overall population up to seven years later (Kreiner et al. 2020 and Blakney and Tholl et al. 2021). Walleye from the 2021 and 2019 year-classes will persist for several more years and will have the opportunity to contribute to another strong year-class when favorable spawning conditions permit.

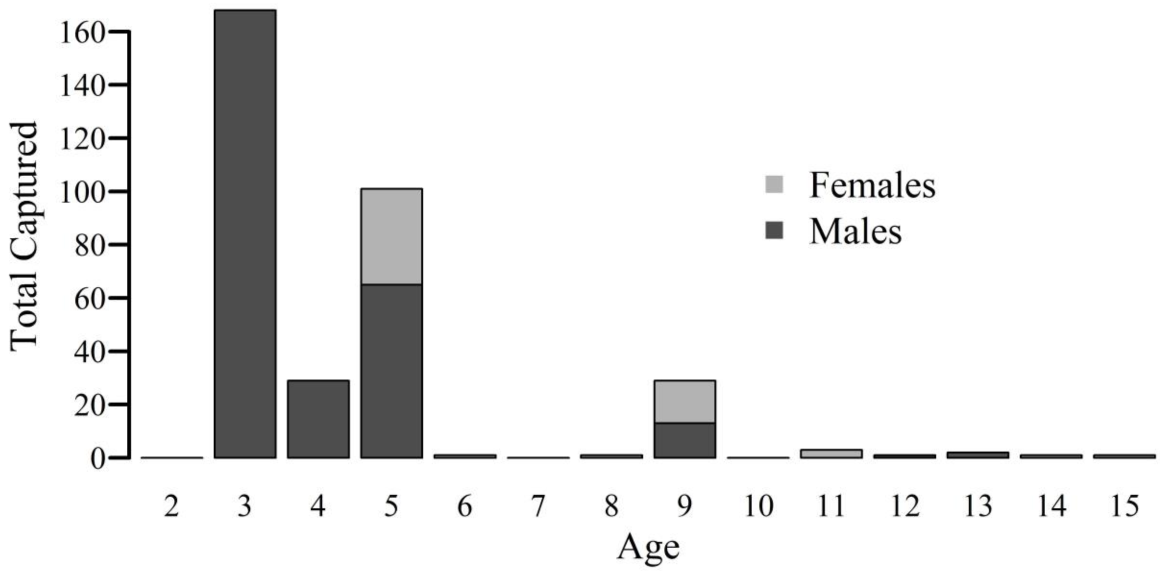

Figure 21. Age frequency distribution of spring caught Walleye from Noxon Reservoir in 2024.

Mean length of males captured was 392 mm (range = 305–605; Table 5). Of these fish, 80 (29%) exceeded 400 mm in length. Size structure decreased in 2024 with strong influence from the young 2021 year-class. In contrast, mean length of females captured was 612 mm (range = 500–765; Table 5). All females exceeded 400 mm in length with the majority now being represented by the 2019 year-class. The 2015 year-class, that has dominated the female spawning populations since 2018 (Kreiner et al. 2020), has begun to age out of the population and will be replaced by strong year-classes of 2019 and 2021. Size structure of the female spawning population of Walleye is similar to recent years and should increase as the 2019 and 2021 year-classes age. However, over the next couple of years, we predict that overall size structure could decrease as we expect influx of Walleye from the 2021 year-class to recruit to the spawning population. Additionally, while we have shown that Walleye can persist in Noxon Reservoir for up to 18 years (Rehm et al. 2022), we expect the majority of the 2015 year-class to age out the population over the coming years.

Table 5. Mean length-at-age for spring caught Walleye from Noxon Reservoir in 2024.

Age	Males			Females			Total		
	n	Mean Length (mm)	SD	n	Mean Length (mm)	SD	n	Mean Length (mm)	SD
3	168	354	20.7	-	-	-	168	354	20.7
4	29	367	12.2	-	-	-	29	367	12.2
5	65	458	38.5	36	561	24.6	101	495	60.2
6	-	-	-	1	608	-	1	608	-
7	-	-	-	-	-	-	-	-	-
8	-	-	-	1	630	-	1	630	-
9	13	567	19.4	16	690	26,5	29	635	67.0
10	-	-	-	-	-	-	-	-	-
11	-	-	-	3	702	7.1	3	702	7.1
12	1	605	-	-	-	-	1	605	-
13	2	584	4.9	-	-	-	2	584	4.9
14	-	-	-	1	754	-	1	754	-
15	-	-	-	1	765	-	1	765	-

Overall catch rate was 46.2 fish per hour and ranged 15.7–105.3 fish per hour. Total catch peaked on April 17 when water temperature was 10.0°C and flow was 20,500 cfs (Figure 22). Female catch rate remained relatively low until April 3 and peaked on April 17 at 14.0 per hour. Total fish captured was highest just prior to the increasing limb of the hydrograph, when Walleye are responding to spring temperature and flows and moving to spawning areas (Colby et al. 1979). However, as flows continued to rise, the catchability with our sampling equipment quickly declined as did catch rates.

