MONTANA FISH, WILDLIFE & PARKS

FISHERIES DIVISION
JOB PROGRESS REPORT

STATE: MONTANA PROJECT TITLE: Lower Clark Fork

PROJECT NO.: 3150 and 31005

STUDY TITLE: Noxon Rapids and Cabinet Gorge Reservoir Fisheries Monitoring

JOB NO.: JOB TITLE: Northwest Montana - Reservoirs

PROJECT PERIOD: JULY 1, 2000 THROUGH JUNE 30, 2004

ABSTRACT

Cabinet Gorge and Noxon Rapids Reservoirs were created in 1952 and 1958 to facilitate their respective hydroelectric projects. Since their creation, there have been changes in hydroelectric project operations that have modified the reservoir environments. Species composition of the reservoirs has changed as a result of these habitat modifications that possibly favored one species over another. In addition, new species have been introduced since the reservoirs were created. The fisheries in Noxon Rapids and Cabinet Gorge reservoirs were monitored in 2000, 2002, and 2003. The monitoring was conducted to assess trends in fish abundance and species composition in both reservoirs. Additional effort was expended to monitor populations with particularly important recreational value as well as the effects of an illegal introduction of walleye in Noxon Rapids Reservoir.

The trends in fish populations in Cabinet Gorge and Noxon Rapids reservoirs were monitored primarily with gill nets, but cold-water areas were monitored with merwin traps. The recruitment and status of the bass fishery in Noxon Rapids Reservoir was monitored with beach seining and bass tournaments. The illegal introduction of walleye was monitored by analyzing the relative abundance, size and age structure of walleye captured with the general gill netting effort in Noxon Rapids Reservoir. In addition, because yellow perch may be an indicator of walleye numbers and effects on the prey in Noxon Rapids Reservoir, the relative abundance, size and age structure, and condition of yellow perch captured with the general gill netting effort was monitored.

Comparisons of gill net catch rates from 2000 to 2002 suggested some possible changes in fish abundance and species composition in Noxon and Cabinet Gorge Reservoirs, however, only two years of gill netting data was analyzed. Thus, the trends observed between 2000 and 2002 must simply be viewed as “possible” trends and further monitoring will be necessary to truly assess changes in fish abundance and species composition in the reservoirs. Possible changes in the abundance of gamefish in Noxon

Rapids and Cabinet Gorge Reservoirs include changes in the relative abundance of walleye, yellow perch, and northern pike. Northern pike catch rates declined from 2000 to 2002 in both Noxon stratum one and two, while a slight increase was observed in Cabinet Gorge Reservoir.

Comparisons of growth rates for largemouth bass captured during beach seining surveys from 2000 through 2002 indicate that overall, age-0 largemouth bass growth rates were highest in 2001 and lowest in 2002. Largemouth bass growth rates observed in 2000 were somewhat intermediate to those observed in 2001 and 2002. Successful largemouth bass recruitment was likely attained in 2001, may have been largely unsuccessful in 2002, and was questionable in 2000.

Catch rates for bass tournaments held on Noxon Rapids Reservoir appear to have changed minimally from 1997 through 2001. A noticeable change in species composition appears to have occurred in the bass community based on tournament catch rates. Tournament catch rates for smallmouth bass increased from 1997 to 2000 while catch rates for largemouth bass largely declined. An increase in the number of quality sized (>380 mm) bass also appears to be occurring in Noxon Rapids Reservoir.

Walleye catch rates and their distribution appeared to increase substantially in Noxon Rapids Reservoir from 2000 to 2003. In addition, the size structure included what appeared to be an age-0 fish indicating successful reproduction is occurring. A decline in yellow perch catch rates may also suggest that walleye expansion is occurring in Noxon Rapids Reservoir, however, further data collection will be necessary to truly evaluate whether yellow perch continue to decline. A shift in the average size of yellow perch observed from 2000 to 2002 also suggests that increased walleye predation on smaller yellow perch may be occurring. However, other factors such as fluctuating temperature regimes or reduced competition as a result reduced yellow perch densities may be affecting yellow perch growth patterns.

BACKGROUND

Cabinet Gorge and Noxon Rapids Reservoirs were created in 1952 and 1958 to facilitate their respective hydroelectric projects. Since their creation, there have been changes in hydroelectric project operations that have modified the reservoir environments. Species composition of the reservoirs has changed as a result of these habitat modifications that possibly favored one species over another. In addition, new species have been introduced since the reservoirs were created.

The current emphasis of management of Cabinet Gorge and Noxon Rapids reservoirs is a mix of native species and recreational species. Management of the reservoirs is currently guided by the Montana Warmwater Fisheries Management Plan, Avista Clark Fork Settlement Agreement, and Avista Native Salmonid Restoration Plan.

The Montana Warmwater Fisheries Management Plan (Warmwater Plan) guides the management of warmwater fisheries throughout Montana including those in Noxon Rapids and Cabinet Gorge reservoirs (MFWP 1997). The management emphasis for

Cabinet Gorge Reservoir is on bull trout while managing the present bass fishery. The primary management emphasis for Noxon Rapids Reservoir is to enhance largemouth and smallmouth bass populations with lesser emphasis on northern pike and yellow perch, and is balanced with maintenance of native salmonid populations. Walleye were suspected to be illegally introduced to Noxon Rapids Reservoir in the early 1990s. The Montana Warmwater Fisheries Management Plan provides further direction on walleye management in Northwestern Montana stating the Montana Fish, Wildlife and Parks Commission has implemented a policy which bans management of walleye west of the continental divide due to the potential impacts on trout and salmon and that any management efforts directed towards walleye in Region One will be aimed at minimizing their density and distribution to avoid conflicts with other gamefish and native species.

