Section 4
Hauser Reservoir

Management History

Hauser Reservoir supports 12 game and 10 nongame fish species (Table 6). Of these 21 species, 11 are native and 10 are nonnative. Yellow perch, rainbow trout, and kokanee salmon have historically been the most abundant game fish found in the reservoir. In recent years, walleye numbers have increased to comprise a major component of the Hauser fishery. Suckers (white and longnose) are the most abundant nongame species. Native game species including burbot (ling), westslope cutthroat trout and mountain whitefish that all occur at low densities.

Since construction of Hauser Dam in 1911, a variety of fish species have been introduced into the reservoir without consideration of habitat requirements. Earliest records from the 1930s document the haphazard introduction of sunfish, bass, bullheads, bluegills, coho salmon, rainbow trout, brown trout, and yellow perch. Most of these early introductions failed to produce a fishery. Rainbow trout, brown trout, and yellow perch proved relatively successful (Figures 7 and 8). Walleye were first planted by FWP into Lake Helena in 1951. Survivors from this plant maintained a sparse population in Hauser Reservoir with numerous documented angler creel reports and gill net catches throughout the 1960s and 1970s. Walleye were again stocked in 1989 by FWP as part of the 1989-1994 Hauser Reservoir Management Plan. Approximately 5,000 advanced fingerlings (3-5" total length) were stocked annually 1989 through 1998. Walleye stocking ceased following expansion of the Canyon Ferry walleye population.

In the early 1950s, kokanee salmon were introduced into Hauser Reservoir. Kokanee plants were unsuccessful in producing a fishery in the reservoir despite stocking almost one million kokanee over a six- year period. The kokanee population that thrived through the 1980s and 1990s apparently originated from plants that were made into Canyon Ferry Reservoir in the late 1960s or from plants made into the Helena Valley Regulating Reservoir in the 1970s. Some of the kokanee stocked in Canyon Ferry Reservoir were siphoned into the Regulating Reservoir where they survived and produced a good fishery, which prompted annual stocking beginning in 1971. The kokanee population in Hauser Reservoir began to develop when the Regulating Reservoir was drained for repairs in 1978. Apparently, kokanee from the Regulating Reservoir were spilled into the Hauser system when the repair work was conducted. Since the late 1970s, the kokanee population in Hauser Reservoir expanded dramatically and has undergone large annual fluctuations. Record high runoff and associated fish flushing during 1995, 1996 and 1997 resulted in a severe decline in the Hauser kokanee population to a fraction of early 1990s levels (Figure 7). Hatchery plants throughout the late 1990s and early 2000s were unsuccessful at reestablishing the kokanee population.

The rainbow trout fishery in Hauser Reservoir has been maintained by annual stocking. Wild rainbow comprise less than 10% of the fishery due primarily to poor quality spawning habitat in tributary streams. Approximately 200,000 3-5 inch Arlee rainbow trout were planted annually through 1990 when stocking numbers were reduced to nearly half in response to the dramatic increase of the kokanee salmon population. Catch rates for rainbow trout declined steadily following reductions in the number of hatchery rainbow stocked. Through the early and mid 1990s, Arlee rainbow were planted after spring runoff in an attempt to minimize losses of fish over the dam when water was spilled. Following the

Table 6. Fish Species in Hauser Reservoir Including Statewide Native Status, First Stocking Date, Population Trend and Relative Abundance.

Species	Native	First Stocking Date	Population Trend (1986-2008)	Relative Abundance (Based on historic field monitoring.)
Game Fish Species				
Kokanee salmon	No	1950	Decreasing	Common
Rainbow trout	No	1934	Stable	Abundant
Brown trout	No	1931	Stable	Common
Burbot	Yes	Native	Increasing	Common
Mountain whitefish	Yes	Native	Decreasing	Common
Yellow perch	No	1938	Decreasing	Abundant
Walleye	No	1951	Increasing	Abundant
Northern pike	No	Unknown	Unknown	Rare
Largemouth bass	No	1926	Unknown	Uncommon
Smallmouth bass	No	Unknown	Unknown	Uncommon
Brook trout	No	Unknown	Unknown	Rare
Cutthroat trout	Yes	Native	Unknown	Rare
Nongame Fish Species				
Common carp	No	Unknown	Stable	Abundant
Longnose sucker	Yes	Native	Decreasing	Abundant
Mottled sculpin	Yes	Native	Unknown	Abundant
White sucker	Yes	Native	Decreasing	Abundant
Fathead minnow	Yes	Native	Unknown	Common
Longnose Dace	Yes	Native	Unknown	Uncommon
Utah chub	No	Unknown	Decreasing	Uncommon
Flathead chub	Yes	Native	Unknown	Rare
Smallmouth Buffalo	Yes	Unknown	Unknown	Rare
Stonecat	Yes	Native	Unknown	Rare

kokanee population crash, numbers of stocked rainbows were increased to the current level of 50,000 Eagle Lake strain rainbow trout planted after spring runoff and 100,000 Arlee rainbow trout stocked in the fall. Plants of catchable sized rainbow trout were initiated in 2002 to reduce predation by the growing walleye population.