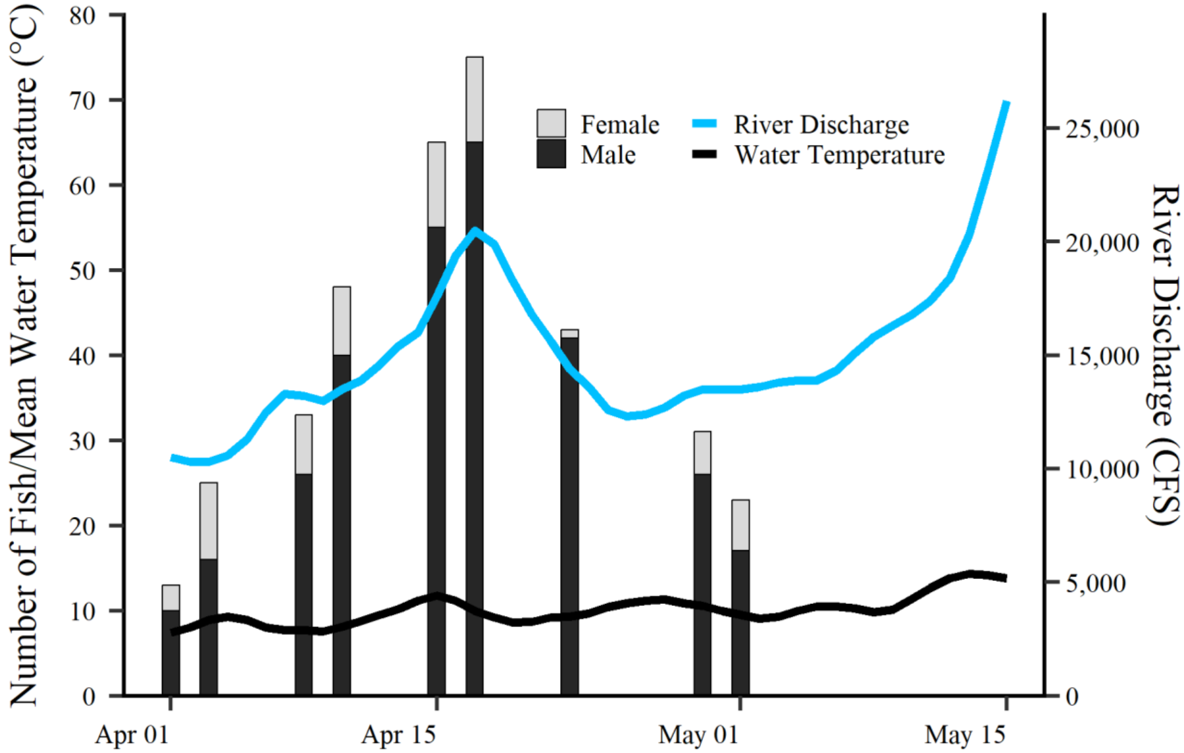

Figure 22. Catch per unit effort of Walleye during spring 2024, with river discharge and mean water temperature.

Of the 258 fish PIT tagged and released alive, 19 were subsequently captured during a later sampling date in 2024 (within year recaptures), and 16 additional fish captured in 2024 had been captured and tagged in prior years (previous year recaptures). Most of the Walleye tagged in previous years were recaptured after only one growing season (44%). However, Walleye recaptured after two growing seasons is still common (31%). The remaining fish were captured after three (12.5%) and five (12.5%) growing seasons (Table 6). Recaptures from 2019 sampling still regularly occurring is likely due to the high number of Walleye (n = 521) tagged that spring. Recapture rates for fish PIT tagged in 2019 and 2021 through 2023 were <1%, 1.2%, 2.8%, and 4.5% respectively. The majority of recaptured Walleye were male, little inferences may be drawn from this as most previously PIT tagged Walleye are also male. The mean length of recaptured fish was 557 mm. Recaptured fish grew between 19 and 46 mm per year with a mean value of 29 mm (Table 6).

Table 6. Mean yearly growth of recaptured Walleye sampled during spring 2024.

PIT Tag Number	Initial Capture Date	Initial Capture Length (mm)	Recapture Date	Recapture Length (mm)	Sex	Mean Yearly Growth (mm)
982000362691413	4/10/2019	400	4/22/2024	550	Male	30
982000362929561	4/25/2019	397	4/17/2024	579	Male	36
982000357016266	4/22/2021	585	4/15/2024	691	Female	35
982000357016293	5/3/2021	485	4/10/2024	570	Male	28
982091070216184	4/18/2022	399	4/17/2024	490	Male	46
982091070216198	4/18/2022	528	4/10/2024	566	Male	19
982091070216212	4/26/2022	548	4/17/2024	588	Male	20
982091070216130	4/27/2022	595	4/15/2024	664	Female	35
982091070216278	4/27/2022	375	4/15/2024	438	Male	32
982091070216295	4/17/2023	465	4/17/2024	490	Male	25
982091070216336	4/17/2023	404	4/10/2024	428	Male	24
982091070216401	4/19/2023	689	4/17/2024	715	Female	26
982091070216358	4/24/2023	570	4/10/2024	595	Male	25
982091070216368	4/24/2023	438	4/1/2024	467	Male	29
982091070216395	4/24/2023	644	4/17/2024	675	Female	31
982091070216550	5/1/2023	391	4/3/2024	410	Male	19

Beginning in 2024 submersible Biomark antenna systems were deployed in upper Noxon Reservoir directly below Thompson Falls Dam as part of efforts to evaluate the efficacy of the Thompson Fall Dam Fish Ladder (NWE 2025). These antennas detected eight Walleye originally tagged during spring electrofishing efforts in 2017 (n = 1), 2019 (n = 2), 2020, (n = 2), 2021 (n = 1), 2023 (n = 1), and 2024 (n = 1). Detection dates ranged from July 15th to October 21st 2024 providing evidence that Walleye inhabit the upper reaches of Noxon Reservoir outside their spawning season.

Growth curves and parameters (Appendix E) were calculated for all Walleye and both sexes from otoliths of 54 males and 25 females. Supporting reported mean length-at-age data, female Walleye growth rate was greater than that of males (Table 5; Appendix E).

Bass Tournament Monitoring

Four bass tournaments, all spanning two days, were monitored to help assess the overall status of the bass fishery in Noxon (n = 3) and Cabinet Gorge reservoirs (n = 1). The first being the Montana Bass Team Open (May 4 and 5), the second being the Montana Bass Nation State Team Qualifier (June 1 and 2), the third was the Montana Bass State Championship on Cabinet Gorge (July 16 and 17), and the fourth was the Tri-State Buddy Tournament (July 27 and 28). Two other bass tournaments occurred on Noxon Reservoir but were not monitored in 2024. Similar to recent years, mean length and proportion of quality fish were high for both species in Noxon Reservoir (Table 7, Figures 21 and 22). Bass weighed in at Noxon Reservoir tournaments continued to be mostly Largemouth Bass (67 %; Table 7). A total of 816 bass were measured during the three Noxon Reservoir tournaments with a mean length of 411 mm for Largemouth Bass and 405 mm for Smallmouth Bass. Of checked-in bass, 11% of Largemouth Bass and 10% of Smallmouth Bass were greater than 460 mm (18 inches; Table 7).

Table 7. Catch statistics for Largemouth (LMB) and Smallmouth Bass (SMB) caught during Noxon Reservoir bass tournaments (listed by dates held) monitored in 2024. Numbers DO NOT include culled fish.

