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F-78-R-6
Region 4

MONTANA DEPARTMENT OF FISH, WILDLIFE AND PARKS

FISHERIES DIVISION

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Abstract: Fisheries data were gathered on Hauser and Holter reservoirs to provide information needed to: 1) manage the fishery of the two reservoirs; 2) evaluate impacts of reservoir operations on the sport fishery; and 3) evaluate the success of the hatchery stocking program. This report summarizes data collected during the 2000 field season.

Throughout this report, species management goals are presented. These goals/targets were developed during the Canyon Ferry, Hauser, Holter Fisheries Management workgroup that took place in 1999 and are presented in detail in the document, "Upper Missouri River Reservoir Fisheries Management Plan; 2000-2009". This management plan set the direction of fisheries management for the period 2000-2009.

Hauser Reservoir

Hauser reservoir continues to recover from the impacts of high water and flushing that occurred 1995 through 1997. Kokanee salmon, rainbow trout and yellow perch all remain below their respective management plan targets which are based on gill net catch rates and in some instances, angler catch rates. Walleye densities, although having declined since the 1998 record high, remain above the management plan target. In spite increased stocking of rainbow trout, catch rates remain low. Early indications suggest good survival of the 2000 plant of 189,000 Arlee rainbow trout. Efforts to recover the once wild reproducing kokanee salmon population with hatchery stocks have failed to date. Walleye predation and flushing losses are suspected in the poor survival of hatchery trout and kokanee. Predation on kokanee doubled from 1999 levels and remains high relative to kokanee densities. Predation pressures are also being manifested on yellow perch and sucker spp. populations. Both perch and sucker populations reached record low densities (based on gill net catch rates) in 2000. Concurrent with the low densities, both populations achieved the largest (oldest) average size on record indicating predation is having a substantial impact on recruitment.

Holter Reservoir

Holter reservoir continues to maintain a quality multi-species fishery in spite of falling below management plan targets for rainbow trout and yellow perch. Walleye populations in 2000 were at sufficient densities to produce the highest ever recorded summer catch rate of 0.13 walleye per hour for all anglers and a remarkable 0.23 per hour for anglers specifically targeting walleye. Additionally, the three-year running average gillnet catch rate is double the management plan target. Walleye predation has had an impact on perch population with 81% of the walleye diet comprised of yellow perch in fall 2000. Preliminary rainbow trout age at stocking evaluation

from 1996 and 1997, suggests a four-fold survival advantage of age one Eagle Lake rainbow over age zero Eagle Lakes. Wild rainbow trout in floating gillnets fell to a record low in 2000 at 7%. Yellow perch angler and gillnet catch rates remained below average in 2000 prompting a regulation change. In 2000, a limit of 50 perch and no possession limit was instituted for both Hauser and Holter Reservoirs.

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PROCEDURES

The study area has been previously described by Rada (1974), Berg and Lere (1983) and MFWP (1985). A map of the two reservoirs is presented in Figure 1. Vertical and horizontal gillnetting (timing, net size and net locations) continued in 2000 based on procedures established in Lere (1986). Single-lead trap nets (4 x 6 foot frame with either 1" or ½" mesh) were used to sample walleye on Holter Reservoir in spring 2001. The partial creel census continued on Hauser and Holter reservoirs from May through October and again during ice-coverd months (January through March) as described in Lere (1987). Zooplankton and water quality samples were collected during ice-free months at three established locations on Hauser and Holter Reservoirs according to methods established in Lere (1987). Hydroacoustic estimates of pelagic fish densities and total fish abundance were conducted as described in Skaar and Humphrey (1995) and Dalbey and Humphrey (1999). In 2000, hydroacoustic surveys were completed between September 18 and 19.

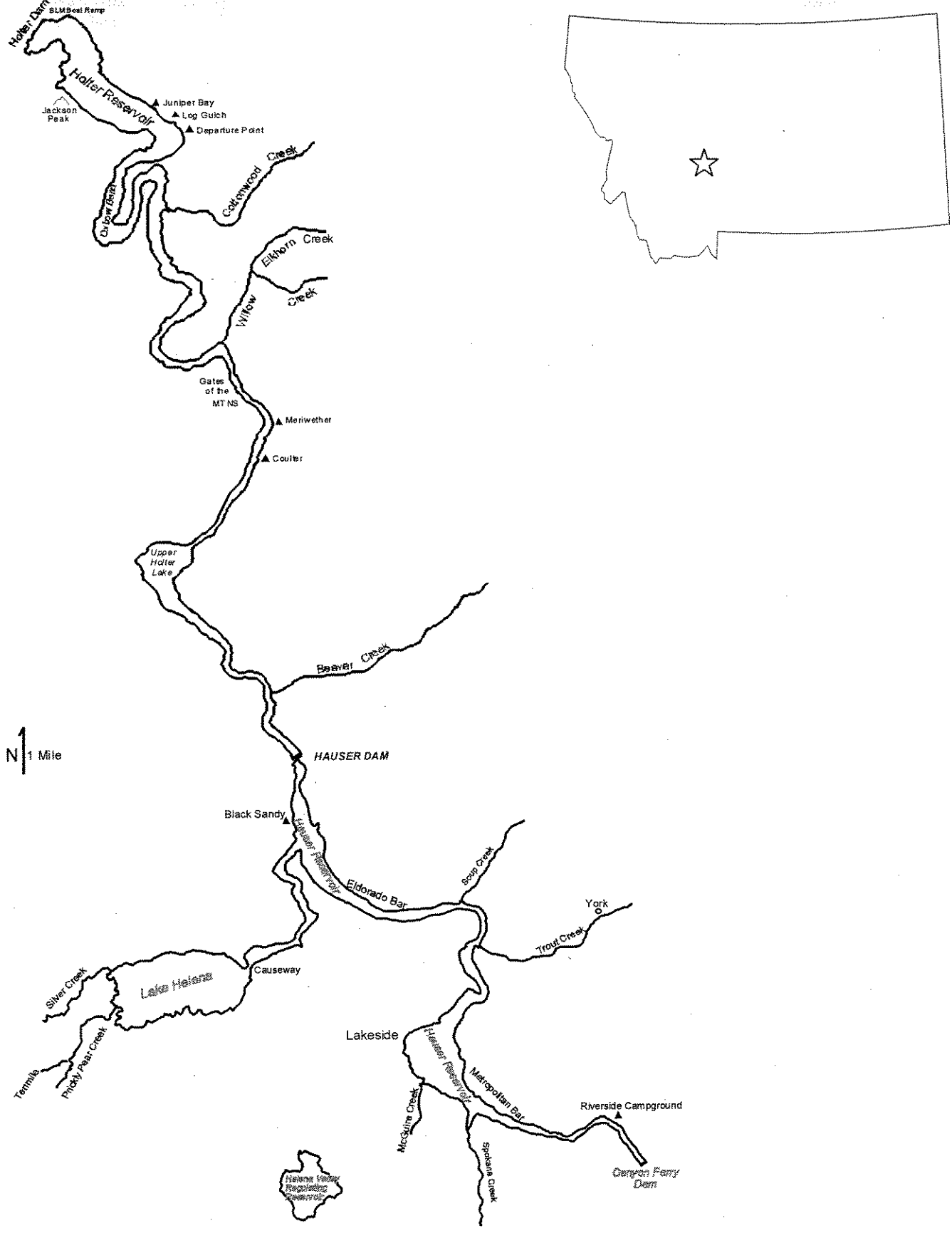


Figure 1. Map of Hauser, Holter and the Helena Valley Regulating Reservoirs.

Hauser Reservoir

Creel Surveys

Summer Creel (Table 1)

A total of 446 anglers were interviewed during the 2000 summer creel on Hauser Reservoir. Total numbers of creeled fish include; 89 rainbow trout, 9 yellow perch, 0 kokanee, 26 walleye and 8 brown trout. Statistics generated from the weekend creel indicate the average shore trip was 3.8 hours and 6.2 hours for a boat based trip. Angling pressure was greatly reduced on Hauser Reservoir in 2000 due to poor fishing combined with numerous large fires that occurred around the Helena Valley. Average catch rates for the summer were low for all species with rainbow documenting the highest at 0.06 fish/hour. Rainbow fishing was most productive in October while walleye catch rates peaked in July at 0.10 fish/hour. The majority of anglers interviewed continue to fish for rainbow trout (38%) while anglers responding that they were fishing for "any fish" accounted for 26%. Walleye anglers comprised 23.5% of anglers surveyed.

Winter Creel (Table 2)

A total of 266 ice fishermen were interviewed during the 2000 ice-fishing season. Poor ice, late ice-on and generally low catch rates resulted in less than average ice-fishing pressure. Only 188 total fish were recorded compared to the long-term average of 614. Rainbow catch rates remained above the long-term average at 0.11 fish/hour with an average size of 19.0 inches (range = 12.7-23.0 inches). A total of 31 walleyes were recorded with an overall catch rate of 0.04/hour through the ice. Average size of walleyes was 13.7 inches (range = 12.8 to 16.0 inches). Nearly all the walleyes harvested came from the Causeway arm. Yellow perch catch rates remained below the long-term average of 0.37 perch per hour at 0.11 (Table 2). Average size of perch remained excellent at 10.5 inches.

Table 1. Summer catch rates, mean size, and harvest of selected species in Hauser Reservoir. Harvest includes winter ice fishing.

	RAINBOW			KOKANEE			YELLOW PERCH			WALLEYE		
Year	Catch rate (fish/hr)	Mean Size (inches)	Harvest (X 1000)	Catch rate (fish/hr)	Mean Size (inches)	Harvest (X 1000)	Catch rate (fish/hr)	Mean Size (inches)	Harvest (X 1000)	Catch rate (fish/hr)	Mean Size (inches)	Harvest (X 1000)
1986	0.25	13.5	-	0.10	16.6	-	0.13	8.6	-	0.00	N/A	-
1987	0.24	14.2	-	0.13	15.6	-	0.12	9.7	-	0.00	N/A	-
1988	0.24	15.8	-	0.24	16.3	-	0.06	9.6	-	0.00	N/A	-
1989	0.12	13.7	25.5	0.42	14.6	101.4	0.10	7.7	27.2	0.00	N/A	N/A
1990	0.10	14.9	27.8	0.22	15.7	60.9	0.17	8.9	38.9	0.00	N/A	N/A
1991	0.02	15.3	7.8	0.46	14.7	141.3	0.08	8.1	36.8	0.0001	N/A	0.03
1992	0.05	15.1	13.0	0.22	15.8	78.4	0.16	9.0	55.4	0.0005	*	0.08
1993	0.05	16.3	16.5	0.22	16.0	89.3	0.05	9.0	49.4	0.0001	N/A	0.03
1994	0.02	16.6	4.2	0.15	14.8	37.1	0.15	10.6	38.2	0.0004	N/A	0
1995	0.05	17.5	11.5	0.11	17.0	29.1	0.16	8.9	23.2	0.002	*	0.08
1996	0.05	17.5	12.4	0.10	14.1	18.6	0.31	9.4	37.2	0.002	*	0.09
1997	0.08	16.9	11.0	0.03	16.8	5.8	0.07	8.4	16.1	0.001	*	0.09
1998	0.08	16.4	10.6	0.01	16.3	1.5	0.12	9.8	28.9	0.04	16.4	3.9
1999	0.12	17.4	21.4	0.01	19.1	1.8	0.06	9.2	12.9	0.14	13.6	7.9
2000	0.06	20.5	15.0	0.00	N/A	0.06	0.01	10.1	6.8	0.02	14.2	4.9
Mean	0.10	16.1	14.7	0.16	15.6	47.1	0.12	9.1	30.9	0.01	14.7	1.4

Harvest estimates for 1986 - 88 were not estimated because creel surveys were not completed during winter months.