Prior to 1988, daily and possession limits for trout were 10 pounds and 1 fish, not to exceed 10 fish. For kokanee and walleye, the daily and possession limits were 10 fish and 5 fish, respectively. Beginning in 1988, more conservative regulations were implemented to prevent over harvest of kokanee and protect the walleye population. The trout and kokanee limits were combined making the daily and possession limits 10 trout and kokanee in combination. In 1996, the combined trout/kokanee limit was reduced to 5 fish with a possession limit of 10 trout and salmon in any combination, and the limit for walleye was changed to 5 fish, only one of which could exceed 20 inches. Current regulations (2009) allow the harvest of 5 trout and salmon in any combination. Walleye regulations have been liberalized to 10 fish daily, only one over 28-inches.

Hauser Reservoir Management Goals and Limiting Factors

The goal for managing the Hauser Reservoir fishery is to provide a cost-effective, balanced multi-species fishery with the opportunity to catch rainbow trout, walleye, and yellow perch with kokanee, brown trout, and other species occasionally contributing to the sport fishery.

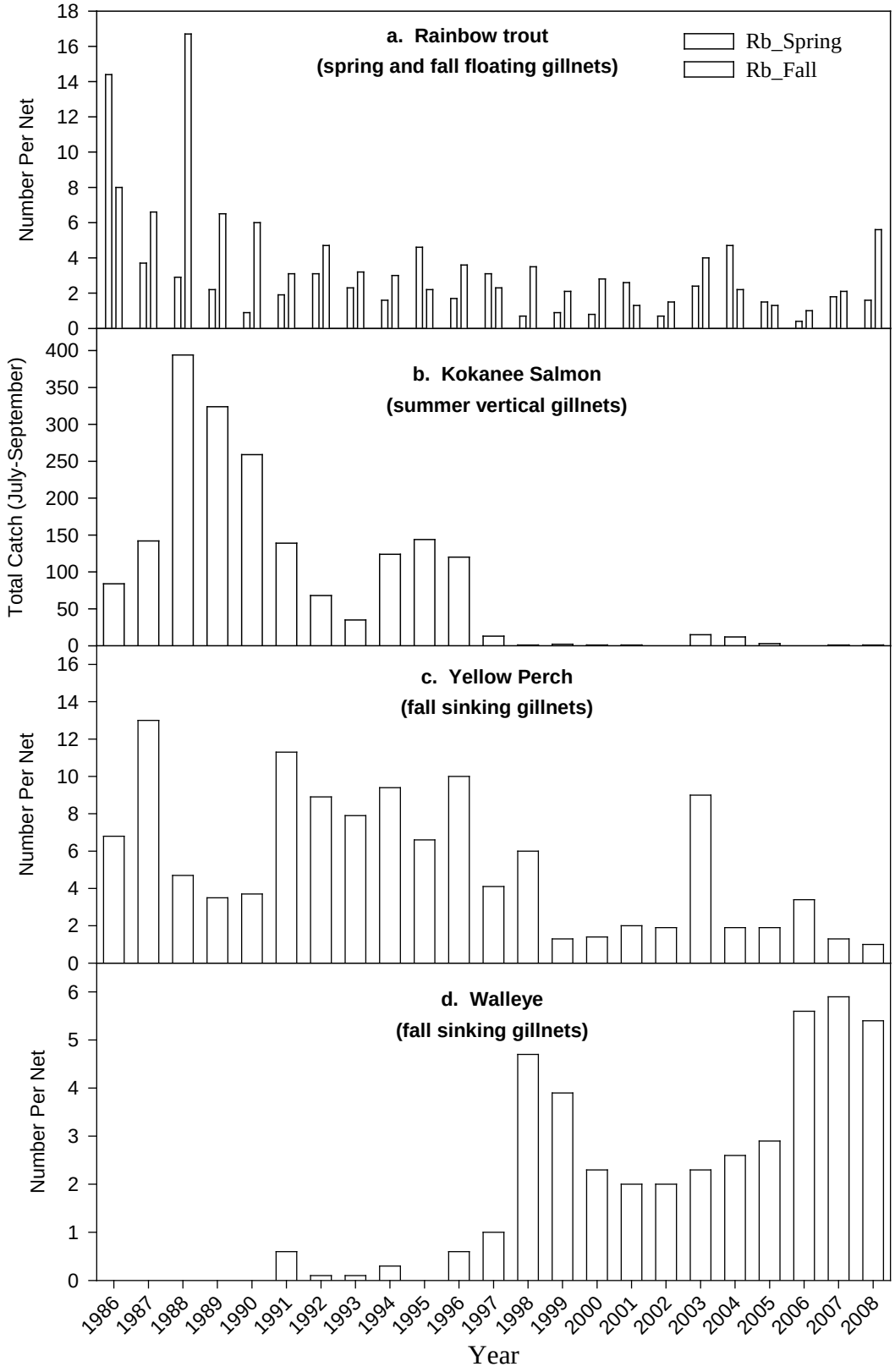

Figure 7. Hauser Reservoir Fisheries Gillnetting Trends for the Four Principal Game Fish: Rainbow Trout (A), Kokanee (B), Yellow Perch (C), and Walleye (D). Species Trends are for the Period 1986 through 2008.