The Avista Native Salmonid Restoration Plan is a plan to recover native salmonids in the Lower Clark Fork system from Thompson Falls Dam downstream to Lake Pend Oreille (Kleinschmidt and Pratt 1998). It provides a step-wise approach for restoration efforts. This includes examining issues influencing availability of native fish stocks suitable for passage at Cabinet Gorge and Noxon Rapids dams. These issues include genetics, pathogens, introduced or exotic fish fish species distribution and control, native fish abundance, and tributary and mainstem habitat evaluation, protection, and enhancement.

The Avista Clark Fork Settlement Agreement (Settlement Agreement) provides protection, mitigation, and enhancement measures to mitigate for the effects of the dams (Avista 1999a). This includes mitigating for the effects of power peaking and reservoir operational impacts of the Cabinet Gorge and Noxon Rapids dams to native salmonids and recreational fisheries and increasing the viability of native salmonid populations by providing fish passage between tributaries upstream of Cabinet Gorge, Noxon Rapids, and Lake Pend Oreille. This also involves increasing the viability of bull trout populations by reducing poaching, accidental harvest, and habitat loss, assisting local landowner groups to protect and improve Lower Clark Fork River and Lake Pend Oreille watersheds, and maintaining and improving water quality in the vicinity of the dams.

Montana Fish, Wildlife and Parks implements one protection, mitigation and enhancement measure of the Settlement Agreement, the Montana Tributary Habitat Acquisition and Recreational Fishery Enhancement Program (Appendix B). The purpose of this program is to offset the impacts of the power peaking operation of the Cabinet Gorge and Noxon Rapids Projects to native salmonids and recreational fisheries in Montana. This program is a multiple component effort that includes the restoration and enhancement of Clark Fork River tributary watersheds, support of recreational fishery monitoring and management, and evaluation and implementation of recreational fishery enhancement projects.

One component of this program was implemented recently that is related to reservoirs in the Lower Clark River drainage: Fish Resource Monitoring, Enhancement, and Management. This program involves monitoring the status and trends of fish populations; assessing and monitoring habitat conditions; and working to potentially enhance public fishing and recreational opportunities.

Montana Fish, Wildlife and Parks (MFWP) and Avista Corporation (Avista) have monitored the fish populations in Cabinet Gorge and Noxon Rapids Reservoirs since their creation. However, methods and gear types have changed along with the availability of new sampling technology and information needs between 1952 and the present.

Walleye were illegally introduced into Noxon Rapids Reservoir, presumably in the early 1990s. Avista sampled six walleye in summer and fall of 1994 gill net sampling totaling 3,783 hours (WWP 1995, 1996). An additional 1,682 hours in the winter and spring of 1995 yielded zero walleye. One walleye was also captured by Avista in Cabinet Gorge Reservoir in the spring of 1995 (Avista 1999b).

Yellow perch may be an indicator of walleye numbers and effects on the prey in Noxon Rapids Reservoir and are an important recreational species. Yellow perch is a favored prey of walleye. And, where walleye have been introduced in reservoirs containing abundant yellow perch, walleye soon become abundant at the expense of yellow perch.

The fisheries in Noxon Rapids and Cabinet Gorge reservoirs were monitored in 2000, 2002, and 2003. The monitoring was conducted to assess trends in fish abundance and species composition in both reservoirs. Additional effort was expended to monitor populations with particularly important recreational value as well as the effects of the illegal introduction of walleye in Noxon Rapids Reservoir.

OBJECTIVES AND DEGREE OF ATTAINMENT

Activity 1 – Survey and Inventory

Objectives: 1) To survey and monitor the characteristics, status and trends of fish populations and angler use and harvest in selected streams and lakes

Activity 2 – Fish Population Management

Fisheries Management
Desired Outcomes: 1) Abundant, fishable populations of sport fish species – native and non-native.
Performance Measures: 1) Size, status, and trends of fish populations through population surveys and inventories.

The Reservoir Monitoring study plan met the survey and inventory objective #1, and fish population management, desired outcome and performance measure #1. The Reservoir Monitoring study plan had the following objectives from 2000 to 2003: 1) monitor trends in fish populations in Cabinet Gorge and Noxon Rapids reservoirs with emphasis on fishes of recreational value and potential predators of fishes that use the reservoirs as a migration corridor, 2) monitor the recruitment and status of the bass fishery in Noxon Rapids Reservoir, and 3) assess the effects of the illegal introduction of walleye to Noxon Rapids Reservoir.

PROCEDURES

Determining trends in fish populations – Gill netting and merwin trapping

Gill netting and merwin trapping were used to monitor trends in fish populations in Cabinet Gorge and Noxon Rapids reservoirs. Gill netting is an efficient method to sample fish in a variety of habitats. Therefore, gill netting was the primary gear used to sample the fisheries of the reservoirs. All habitats throughout the reservoirs were sampled with gill nets, with the exception of cold water sites. Because gill nets cause significant mortality of captured fish and cold water sites may be inhabited by bull trout, a threatened species, merwin traps were used to sample cold water habitats. Merwin traps are a non-lethal method of sampling and thus are a more acceptable form of sampling in areas suspected to contain bull trout.