* Insufficient sample size.

Species Trends and Relative Abundance (Creel and Gillnetting):

Rainbow Trout

Creel

Rainbow catch rates averaged 0.06 per hour, with average size of 20.5 inches and 3.4 pounds (Table 1). Average size of summer caught rainbow trout is the largest achieved since 1986 and well above the long-term average of 16.1". Catch rates were half of those recorded during the summer of 1999 and well below the long-term average of 0.10 fish per hour. Winter catch rates fell from near record highs in 1999 (0.17 per hour) but remained above average at 0.11 per hour. The majority of rainbows caught were products of the 1996-1997-age class of Arlee rainbow. Only one rainbow from the 98 plant was recorded and no fish from the 1999 plant were caught.

- Management plan targets call for a three-year running average angler catch rate of 0.15 to 0.20 fish/hour. Current = 0.09 fish/hour

Floating Gillnets (Figure 3a)

In spite of increased stocking rates, rainbow trout catch rates in floating gillnets remained low at 0.8 fish per net, which is well below the long-term average of 3 fish per net. Starting in 1999, stocking rates increased from approximately 100,000 Arlee to 144,000 Arlee with an additional 30,000 Eagle Lake rainbows in an effort to enhance angling opportunity in light of the depressed kokanee salmon fishery (Figure 2). Spring rainbows average 19.5 inches while rainbows collected in the fall averaged 15.2 inches. Of the rainbows collected in fall nets, 56% were products of the 2000 plant. A total of 189,000 Arlee (no Eagle Lake) were planted in 2000 with initial surveys indicating good survival. Comparison of survival of hatchery plants is presented in Appendix B. In 1997, the 1996 Arlee plant recruited 47% to horizontal gillnets as age 1. In 1998, the 1997 plant recruited 44% to this sampling gear. In 1999, the survival of the 1998 plant fell to 12%; in 2000 recruitment of the 1999 plant fell to 2.6%. Recruitment of the 2000 plant to fall horizontals (as age 0 fish) was 52%, a significant improvement over the previous two years (1998=0%; 1999=0%).

- Management plan targets call for a three-year running average of five rainbows per fall floating gill net; currently at 2.8

Discussion of Rainbow Trout Status

Reasons for the failure of the 98 and 99-year classes are likely related to several factors that include walleye predation, flushing and entrainment and substandard water quality issues. Walleye predation on hatchery trout is a well-documented problem in western U.S. reservoirs (McMahon and Bennett, 1996). On Seminole Reservoir in Wyoming, McMillan (1984) determined that most of the 500,000-fingerling trout stocked annually were eaten within a few weeks after planting. In Hauser and Holter, rainbow trout have been planted in June and July (following high spring flows) to take advantage of the zooplankton blooms. Previous management efforts have attempted to determine survival differences between strain and size of rainbow at stocking with limited success (Lere, 1990). In an effort to reduce the potential losses to walleye predation, Hauser rainbow will be planted in September/October as walleye feed less actively during the fall/winter months. This shift was based on studies from the North Platte Reservoir system in Wyoming where it was demonstrated that survival of hatchery rainbow, subject to intense walleye predation, (using the variables strain, time of stocking and size at stocking) was nearly double for fall release catchables (> 8") (Yule et al. 2000).

Walleye diet analysis since 1986 has failed to document a significant increase in trout consumption (Figure 4). However, inference from these data should be cautioned, as sample sizes during the period 1986 through 1990 were very small. In general, stomachs have only been collected during gillnetting sampling in May (pre-stocking) and October (2-3 months post-stocking). If walleye predation on rainbow trout is a significant source of hatchery rainbow trout loss, it is likely occurring within 2-3 weeks after trout are planted. The current predator diet-sampling program does not incorporate these periods of suspected high predation.

Flushing losses have also been shown to play a significant role in success of Hauser rainbow plants (Skaar and Humphrey, 1997). Skaar's report determined that both flushing and turbine entrainment of rainbows through Hauser dam can be high at certain times of the year when rainbow distribution in the water column corresponds with penstock withdrawal depths. Quantity of water released through the Hauser turbines and spillway on a given year plays a significant role in retention of rainbow trout. Following the record high water years of 1995, 1996 and 1997, the two years of 1998 and 1999 were near average. However, total water spilled from Hauser for 1998 and 1999 remained high at 1713 and 1255 acre-feet

respectively. This compares with relative drought years of 1988 (16 acre-feet) and 2000 (100 acre-feet).

Dissolved oxygen (DO) in water discharged from Canyon Ferry dam has been shown to be below the state water quality standard of 6.5 mg/l for an average 90-120 days (Frank Pickett, PPLM Water Quality, personal communication). This trend is based on water quality monitoring since 1996 that details the temporal and spatial magnitude of the low DO plume in Hauser. Hydroacoustic monitoring of fish distributions by Bureau of Reclamation in 1999 and 2000 during periods of low DO demonstrate the impacts to Hauser fish populations. Depending on the severity and magnitude to the low DO, substantial portions of Hauser Reservoir are exclusionary to coldwater fish species (Horn 2000).

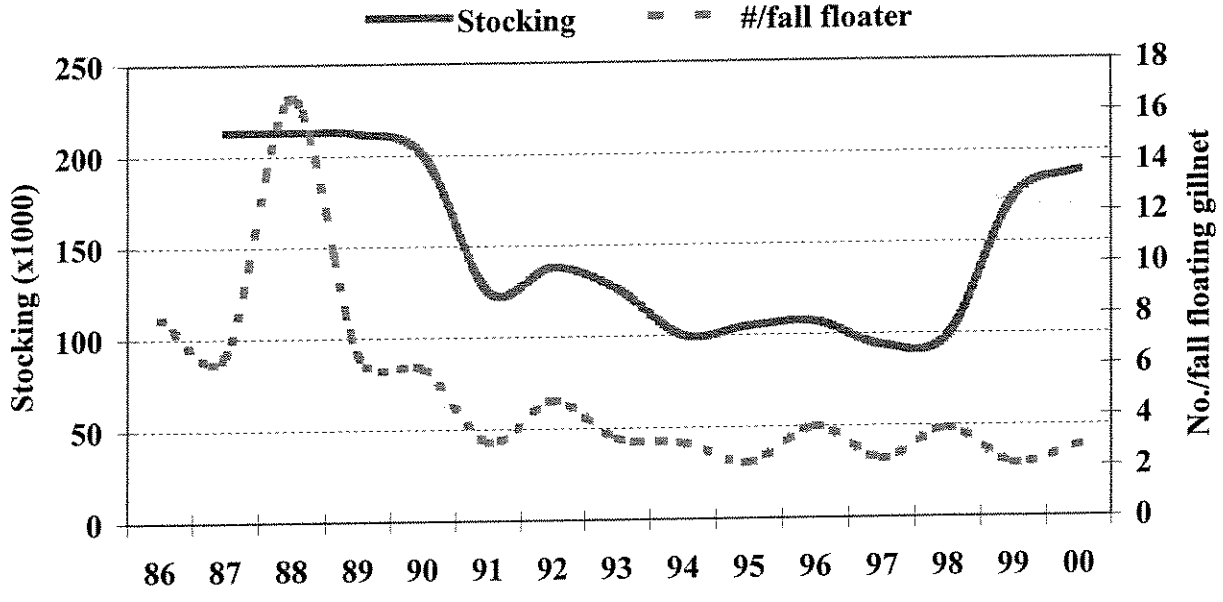


Figure 2. Number of total rainbow trout stocked versus number of rainbow trout (all age classes) collected in fall floating gillnets on Hauser Reservoir. Stocking records are offset one year (e.g. 1986 plant are represented in 1987)

Kokanee

Creel

No kokanee salmon were recorded in the 2000 summer creel while one was recorded during the winter creel (Table 2). Stocking of hatchery kokanee continued in 2000 with 414,000 unmarked sac-fry released into Spokane Creek bay and Riverside access below Canyon Ferry dam. Additionally, 371,000 fingerlings were released throughout the reservoir during June and July. Many of the fingerlings were boat planted in an effort to avoid predation (avian and piscavore). Only 3% of anglers interviewed during the summer were fishing primarily for kokanee.

The Montana state record for kokanee salmon was broken twice in 2000 with fish weighing 6.03 and 6.07 pounds. The previous record of 5.94 pounds was set in Hauser Reservoir in 1997.

- Management plan targets call for a three-year running average angler catch rate (during summer angling season) of 0.10 kokanee per hour; currently at 0.007.

Summer Vertical Gillnets (Figure 3b)

Plants from 1998 (220,000 fingerlings and 121,800 fry into Lake Helena) and 1999 (86,400 fry into Lake Helena and 222,000 fry) have not demonstrated good survival. Only one kokanee was collected during the summer vertical gillnetting series (July through September). This hatchery fish was collected in September nets and was 6.3 inches.

Although trend data is based solely on the July through September vertical nets (0.75" through 1.5" mesh net) run in the Hauser forebay, other sampling gear collected kokanee throughout the year. A total of 19 kokanee were collected in vertical gillnets; the majority were 2000 hatchery plants collected in ½" mesh net. Interestingly, 17 of these fish were netted at Hauser dam within two months after stocking at Lakeside Marina. No kokanee were collected in spring horizontal nets while one wild kokanee (19.3", 2.9 lbs) was collected in fall floating gill nets.

- Management plan calls for a three-year running average of 20 kokanee salmon in summer vertical gillnets (July through September); currently at 3.