Statistic	Species	5/4–5/5	6/1–6/2	7/27–7/28	Combined
% of Catch	LMB	66	68	68	67
	SMB	34	32	32	33
% ≥ 380 mm	LMB	71	80	79	76
	SMB	68	75	72	71
	Both	70	79	77	74
% ≥ 460 mm	LMB	8	16	13	11
	SMB	8	11	12	10
	Both	8	14	13	11
Total Caught	LMB	251	120	252	623
	SMB	130	57	118	305
	Both	381	177	370	928
Mean Length (mm)	LMB	406	415	415	411
	SMB	402	407	408	405

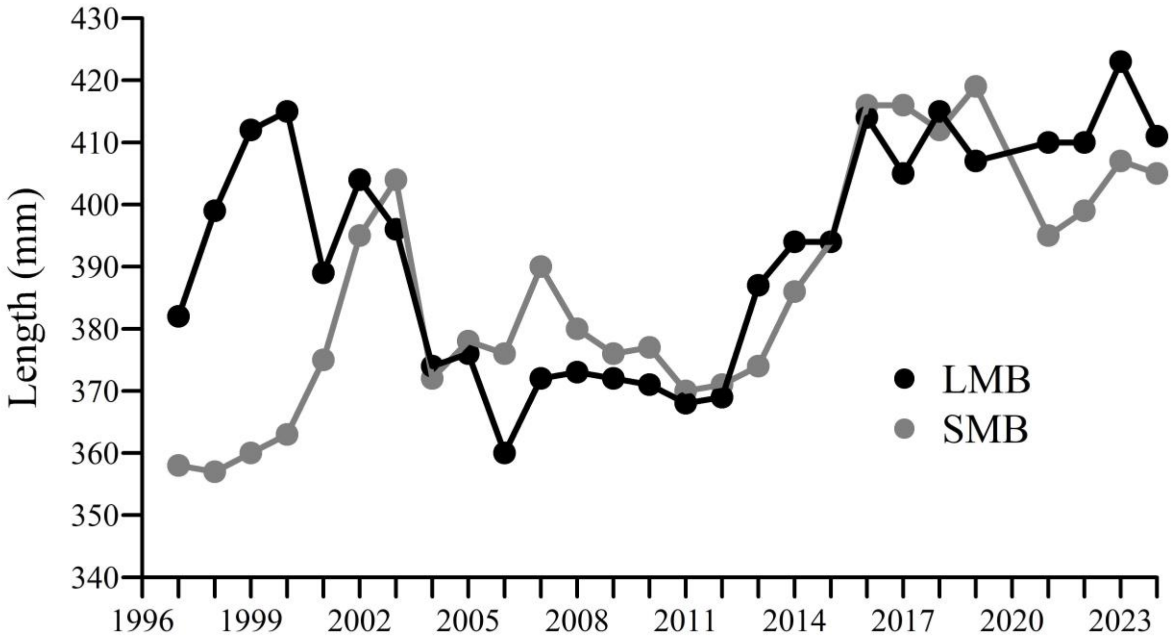

Figure 23. Mean length of both bass species checked in at monitored bass tournaments over time.

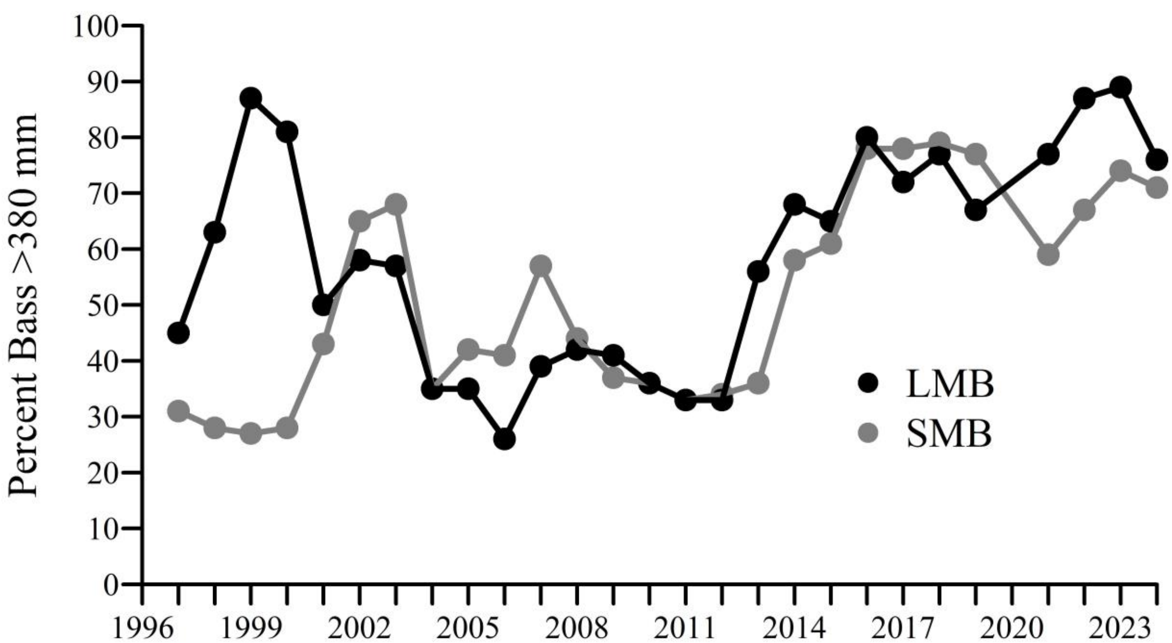

Figure 24. Percent ‘quality’ fish (≥380 mm) checked in at bass tournaments over time.

Bass tournament monitoring continues to show a productive bass fishery in Noxon Reservoir. Sizes and proportion of quality fish of both Largemouth and Smallmouth Bass captured during tournaments are near record highs (Figure 23; Figure 24). Additionally, anecdotal accounts from anglers of Noxon Reservoir have shown high satisfaction with the current bass fishery, no doubt due in part to the consistently higher percentage of quality size bass recorded since 2013. Continued monitoring of bass tournaments will be important moving forward, particularly if abundance of other predators (i.e., Walleye and Northern Pike) within Noxon Reservoir increases.

Bass tournaments are not commonly held on Cabinet Gorge Reservoir. This was only the second time a bass tournament has been monitored on Cabinet Gorge Reservoir. The first was monitored during 2005. Mean length and proportion of quality sized Smallmouth Bass were lower than tournaments monitored in Noxon Reservoir (Table 8). Few Largemouth Bass were weighed, but all were quality fish (Table 8). In contrast with the Noxon Reservoir tournaments, Bass weighed were mostly Smallmouth Bass (96 %; Table 8). A total of 147 Bass were measured during the Cabinet Gorge Reservoir tournament with a mean length of 422 mm for Largemouth Bass and 357 mm for Smallmouth Bass. Of checked-in bass, 0% of Largemouth Bass and 1% of Smallmouth Bass were greater than 460 mm (18 inches; Table 8).

Table 8. Catch statistics for Largemouth (LMB) and Smallmouth Bass (SMB) caught during Cabinet Gorge Reservoir bass tournament monitored in 2024. Numbers DO NOT include culled fish.

Statistic	Species	7/16-7/17
% of Catch	LMB	4
	SMB	96
% $\geq$ 380 mm	LMB	100
	SMB	39
	Both	41
% $\geq$ 460 mm	LMB	0
	SMB	1
	Both	1
Total Caught	LMB	6
	SMB	141
	Both	147
Mean Length (mm)	LMB	422
	SMB	357

Bass tournament monitoring in Cabinet Gorge Reservoir shows a less productive bass fishery than Noxon Reservoir, particularly for Largemouth Bass. Size structure was also smaller for bass measured in the Cabinet Gorge Reservoir tournament. However, in comparison with the 2005 tournament on Cabinet Gorge Reservoir, five times more bass were checked-in during 2024 and both reservoirs had a similar proportion of quality fish. Contemporary, anecdotal observations from anglers of Cabinet Gorge Reservoir have shown high satisfaction with the current Smallmouth Bass fishery.