Noxon Rapids Reservoir was stratified into two separate zones (stratum one and two) for gill netting based on the habitat differences present in the reservoir. Noxon stratum one represents lower Noxon Rapids Reservoir from Beaver Creek Bay (but not including Beaver Creek Bay) to Noxon Rapids Dam. This section of Noxon Rapids Reservoir is characterized by lower velocity habitats with a greater proportion of shallow littoral areas. Overall, this section of Noxon Rapids Reservoir represents a more typical reservoir environment. Noxon stratum two represents upper Noxon Rapids Reservoir from the mouth of Beaver Creek Bay (including Beaver Creek Bay) to Thompson Falls Dam. This section of Noxon Rapids Reservoir is considerably narrower than stratum one with substantially higher water velocities and overall, represents a more riverine environment. Cabinet Gorge Reservoir was not split into strata as the entire reservoir can be characterized primarily as riverine.

More specifically, gill net set locations were selected based on habitat types delineated by Washington Water Power (WWP)(now Avista Corporation)(WWP 1995). WWP (1995) delineated habitat types based on slope, percent vegetation, average substrate size, and water velocity and recognized four specific habitat types: silt, gravel, cobble/boulder, and riverine. An additional habitat type entitled "open water" was included to represent reservoir habitat located outside of littoral areas. WWP (1995) sampled these habitats in proportion to their availability. Because replication of WWP's (1995) effort was not possible annually due to their large number of sampling locations, a random subset of these sampling locations were selected as gill net monitoring locations. This random selection also selected sites in proportion to the habitat available throughout the reservoir. Sites previously sampled by MFWP were given preference during selection, however a majority of the sites previously monitored by MFWP were located in coldwater sites in order to monitor trout abundance.

Nylon multifilament experimental gill nets were used to sample both Noxon Rapids and Cabinet Gorge reservoirs. These nets were 38 m (125 ft) long and 1.8 m (6 ft) deep with five separate 7.6 m (25 ft) panels consisting of 1.9 cm (¾ inch), 2.5 cm (1 inch), 3.2 cm

(1¼ inch), 3.8 cm (1½ inch), and 5.1 cm (2 inch) square mesh. The length and mesh sizes of these nets were identical to those used by MFWP to monitor Noxon Rapids and Cabinet Gorge reservoirs in the past and also maintain the same specifications of standard experimental gill nets used throughout Montana by MFWP. These mesh sizes are however different than those used by WWP (1995) with a narrower range of mesh sizes used during this study than was used by WWP (1995).

A combined total of 45 gill nets were set overnight in Noxon and Cabinet Gorge Reservoirs in 2000, 2002, and 2003. Of these 45, 30 gill nets were set in Noxon Rapids Reservoir with 19 set in Noxon stratum one and 11 set in Noxon stratum two. The remaining 15 were set throughout Cabinet Gorge Reservoir.

Merwin traps were operated in coldwater habitat in 2002 and 2003. Merwin traps were placed in Vermillion and Marten Creek Bays in Noxon Rapids Reservoir in 2002, and in Bull River Bay in Cabinet Gorge Reservoir in 2002 and 2003. Within each bay, two traps were operated for a period of seven days. The seven days each merwin trap was operated were inclusive of the gill netting sampling dates in order to maintain identical reservoir conditions.

The relative abundance (catch-per-unit-effort), species composition (presented as a proportion), and distribution of fish in both reservoirs was determined. In addition, the size structure indices (proportional stock density) and condition (Wr) for recreationally important and potential predator species was calculated.

More detailed information on the methodology used can be found in the attached report (Liermann and Tholl 2003).

Monitoring the recruitment and status of the bass fishery in Noxon Rapids Reservoir

Bass recruitment monitoring was conducted annually in Noxon Rapids Reservoir from 2000 through 2003. This sampling was conducted using a 15 m (50 ft) long by 3 m (10 ft) deep beach seine with 1.0 cm (3/8 inch) mesh and a 1.2 m (4 ft) by 1.2 m pocket. Beach seining was conducted at several sites from early August through mid-October each year. In general, beach seining was conducted until a minimum sample size 50 age-0 bass were captured.

The catch rates, composition, and size structure of adult largemouth and smallmouth bass populations were assessed annually through monitoring bass tournaments held on Noxon Rapids Reservoir. The abundance of largemouth and smallmouth bass was analyzed primarily using catch-per-unit-effort in the form of fish caught per angler hour. In general, bass tournaments held on Noxon Rapids Reservoir maintained a minimum length of 300 mm (12 in) and thus only bass this size or larger were monitored at the tournaments. Additional indices monitored include species composition in terms of smallmouth and largemouth bass captured and the percentage of quality fish (fish greater than 380 mm (15 in.)) captured.

More detailed information on the methodology used can be found in the attached report (Liermann and Tholl 2003).

Assessing the effects of the illegal introduction of walleye to Noxon Rapids Reservoir

The relative abundance, size and age structure of walleye in the reservoirs was monitored with the general gill netting effort. In addition, because yellow perch may be an indicator of walleye numbers and effects on the prey in Noxon Rapids Reservoir, the relative abundance, size and age structure, and condition of yellow perch in the reservoirs was monitored.