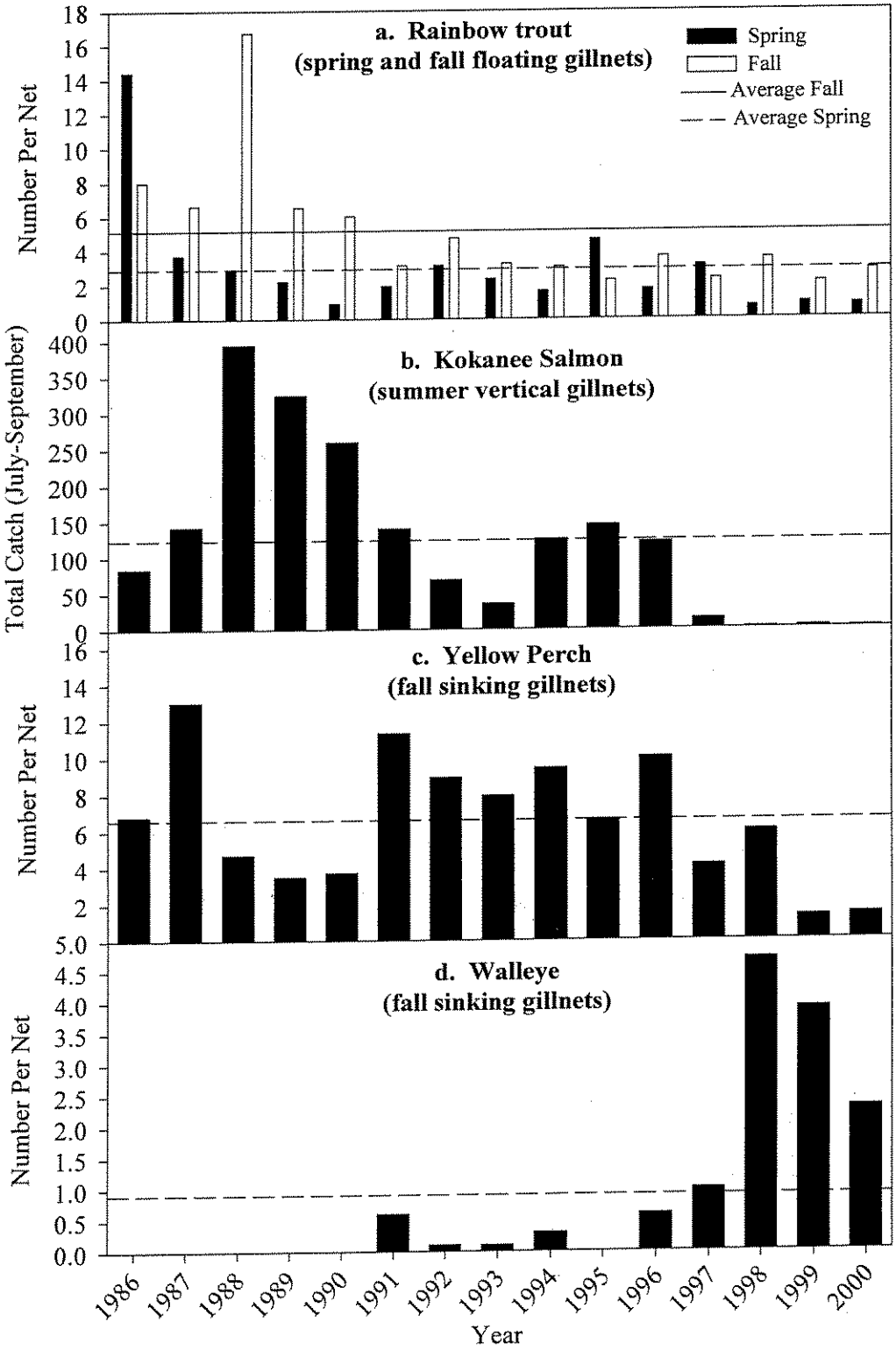


Figure 2. Hauser Reservoir gillnetting trends for the principal game species. Species trends are for the period 1986 through 2000. Dashed lines represent average catch rate for the period 1986 through 2000.

Discussion of Kokanee Salmon Status

Hatchery plants continue to provide disappointing results in Hauser Reservoir especially in light of recent drought conditions. Few, if any wild kokanee remain in the reservoir as demonstrated by summer and winter creel results. The management plan hinges on the ability to remain adaptive with attempts to reestablish a wild reproducing population. As stated in the management plan, efforts to recover kokanee will continue through 2005.

Concerns of predation combined with flushing and entrainment losses are equally pertinent with kokanee as with rainbow trout. One walleye (16 inches; 1.9lbs) collected in September vertical gillnets at the Hauser dam station contained five-hatchery kokanee while a second walleye (16.2 inches, 1.46lbs) contained one kokanee. Overall, 16.2% of all items found in walleye stomachs in 2000 were kokanee salmon with the majority of these being of hatchery origin (Figure 4). Future management efforts should focus on stocking overwintered kokanee, determining timing of stocking to coincide with periods of reduced walleye predation and reducing walleye densities in Hauser reservoir through liberalized bag limits.

Table 2. Total catch, number of interviews and angler catch rates for the principal game species from **winter creel** surveys on Hauser Reservoir.

			Catch Rates (fish per hour)				
Year	**# of Interviews**	**Total Fish**	**Rainbow**	**Brown**	**Kokanee**	**Perch**	**Walleye**
1989	573	882	0.18	0.01	0.23	0.2	0.00
1990	300	337	0.11	<0.01	0.18	0.2	0.00
1991	451	723	0.08	0.01	0.18	0.6	0.00
1992	566	1177	0.02	<0.01	0.30	0.45	0.00
1993	635	2234	0.04	0.01	0.47	0.88	0.00
1994	197	457	0.01	0.02	0.03	0.76	0.00
1995	323	624	0.04	<0.01	0.06	0.45	0.00
1996	247	141	0.04	<0.01	<0.01	0.15	0.00
1997	297	281	0.08	0.00	0.01	0.34	0.00
1998	197	115	0.05	0.00	0.00	0.21	0.00
1999	255	207	0.17	<0.01	<0.01	0.13	0.02
2000	266	188	0.11	0.00	<0.01	0.11	0.04
Mean	359	614	0.08	0.007	0.16	0.37	0.005

Yellow Perch

Creel

Yellow perch angler catch rates during the summer creel remained well below the long-term average of 0.12/hour at 0.01/hour (Table 1). This represents the lowest average summer catch rate on record. Furthermore, only 9 perch were creeled with an average size of 10.1 inches. Only three respondents (0.7% of creeled anglers) during the summer creel said they were fishing exclusively for perch. Previous creels have recorded as high as 16% of the total anglers targeting perch.

Winter creel catch rates were vastly improved over summer. A total of 78 perch were creeled with a catch rate of 0.11 fish per hour and an excellent average size of 10.5 inches (range 7.9 – 12.6 inches). This catch rate of 0.11 perch/hour remains well below the long-term average of 0.37 perch/hour and is the lowest catch rate recorded since 1989 (Table 2).

As part of the UMRRFMP, new angling regulations were adopted in 2000 regarding yellow perch harvest. A limit of 50 perch and no possession limit was implemented in an effort to reduce harvest. This regulation held wide-spread support throughout the fishing community as anglers realized that management action through regulation (conservative perch harvest/liberal walleye harvest) was required. Additionally, management efforts will continue to focus on increasing available spawning/rearing habitat for perch.

- Management plan targets call for a three-year running average angler catch rate (during summer angling season) of 0.10 – 0.15 perch per hour and 0.30 – 0.40 perch per hour during the winter creel; currently at 0.06 perch per hour (summer) and 0.15 perch per hour (winter).

Sinking Gillnets (Figure 3c)

Perch catch rates remain substantially below the long-term average (6.6 per net) in fall sinking gillnets at 1.4 per net. Fish size remained large at 10.8 inches; 0.8 lbs indicating that recruitment has not occurred for several years.

- Management plan calls for a three-year running average of 7 perch per sinking fall gillnet; currently at 3.

Discussion of Yellow Perch Status

All measures of perch relative abundance are at record lows (harvest, gillnetting, number recorded in creel). All monitoring methods (winter and summer creel, spring and fall gillnetting) indicate that the current Hauser perch population is primarily composed of age 6 and 7 fish. Perch produced in 1995 would have been 6-8 inches in 1998 and 1999, which would have been large enough to avoid significant levels of walleye predation. Beach seining in 1996 and 1998 collected strong year classes of perch with 1998 being the highest number collected in the 9-year history of beach seining (Dalbey and Humphrey, 2000). Evidence suggests that the 1998-year class was heavily influenced by predation from record high walleye densities. In 1998, consumption of walleye/yellow perch jumped to a record 28.8% of stomach contents (Figure 4). In 1999, levels remained high at 23% and falling again in 2000 to 16.2%. This trend suggests two concurring factors are influencing perch recruitment; one, walleye densities are of sufficient magnitude to have successfully consumed nearly all young perch that are being produced and two, based on increasing age of perch in Hauser, no young perch are making it past the predation bottleneck to reach spawning size/age. Of significant concern is that walleye levels, based on numbers in fall sinking gillnets, have been nearly double the number of perch collected in 1999 and 2000.

In Salmon Falls Creek Reservoir, Idaho, perch comprised 80% and walleye <1% of the total numbers of sport fish caught in gillnets in 1975, shortly after walleye were introduced. But by 1987, perch and walleye percentages had reversed (Partridge 1988 *in* McMahon and Bennett, 1996). Similar reversals in yellow perch and walleye have been observed in Keyhole and Glendo Reservoirs, Wyoming (McMahon and Bennett, 1996).

Other prey species, primarily catostomid species are experiencing comparable predation pressure. (Figure 5). This emphasizes the importance of management efforts to reduce predator densities while concurrently conducting enhancement and conservation effort for prey species. MFWP completed a Future Fisheries project in the spring of 2001 where 349 bundles of approximately 5 Christmas trees were submerged in Causeway arm of Hauser.

Walleye

Creel

A total of 26 walleyes were recorded in the summer creel (average length 14.2 inches $\pm$ 2.46 inches) (Table 1). Length range of creeled fish was 10.6 inches – 22.5 inches with 85% of the fish being kept. Catch rate for walleyes (for all anglers) was 0.02 walleyes per hour (n=446). By comparison, catch rates for those anglers specifically targeting walleye jumped to 0.07 per hour (n=105). The majority of fish kept (13.0 inches and 14.5 inches), are age 3 walleye likely produced in Canyon Ferry in 1997 and flushed as age 0 during the record high 1997 water year.

Walleye catch rates have seen a substantial decline since 1999 when catch rates reached a record 0.14 walleyes/hour. However, the 2000-catch rate of 0.02/hour is still greater than the long-term average walleye catch rate (since 1986) of 0.01/hour. Percentage of anglers specifically targeting walleye has increased in recent years. In 2000, 23.5% were solely after walleye while 38% were solely after rainbow trout and 26% were fishing for "any fish". For comparison, kokanee salmon were targeted by 70% of anglers in 1991. Anglers targeting walleye has increased over previous years (1998=8%, 1999=5%).

Angler harvest regulations of 10 fish daily, only one greater than 28 inches remains in effect. This liberalized bag limit was implemented during the 2000-2001 cycle to reduce walleye densities in an effort to improve remaining walleye growth rates combined with reducing the predation pressure on rainbow, kokanee salmon and yellow perch.

Sinking Gillnets (Figure 3d)

Walleye collected in 2000 sinking gill nets remained near the long-term average in spring at 1.3/net and returned to above average levels in fall at 2.3/net. Spring fish averaged 12.2 inches while fall fish averaged 14.5 inches. Spine aging indicates that 89% of these fish are age 3; produced in Canyon Ferry in 1997 and flushed into Hauser as age 0 during the record high water of 1997. Limited recruitment has occurred since this event and this 1997-year class continues to dominate the catch (Appendix A). The largest walleye netted was in fall nets at 18.7 inches, 2.47 lbs (age 4). This was also the oldest fish netted in 2000.