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References

Anderson, R. O., and A. S. Weithman. 1978. The concept of balance for coolwater fish populations. Pages 371–381 *in* R. L. Kendall, editor. Selected coolwater fishes of North America. American Fisheries Society Special Publication 11, Bethesda, Maryland.

Bernall, S. and S. Moran. 2005. Cabinet Gorge Reservoir Northern Pike Study, Final Report, 2005. Avista Noxon. Montana.

Blakney, J., R. Kreiner, and T. Tholl. 2017. Lower Clark Fork Angler Creel Survey-2015: Noxon Rapids Reservoir, Cabinet Gorge Reservoir, and Bull River. Prepared for: Avista Corporation, Noxon, MT and Montana, Fish Wildlife and Parks, Helena, MT.

Blakney, J. and T. Tholl. 2021. Noxon and Cabinet Gorge Reservoirs Fisheries Monitoring, Annual Progress Update: 2017. Prepared for: Avista Corporation, Noxon. Montana.

Bonar, S. A., W. A. Hubert, and D. W. Willis, editors. 2009. Standard methods for sampling North American Freshwater fishes. American Fisheries Society, Bethesda, Maryland.

Chapman, D. G. and D. S. Robson. 1960. The analysis of a catch curve. Biometrics, 16:354–368.

Clady, M. D. 1974. Food habits of yellow perch, smallmouth bass and largemouth bass in two unproductive lakes in northern Michigan. American Midland Naturalist, 453–459.

Colby, P. J., R. E. McNicol, and R. A. Ryder. 1979. Synopsis of biological data on the Walleye (Stizostedion v. vitreum (Mitchill 1818)). FAO Fish. Synopsis 119.

Duffy, M. J., J. L. McNulty, and T. E. Mosindy. 2000. Identification of sex, maturity, and gonad condition of walleye (Stizostedion vitreum vitreum). Ontario Ministry of Natural Resources Northwest Science & Technology, Thunder Bay, Ontario. NWST FG–05. 33 pp.

Frey, A. P., M. A. Bozek, C. J. Edwards, and S. P. Newman. 2003. Diet overlap and predation between smallmouth bass and walleye in a north temperate lake. Journal of Freshwater Ecology, 18(1), 43-54.

Gabelhouse, D. W. 1984. A length-categorization system to assess fish stocks. North American Journal of Fisheries Management 4:273–285.

Horn, C., J. Hanson, T. Tholl, and K. Duffy. 2009. Noxon Rapids Reservoir Walleye Life History. Prepared for: Avista Corporation, Noxon, MT.

Horn, C., and T. Tholl. 2010. Noxon and Cabinet Gorge Reservoirs Fisheries Monitoring, Comprehensive Report: 1997–2009. Prepared for: Avista Corporation, Noxon, MT.

Huston, J. E. 1985. Thirty-two years of fish management in Noxon and Cabinet Gorge Reservoirs. Report to Montana Fish, Wildlife and Parks, Helena, MT.

Isermann, D. A., and C. T. Knight. 2005. A computer program for age-length keys incorporating age assignment to individual fish. North American Journal of Fisheries Management 25:1153–1160.

Kalff, J. 2002. Reservoirs. Pages 523–538 *in* J. Kalff, editor. Limnology: Inland Water Ways. Prentice Hall. Upper Saddle River, New Jersey 07458.

Kreiner, R. and T. Tholl. 2013. Noxon and Cabinet Gorge Reservoirs Fisheries Monitoring, Comprehensive Report: 1997–2012. Prepared for: Avista Corporation, Noxon MT.

Kreiner, R., and T. Tholl. 2016. Noxon and Cabinet Gorge reservoirs fisheries monitoring, Comprehensive report: 2013–2015, including data from 1999–2015. Prepared for Avista Corporation, Noxon, MT.

Kreiner, R., M. Terrazas, and T. Tholl. 2020. Noxon and Cabinet Gorge Reservoirs Fisheries Monitoring, Comprehensive Report: 2016–2018. Prepared for: Avista Corporation, Noxon. Montana.

MFWP (Montana Fish, Wildlife & Parks). 2017. Montana Statewide Angling Pressure Surveys. http://fwp.mt.gov/fish/anglingData/anglingPressureSurveys/.

MFWP (Montana Fish, Wildlife & Parks). 2019. Montana Statewide Angling Pressure Surveys. http://fwp.mt.gov/fish/anglingData/anglingPressureSurveys/.

MFWP (Montana Fish, Wildlife & Parks). 2023. Montana Statewide Angling Pressure Surveys. http://fwp.mt.gov/fish/anglingData/anglingPressureSurveys/.

MFWP (Montana Fish, Wildlife & Parks). 2025. Montana Fishing Regulations. http://fwp.mt.gov/fishing/regulations/.

Neumann, R. M., C. S. Guy, and D. W. Willis. 2012. Length, weight, and associated indices. Pages 637–676 *in* A. V. Zale, D. L. Parrish, and T. M. Sutton, editors. Fisheries techniques, 3rd edition. American Fisheries Society, Bethesda, Maryland.

Neumann, R. M., and M. S. Allen. 2007. Size Structure. Pages 375–421 in C. S. Guy and M. L. Brown, editors. Analysis and interpretation of freshwater fisheries data. American Fisheries Society, Bethesda, Maryland.

NWE (NorthWestern Energy). 2025. 2024 Annual Report Fish Passage Project. https://northwesternenergy.com/docs/default-source/default-document-library/clean-energy/environmental-projects/thompson-falls/thompson-falls-2024-annual-report.pdf

Ogle, D.H. 2010. Assigning individual ages with an age-length key. R Vignette.

Ogle, D. H. 2016. Introductory fisheries analysis with R. CRC Press, Boca Raton, Florida.

Ogle, D. H., P. Wheeler, and A. Dinno. 2021. FSA: Fisheries Stock Analysis. R package version version 0.8.32, https://github.com/droglenc/FSA.

Olson, M. H., and B. P. Young. 2003. Patterns of diet and growth in co-occurring populations of largemouth bass and smallmouth bass. Transactions of the American Fisheries Society, 132(6), 1207-1213.

Pope, K. L., and C. G. Kruse. 2007. Condition. Pages 423–471 in C. S. Guy and M. L. Brown, editors. Analysis and interpretation of freshwater fisheries data. American Fisheries Society, Bethesda, Maryland.