FINDINGS

Determining trends in fish populations – Gill netting and merwin trapping

A total of 1,068 fish, representing 16 species were captured in stratum one of Noxon Rapids Reservoir in 2000. Yellow perch were the most abundant species captured with 21.5 fish caught per net night comprising about 36% of the total fish captured in this stratum. Peamouth were the next most abundant species captured averaging 14.3 fish per net night and 24% of the total catch followed by northern pikeminnow, which averaged 8.3 fish per net night and represented 14% of the total catch. The three most abundant gamefish captured through gill netting in Noxon stratum one, besides yellow perch, were pumpkinseed (4.4 fish/net, 7%), lake whitefish (0.7 fish/net, 1%) and northern pike (0.2 fish/net, 0.4%).

A total of 398 fish, representing 10 species were captured in stratum two of Noxon Rapids Reservoir in 2000. Similar to Noxon stratum one, yellow perch were the most abundant species captured in gill nets in Noxon stratum two at 15.2 fish per net night, representing 42% of the fish sampled. Peamouth were the next most abundant fish captured at 7.3 fish per net night and represented 20% of the fish sampled. Northern pike were captured much more frequently in Noxon stratum two than stratum one with 2.9 fish caught per net night, representing 8% of the total catch.

A total of 333 fish, representing 13 species were captured in Cabinet Gorge Reservoir in 2000. Unlike both strata of Noxon Rapids Reservoir, northern pikeminnow were the most abundant species captured in Cabinet Gorge Reservoir at 7.7 fish per net night comprising 31% of the total catch. Yellow perch and peamouth were equally abundant at 4.7 fish per net night, both comprising 19% of the total catch. Unlike both strata of Noxon Rapids Reservoir, mountain whitefish were also quite abundant in Cabinet Gorge Reservoir with 2.4 fish caught per net night. One westslope cutthroat trout was also captured in Cabinet Gorge Reservoir. No northern pike were captured in Cabinet Gorge Reservoir in 2000.

In 2002, in Noxon stratum one, a total of 912 fish representing 13 species were captured. Unlike 2000, peamouth were the most abundant species captured at 12.6 fish per net night and comprising 26% of the total fish captured. Yellow perch were the second most abundant species sampled in Noxon stratum one at 9.8 fish per net night representing 20% of the total number of fish captured. Yellow perch, pumpkinseed, and smallmouth bass were the three most abundant gamefish captured in Noxon stratum one.

In 2002, in Noxon stratum two, a total of 461 fish representing 12 fish species were captured. Similar to 2000, yellow perch were the most abundant species captured in Noxon stratum two at 21.9 fish per net night, representing 52% of the entire gill net catch. Peamouth and black bullheads were the next most abundant species captured at 5.1 and 3.1 fish per net night, respectively. Yellow perch and lake whitefish were the most abundant gamefish captured in Noxon stratum two based on the total number captured however, northern pike made up the largest proportion of the total catch based on weight.

In 2002, in Cabinet Gorge Reservoir, a total of 298 fish representing 10 species were captured during gill net surveys. As in the 2000 survey, northern pikeminnow were the most abundant species captured at 6.9 fish per net night and comprising 35% of the total catch followed by yellow perch at 5.1 fish per net night and comprising 26% of the total catch. Northern pikeminnow were the most abundant captured by total weight (37.0%) followed by largescale suckers and lake whitefish which comprised 18.7% and 11.7% of the catch by weight, respectively. The diversity of species captured in 2002 dropped from 2000 with only 10 species captured in 2002 versus 13 in 2000. Species captured in 2000 which were not captured in 2002 include rainbow trout, westslope cutthroat trout, black bullheads, yellow bullheads and longnose suckers.

A total of 16 species were captured in the Bull River Bay merwin traps. The most abundant species captured was northern pikeminnow which comprised 38% of the total catch followed by peamouth which comprised 27% of the total catch. Catch rates for salmonids were overall rather low with most species representing less than 1% of the total catch, except for mountain whitefish which comprised approximately 3% of the total catch. A total of two bull trout were captured during the trapping period.

A total of 1,584 fish representing eighteen species were captured in merwin traps deployed in the Vermillion River Bay in 2002. The most abundant species captured was yellow perch which comprised 37% of the total catch followed by northern pikeminnow and peamouth which comprised 29% and 20% of the total catch, respectively. Trout species including brown, brook, bull, and westslope cutthroat trout were captured during the trapping period and represented a much larger portion of the total catch then was observed in Bull River Bay. This was due primarily to higher catch rates of brown trout and also higher catch rates of westslope cutthroat trout. Similar to Bull River Bay, two bull trout were also captured in Vermillion River Bay.

A total of 393 fish representing nine species were captured during merwin trapping surveys in Marten Creek Bay in 2002. Largemouth bass were the most abundant species captured comprising 37% of the total catch followed by northern pikeminnow which comprised 31% of the total catch. While largemouth bass were the most abundant species captured, a large portion of those captured were age-0 fish. Salmonids were largely absent from the catch with the one brown trout captured being the only salmonid sampled in Marten Creek Bay. Interestingly, only one yellow perch was sampled in Marten Creek Bay in 2002.

Netting and merwin trapping results from the 2003 efforts will be presented in a subsequent report.

More detailed information on the results of the monitoring can be found in the attached report (Liermann and Tholl 2003).