Growth and condition factors of Hauser walleyes have increased moderately since the first large samples were collected in 1997 and 1998. With decreasing densities, growth rates were greater in 1999 than 1998 but saw a slight decrease in 2000. However, growth and condition

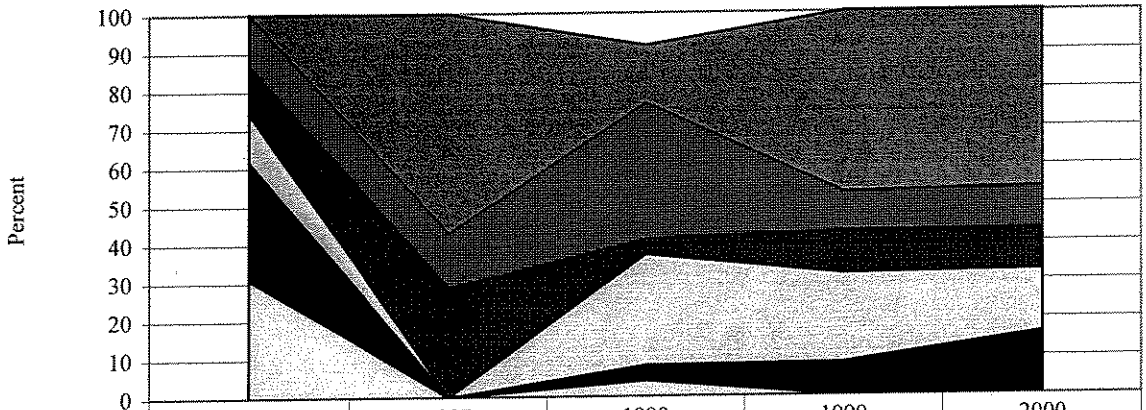
of Hauser walleyes is substantially less than that of Canyon Ferry or Holter Reservoir walleyes. Relative weight data on walleyes in the three-reservoir system reveals that pre-1997, Hauser walleyes maintained comparable relative weights to those found in the upstream and downstream reservoirs. In 1998, following the flushing of Canyon Ferry walleye into Hauser, relative weights showed a substantial decline and were the lowest of the three reservoirs.

- Management plan calls for a three-year running average of 2-3 walleye per sinking fall gillnet; currently at 3.6/net.

Walleye Food Habits

Walleye stomach analysis is shown in Figure 4. Since diet analysis was initiated in 1991, several factors have changed. First, walleye densities have increased significantly (Figure 3d). Second, reservoir wide species assemblage changed following the record high runoff and associated short water retention times that occurred in 1995, 1996 and 1997. Higher walleye densities and increased stomach samples has allowed spring and fall analysis of prey utilization. However, due to the small average size of walleye in Hauser, food items have been biased towards small prey such as invertebrates. Additionally, walleye stomach samples are only collected during spring (May) and fall (October) horizontal gillnetting and vertical gillnets set in the Hauser forebay during the summer months. In order to more clearly determine walleye prey utilization throughout the year, increased sampling is needed.

In 2000, walleyes relied heavily on invertebrates (46.2%) while utilization of suckers and sculpins remained relatively constant. Predation on kokanee nearly doubled in 2000 corresponding with increased kokanee stocking. One walleye (16 inches; 1.9lbs) collected in September vertical gillnets at the Hauser dam station contained five hatchery kokanee. Of significance is the proportion of kokanee in stomachs in 2000 is nearly half of that measured for the period 91-96 while relative densities of kokanee in the reservoir in 2000 are a small fraction of 91-96 levels. Yellow perch utilization has declined since 1998 corresponding with perch population declines. However, comparing recent years to the combined period (1991-1996), prevalence of perch in walleye diets has increased due in large part to the absence of abundant, self-sustaining kokanee populations.



	91-96	1997	1998	1999	2000
Invert	0	57.1	15	47.2	46.2
Su	13.3	14.3	35.6	10.2	10.8
Cot	12.6	28.6	4	11.1	10.8
YP/WE	12.6	0	28.8	23	16.2
Kok	30.9	0	4.1	8.7	16.2
Tro	30.8	0	4.1	0	0

Figure 4. Hauser walleye food habits (percent by weight) for spring and fall seasons combined for the years 1991 through 1996 (combined due to small sample size) including 1997, 1998, 1999 and 2000. Summaries were adjusted for unidentifiable fish and other prey items. Abbreviations of food items are; Invert=invertebrates, Su=sucker spp., Cot=sculpin, YP/WE=yellow perch and walleye (combined), Kok=kokanee salmon, Tro=trout (all trout spp.)

Discussion of Walleye Status

Hauser walleye caught in fall sinking gillnets have declined since the record catch of 1998 (Figure 2d). Fall catch in 1998 was comprised of 90% age 1 walleye while only 4% and 6% of fall catch in 1999 and 2000 respectively was comprised of age 1 walleye. Limited recruitment has occurred since 1997 due to corresponding poor reproduction in Canyon Ferry in 1998 and 1999. Canyon Ferry netting in September has documented age 0 walleye recruitment since 1996 when 0.3/net were collected. In 1997, 0.2/net were recruited while for the period 1998 through 2000, 0.1/net were recorded each of the three years (MFWP data files). Low reproduction success in Canyon Ferry combined with below average water runoff during 1999 and 2000 are likely the dominant factors controlling the Hauser walleye population. Historical data strongly suggests that walleye reproductive success in Hauser is limited and strongly influenced by flushing losses.

The strong 1997-year class continues to dominate creel catches resulting in incremental increases in the average size 11.1 inches in 1998 to 14.2 inches in 2000. This increase in average size has resulted in a higher proportion of walleyes being kept by anglers. In 1998, 51.8% of walleyes were kept while this percentage declined in 1999 to 32.6%. In 2000, 85% of walleyes were kept with an apparently acceptable average length of 14.2 inches. Limited recruitment, natural mortality, flushing losses combined with a liberal angler harvest regulation has resulted in decreasing walleye densities. Population trends could reverse rapidly if the Canyon Ferry walleye population successfully produces a strong year class in 2001 combined with high flushing losses.

Suckers (White and Longnose)

Sucker populations have decreased since historic highs in the late 1980's when numbers exceeded 60 white suckers/sinking gill net (Figure 5). Longnose sucker catch rates have oscillated between 10 and 20 fish per net until 1997 when numbers exceeded 30 per net. This was followed in 1998 by a decline to zero/net. In 2000, longnose catch rates were 11/net in spring sinkers while white suckers were 19/net. Both species are below the long-term average of 16/net (longnose) and 41/net (white).

Long term catch rates for combined white and longnose suckers in spring and fall gillnets have shown nearly a three-fold decrease since 1987 (1108 to 440). Concurrently, average size of both sucker species has increased by approximately three inches over the long-term average (Figure 5). Proportion of suckers in walleye diets has remained low in 1999 and 2000 at 10.2% and 10.8% respectively; a decrease from the 1998 high of 35.6% (Figure 4).

With increasing predation pressure from walleyes, the average size of both white and longnose suckers have increased. This same phenomenon was observed on Seminole Reservoir; following walleye population expansion between 1970 and 1972, the average weight of white suckers increased from 0.65 to 0.95 pounds (McMillan, 1984)

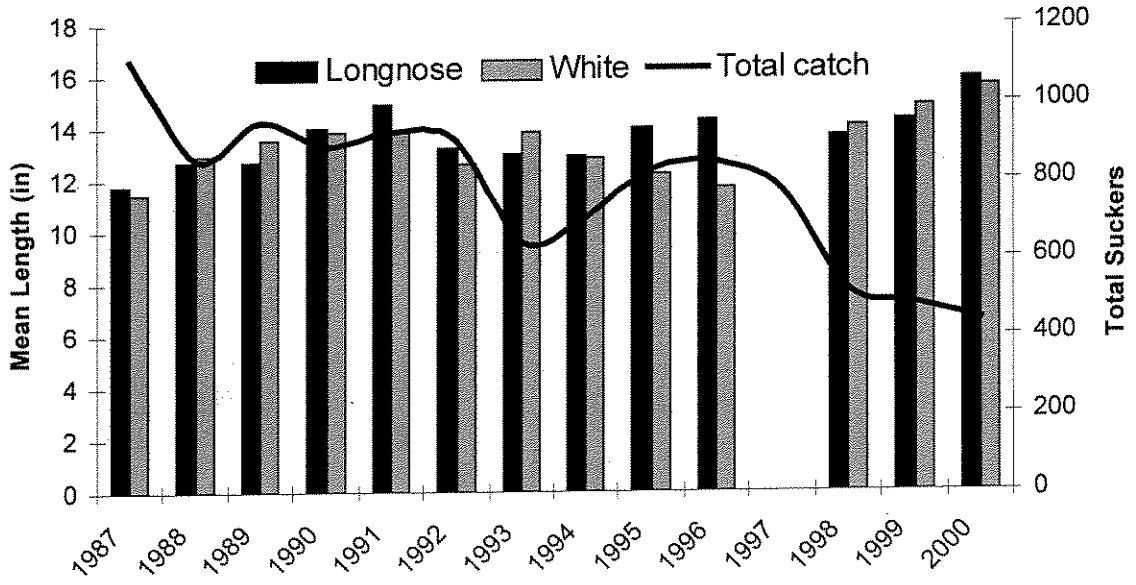


Figure 5. Hauser Reservoir total catostomid catch (longnose and white sucker) total catch (combined from spring and fall sinking gillnets) and average length of both species from same netting surveys. No sucker length data was collected in 1997.

Hydroacoustic Estimates of Fish Abundance in Hauser Reservoir

Hauser reservoir hydroacoustic transects were esonified from Eldorado Bar downstream to the Dam including the lower half of the Causeway Arm to estimate total fish abundance (areas described are shown in Figure 1). Upper sections of the reservoir were excluded from analysis due to shallow water depth. Vertical gillnets were set at the power lines near the upper most transect and at the dam. Nets were fished concurrent with acoustic sampling allowing apportioning of acoustic targets by species.

Fish population estimates for 2000 increased to 400,000 (± 280,000) total fish; nearly tripling the 1999 estimate of 110,000 fish. Estimates of pelagic species were 89,500 kokanee and 79,000 rainbow trout. Estimates for benthic species were 42,000 walleye, and 184,000 suckers. Also included in the estimate because of presence in vertical nets; 5,000 brown trout. Fish densities by depth found that 24% were encountered from the surface to 16 feet below the surface, 34.5% from 16 to 33 feet, 30% from 36 to 53 feet and 12% from 53 feet to 66 feet. Following trends from past years, densities were lowest in the Eldorado Bar (upstream transects) area and highest at the mouth of the Causeway and mid-Causeway.

Table 3. Hydroacoustics estimates of Hauser Reservoir fish populations from Eldorado Bar to Hauser dam including the lower half of the Causeway arm. Estimates are apportioned by species (Kok=kokanee, Rb=rainbow trout, We=walleye, LL=brown trout, Su=white and longnose sucker).

Year	Pop. Est.	S.D.	#/Acre	Kok	Rb	We	LL	Su
1996	400,000	± 100,000	N/A	324,000	19,200	0	0	51,000
1997	200,000	± 100,000	N/A	74,000	7,800	1,800	3,800	113,000
1998	210,000	± 93,000	183	0	157,000	10,000	0	42,000
1999	110,000	± 81,000	96	4,000	19,400	11,300	11,000	35,000
2000	400,000	± 280,000	349	89,500	79,000	42,000	5,000	184,000

Beach Seine

No beach seining was conducted in 2000 due to scheduling conflicts with Protection, Mitigation and Enhancement associated with FERC relicencing.