Quist, M. C., and D. A. Isermann, editors. 2017. Age and growth of fishes: principles and techniques. American Fisheries Society, Bethesda, Maryland.

R Core Team. 2020. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL https://www.R-project.org/.

Rehm, T., J. Blakney, and T. Tholl. 2022. Noxon and Cabinet Gorge Reservoirs Fisheries Monitoring, Annual Progress Update: 2021. Prepared for: Avista Corporation, Noxon. Montana.

Rehm, T., J. Blakney, and T. Tholl. 2023. Noxon and Cabinet Gorge Reservoirs Fisheries Monitoring, Annual Progress Update: 2022. Prepared for: Avista Corporation, Noxon. Montana.

Rehm, T., J. Blakney, and T. Tholl. 2024. Noxon and Cabinet Gorge Reservoirs Fisheries Monitoring, Annual Progress Update: 2023. Prepared for: Avista Corporation, Noxon. Montana.

Robson, D. S., and D. G. Chapman. 1961. Catch curves and mortality rates. Transactions of the American Fisheries Society, 90:181–189.

Scarnecchia, D. L., Y. Lim, S. Moran, T. Tholl, J. DosSantos, and K. Breidinger. 2014. Novel fish communities: native and non-native species trends in two run-of-the-river reservoirs, Clark Fork River, Montana. Reviews in Fisheries Science 22:97–111.

Scarnecchia, D.L., and Y. Lim. 2016. Potential effects of Walleye on the fish community of Noxon Rapids Reservoir, Montana. A report for Montana Fish, Wildlife and Parks. Helena, Montana.

Stevenson, D. K., and S. E. Campana. 1992. Otolith microstructure examination and analysis. Canadian Special Publication of Fisheries and Aquatic Sciences 117–126.

Saffel, P. D. 2000. Survey and inventory of warmwater lakes: Northwest Montana warmwater lakes. Federal Aid in Sport Fish Restoration Project F-78-R-3 through 6, Job IV-a, progress report. Montana Fish Wildlife and Parks, Thompson Falls.

Saffel, P. D. 2003. Influence of spring runoff and water temperature on hatch date and growth of age-0 largemouth bass in a Montana Reservoir. Northwest Science 77:25–35.

Scott, W. B., and E. J. Crossman. 1973. Freshwater Fishes of Canada. Fisheries Research Board of Canada, Ottawa. 966 pages.

Suski, C. D., and D. P. Philipp. 2004. Factors Affecting the Vulnerability to Angling of Nesting Male Largemouth and Smallmouth Bass. Transactions of the American Fisheries Society 133:1100–1106.

Von Bertalanffy, L. 1938. A quantitative theory of organic growth (inquiries on growth laws II). Human Biology 10:181–213.

Willis, D.W. and J.L. Stephen. 1987. Relationships between storage ratio and population density, natural recruitment, and stocking success of walleye in Kansas reservoirs. North American Journal of Fisheries Management 7:279–282.

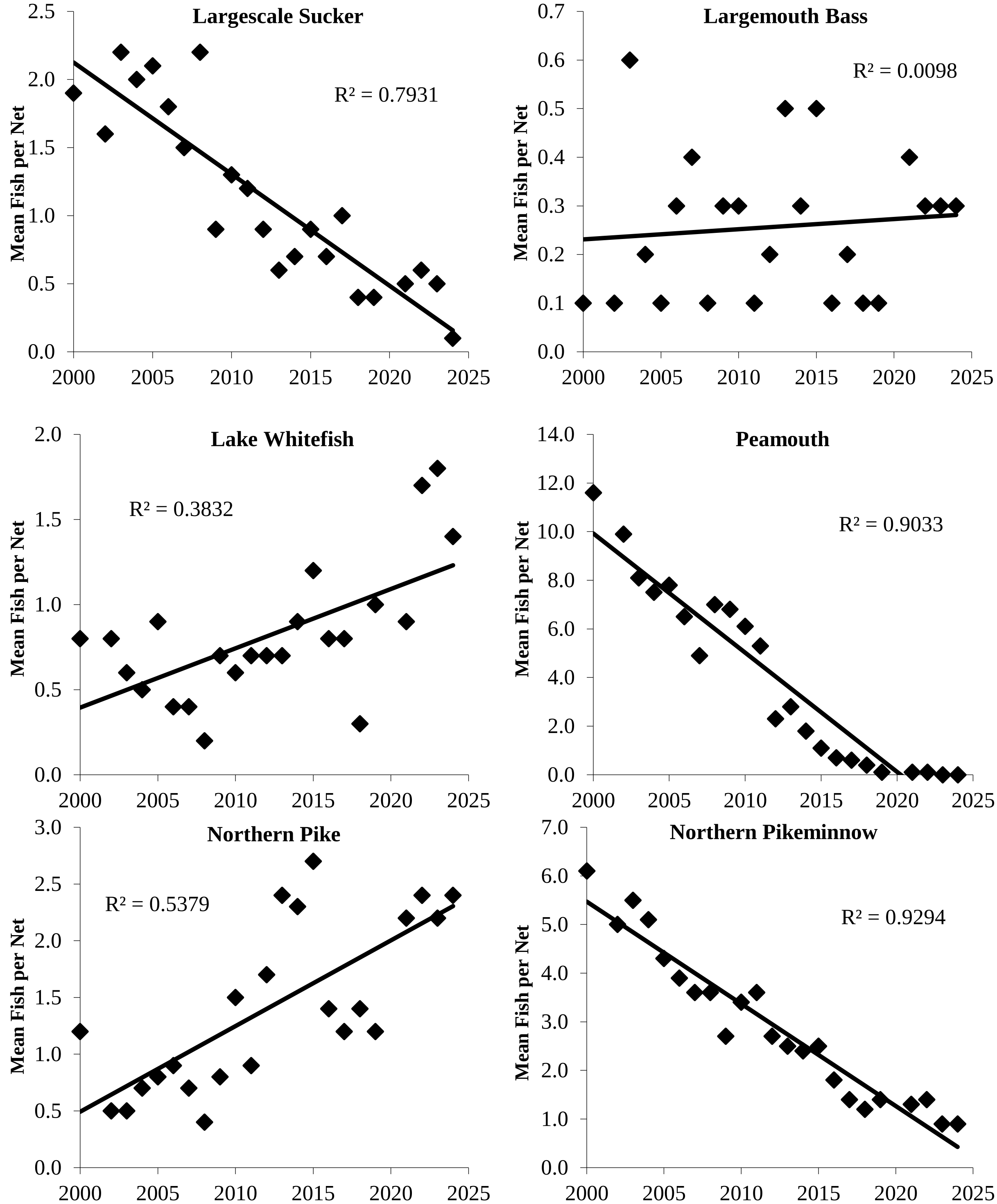
Wege, G. J., and R. O. Anderson. 1978. Relative weight (Wr): a new index of condition for largemouth bass. Pages 79–91 in G. Novinger and J. Dillard, editors. New approaches to the management of small impoundments. American Fisheries Society, North Central Division, Special Publication 5, Bethesda, Maryland.