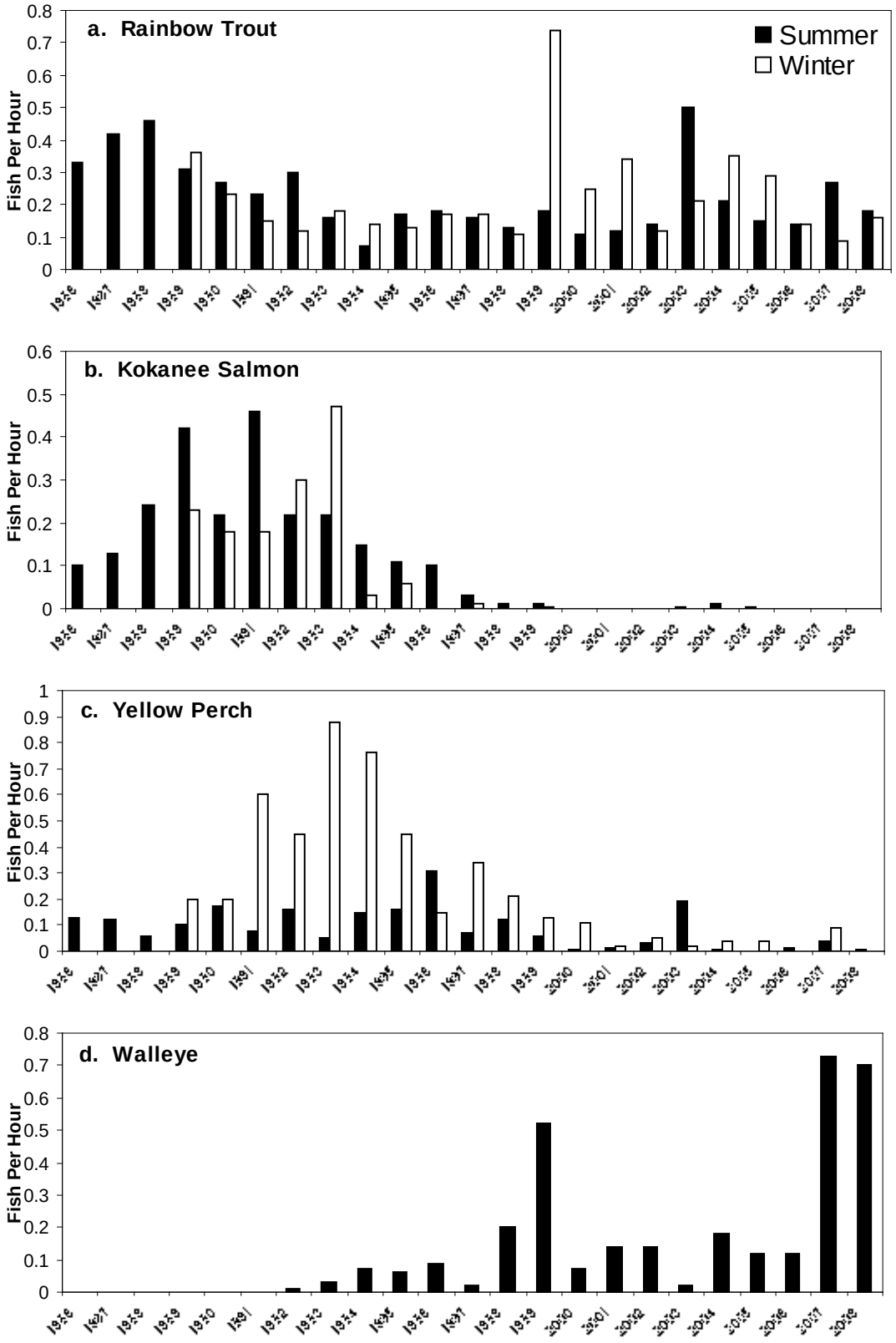

Figure 8. Angler Catch Rates (Fish/Hour) for the Principal Game Species in Hauser Reservoir for the Period 1986 through 2008. Summer (dark bars) and winter (light bars) are represented. Catch rates for rainbow and walleye represent anglers targeting only those species, while kokanee and perch represent all anglers.

Until factors limiting fisheries production in Hauser Reservoir are addressed, the fishery will not reach it's full potential. Most of the problems are large in scale, and involve numerous government agencies and private landowners. Resolution of these problems will require cooperation of highly focused individuals representing the various agencies. As with many large-scale resource management problems, money and manpower will limit the completion of any goals targeted at benefiting the fishery. PPL Montana took over operational control of Hauser and Holter dams in 2000, and received a new federal operating license in 2001. FERC requires PPL Montana to provide funds for monitoring, protection, maintenance, and enhancement of fisheries resources in Hauser and Holter Reservoirs.