Holter Reservoir

Creel Surveys

Summer Creel (Table 4)

A total of 664 anglers were interviewed during the 2000 summer creel on Holter Reservoir. Total numbers of recorded fish were 152 rainbow trout, 233 yellow perch, 3 kokanee, and 397 walleye. Statistics generated from the weekend creel indicate average catch rates for rainbow trout, kokanee salmon and yellow perch were far below the long-term averages. Concurrently, catch rates for walleye were the highest on record at 0.13/hour (all anglers). The long-term walleye catch rate for the period 1986 through 2000 is 0.02/hour. The previous high was in 1999 at 0.05 walleyes/hour. As demonstrated by the record low number of interviews for the summer (664; average = 1296), angling pressure was greatly reduced on Holter Reservoir in 2000 due numerous fires that that reduced lake access. Regardless, June recorded the highest number of walleye on record at 312 with an exceptional catch rate of 0.17 walleye/hour. For anglers specifically targeting walleyes, catch rates were 0.23 walleye/hour. On average, 67.5% of walleyes caught were kept. Yellow perch catch rates peaked in August at 0.33/hour with an average size in the summer creel of 7.9 inches. Walleye anglers were the most common group interviewed at 40% followed by those fishing for rainbows at 30%. Anglers fishing for "any fish" accounted for 12% and perch anglers comprised 5% of respondents.

Average size of walleye in the summer creel was 14.8 inches, ranging from 9.5 to 26.5 inches. The majority (67%) of walleye harvested (all walleyes between 20" and 28" must be released) ranged between 13 and 16 inches. These fish are primarily age 2+ and age 3+.

Winter Creel (Table 5)

A total of 88 ice fishermen, accounting for 288 angling hours, were interviewed during the 2000 ice-fishing season. Late ice-on and generally poor quality ice resulted in minimal ice-fishing pressure. Catch rates were recorded for yellow perch and rainbow trout only for the months of February and March. During this limited season, perch catch rates reached a six-year high of 3.2/hour and were above the 12-year average of 2.5/hour. Average size of creeled perch was good at 9.8 inches (Range: 6.4-11.5 inches). Rainbow trout catch rate was 0.11/hour however only 15 trout were creeled. These fish averaged and astounding 19.3 inches (Range: 17.8-22.2 inches). The rainbow catch rate of 0.11/hour is nearly half of the long-term average of 0.18/hour.

Table 4. Summer catch rates, mean size, and harvest of selected species in Holter Reservoir. Harvest estimates include winter ice fishing.

	RAINBOW TROUT			KOKANEE SALMON			YELLOW PERCH			WALLEYE		
Year	Catch rate (fish/hr.)	Mean Size (in)	Harvest (x1000)	Catch rate (fish/hr.)	Mean Size (in)	Harvest (x1000)	Catch rate (fish/hr.)	Mean Size (in)	Harvest (x1000)	Catch rate (fish/hr.)	Mean Size (in)	Harvest (x1000)
1986	0.34	13.9	---	0.01	16.9	---	0.16	---	---	0.002	15.0	---
1987	0.37	13.8	---	0.01	16.7	---	0.39	8.8	---	0.02	16.1	---
1988	0.32	13.7	---	0.01	16.8	---	0.37	---	---	0.01	17.4	---
1989	0.27	14.5	57.1	0.01	16.1	2.1	0.85	9.0	330.0	0.004	20.3	0.9
1990	0.26	14.2	59.2	0.11	16.1	24.3	0.53	9.2	297.2	0.004	17.9	0.3
1991	0.27	12.6	62.3	0.10	15.2	22.4	0.40	8.6	237.7	0.003	16.4	0.5
1992	0.22	14.1	53.2	0.09	16.6	20.4	0.52	8.9	492.9	0.005	20.4	0.6
1993	0.14	15.9	33.7	0.06	16.1	12.0	0.22	9.1	313.2	0.001	18.6	0.1
1994	0.03	14.7	10.4	0.06	16.2	13.4	0.34	9.5	336.9	0.01	19.5	1.3
1995	0.16	14.1	20.1	0.03	15.7	4.3	0.08	9.5	108.6	0.003	*	0**
1996	0.21	13.8	49.3	0.16	14.1	34.0	0.04	9.5	49.3	0.02	13.2	1.9
1997	0.11	15.5	32.3	0.02	16.9	4.0	0.07	7.8	29.3	0.01	17.7	1.1
1998	0.10	15.5	15.4	0.01	16.8	1.9	0.10	9.7	82.4	0.04	15.5	4.6
1999	0.14	18.0	41.3	0.002	15.6	0.4	0.23	8.3	75.7	0.05	14.1	5.6
2000	0.05	19.6	16.0	0.001	*	0.09	0.08	7.9	139.9	0.13	14.8	24.3
Mean	0.20	14.9	37.5	0.05	16.1	11.6	0.30	8.9	207.7	0.02	16.9	3.4

Harvest estimates for 1986 - 88 were not estimated because creel surveys were not completed during winter months. *Insufficient sample size **All fish were released.

Table 5. Anglers catch rates on Holter Reservoir during the ice-fishing season; 1989 through 2000. Catch rates for walleye and brown trout were less than 0.01 for all years.

			Catch Rates (fish per hour)		
Year	# of Interviews	Total Catch	Rainbow	Kokanee	Perch
1989	493	4708	0.23	<0.01	2.95
1990	346	3597	0.24	<0.01	3.05
1991	547	6162	0.27	0.02	3.57
1992	166	2930	0.23	<0.01	5.60
1993	486	4487	0.09	<0.01	2.73
1994	349	4519	0.07	<0.01	3.79
1995	121	624	0.06	0.00	1.69
1996	160	403	0.25	0.00	0.65
1997	283	476	0.24	0.00	0.38
1998	139	630	0.11	<0.01	1.31
1999	136	547	0.29	0.00	0.95
2000	88	958	0.11	0.00	3.22
Mean	276	2503	0.18	<0.01	2.50

Species Trends and Relative Abundance (Creel and Gillnetting):

Rainbow Trout

Creel

Rainbow catch rates averaged 0.05 per hour, with average size of 19.6 inches and 2.97 pounds (Table 4). Similar to Hauser reservoir, average size of summer caught rainbow trout is the largest achieved on record and well above the long-term average of 14.9 inches. Catch rates fell from 0.14 rainbow/hour in 1999 to 0.05/hour in 2000; below the long-term average of 0.20/hour. Winter catch rates fell from record highs achieved in 1999 (0.29) to 0.11 per hour. Average size of rainbows has increased since 1996 when the first Eagle Lake rainbows were planted into Holter. For the period 1990 through 1995, age 1 rainbow have dominated the summer creel comprising an average 59%. Since 1996, the first year Eagle Lake rainbow were planted, survey data has documented alternating strong year classes. This is due to the stocking scheme adopted for the period 1996 through 1999 where age zero and age one fish were planted on alternating years.

In 1996, 106,200 age 1 Eagle Lakes were stocked which resulted in 81% of the summer creel being comprised of age 1 fish. In 1997, 371,400 age 0 were planted and the resultant summer creel was composed of 91% age 2 rainbow indicating the age 0 fish were too small to be represented in the creel. In 1998, age 1 fish were again planted (141,500) and these fish, combined with the 1997 plant, were well represented in the summer creel at 71%. Additionally, good survival of the 1996 plant continued with 27% of the summer creel

composed of age 3 rainbows. In 1999, 400,700 age 0 Eagle Lakes were stocked. The creel was composed entirely of age 2 (67%) and age 4 (32%) fish.

Although total number of rainbow creeled was small (80) compared to previous years, the 2000 summer creel was again composed of large fish. Approximately 88% were age 3 or greater with good representation of the 1997 (age 0 plant) and/or 1998 (age 1 plant) as age 3's. Disappointingly, the 1999 age 0 plant demonstrated poor survival, as only 10% of summer creeled rainbows were products of this plant. Additionally, 65,000 fall release Arlee rainbows (7"-7.6") were stocked in September 2000. None of these were collected in the summer or winter creel.

The Eagle Lake planting scheme that was in place for the four-year period (1996-1999) was changed in 2000. In an attempt to eliminate the alternating year class situation, both age 0 and age 1 Eagle Lake rainbows were stocked in the same year. Starting in 2000, approximately 75,000 age 1 and 200,000 age 0 fish were stocked.

- Management plan targets call for a three-year running average angler catch rate of 0.25 fish/hour. Current three-year average = 0.10 fish/hour

Floating gillnets (Figure 7a)

Spring floating gillnets collected 1.9 rainbows per net; an increase from 1998 and 1999 levels however, well below the long-term average of 5.7. Fall nets saw a modest increase over 1999 (3.9) to 5.7 rainbows per net; again below the 15-year average of 7.3/net. Average length and weight in spring floaters was 19.1" and 2.8 pounds. Nearly 90% of the fish collected were age 3+ (products of 1997, 371,400 age 0 and/or 1998, 141,500 age 1) and nearly 30% were wild. Average length and weight in fall floating nets was 16.1 inches and 1.9 lbs. Approximately 49% of the rainbows in fall floating gillnets were age 1 with 100% of these exhibiting hatchery dorsal. Only 9% of the catch was comprised of age 0 fish. Three of these were fall release Arlees and two were age 0 Eagle Lakes stocked in 2000. Approximately 40% were age 3+ fish with 100% of these classified as hatchery fish.

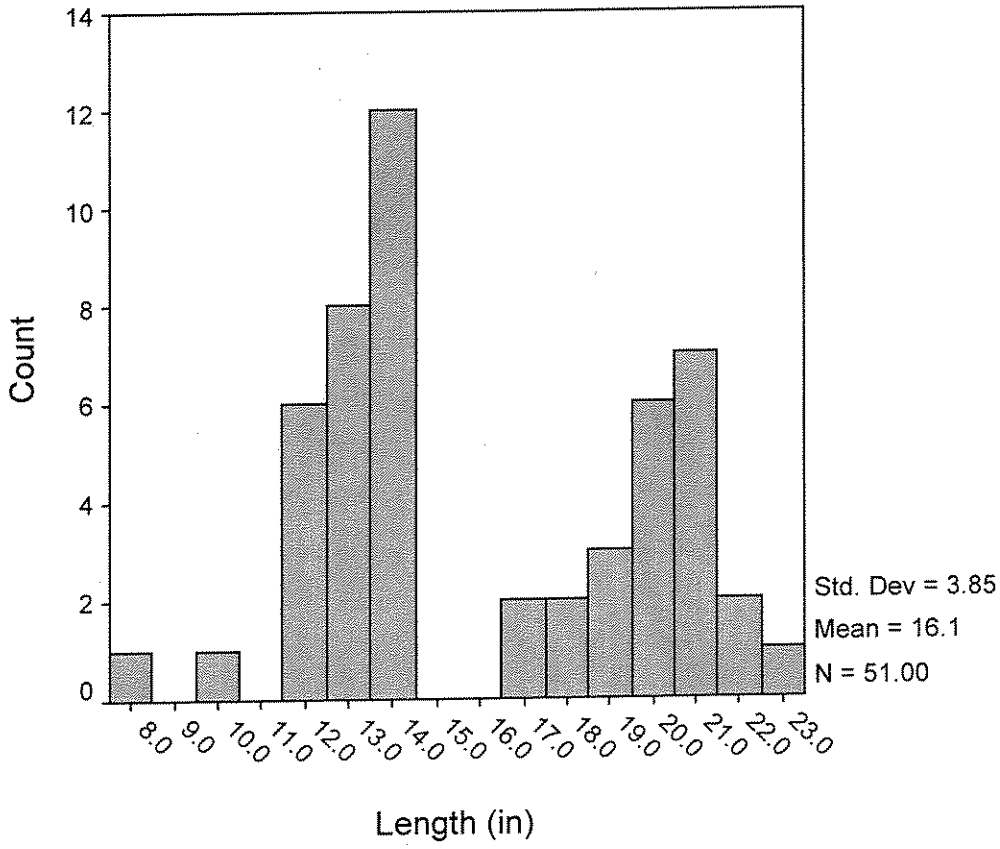


Figure 6. Length frequency of Holter rainbow trout collected in fall floating gillnets, 2000. Age 0 fish are 7.8"-11.1". Age 1 fish were 11.7"-14.4". Age 3 fish were 17.2"-22.1". No age 2 or 4 fish were collected. One age 5 fish was collected (23.4").