WWP (Washington Water Power). 1995. Fish community assessment on Cabinet Gorge and Noxon Rapids Reservoirs. Spokane, WA.

Appendix A. Current relative abundance (A=abundant, C=common, R=rare) and abundance trend from 2000 to 2024 (I=increasing, S=stable, D=decreasing, U=unknown) of fish species present in Noxon and Cabinet Gorge Reservoirs.

Common Name	Scientific Name	Abbreviation	Relative Abundance	Trend	Native
Game fish species					
Bull Trout	*Salvelinus confluentus*	BULL	R	U	Y
Brook Trout	*Salvelinus fontinalis*	EB	R	U	N
Brown Trout	*Salmo trutta*	LL	C	U	N
Kokanee	*Oncorhynchus nerka*	KOK	R	U	N
Lake Trout	*Salvelinus namaycush*	LT	R	U	N
Lake Whitefish	*Coregonus clupeaformis*	L WF	A	I	N
Largemouth Bass	*Micropterus nigricans*	LMB	A	S	N
Mountain Whitefish	*Prosopium williamsoni*	MWF	R	U	Y
Northern Pike	*Esox lucius*	NP	A	I	N
Rainbow Trout	*Oncorhynchus mykiss*	RB	R	U	N
Smallmouth Bass	*Micropterus dolomieu*	SMB	A	I	N
Walleye	*Sander vitreus*	WE	A	I	N
Westslope Cutthroat Trout	*Oncorhynchus lewisi*	WCT	R	U	Y
Yellow Perch	*Perca flavescens*	YP	A	S	N
Non-game fish Species					
Black Bullhead	*Ameiurus melas*	BL BH	R	U	N
Brook Stickleback	*Culaea inconstans*	BR SB	R	U	N
Longnose Sucker	*Catostomus catostomus*	LN SU	R	D	Y
Largescale Sucker	*Catostomus macrocheilus*	LS SU	C	D	Y
Northern Pikeminnow	*Ptychocheilus oregonsis*	N PMN	C	D	Y
Peamouth	*Mylocheilus caurinus*	PEA	R	D	Y
Pumpkinseed	*Lepomis gibbosus*	PUMP	A	I	N
Redside Shiner	*Richardsonius balteatus*	RD SH	R	U	Y
Yellow Bullhead	Ameiurus natalis	YL BH	C	S	N

Appendix B. Catch per Unit Effort (CPUE) trends of selected fish from annual gill net surveys in Noxon Reservoir, 2000–2024.



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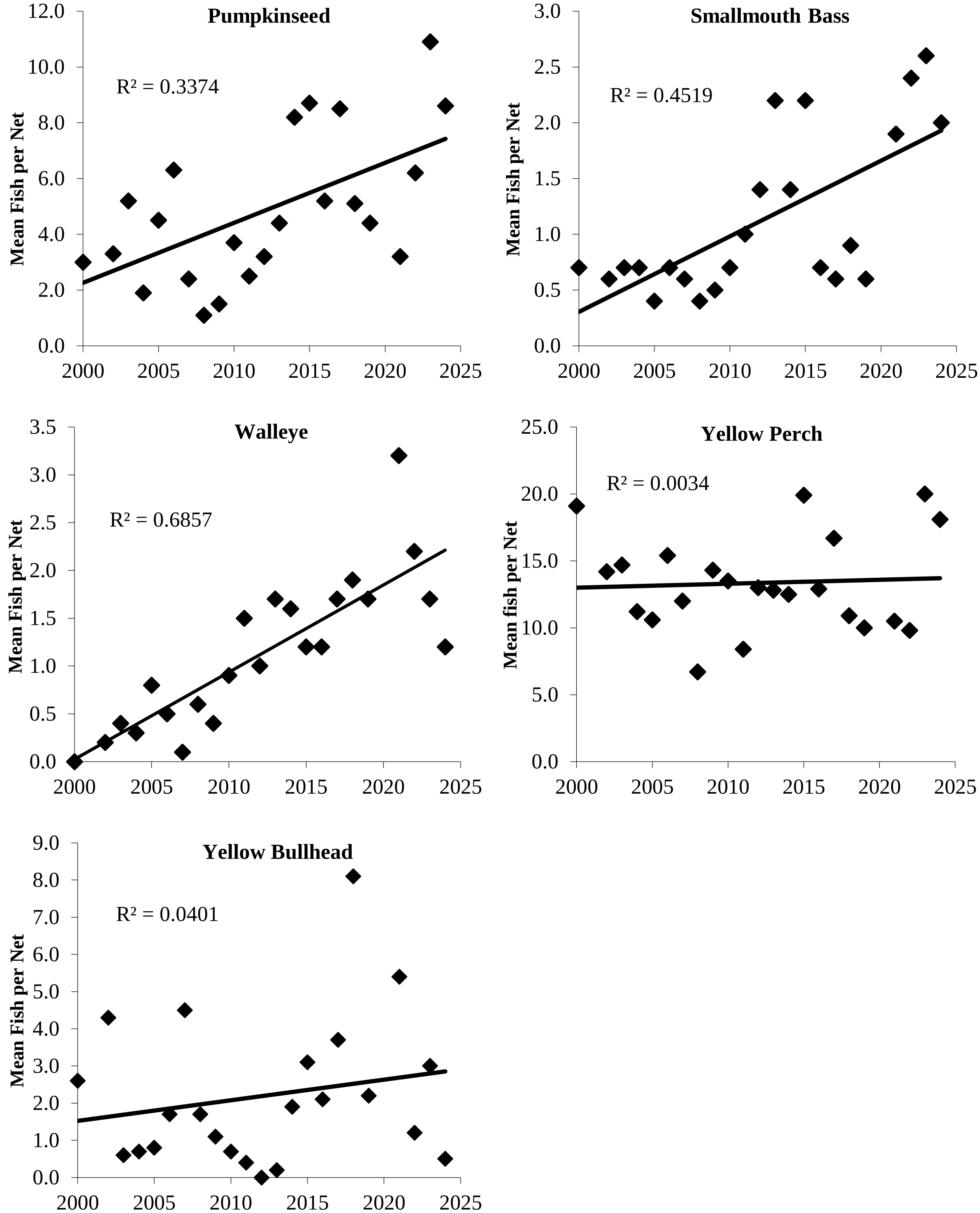
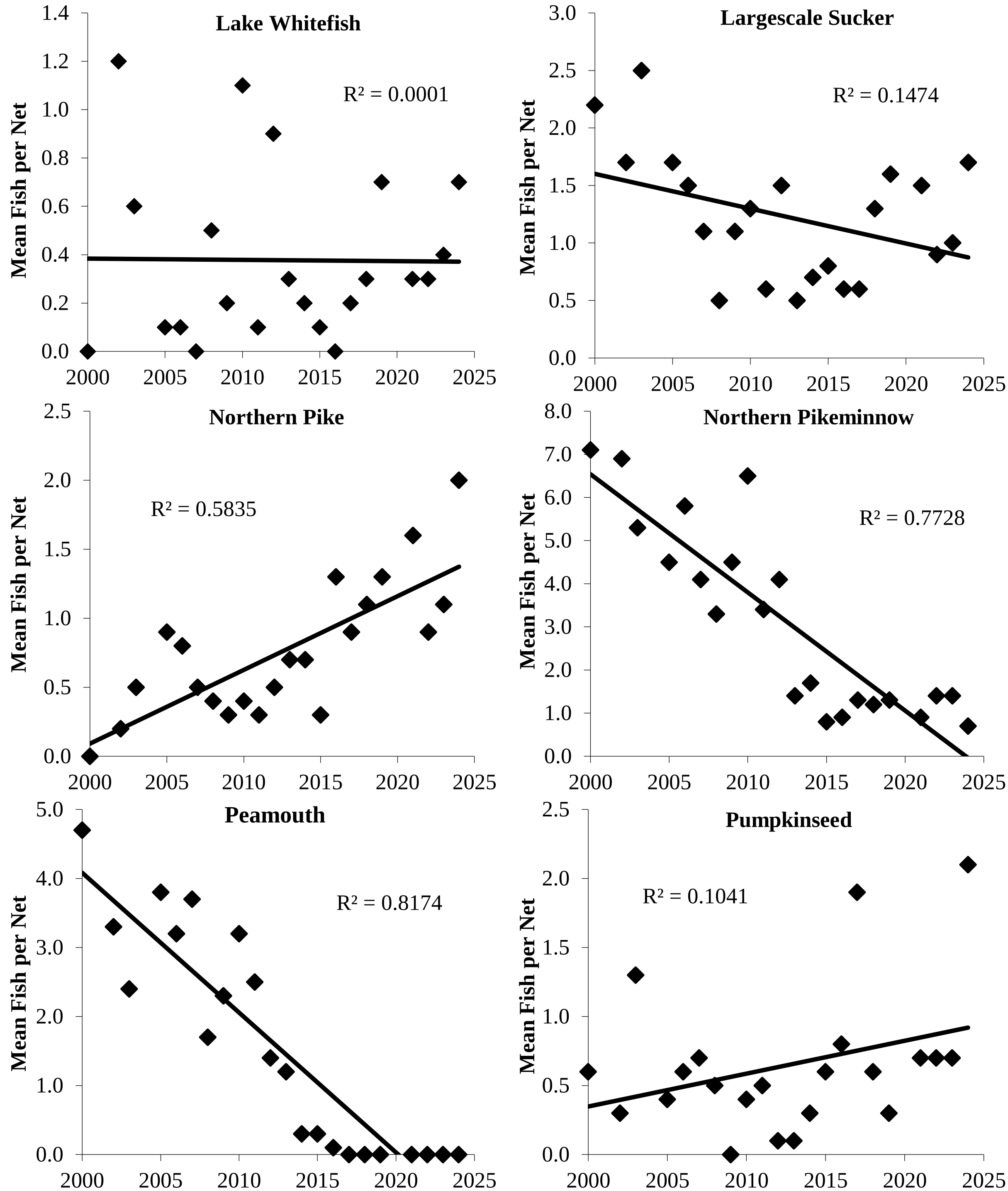