Five factors have been identified as limiting fisheries production in Hauser Reservoir:

- Oxygen deficient water continues to be an issue and could be a key limiting factor. Oxygen deficient water (less than 6.5mg/l) is being released annually during fall months (August, September, and October) from Canyon Ferry Dam. Low levels of dissolved oxygen (DO) were first discovered in 1996 below Canyon Ferry dam in Hauser Reservoir, although evidence suggests that it may not be a recent phenomenon. Data collected through the summer and fall of 1998 revealed that the problem is severe at times with low DO values falling below 3mg/l and extending through as much as 75-80% of the surface area of Hauser Reservoir. Based on scientific literature, low DO related impacts to fish range from simple avoidance to increased susceptibility to disease or death if fish are exposed to chronically low DO. Each species is affected differently; although salmonids are more sensitive than most cool and warm water species, especially to DO levels less than 5 mg/l (Environmental Protection Agency (EPA) 1976). Levels below 5 mg/l are especially critical to aquatic life and are estimated to occur an average 45 days/year in Hauser Reservoir. FWP studies conducted in 2002 found that Hauser fish are forced down-reservoir to avoid deoxygenated water, forcing fish to reside either in the Causeway arm or in front of Hauser Dam, where DO typically is at saturation. Downstream movement to avoid low DO waters may cause increased entrainment over Hauser Dam during the fall months. Kokanee salmon likely sustained the most severe impact from low DO, as they would spawn in the fall immediately below Canyon Ferry Dam, where DO values are lowest. Air injection units placed on one turbine at Canyon Ferry Dam has been in place since 2007 and appears effective at bringing DO at least to statewide standards for running water during the fall. Further monitoring in upper Hauser is needed to determine the overall effectiveness of the modified turbine unit and its effects on the fishery.

- Fish loss out of Hauser Reservoir from flushing over the spillway and entrainment (passage through the turbines in the dam) continues to be one of the principal factors affecting species assemblages on an annual basis. While all fish species are susceptible to flushing, kokanee salmon may flush at higher rates because of behavioral tendencies. Skaar and Humphrey (1996) documented flushing of stocked rainbow trout correlated with high runoff. Walleye flushing has been documented through the recovery of tagged fish. Walleye tagged in Hauser Reservoir have been recaptured in Holter Reservoir and the Missouri River below Holter Dam by anglers and FWP survey crews.

- Walleye flushed from Canyon Ferry Reservoir into Hauser Reservoir is an issue that affects the balance of the multi-species fishery. Depending on annual year class strength and water year, the number of walleye flushed into Hauser Reservoir has the potential to be significant. Since the expansion of the Canyon Ferry walleye fishery, walleye relative abundance in Hauser has increased 1,700%, from an average abundance of 0.2 walleye per net (1986-1997) to an average of 3.6 walleye per net (1998-2008). Although Hauser has historically supported a low-level walleye population, there is not enough forage to support the current abundance of walleye in Hauser. Growth rates and

condition factors for Hauser walleye are very poor. Currently, invertebrates and zooplankton comprise the majority of walleye diet samples rather than fish, which is an expected and preferred prey item.

No screening devices are in place on Canyon Ferry Dam to limit the number of walleye flushed into Hauser and Holter Reservoir. However, there may be technology available that may limit the effects of fish flushing from Canyon Ferry. Electric weirs have been successful at reducing entrainment at some dam and diversion facilities. There may also be potential to add pressurization devices that kill any fish that are entrained. Such systems will be expensive and further research is needed to evaluate the cost-effectiveness of such a system. These types of measures may be necessary to maintain a balanced multi-species fishery in Hauser Reservoir.

- Poor quality spawning tributaries to Hauser Reservoir will continue to limit the production of wild fish and the contribution of wild fish to the Hauser fishery. Kokanee salmon have been the only sport fish that has at times had excellent success spawning in Hauser. Spawning has occurred in the Hauser tailrace and Spokane Creek. Other available streams (Trout, McGuire, Soup, Prickly Pear and Silver Creeks) have water quality and quantity problems. Poor land management practices (both historic and present) in these watersheds will continue to limit fish production. Until these issues are addressed, there is little potential for establishing wild runs of fish that could contribute significantly to the Hauser Reservoir fishery.

  Yellow Perch spawning habitat in Hauser Reservoir is limited by the lack of structure in the Reservoir. This is a common problem in many reservoirs as submerged wood that is initially inundated following dam construction breaks down over time. Based on the age of Hauser Reservoir, nearly all of the trees that were initially flooded have decayed.

- Whirling disease is a prominent player in fish management in Montana. Because Hauser Reservoir is reliant on hatchery rainbow trout, this disease has not had as great an impact as it has had on fisheries dependant on wild salmonid reproduction. Rainbow trout are planted into Hauser when they are 8 inches, which lowers the susceptibility to contracting whirling disease compared to smaller fish. However, wild fish produced from tributary or tailrace spawning have a high chance of exposure to the disease. Silver Creek (tributary to Lake Helena/Hauser) was the first tributary in the Hauser/Holter system to test positive for whirling disease in 1998. Since then Prickly Pear, Trout and Spokane creeks have tested positive for whirling disease. Other Hauser tributaries have been tested but results are not yet available. Whirling disease testing will continue at some level on all principal tributaries of the reservoirs.