Monitoring the recruitment and status of the bass fishery in Noxon Rapids Reservoir

Length data of age-0 largemouth bass captured between 2000 and 2002 were compared to assess the variation in average size and growth observed between largemouth bass year-classes. These comparisons indicate the average size and growth of age-0 largemouth bass varied substantially between years from 2000 to 2002. Overall, the cohort of age-0 largemouth bass spawned in 2001 were on average larger than age-0 largemouth bass spawned in either 2000 or 2002. Likewise, age-0 largemouth bass spawned in 2000 were on average larger than those spawned in 2002. Age-0 largemouth bass spawned in 2001 also demonstrated higher growth rates than those spawned in 2000 or 2002. Age-0 largemouth bass growth was not substantially higher in 2001 than 2000.

Two bass tournaments were monitored in 2000. Catch rates for largemouth bass were substantially higher during the April tournament than the late July tournament while catch rates for smallmouth bass were similar for both tournaments. The proportion of quality-sized bass (>380 mm) was similar between both tournaments monitored in 2000. Substantially more smallmouth bass were captured at both tournaments monitored in 2000 than largemouth bass.

Four bass tournaments were monitored in 2001. Catch rates for both largemouth and smallmouth bass varied substantially by tournament with catch rates for both species being highest in early July. While catch rates were highest in early July in 2001, more quality-sized bass (>380 mm) were captured at the May tournament than at any other tournament held in 2001. Overall, substantially more smallmouth bass were captured at all tournaments monitored in 2001 than largemouth bass.

Three bass tournaments were monitored on Noxon Rapids Reservoir in 2002. Two other tournaments were held in August, however they were not monitored to avoid stress caused by additional handling during a time when temperatures were quite warm. Catch rates were again highest for the tournament held in early July versus all other tournament dates. In 2002, the catch of quality-sized fish (>380 mm) was also greatest during the early July tournament but was fairly similar throughout the three tournaments. Smallmouth bass made up a majority of the bass captured in 2002 however, the disparity in catch rates between these species was not as prominent as was observed in 2000 or 2001.

Monitoring data of the recruitment and status of the bass fishery in Noxon Rapids Reservoir in 2003 will be presented in a subsequent report.

More detailed information on the results of the monitoring can be found in the attached report (Liermann and Tholl 2003).

Assessing the effects of the illegal introduction of walleye to Noxon Rapids Reservoir

Only one walleye (448 mm TL) was captured in stratum one of Noxon Rapids Reservoir in 2000. However, seven walleye were captured in stratum one of Noxon Rapids Reservoir in 2002 averaging 420 mm TL (range = 330-540 mm) and weighing on average 842 g (range = 342-1,820 g). In 2003, twelve walleye were captured in both stratum one (n = 5) and stratum two (n = 7) in Noxon Rapids Reservoir. Although catches in 2000 and 2002 were concentrated around the town of Trout Creek, in 2003 walleye capture locations were distributed from just downstream of Marten Creek Bay nearly to Thompson Falls Dam. Walleye sizes captured (230-725 mm TL) also varied more in 2003 than in 2000 or 2002 and included what was considered an age-0 walleye. Other data on walleye captured in 2003 will be part of a subsequent report.

Catch rates of yellow perch changed in both strata of Noxon Rapids Reservoir with decreases observed in stratum one and increases observed in stratum two from 2000 to 2002. In Noxon stratum one, yellow perch catch rates decreased from 21.6 to 9.8 fish per net night from 2000 to 2002. In Noxon stratum two however, catch rates of yellow perch increased from 15.2 to 21.9 fish per net night from 2000 to 2002. The size structure of the Noxon Rapids Reservoir yellow perch population also changed substantially from 2000 to 2002. Yellow perch captured in Noxon Rapids Reservoir in 2000 averaged 183 mm TL (range = 96-275) while yellow perch captured in 2002 averaged 200 mm TL (range = 115-251). Data on yellow perch captured in 2003 will be part of a subsequent report.

More detailed information on the results of the monitoring can be found in the attached report (Liermann and Tholl 2003).

CONCLUSIONS

Determining trends in fish populations – Gill netting and merwin trapping

Reservoir monitoring has been conducted periodically in Cabinet Gorge and Noxon Rapids reservoirs since their creation and filling in 1952 and 1958, respectively. This monitoring traditionally included gill net surveys (Huston 1985, WWP 1995). However, the locations of gill net sets in addition to the lengths and mesh sizes of the gill nets used for sampling has varied substantially between studies (Katzman et al. 2000). Thus, only general comparisons can be drawn between the current reservoir monitoring data presented in this report and historic data collected by other researchers as to changes in fish abundance and species composition in Noxon Rapids and Cabinet Gorge Reservoirs (Huston 1985, WWP 1995).

Comparisons of gill net catch rates from 2000 to 2002 allude to some possible changes in fish abundance and species composition in Noxon and Cabinet Gorge Reservoirs, however, only two years of gill netting data has been analyzed that followed collection methods outlined by Katzman et al. (2000). Thus, the trends observed between 2000 and 2002 must simply be viewed as "possible" trends and further monitoring will be necessary to truly assess changes in fish abundance and species composition in Noxon Rapids and Cabinet Gorge Reservoirs. Possible changes in the abundance of gamefish in Noxon Rapids and Cabinet Gorge Reservoirs include changes in the relative abundance of walleye, yellow perch, and northern pike. Possible changes in relative abundance of walleye and yellow perch are discussed below.