Appendix C. Catch per Unit Effort (CPUE) trends of selected fish from annual gill net surveys in Cabinet Gorge Reservoir, 2000–2024.



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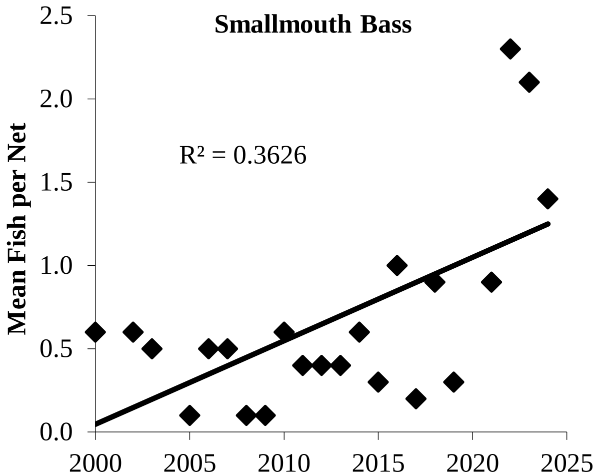
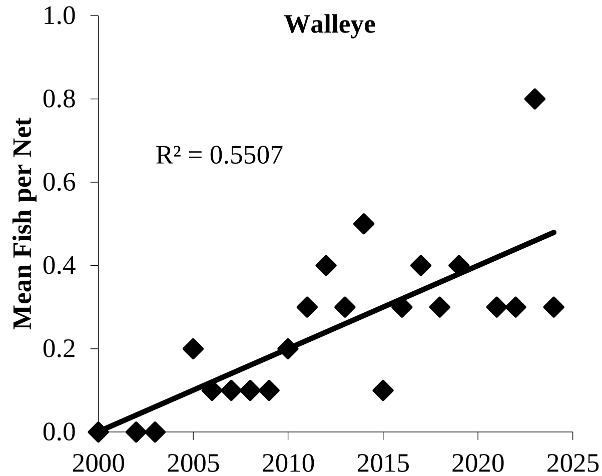
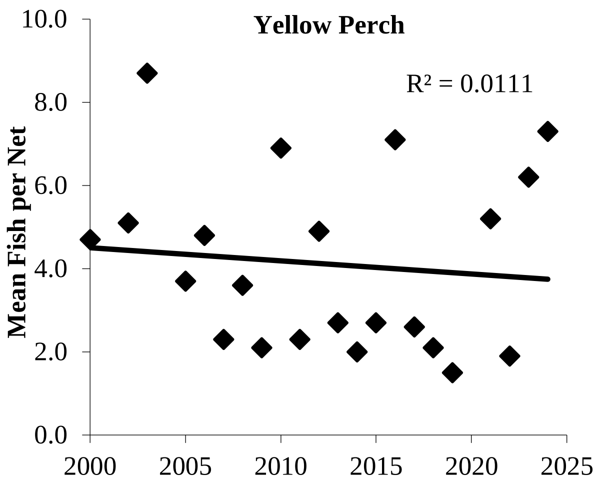