Hauser Reservoir Management Goals by Species

In order to manage a fish community that includes multiple sport fish species, it is important to recognize that the goal for each species is affected by the success of management strategies for other species in the system and that all fish species may not be maximized simultaneously.

Rainbow Trout

Goals and Objectives:

Rely on rainbow trout to provide a principal component of the sport fishery.

- Recruit a three-year running average of 3 rainbow trout per net to fall floating horizontal gill nets.

- Provide a three-year running average angler catch rate of 0.15 to 0.20 fish/hour.

Rationale:

Throughout the late 1980s, rainbow trout provided a significant percentage of the Hauser Reservoir fishery. Catch rates during this period were considered good, averaging 0.24 rainbow/hour. Concurrently, FWP was annually stocking roughly 220,000 rainbow fingerlings per year. In 1990, the number of rainbows planted was reduced by nearly half to an eight-year average of only 118,000 fingerlings based on recommendations made in the previous management plan to maximize harvest of the self-sustaining kokanee population (FWP 1989). From 1995-1996, an average 100,000 fingerlings were stocked annually with catch rates during this period averaging 0.06 rainbow/hour. Following the crash of the kokanee fishery in the late 1990s, rainbow stocking rates and size of fish at stocking were increased to 150,000 8-inch rainbows stocked in the summer and fall. These stocking rates have yielded an average summer angler catch rate of 0.14 rainbow per hour (2006-2008).

Strategies:

- Continue annual rainbow plants of approximately 100,000 Arlee rainbow (average 8-inches in length) and 50,000 Eagle Lake rainbow (8-inches). These fish will be stocked following peak runoff to reduce flushing impacts. Adaptive management changes in the rainbow stocking plan could occur in response to walleye predation.

    - If three-year average catch in fall floating gillnets falls below 2 rainbow per net, consider changes to the stocking plan (e.g., timing and location of fish plants, strains, size at stocking) and implement if deemed cost-effective.

    - If three-year average catch in fall floating gillnets falls below 1 rainbow per net, consider more liberal management actions, such as reducing harvest limits and/or predator suppression measures.

- Continue evaluation of fall released rainbow trout:

    - Stock rainbow trout at a larger size in the fall to reduce susceptibility to walleye predation and reduce flushing losses.

    - Avoid low DO by waiting until Canyon Ferry Reservoir turns over (generally the first two weeks in October) before stocking fish. Stocking would occur when DO values in Hauser Reservoir are within a more optimum range for rainbow trout (greater than 6.5mg/l).

- Maintain the current fishing regulation of 5 trout or salmon daily in combination, 10 trout or salmon in combination in possession.

Kokanee Salmon

Goals and Objectives:

Recognize kokanee salmon as a limited supplemental species to rainbow trout with poor opportunity as a viable sport species in Hauser Reservoir. Current kokanee abundance is too low to set or maintain a realistic management goal.

Rationale:

Although popular with some anglers, the kokanee fishery in Hauser has historically proven to be erratic and heavily influenced by runoff and to a lesser degree, harvest. Following record water years in 1997 and increased flushing of walleye from Canyon Ferry, current abundance of Hauser kokanee is a fraction of historic levels. Attempts at reestablishing the kokanee population through stocking have failed. Given the current species composition and abundance in the reservoir, it is no longer cost effective to maintain the Hauser kokanee fishery.

Strategies:

- Eliminate stocking kokanee in Hauser Reservoir. Water quality issues, walleye predation, and flushing rates of kokanee make the cost-effectiveness of continued kokanee stocking unjustifiable. Stocking may continue if these limiting factors can be mitigated.

- Evaluate other strategies that may provide cost-effective solutions to maintaining the Hauser kokanee fishery (i.e., artificial spawning channels).

Walleye

Goals and Objectives:

Maintain walleye as a species that provides a balanced, cost-effective fishing opportunity in Hauser.

- Maintain a three-year running average of 2-3 walleye per fall sinking gill net.

Rationale:

The current prey base in Hauser is not capable of supporting walleye abundance at current walleye population levels. Walleye population numbers should be decreased to meet prey availability. The stated objective of 2-3 walleye per sinking fall gillnet is based on recent gillnetting trends as well as the successful multi-species fishery that historically existed in Holter Reservoir prior to expansion of walleye in Canyon Ferry. Holter has provided a sustainable multi-species fishery containing rainbow trout, kokanee salmon, walleye and yellow perch. Hauser Reservoir differs from Holter Reservoir in several key physical parameters. Most prominent is water retention time: Holter exchanges water on average every 21 days while Hauser is only 8 days (Table 1). This has the potential to strongly influence walleye populations and prey availability because of flushing losses. The substantially lower growth rates of Hauser walleye indicate prey availability is much lower than in adjacent reservoirs. Flushing of walleye from Canyon Ferry will continue to be a problem unless a way to reduce entrainment at Canyon Ferry Dam is found.

Strategies:

- Adjust angler bag limits to increase harvest and lower walleye abundance to levels sustainable with forage abundance.