Northern pike showed a substantial amount of variation in gill net catch rates from 2000 to 2002. Northern pike catch rates declined from 2000 to 2002 in both Noxon stratum one and two, while a slight increase was observed in Cabinet Gorge Reservoir. In Noxon stratum one, only a slight decline was observed from four northern pike captured in 2000 to three in 2002. In Noxon stratum two however, northern pike catch rates declined substantially from 32 northern pike captured in 2000 to 13 in 2002. Reasons for this decline are not immediately evident and further monitoring is necessary to determine if northern pike are truly declining in abundance.

More detailed information on the conclusions of the monitoring can be found in the attached report (Liermann and Tholl 2003).

Monitoring the recruitment and status of the bass fishery in Noxon Rapids Reservoir

The growth of age-0 largemouth bass in Noxon Rapids Reservoir is largely controlled by the flows entering Noxon Rapids Reservoir (Saffel 2003). Noxon Rapids Reservoir is a run of the river impoundment with a low retention time. Thus, Clark Fork River flows largely dictate water temperatures in Noxon Rapids Reservoir particularly during largemouth bass spawning and hatching times which generally occur directly after spring high flows subside (Saffel 2003). The growth of age-0 largemouth and smallmouth bass during their first growing season is believed to substantially influence overwinter survival to age 1 (Oliver et al. 1979, Miranda and Hubbard 1994a, Garvey et al. 1998), particularly in northern climates (Bennet and Bennett 1991, Walker-Smith 1995). Thus, flow conditions in Noxon Rapids Reservoir which dictate growth conditions also likely affects annual largemouth and smallmouth bass recruitment.

Comparisons of growth rates for largemouth bass captured during beach seining surveys from 2000 through 2002 indicate that overall, age-0 largemouth bass growth rates were highest in 2001 and lowest in 2002. Largemouth bass growth rates observed in 2000 were somewhat intermediate to those observed in 2001 and 2002. Similar to the results observed by Saffel (2003), age-0 largemouth bass growth rates appear to be related to Clark Fork River flow conditions observed in each year. Stream flow conditions for the Clark Fork River in 2001 were substantially lower than the historical average. The duration of high spring flows was also shorter in 2001. Due to the low flow conditions observed in 2001, largemouth bass spawning and hatching likely occurred earlier in 2001 than 2000 and substantially earlier than in 2002. Similarly, largemouth bass spawning and hatch dates were likely intermediate in 2000 based on flow conditions, which again, likely led to the intermediate growth rates observed in 2000.

The current largemouth and smallmouth bass literature clearly shows that the size of a bass at the onset of winter is a key factor in overwinter survival, particularly in northern populations. Several other authors have suggested 50 mm TL as the minimum threshold that largemouth and smallmouth bass need to attain to endure winter periods in northern climates (Bennett and Bennett 1991, Walker-Smith 1995) and that any additional growth would likely improve survival (Bennett and Bennett 1991). Saffel (2000) found that largemouth bass averaged 76 and 82 mm TL at the onset of winter in two years of successful recruitment in Noxon Rapids Reservoir while largemouth bass averaged from 48 to 64 mm at the onset of winter in several unsuccessful recruitment years.

Based on the observations of Saffel (2000) and other literature, successful largemouth bass recruitment was likely attained in 2001. Largemouth bass seined in mid-October 2001 maintained an average total length of 71 mm, and this size was likely underestimated. Unlike 2001, largemouth bass recruitment in 2002 may have been largely unsuccessful. Largemouth bass seined in early October of 2002 had only attained a mean total length of 58 mm. Largemouth bass recruitment in 2000 is also questionable. Age-0 largemouth bass seined in early October had attained an average total length of 63 mm. Based on past observations by Saffel (2000), these age-0 largemouth bass may not have attained a large enough size to produce substantial recruitment into the Noxon Rapids Reservoir largemouth bass fishery. However, this relationship between age-0 largemouth bass growth and overwinter survival is not clearly defined and needs to be further researched (Saffel 2003).

Catch rates for bass tournaments held on Noxon Rapids Reservoir appear to have changed minimally from 1997 through 2001. Catch rates for tournaments held in May dropped only slightly from 1997 to 2001 while catch rates for tournaments held in late July appear to have dropped more substantially from 1997 to 2001. On the other hand, catch rates for tournaments held in September increased from 1997 to 2001. Thus, it appears that the abundance of bass in Noxon Rapids Reservoir did not changed substantially during this period. However, catch rates for all tournaments monitored in 2002 declined from those held in 2001, including a decline in catch rates for tournaments held in early July. This reduction in tournament catch rates should be monitored closely during the next two years to better determine if substantial changes in largemouth and smallmouth bass abundance are occurring and to determine whether changes in current bass management in Noxon Rapids Reservoir are necessary.

A noticeable change in species composition appears to have occurred in the bass community based on tournament catch rates. Tournament catch rates for smallmouth bass increased from 1997 to 2000 in tournaments held during each season while catch rates for largemouth bass largely declined. While species composition for tournaments monitored in 2002 were not as skewed as those observed in 2000, smallmouth bass still comprised a larger percentage of the tournament catch than was observed in 1997 and 1998. This trend in species composition of bass captured during tournaments may be due to smallmouth bass expanding their abundance or may be due to tournament fishermen beginning to target smallmouth bass. Smallmouth bass were first introduced into Noxon Rapids Reservoir in 1982 (Huston 1995). While smallmouth bass were captured consistently relatively soon after their introduction in 1982 (Huston 1985), it is quite possible that they are still expanding in abundance in Noxon Rapids Reservoir, especially considering that substantial bass recruitment may only be occurring during low water years. However, this shift may also be due to tournament fishermen altering their techniques to capitalize on smallmouth bass in Noxon Rapids Reservoir. Nonetheless, both scenarios likely indicate that smallmouth bass have become an important addition to the Noxon Rapids Reservoir bass fishery.