- Management plan targets call for a three-year running average of eight rainbows per floating gill net; currently at 6

Discussion of Rainbow Trout Status

Rainbow catch rates and harvest reached the second lowest level on record while average size of rainbow caught attained a record high 19.6 inches. The principal factors influencing these trends appear to be poor survival of age 0 Eagle Lake plants in 1999 (Appendix B). The stocking scheme implemented from 1996 through 1999 resulted in alternating strong year classes. This started in 1996 with the initial, age 1 Eagle Lake plant, which demonstrated excellent survival and was well represented through 1999 with one age 5 individual collected in 2000 netting. The 1997 age 0 plant also showed good initial survival and has remained a strong cohort in spite of the potential flushing that likely occurred in

1997. This trend continued in 1998 with the second age 1 plant. Both the 1996 and 1998 plants were sampled as age 1 fish in fall netting (58% in 1996 and 38% in 1998) suggesting that initial survival was good. The 1999 age 0 plant recruited zero fish to the 1999 fall gillnets but comprised 27% of the 2000 fall rainbow catch as age 1. Initial survival of age 0 fish is difficult to assess although Hauser Arlee age 0 plants can be used for rough comparison. Age 0 Arlee have comprised as high as 55% of rainbows sampled in the year they were planted (1998) (Appendix B). Initial recruitment of these age 0 Arlee in Hauser has proven to be reliable in predicting year class failure's as occurred in 1998 and 1999. Preliminary evaluation of Eagle Lake age at stocking from 1996 and 1997 (fish from 1997 could still be collected in 2001) indicate a four-fold return to fall gillnets of the 1996 age 1 over the 1997 age 0 plant.

Wild rainbow proportions in floating gillnets reached a record low in 2000 at 7% (Appendix D). This is disappointing as large numbers of redds were counted below Hauser dam. A marked increase in spawning activity was observed in 2000 with many of these fish suspected to be age 3+ Eagle Lakes. Redd surveys were conducted on April 11, 2000 with a total count of 203 counted from approximately one-half mile above Beaver Creek to one half mile below the confluence of Beaver Creek with the Missouri River. Water temperatures during this survey were 44°F.

Kokanee

Creel

Three kokanee were caught during the 2000 summer creel (Table 4). Only one of these fish was kept.

- Management plan states that the Holter kokanee fishery is reliant on the success/failure of the Hauser kokanee fishery.

Summer Vertical Gillnets (Figure 7b)

A total of 11 kokanee salmon were collected in summer vertical gillnets on Holter reservoir. These fish were all age 1 with 10 of 11 being of hatchery origin (stocked in Hauser Reservoir). All kokanee were collected in August and September verticals; no kokanee were collected in July.

- No Management Plan target

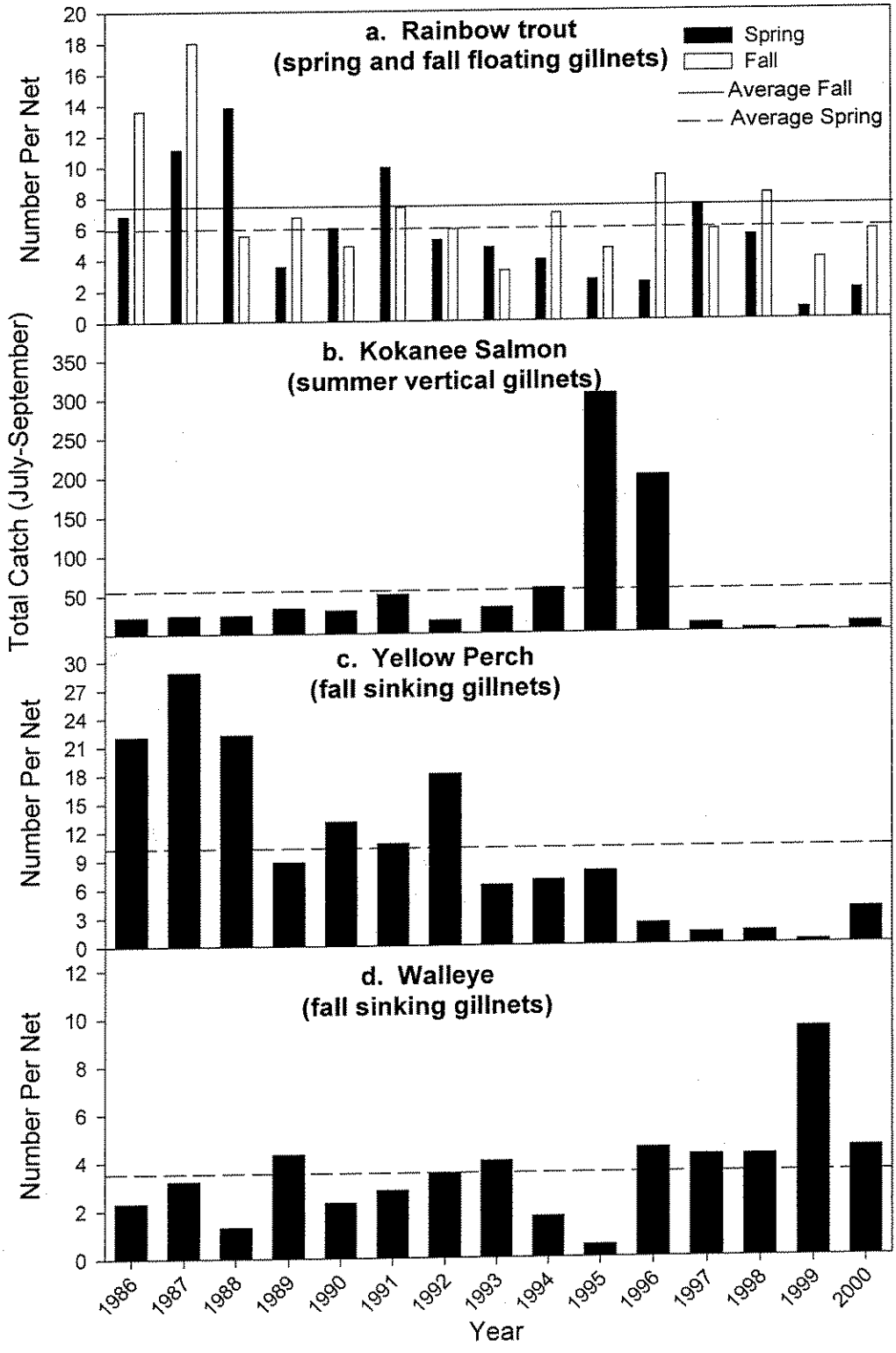


Figure 7. Holter Reservoir gillnetting trends for the principal game species. Species trends are for the period 1986 through 2000. Dashed lines represent average catch rate for the period 1986 through 2000.

Discussion of Kokanee Salmon Status

Holter Reservoir has demonstrated better survival of Hauser stocked kokanee than Hauser. Flushing of kokanee out of Hauser continues even with drought conditions.

Yellow Perch

Creel

Yellow perch angler catch rates during the summer creel remained well below the long-term average (0.30) at 0.08 perch per hour (Table 4). A total of 233 perch were recorded with 90% being kept. Catch rates peaked in July and August at 0.11 and 0.33 perch per hour respectively. Anglers specifically targeting perch recorded an average catch rate of 1.21 perch per hour. These anglers represented 5% of the total number interviewed. Yellow perch caught in the summer averaged 7.9 inches and ranged from 5.2 to 14.3 inches. Distribution of size groups revealed that 48% of the perch were less than 8 inches while 52% were greater than 8 inches.

Winter creel catch rates jumped to 3.22 perch per hour, which is well above the long-term average of 2.5 (Table 5). This catch rate represents the 4th highest in the 12-year history of Holter winter creel. A total of 737 perch were recorded with an excellent average size of 9.8 inches (range 6.4 – 11.5 inches)

New angling regulations were adopted in 2000 regarding yellow perch harvest. A limit of 50 perch and no possession limit was implemented in an effort to reduce harvest in light of recent population declines.

- Management plan targets call for a three-year running average angler catch rate (during summer angling season) of 0.2-0.4 yellow perch per hour and 1.0 – 2.0 yellow perch per hour during the winter creel.
- As of 2000, three-year running averages: Summer = 0.14 , Winter = 1.8

Sinking Gillnets (Figure 7c)

Perch catch rates remain substantially below the long-term average (34 per net) in spring sinking gillnets at 3.3 per net. Spring fish averaged 9.7 inches (range 7.3-12.3 inches) with a median size of 9.9 inches. Only 12% of these fish were less than 8 inches raising recruitment concerns similar to Hauser Reservoir. Fall sinking gillnets collected 3.7 per net, which falls short of the long-term average of 10.2 per net. However, this represents the highest catch rate since 1995. Average length was 8 inches range (5.5-11.4 inches) with an encouraging 55% being less than 8 inches.

- Management plan calls for a three-year running average of 10 yellow perch per sinking fall gillnet; currently at 1.8.

Discussion of Yellow Perch Status

Holter yellow perch populations continue to exhibit resilience in the face of the second highest recorded walleye density since 1986. This was demonstrated by the slight increase in fall gillnet catch and winter creel catch rates. However, gillnet catch rates remain depressed and an increasing average size in sampling indicates that recruitment of perch is of concern. Additionally, average size of gillnetted perch in both spring and fall was 8.9 inches in 2000; above the long-term average of 8.5 inches. No beach seining occurred in 2000. In 1998 and 1999 an estimated 3000 YOY yellow perch were collected per seine tow, substantially higher than the long-term average of 729/tow. These fish should start to recruit to gillnets in 2001.

Consumption of yellow perch by walleyes has varied through the years with perch comprising a significant portion. Proportion of perch in Holter walleyes for the combined spring through fall periods show an increasing trend through 1999 when 63% of the diet was perch. This fell in 2000 to 45.6%. However, consumption of perch in the fall has increased since 1997 (35.1%) to 80.5% in 2000. Much of this is attributable to bumper crops of available perch produced in 1998 and 1999 combined with extremely low kokanee densities.

Walleye

Creel

The 2000 summer angling season recorded the best walleye catch rate on record at 0.13 walleye per hour (Table 4). This catch rate includes all anglers contrasted with catch rates for anglers specifically targeting walleyes, which jumped to 0.23 walleye per hour. Walleye catch rates peaked in August at 0.24 per hour for all anglers. A total of 155 walleye were measured averaging 14.8 inches and 1.2 pounds. Sixty-seven percent of the harvested walleye were between 13 and 16 inches and based on aging of fall-gillnetted walleye; these creeled fish are age 2 and 3. Walleye catch rates and harvest has increased every year since 1997. In 2000, harvest reached an estimated 24,300 walleyes, nearly a 5-fold increase over 1998 and 1999 levels.