    - Increase daily bag limit to 20 fish only one over 28-inches, 40 in possession to maximize walleye harvest and decrease abundance to levels more consistent with available forage.

    - Monitor harvest from the new Lake Helena Fishing Access Site (FAS) to determine if size or seasonal restrictions are necessary to protect larger-sized fish during the spring. Until recently, boat access to Lake Helena has been limited, and the new FAS may increase fishing pressure during the spring.

- Evaluate restrictions in walleye bag limits if walleye abundance falls below the three-year average of 2 walleye per gillnet and angler harvest is determined to be the cause of abundance declines.

    - Regulation changes will be considered if rainbow trout abundance exceeds management goals (three-year running average of 3 rainbow trout per fall floating gillnet) and yellow perch abundance is near management goals (three-year running average of 4 yellow perch per fall sinking gillnet).

    - Restrictions may include reducing bag limits, size restrictions, and/or seasonal closures.

- Evaluate use of other tools to reduce walleye numbers if three-year average walleye catch in fall sinking gillnets increases above 6 walleye per net or if rainbow trout and/or yellow perch abundance falls below 1 fish per fall gillnet on a three-year average. Other tools may include unlimited harvest, gillnetting or trap netting during periods when fish are highly concentrated, spearing through the ice or underwater, among others. Any of these management actions will require public input prior to implementation.

    - If these triggers are exceeded within three years following plan implementation, consider deferring management action to better determine effectiveness of strategies outlined in this plan.

- Solicit funding to determine walleye flushing and entrainment at Canyon Ferry Dam.

    - Determine the feasibility of screening or other methods to reduce walleye entrainment and evaluate the effects on Canyon Ferry Reservoir.

Brown Trout

Goals and Objectives:

Rely on brown trout to provide a limited trophy-fishing experience that is reliant entirely on wild reproduction.

- Maintain at least 0.5 brown trout per sinking gillnet.

Rationale:

Evidence suggests that kokanee salmon had a detrimental impact on brown trout populations in Hauser Reservoir. Competition for spawning areas may have reduced brown trout populations. With kokanee populations depressed, brown trout populations have demonstrated minor increases. Brown trout are a long-lived species that have maintained low densities in Hauser because of limited reproduction and/or recruitment. Relatively few anglers target brown trout however, records indicate that prior to the kokanee population explosion in the early 1990s, brown trout numbers were higher and represented an important trophy fishery.

Strategies:

- Identify critical brown trout spawning areas (e.g., Spokane Creek) and implement habitat improvement projects to increase spawning and recruitment.

- Continue catch and release angling regulations on brown trout from below Canyon Ferry dam to Hauser Dam.

- Eliminating angler harvest allows the brown trout population to rebuild. Continuing this regulation maintains consistency with brown trout regulations proposed throughout the reservoir system.

Yellow Perch

Goals and Objectives:

Rely on yellow perch to provide a self-sustaining fishery that is based entirely on wild reproduction.

- Maintain a running average of at least 4.0 yellow perch per fall sinking gill net.

Rationale:

Yellow perch were planted in Hauser Reservoir from 1939 to 1955. Subsequently they have maintained moderate population levels in the reservoir entirely through natural reproduction. Although present for approximately the same period of time, perch densities have not achieved levels comparable to Holter Reservoir. Yellow perch populations have been limited by flushing, habitat conditions, predation, and possible competition with abundant planktivores (kokanee salmon). Populations appear to be driven by environmental conditions rather than by the number of spawning aged adults. A relatively small spawning stock of adult yellow perch can still produce large year-classes of fish. Perch flushed from Canyon Ferry also heavily influence population abundance.

Yellow perch were commonly the most sought after species by Hauser ice-fisherman and can be an important component of the Hauser winter fishery. Catch rates have always been variable but have declined as walleye abundance has increased. Winter angler catch rates averaged 0.45 fish per hour (1989 through 1997) and has declined to an average of 0.06 fish per hour (1998-2008). In winter 2008 no anglers were surveyed who were targeting exclusively perch.

Strategies:

- Identify and implement cost-effective yellow perch habitat enhancement projects.
  - Construct and deploy tree structures for spawning and rearing habitat if an easily accessible source of trees is available. Recycled Christmas trees from the Helena and Bozeman areas are used to construct perch spawning structure in Canyon Ferry. Hauling of Christmas trees or cutting junipers from nearby areas are options for more trees, however these options are often limited by the cost of cutting and hauling trees on site.
  - Identify and experiment with other artificial habitat structures that may enhance perch spawning.
- Lower daily angler bag limit to 25 yellow perch daily with no possession limit.
  - Limiting factors listed above (see Rationale) likely have more significant impacts to yellow perch abundance than angler harvest. Dropping the daily bag limit from 50 to 25 will allow evaluation of angler harvest and determine if harvest is a significant limiting factor.
  - Recommend raising the bag limit if yellow perch abundance increases above 7 perch per fall sinking gillnet on a three-year running average.
- Consider additional management actions if yellow perch abundance falls below 1 perch per fall sinking gillnet on a three-year running average.