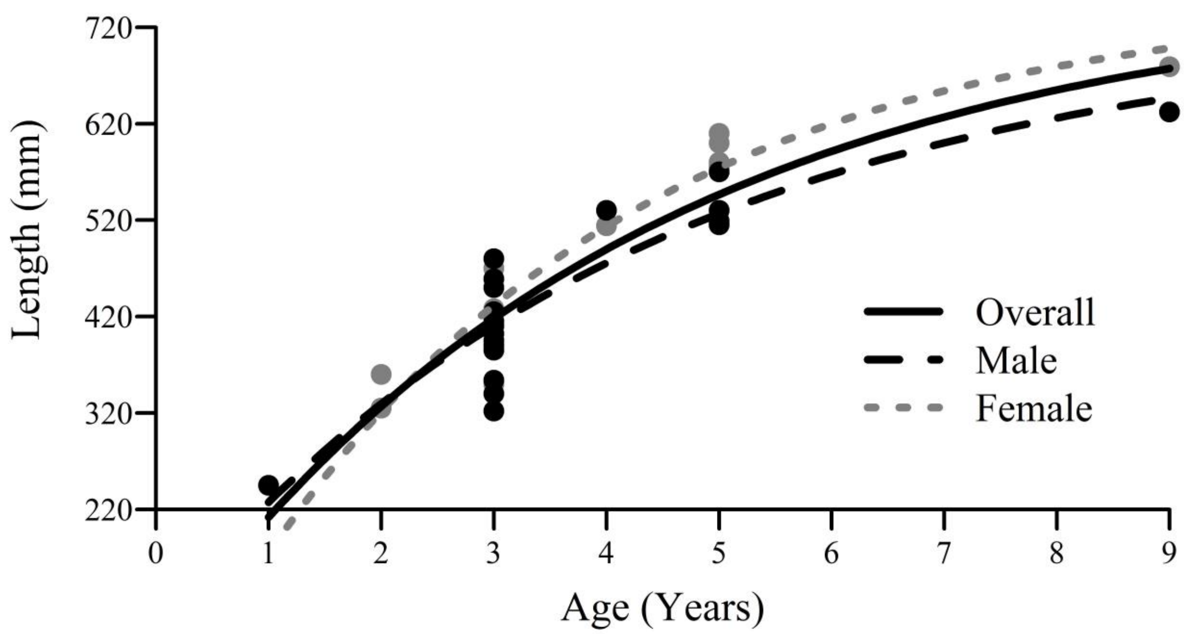




Appendix D. Von Bertalanffy growth curves and parameters for both male and female Walleye using estimates derived from Walleye collected from Noxon Reservoir in fall 2024.

Von Bertalanffy parameter estimates derived from Walleye collected from Noxon Reservoir in Fall 2024.

Von Bertalanffy parameter	Data Source					
	Female		Male		All Walleye	
	Est.	95% CI	Est.	95% CI	Est.	95% CI
L_{inf}	754	601–907	727	531–923	761	618–904
K	0.29	0.09–0.49	0.23	0.06–0.40	0.24	0.11–0.37
T_0	0.1	-0.98– 1.18	-0.64	-1.98– 0.7	0.39	-0.53– 1.31

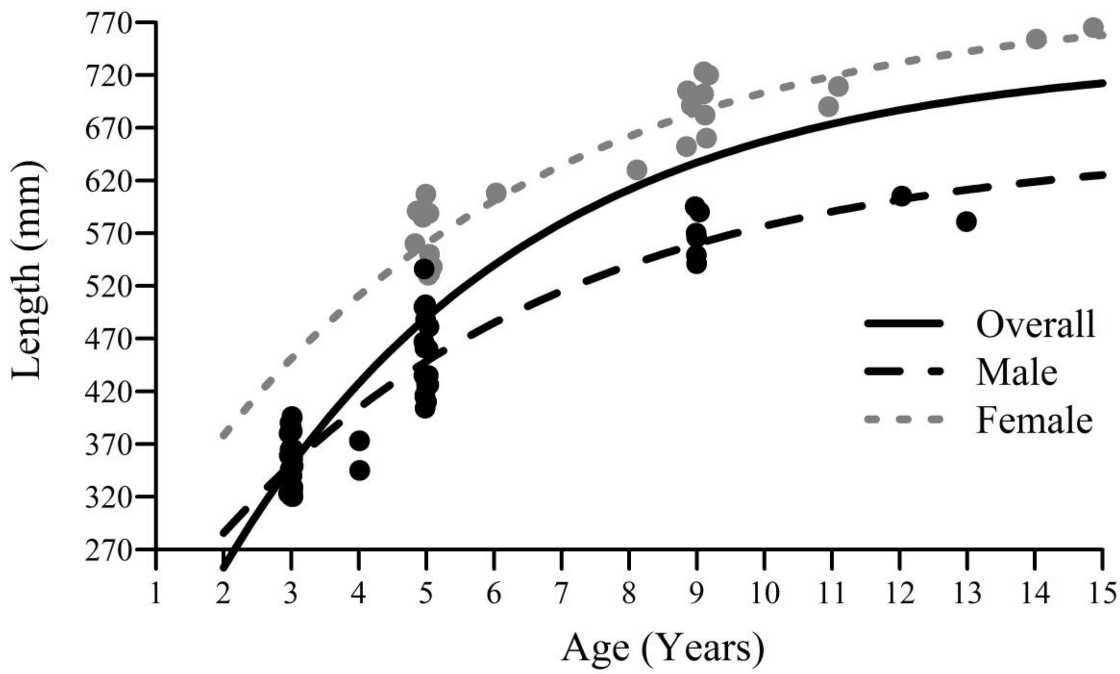


Von Bertalanffy growth curves for Walleye using estimates derived from Walleye collected from Noxon Reservoir in fall 2024.

Appendix E. Von Bertalanffy growth curves and parameters for both male and female Walleye using estimates derived from Walleye collected from Noxon Reservoir in spring 2024.

Von Bertalanffy parameter estimates derived from Walleye collected from Noxon Reservoir in spring 2024.

Von Bertalanffy parameter	Data Source					
	Female		Male		All Walleye	
	Est.	95% CI	Est.	95% CI	Est.	95% CI
L_{inf}	791	697–885	655	570–740	739	660–818
K	0.19	0.5–0.33	0.19	0.10–0.28	0.22	0.13–0.31
T_0	-1.4	-4.7– 1.9	-1.0	-2.3– 0.3	0.12	-0.81– 1.05



Von Bertalanffy growth curves for Walleye using estimates derived from Walleye collected from Noxon Reservoir in spring 2024.