Anglers targeting walleye accounted for 40.2% of species-specific anglers on Holter in 2000. If the various species combinations of angler responses (i.e. trout-walleye and walleye-perch –trout) that include walleye are lumped, it accounts for 50% of the angling pressure on Holter. General trout anglers account for approximately 33% with "any fish" and perch account for 12% and 5% respectively.

Angler harvest regulations of 6 fish daily, five under 20 inches and one greater than 28 inches (fish between 20-28 inches must be released) remained in effect during the 2000 season. This liberalized bag limit was implemented during the 2000-2001 cycle to reduce walleye densities in an effort to improve remaining walleye growth rates combined with reducing the predation pressure on rainbow, kokanee salmon and yellow perch. The previous slot limit (1996 through 2000) allowed a daily bag limit of three walleye less than 18 inches and one greater than 28 inches.

- Management plan calls for a three-year running average angler catch rate of 0.10 walleye per hour for anglers specifically targeting walleye; currently at 0.26 walleye per hour.

Sinking Gillnets (Figure 7d)

Walleye collected in 2000 sinking gill nets were double the long-term average in spring at 6.2/net and were also above average levels in fall at 4.7/net. Spring fish averaged 14.0 inches while fall fish averaged 14.9 inches. Unlike Hauser Reservoir where Canyon Ferry walleye production and flushing apparently dictate walleye population parameters, Holter has maintained a diverse age structure of the population via natural reproduction. The majority of Holter walleye collected in 2000 nets were of the 1997 and 1998-year classes. Age one walleye were represented with 8% of the total collected. The Holter walleye population has undergone significant changes in the age class structure since 1996; primarily, the percentage of walleye that fall within the slot limit bounds. Since 1996, when the slot range was 18-28 inches, the percentage of walleye collected in spring and fall gillnets averaged 64%. This figure fell to 20% in 1999 in conjunction with the record catch rate (9.5/net) of primarily age 2 walleye. In 2000, the slot bounds were liberalized to include 20-28 inch walleye, however, the average proportion of walleyes collected within this range further decreased to 8%.

- Management plan calls for a three-year running average of 3 walleye per sinking fall gillnet; currently at 6.1/net.
- Management plan calls for a three-year running average of at least 30% of the population between 20 and 28 inches in fall sinking gillnets; currently at 11%.

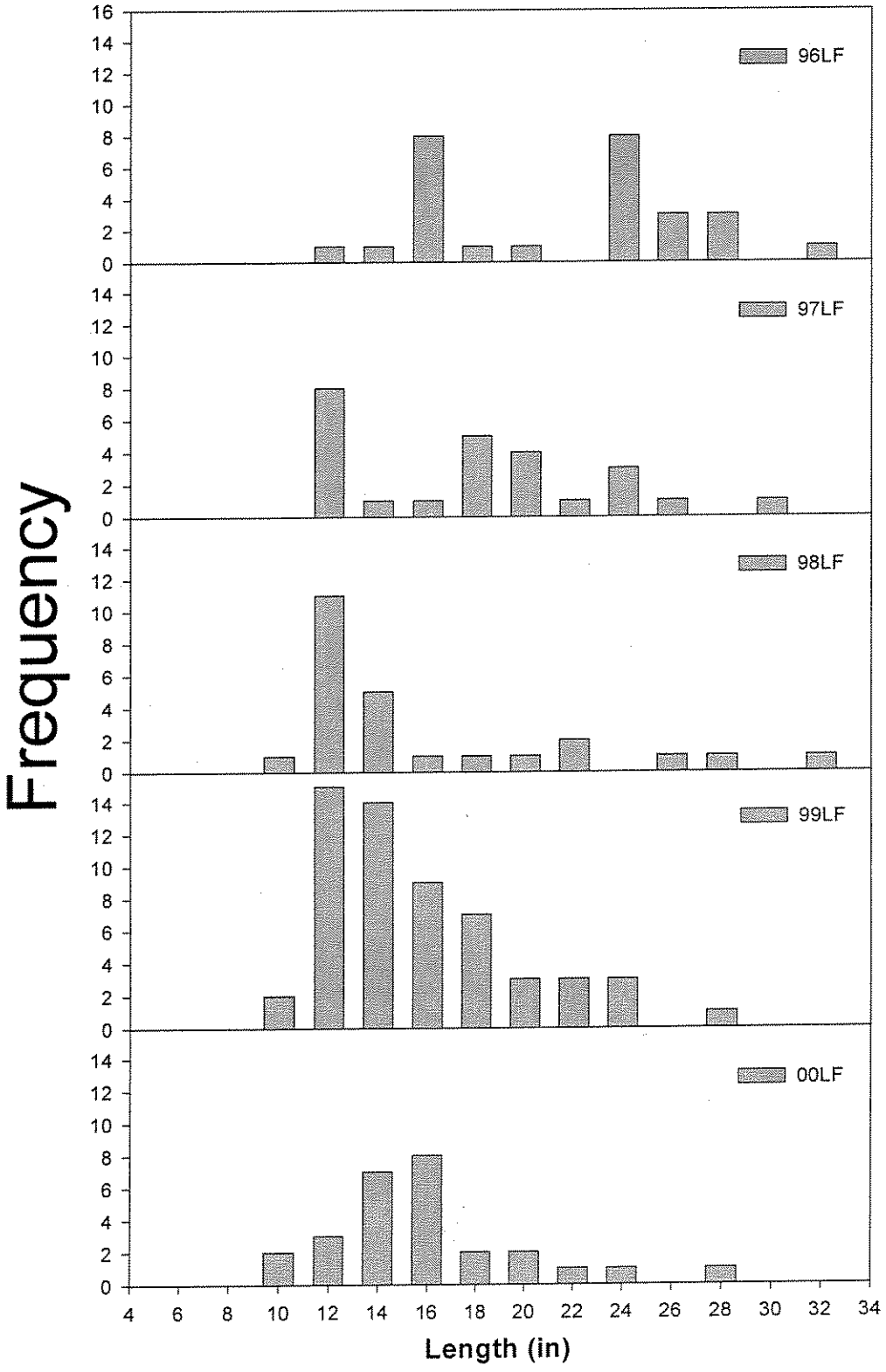


Figure 8. Holter Reservoir walleye length frequencies from fall sinking gillnets for the perio 1996 through 2000.

Walleye Food Habits

In 2000, Holter walleyes relied heavily on invertebrates in the spring (74% by weight). Yellow perch were an important food item throughout the year ranging from 8% in the spring to a peak utilization in the fall at 81%. Since 1997, perch have comprised approximately 50% of walleye diets. Perch consumption peaked in 1999 at 63% but fell to 46% in 2000. Salmonids comprised a relatively low percentage of the diet ranging from 2% in the spring to 16% in the fall. Salmonid consumption has averaged approximately 11% since 1997 for the entire year. Surprisingly, no suckers were found in stomachs. Sculpins were an important part of spring diets at 16% but accounted for only 4% by fall.

Suckers (White and Longnose)

Catch rates of sucker species (spring and fall nets combined) have decreased since historic highs in the early 1990's when numbers reached nearly 120 white suckers per net. White sucker catch rates in 2000 fell below the long-term average of 90 per net to 78 per net. Longnose sucker catch rates in 2000 were 15 per net. Concurrent with declining sucker catch rates, average white sucker length has increased since 1998 to 15 inches in 2000. The long-term average length of suckers since 1986 is 14 inches.

Hydroacoustic Estimates of Fish Abundance in Holter Reservoir

Hydroacoustic fish estimates continued in 2000 for the area from Oxbow Bend to the Holter dam. Total fish abundance in 2000 was estimated at 1,038,000 (± 727,000) fish (Table 6). Individual species estimates (based on vertical gillnet catch run concurrent with acoustics) were 480,000 kokanee, 400,000 rainbow and 160,000 walleye. Longitudinal fish distribution revealed that fish densities were higher in upper-reservoir (Oxbow) with transects generally decreasing downstream to the dam. Vertical fish distribution recorded the highest acoustic target densities (52%) between 1 and 6 meters in depth. Based on vertical fish distribution in gillnets, the majority of these near-surface targets to roughly 40 feet, are rainbow trout. Kokanee salmon were collected in nets below 50 feet. Target densities increased from .0026 to .0041 fish/meter^3 between 37 and 53 feet. The 2000 pelagic fish estimate (fish in water depths greater than 21 meters) was 128,000. Two walleye were collected in vertical nets at depths of 11 and 44 feet. Acoustics estimates conducted in 2000 declined from 1999 levels of 2.8 to 1.04 million fish. However, with the standard deviation of both estimates, it is difficult to determine the extent of the decline. Kokanee salmon estimates increased over 1999 levels of zero kokanee to 479,479. Rainbow trout saw a substantial decline from 2.56 million in 1999 to 400,000 in 2000.

Table 6. Hydroacoustics estimates of Holter Reservoir fish populations from Oxbow Bend to Holter dam. Estimates are apportioned by species (Kok=kokanee, Rb=rainbow trout, We=walleye, LL=brown trout, Su=white and longnose sucker).

Year	Pop. Est.	S.D.	#/Acre	Kok	Rb	We	LL	Su
1996	478,000	± 347,000	N/A	353,000	63,000	0	0	0
1997	1,520,000	± 100,000	N/A	373,000	344,000	0	0	545,680
1998	878,553	± 791,195	305	399,342	79,868	399,342	0	0
1999	2,800,270	± 2,390,000	973	0	2,560,247	8,008	0	0
2000	1,039,000	± 727,000	361	479,479	399,566	159,826	0	0

Beach Seine

No beach seining was conducted in 2000 due to scheduling conflicts with Protection, Mitigation and Enhancement associated with FERC relicencing.

Trap Netting

Trap net results are shown in Table 7. Nets were fished from 8 May to 11 May 2001 with netting focused on maximizing the number of tagged walleyes in an effort to determine angler exploitation and strength of spawning aged walleye in Holter reservoir. A total of 82 male, 24 female and 4 immature walleye were netted in 2001. Average length of spawning age walleye was nearly identical to 2000 at 18.5 inches (males) and 25.8 inches (females). A total of 34% of the male walleye collected were greater than the 20-inch minimum slot limit while 21 of 24 (88%) of the females were greater than 20 inches. Of the females, 10 of 24 (42%) were greater than the upper slot limit of 28 inches. Four females were larger than 30 inches with the largest being 32.5 inches. Two walleyes netted in 2001 (30.4 and 30.5 inches) are the largest walleyes netted in Holter since trap netting began in 1995.

A total of 10 of 110 walleyes netted in 2001 had been tagged in previous years netting efforts. This is the lowest recapture rate since 1996 and also below the long-term average of 14%. This low recapture rate combined with the second highest number of walleyes collected in 25 net-nights (4.4 walleye/net-night) suggests a strong spawning population is being maintained in Holter. Furthermore, the catch rate of 4.4 walleye/net-night represents the second highest since 1996 (4.7) and well above the long-term average catch rate of 3.1.