- Additional actions may include further reductions in angler harvest of perch and/or implementation of active walleye management strategies.

- If these triggers are exceeded within three years following plan implementation, consider deferring management action to better determine effectiveness of strategies outlined in this plan.

Burbot (Ling)

Goals and Objectives:

Rely on burbot to provide a low-level, self-sustaining fishery that is supported entirely by wild reproduction.

- Attempt to recruit a three-year running average of 0.5 to 1.0 burbot per fall sinking gill net.

Rationale:

Burbot (ling) is one of three native game fish in Hauser Reservoir. Limited information is known on burbot population dynamics and basic life history in the upper Missouri River reservoir complex, however burbot abundance in Hauser appears to have increased over the past four years.

Strategies:

- Increase knowledge of burbot population dynamics in Hauser Reservoir. Specifically, efforts will be made to collect data (age, growth, food habits, general abundance) from burbot during normal field sampling (gill netting and electrofishing).

- Evaluate reduction in angler harvest if three-year running average falls below 0.5 burbot per fall sinking gillnet.

- Evaluate increasing angler harvest if three-year running average catch of burbot increases above 2.0 burbot per fall sinking gillnet.

- Consider establishing a sampling regime specifically targeting burbot. This would likely involve use of specialized sampling gears deployed in the late winter months.

- Redirect effort during winter creel to determine burbot harvest.

Northern Pike

Goals and Objectives:

Monitor and suppress the northern pike population in the reservoir, and evaluate impacts to other species.

Rationale:

Increased abundance of northern pike in upstream waters significantly increases the likelihood of flushing of northern pike into Hauser. FWP documented the first northern pike in Hauser during standardized sampling in fall, 2009. Northern pike are highly piscivorous fish and the current forage base in Hauser is likely not adequate to support an additional voracious predator.

Strategies:

- Eliminate all angler bag limits for northern pike in the upper Missouri River reservoir system.

- Identify critical spawning habitats in the reservoir and determine if habitat manipulations can suppress pike numbers and emigration through the system.

- Explore and implement other opportunities or techniques to suppress northern pike numbers.

- Determine impacts of northern pike to existing forage.

- Additional management methods may be necessary to reduce pike populations (e.g., spearing, commercial fishing, required harvest during tournaments) following public review and MEPA process.

Other Hauser Reservoir Fisheries Management Issues

Low Dissolved Oxygen (DO)

Goals and Objectives:

- Monitor DO values in Hauser Reservoir to ensure that water released from Canyon Ferry contains at least 5mg/l DO throughout the entire year.

Rationale:

Low levels of DO (less than 6.5 mg/l) were first discovered in 1996 below Canyon Ferry Dam in Hauser Reservoir. Based on scientific literature, DO values of at least 5 mg/l are required to maintain "well-rounded" fish populations while 6 mg/l is required to support healthier and more diverse populations (EPA 1976). Impacts of broad environmental stresses such as low DO are manifested through an increased incidence of parasites and disease. Species are affected differently by low DO, but in general, salmonids are more sensitive than most cool and warm water species to DO levels less than 5 mg/l. Monitoring on Hauser has found that fish are avoiding the upper reservoir; especially during periods when oxygen levels from water releases from Canyon Ferry Dam are lowest (late-summer and early-fall). Presence of a low DO plume may also increase fish entrainment at Hauser Dam as fish move into the lower reservoir to avoid the low DO plume.

Strategies:

- Continue to monitor fish movement in Hauser Reservoir and monitor the effectiveness of oxygenation units on Canyon Ferry dam.

- Evaluate the results of recent flushing study at Hauser Dam to determine effects of water quality on fish entrainment at Hauser Dam and determine if low DO increases fish flushing out of Hauser Reservoir.

- Work with BOR to identify and rectify any problems with the oxygenation unit on the turbine at Canyon Ferry Dam. Cavitation and excessive wear on the turbine unit has been observed, occasionally making the unit inoperable.

- Enhance water quality monitoring by collecting DO measurements in the upper reservoir during low DO periods (July-September).

Flushing Losses at Hauser Dam

Goals and Objectives:

Evaluate annual and seasonal flushing rates of fish out of Hauser Reservoir. Determine feasibility of screening Hauser dam to reduce flushing losses.

Rationale:

Flushing loss of fish out of Hauser Reservoir is a key limiting factor affecting fish populations. All fish species are susceptible to flushing, however, kokanee may flush at higher rates because of behavioral tendencies. Kokanee population fluctuations can be largely attributed to age class strength and magnitude of water runoff. Rainbow trout and walleye flushing have also been documented. Skaar and Humphrey (1996) documented that flushing losses of hatchery rainbow trout was correlated with high runoff. Fish flush both through turbines and over the spillway. Walleye flushing has been documented through the recovery of tagged fish. Walleye tagged in Hauser Reservoir have been recaptured in Holter Reservoir and in the Missouri River below Holter Dam by anglers and FWP sampling.

Strategies:

- Evaluate entrainment and flushing rates of fish out of Hauser Dam as determined by recent graduate study. Determine timing and magnitude of flushing losses.