An increase in the number of quality sized (>380 mm) bass also appears to be occurring in Noxon Rapids Reservoir. No substantial management changes have occurred recently which would have induced this change. This increase may also be due in part to the expansion of smallmouth bass in Noxon Rapids Reservoir and the additional recruitment of larger individuals into this population since their introduction in 1982. However, other factors such as the development of strong year classes as a result of high recruitment years may also affect this index. Nonetheless, this apparent improvement in quality sized bass is a positive trend which should continue to be monitored.

More detailed information on the conclusions of the monitoring can be found in the attached report (Liermann and Tholl 2003).

Assessing the effects of the illegal introduction of walleye to Noxon Rapids Reservoir

Walleye catch rates and their apparent distribution increased substantially in Noxon Rapids Reservoir from 2000 to 2003. In addition, the size structure appeared to include an age-0 fish indicating successful reproduction is occurring.

Another indication of the possible expansion of walleye in Noxon Rapids Reservoir is the abundance and size structure of yellow perch in Noxon Rapids Reservoir. Yellow perch are a common prey item of walleye and the negative effects walleye introductions can have on yellow perch fisheries in western impoundments are well documented (McMahon 1992).
The observed decline in yellow perch catch rates again suggest that walleye expansion may be occurring in Noxon Rapids Reservoir, however, further data collection will be necessary to truly evaluate whether yellow perch continue to decline. The shift in the average size of yellow perch observed from 2000 to 2002 also suggests that increased walleye predation on smaller yellow perch may also be occurring. However, other factors such as fluctuating temperature regimes or reduced competition as a result reduced yellow perch densities may be affecting yellow perch growth patterns. For instance, yellow perch captured in 2002 may simply be exhibiting higher growth rates than those captured in 2000 based on the low flow conditions and the subsequent above average water temperatures experienced during 2000 and 2001.

More detailed information on the conclusions of the monitoring can be found in the attached report (Liermann and Tholl 2003).

RECOMMENDATIONS

Determining trends in fish populations – Gill netting and merwin trapping

Due to logistical constraints it was recommended that merwin trapping occur every other year (one year in Cabinet Gorge Reservoir and the next in Noxon Rapids Reservoir). In addition, to assist in making logistics more reasonable it was suggested to conduct merwin trapping the week following gill netting each year.

Monitoring the recruitment and status of the bass fishery in Noxon Rapids Reservoir

Comparisons of the number of largemouth bass captured at each site per year as an index of recruitment potential was not possible from 2000 to 2002. This was due primarily to beach seining being conducted at different locations each sampling period and each year. In 2002, the beach seining protocol was altered to include seven sampling locations to be sampled during each sampling period. This new protocol implemented should allow for the comparison of the number of bass caught per seine haul at each site between years. This data, in conjunction with the comparison of length data, should provide a more comprehensive approach to monitoring largemouth bass recruitment in Noxon Rapids Reservoir.

While the current bass recruitment monitoring protocol provides adequate data for monitoring largemouth bass recruitment in Noxon Rapids Reservoir, very little data was being collected on the recruitment of smallmouth bass. This was largely due to very few smallmouth bass being captured during beach seining surveys. In general, age-0 smallmouth bass utilize different rearing habitat than age-0 largemouth bass, which are not currently sampled. While age-0 smallmouth bass appear to have similar growth requirements to achieve overwinter survival as largemouth bass (Bennett and Bennett 1991), alternative sampling techniques would likely need to be employed to more completely assess smallmouth bass recruitment in Noxon Rapids Reservoir.

A substantial change to the current bass tournament monitoring methodology was implemented in 2003. As of 2002, only the number of bass that tournament anglers brought to weigh-ins were counted towards angler catch rates. The typical limit for most tournaments is five bass greater than 300 mm TL. However, after a tournament angler has captured five bass (the daily limit), they are allowed to replace smaller bass with larger bass to improve the weight of their catch while still maintaining their five fish limit, a practice referred to as "culling". Thus, when only the fish brought in to weigh-ins are included towards catch rates, a substantial number of culled fish are not included. This practice of not counting culled fish could lead to the "smoothing" of this trend data. For instance, in years when bass are highly abundant, the number of five fish limits may be similar to years when bass are less abundant, however many more bass are likely culled at tournaments held during years when bass are highly abundant. However, since only the number of bass brought in to the weigh-ins are counted, the actual total number of bass greater than 300 mm caught is underestimated. Therefore, beginning in 2003, each angler at tournament weigh-ins was asked for the number of largemouth and smallmouth bass greater than 300 mm (12 in) that were culled during that day. While the accuracy of this data does rely on the angler's memory, the catch-per-unit-effort index of fish caught per angler day will be much more sensitive to detecting changes in bass populations. Counting the number of culled fish will also allow for the comparison of tournaments with different tournament structure (individual vs. team limits) or limits, as all bass greater than 300 mm will be represented in the catch rates. This will facilitate accurately monitoring bass populations despite changes in tournaments, which commonly occur. The number of culled fish will be recorded separately so that newly collected data will still be comparable to the data collected over the past several years.