- Determine feasibility of reducing fish flushing losses out of Hauser Reservoir.

    - Evaluate screening devices on Hauser Dam that would reduce flushing losses.

    - Investigate other technologies that may be effectively employed on Hauser Dam to reduce fish flushing losses.

Walleye Flushing from Canyon Ferry Reservoir

Goals and Objectives:

Determine walleye flushing rates from Canyon Ferry Reservoir and evaluate measures to reduce or eliminate walleye flushing from Canyon Ferry Dam.

Rationale:

Walleye flushing out of Canyon Ferry into Hauser Reservoir has increased as the walleye population in Canyon Ferry increased. Increased walleye densities in Hauser Reservoir affect the balance of the multi-species fishery with increased predation on trout and yellow perch. Since the expansion of the Canyon Ferry walleye fishery, walleye relative abundance in Hauser has increased 1,700%, from an average abundance of 0.2 walleye per net (1986-1997) to an average of 3.6 walleye per net (1998-2008). Although Hauser has historically supported a low-level walleye population, there is not enough forage to support the current abundance of walleye in Hauser.

Strategies:

- Request funding from BOR to determine how most walleye pass through Canyon Ferry Dam, study walleye flushing rates, and identify strategies to reduce or eliminate entrainment.

- Determine feasibility of reducing fish flushing losses out of Canyon Ferry Reservoir.

    - Evaluate screening devices on Canyon Ferry Dam that would reduce flushing losses.

- Investigate other technologies that may be effectively employed on Canyon Ferry Dam to reduce fish flushing losses and entrainment to downstream waters.

Habitat

Goals and Objectives:

Enhance wild fish spawning opportunities in Hauser Reservoir and in tributary streams to Hauser Reservoir.

Rationale:

In the past, lack of funding limited the number of projects completed to enhance wild reproduction of Hauser fish. Over the past 10 years, habitat projects such as yellow perch spawning structure placement, habitat enhancement on Prickly Pear Creek, and Merritt Spring Creek channel reconstruction have been constructed or implemented. Other identified projects that are currently limited by funding or other resources include Spokane Creek channel reconstruction, water allocation in Prickly Pear Creek, removal of potential barriers on Trout Creek, among others. The Future Fisheries program provides funding for projects targeting enhancement of wild fish and will continue to provide financial assistance for projects in the future. An important component to accomplishment of habitat enhancement projects on Hauser Reservoir will be the participation by various watershed and local sportsman's groups.

Strategies:

- Develop a list of habitat projects that would be funded by FERC relicensing. Develop this list in conjunction with sportsmen's groups and local watershed groups. Prioritize projects based on cost-effectiveness and highest benefit.

- Implement enhancement projects that will benefit spawning and recruitment of wild fish in Hauser Reservoir.

- Submit future fisheries grant proposals for habitat enhancement projects benefiting Hauser Reservoir.

Disease and Aquatic Nuisance Species

Goals and Objectives:

Monitor Hauser Reservoir tributaries for whirling disease. Prevent introduction of exotic plant and wildlife species from entering the reservoir system.

Rationale:

Whirling disease is a prominent factor in fish management in Montana. Because of Hauser Reservoir's reliance on hatchery rainbow trout, this disease has not had as great an impact as on wild salmonid fisheries. Rainbow trout are planted into Hauser when they are 8 inches. Fish of this size are not as susceptible to contract whirling disease as smaller fish. However, wild fish produced from tributary or tailrace spawning have a high chance of exposure to the disease. Introductions of invasive aquatic species have the potential to out-compete desirable flora and fauna in the reservoir system and can negatively impact recreation and water use as well as fish populations.

Strategies:

- Sample Hauser Reservoir tributaries for whirling disease as part of a state-wide monitoring program. Include whirling disease testing results in annual report.

- Periodically conduct on-site exposure testing in Silver, Prickly Pear, and Trout creeks. Collections will also be made in the Hauser tailrace. McGuire, Spokane, and Ten Mile creeks will be tested as funding allows.

    - Utilize statewide whirling disease taskforce funding and manpower to conduct *in situ* exposure of fish to determine infection rates and severity.

Derbies/Tournaments

Goals and Objectives:

Manage derbies/tournaments on Hauser Reservoir to minimize conflict with the general angling public, encourage safety, and ensure consistency with fishery management goals and objectives.

Rationale:

Currently one angling tournament is held on Hauser Reservoir in the summer, and no tournaments are held in the winter. Increased interest in fishing tournaments may result in additional requests in the future.

Strategies:

- Do not allow ice fishing tournaments on Hauser Reservoir for public safety reasons. Ice on Hauser often does not develop to a thickness that would allow for safe ice-fishing tournaments.

- Monitor harvest associated with angling tournaments. If harvest of sport fish is deemed excessive and detrimental to the population, angling tournaments of this nature will be discontinued.

- No more than three derbies/tournaments will be allowed each year. Tournaments would be required to coordinate with Bureau of Land Management (BLM) and/or FWP for access (where appropriate). FWP will encourage use of private access facilities (where possible) to alleviate crowding problems.