Assessing the effects of the illegal introduction of walleye to Noxon Rapids Reservoir

Due to the apparent expansion of walleye in Noxon Rapids Reservoir in both abundance and
distribution, a study was recommended in 2003 and begun in 2004 to further investigate the status of the population (Liermann 2003). Specific objectives of this study include: 1) determining the seasonal habitat use of walleye in Noxon Rapids Reservoir particularly during spawning, 2) obtaining additional distributional and abundance information on walleye while concurrently determining the catchability of walleye during spring and fall periods, and 3) obtaining age and growth information on captured walleye and potentially determining variation in annual walleye recruitment using age data.

The results of this study should provide a much better understanding of seasonal habitat use of walleye particularly during spawning and also characterize some basic life history attributes of walleye in Noxon Rapids Reservoir. Data collected from this study will also assist in determining whether future management activities are necessary and will provide the basic information necessary to conduct possible future management actions. Based on the position taken by the MFWP Commission and the Montana Warmwater Fisheries Management Plan, if the results of this study suggest that walleye in Noxon Rapids Reservoir are potentially vulnerable to removal techniques, actions aimed at reducing walleye densities will likely be proposed.

LITERATURE CITED

Avista Corporation (Avista). 1999a. Volume III settlement agreement including appended PM&Es and cultural resource programmatic agreement, Cabinet Gorge Hydroelectric Project (FERC No. 2058) and Noxon Rapids Hydroelectric Project (FERC No. 2075). Application for new license submitted to Federal Energy Regulatory Commission, Washington D.C. Avista Corporation, Spokane, Washington.

Avista Corporation (Avista). 1999b. Habitat use and movement of fish in Noxon and Cabinet Gorge reservoirs. Avista Corporation, Spokane, Washington.

Bennett, D. H. and K. M. Bennett. 1991. Effects of potential introductions of smallmouth bass (*Micropterus dolomieui*) into waters of the Clark Fork, Flathead, and Kootenai drainages of western Montana. Report to Montana Fish, Wildlife and Parks, Kalispell and the Confederated Salish and Kootenai Tribes, Pablo, Montana.

Garvey, J. E., R. A. Wright, and R. A. Stein. 1998. Overwinter growth and survival of age-0 largemouth bass (*Micropterus salmoides*): revisiting the role of body size. Canadian Journal of Fisheries and Aquatic Sciences 55:2414-2424.

Huston, J. E. 1985. Thirty-two years of fish management in Noxon and Cabinet Gorge Reservoirs. Report to Montana Fish, Wildlife and Parks, Helena. 30pp.

Katzman, L. M., P. Saffel, K. Pratt and J. Huston. 2001. Cabinet Gorge and Noxon Reservoir Fisheries Monitoring Plan, 2000 to 2002. Montana Tributary Habitat Acquisition and Recreational Fishery Enhancement Program Appendix B. Study plan to Avista Corporation, Spokane, Washington. Montana Fish, Wildlife and Parks, Thompson Falls. 5 pp.

Kleinschmidt Associates and K. L. Pratt. 1998. Clark Fork River native salmonid restoration plan. Report to Washington Water Power Company, Spokane, Washington.

Liermann, B. W. 2003. Noxon Reservoir walleye life history investigations, 2004-2005. Montana Tributary Habitat Acquisition and Recreational Fishery Enhancement Program Appendix B. Study plan to Avista Corporation, Spokane, Washington. Montana Fish, Wildlife and Parks, Thompson Falls. 5 pp.

Liermann, B. W., and T. D. Tholl. 2003. Noxon and Cabinet Gorge reservoir fisheries monitoring comprehensive report, 2000-2002. Montana Tributary Habitat Acquisition and Recreational Fishery Enhancement Program Appendix B. Report to Avista Corporation, Spokane, Washington. Montana Fish, Wildlife and Parks, Thompson Falls, and Avista Corporation, Noxon, Montana.

McMahon, T. E. 1992. Potential impacts of the introduction of walleye to the fishery of Canyon Ferry Reservoir and adjacent waters. Prepared for Montana Fish, Wildlife and Parks, Helena.

Miranda, L. E., and W. D. Hubbard. 1994b. Winter survival of age-0 largemouth bass relative to size, predators and shelter. North American Journal of Fisheries Management 14:790-796.

Montana Fish, Wildlife and Parks (MFWP). 1997. Montana warmwater fisheries management plan, 1997-2006. Montana Fish, Wildlife and Parks, Helena.

Oliver, J. D., G. F. Holeton, and K. E. Chua. 1979. Overwinter mortality of fingerling smallmouth bass in relation to size, relative energy stores, and environmental temperature. Transactions of the American Fisheries Society 108:130-136.

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(1):25-35.

Walker-Smith, K. 1995. Environmental and biological factors limiting reproduction, recruitment and growth of largemouth bass in Seeley and Echo Lakes, Montana. M. S. thesis, University of Montana, Missoula.

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

Washington Water Power (WWP). 1996. Fish community assessment on Cabinet Gorge and Noxon Rapids Reservoirs: A supplemental report. Washington Water Power Company. Spokane, Washington.