A low of 50 yellow perch were netted in 2001. Netting focused on walleye collection and was conducted with water temperatures ranging from 48 to 54 degrees F. This is generally

considered warmer than optimal for perch spawning which is reported to occur between 45 and 50 degrees F (Brown, 1971). A total of 137 rainbow trout were sampled in 25 net nights. Average length of rainbows was 19.8 inches, which is the same average recorded in 2000 compared to 16.9 inches in 1999.

Table 7. Numbers and species of fish captured in trap nets in Holter Reservoir.

			WALLEYE				PERCH		RAINBOW
			Total Catch		Mean Length (in)				
Year	Dates	Nets	♂	♀	♂	♀	Total	# of Clips	Total
1995	4/26-5/12	52	250	59	22.4	26.6	3,281	1,251	84
1996	4/25-5/17	69	181	60	22.9	26.0	1,558	1,100	350
1997	4/29-5/13	45	66	29	22.3	25.5	2,025	1,638	247
1998	4/28-5/8	52	32	11	19.2	26.3	1,890	1,478	124
1999	5/4-5/7	24	59	13	21.4	27.0	1,007	0	159
2000	5/2-5/5	28	66	17	18.9	26.0	291	0	50
2001	5/8-5/11	25	82	24	18.5	25.8	50	0	143
AVE	——→		108	30.4	20.8	26.2	1,443	N/A	165

Walleye Tagging

In an effort to estimate angler harvest, walleye caught in trend and trap net operations have been tagged with dangler and more recently monel (jaw tags). From 1988 through 2000 a total of 192 of 1333 tags (14%) implanted into Holter reservoir walleye have been returned (Appendix E). One-year tag return percentages have ranged from 4% in 1997 to 36% in 1990. In 2000, 10% of the number of walleyes that were tagged were returned (9 of 91). Tags recovered in the Missouri River below Holter have accounted for up to 78% (1995) of a given years returns. In 2000, no tags (0%) were returned from Missouri River walleye.

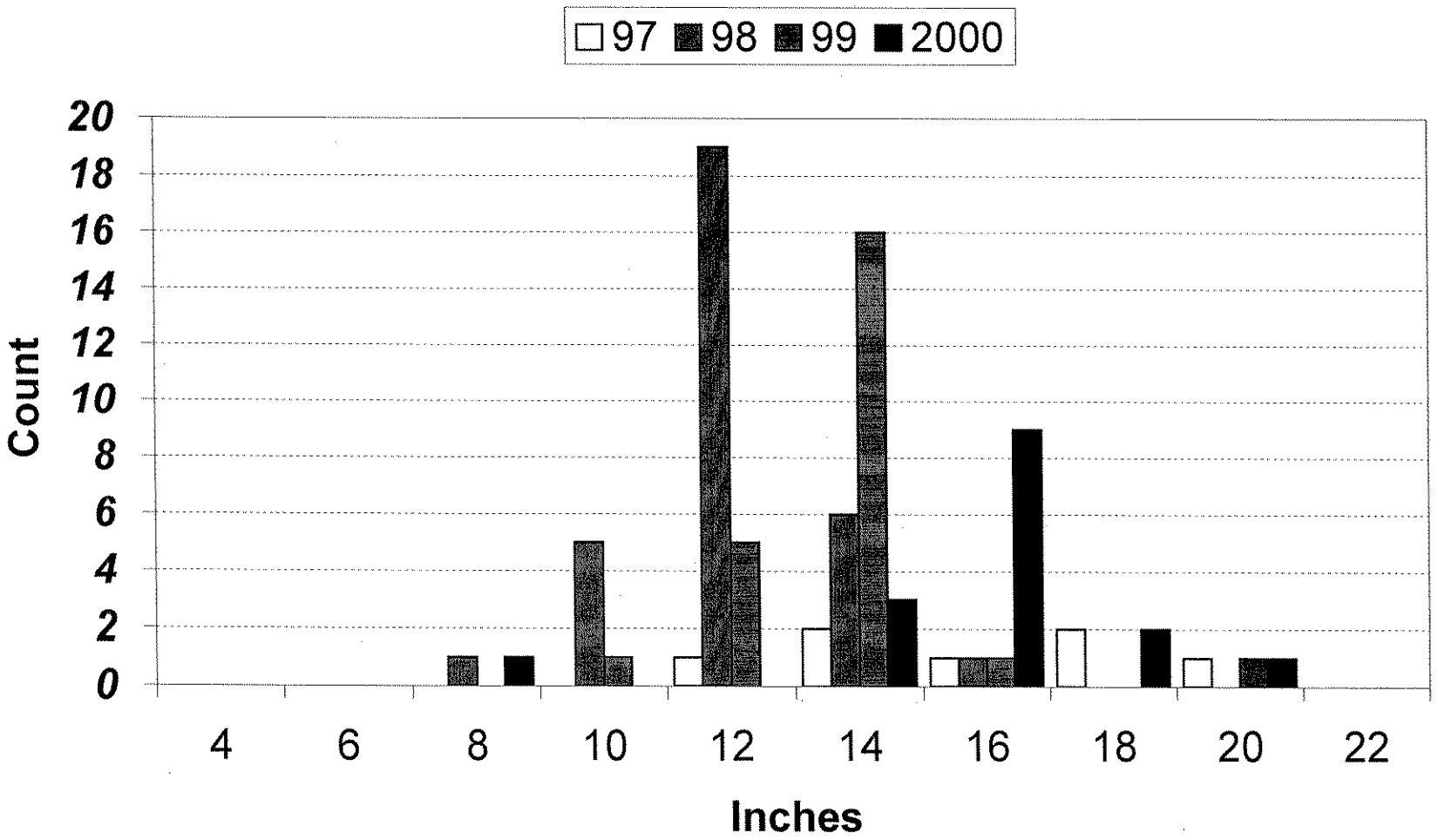
A walleye tag evaluation study was initiated in 1996 when 212 walleye were double-tagged on Holter Reservoir (Table 8). Monel (jaw) tags were placed primarily in the upper jaw and wire dangler tags were placed in the back behind the dorsal fin. There was 100% retention of both tags two years post tagging. Four years post-tagging, only 25% of the fish retained both tags. Surprisingly, there were more jaw tags lost than dangler tags. In 2001 this pattern continued as one walleye retained the dangler tag, but had lost the jaw tag. The majority of the fish that were double-tagged had the jaw tag placed into the upper jaw, which could have lead to a decrease in retention.

Table 8. Recaptured fish are from walleye handled exclusively by FWP personnel during the years 1996-2001.

Year	Years Since Initially Tagged	Total Number Sampled	Both Tags Retained	%	Jaw Tag Only	%	Dangler Tag Only	%
1996	0	1	1	100				
1997	1	20	20	100				
1998	2	1	1	100				
1999	3	6	4	67	1	17	1	17
2000	4	8	2	25	2	25	4	50
2001	5	1	0	0			1	100
TOTALS		**37**	**28**	**76**	**3**	**8**	**6**	**16**

APPENDICES

Appendix A. Length frequency of walleye collected in fall sinking gillnets in Hauser Reservoir for the period 1997 through 2000.



Appendix B. Recruitment of hatchery rainbow trout to fall horizontal gillnets in Hauser and Holter Reservoirs (1996-2000)

HAUSER RESERVOIR

					Number in Fall Horizontal Gillnets (percent of total)					
Year	**Stocking (X1000)**	**Strain**	**Age**	**Release Date**	**1996**	**1997**	**1998**	**1999**	**2000**	**TOTAL (∑Returned/total # stocked)**
1996	94.2	Arlee	0	Summer	21/42 (50%)	8/28 (29%)	5/38 (13%)	1/23 (4%)		3.71E-04
1997	98.7	Arlee	0	Summer		13/28 (46%)	9/38 (24%)	8/23 (35%)	2/31 (6%)	3.24E-04
1998	98.2	Arlee	0	Summer			21/38 (55%)	9/23 (39%)	2/31 (6%)	3.26E-04
1999	174.3	Arlee/E. Lake	0	Summer				3/23 (13%)	4/31 (13%)	4.02E-05
2000	189.2	Arlee	0	Summer					16/31 (52%)	8.46E-05

HOLTER RESERVOIR

					Number in Fall Horizontal Gillnets (percent of total)					
Year	**Stocking (X1000)**	**Strain**	**Age**	**Release Date**	**1996**	**1997**	**1998**	**1999**	**2000**	
1996	106.2	Eagle Lake	1	Summer	53/92 (58%)	18/62 (29%)	5/76 (7%)	6/37 (16%)	1/55 (2%)	7.81E-04
1997	371.4	Eagle Lake	0	Summer		18/62 (29%)	31/76 (41%)	15/37 (41%)	14/55 (25%)	2.10E-04
1998	141.5	Eagle Lake	1	Summer			29/76 (38%)	8/37 (22%)	8/55 (15%)	3.18E-04
1999	400.7	Eagle Lake	0	Sum/Fall				0/37 (0%)	15/55 (27%)	3.74E-05
2000	75.3	Eagle Lake	1	Summer					12/55 (22%)	1.59E-04
	191.6	Eagle Lake	0	Summer					2/55 (4%)	1.04E-05
	65.0	Arlee	0	Fall					3/55 (5%)	4.62E-05

Appendix C. Stocking records, creel survey results, harvest and gillnet trends for **rainbow trout** in Hauser Reservoir.

Year	Stocking (X1000)	Summer Catch Rates (fish/hr.)	Winter Catch Rates (fish/hr.)	Ave. size (inches) Summer Creel	Harvest (X1000)	Spring Floaters (fish/net)	Fall Floaters (fish/net)	% wild from Floaters
1986	212.6	0.25	N/A	13.5	N/A	14	8	
1987	212.8	0.24	N/A	14.2	N/A	4	7	
1988	211.8	0.24	N/A	15.8	N/A	3	17	4
1989	244.5	0.12	0.18	13.7	25.5	2	7	7
1990	154.0	0.10	0.11	14.9	27.8	1	6	4
1991	138.1	0.02	0.08	15.3	7.8	2	3	11
1992	126.4	0.05	0.02	15.1	13.0	3	5	11
1993	118.6	0.05	0.04	16.3	16.5	2	3	16
1994	105.1	0.02	0.01	16.6	4.2	2	3	
1995	106.7	0.05	0.04	17.5	11.5	5	2	
1996	94.2	0.05	0.04	17.5	12.4	2	4	
1997	98.7	0.08	0.08	16.9	11.0	3	2	15
1998	98.1	0.08	0.05	16.4	10.6	1	3	11
1999	174.3	0.12	0.17	17.4	21.4	1	2	9
2000	189.2	0.06	0.11	20.5	15.0	1	3	23
Mean	**152.3**	**0.10**	**0.08**	**16.1**	**14.7**	**3**	**5**	**11**

%wild in 1986-87 were not estimated because hatchery fish were not marked before 1986.
%wild in 1994-96 were not estimated because hatchery fish were not marked in 1994.

Appendix D. Stocking records, catch rates, harvest and gillnet trends for **rainbow trout** in Holter Reservoir

Year	Stocking (X1000)	Summer Catch Rates (fish/hr.)	Winter Catch Rates (fish/hr.)	Ave. size (inches) Summer Creel	Harvest (X1000)	Spring Floaters (fish/net)	Fall Floaters (fish/net)	% wild from Floaters
1986	357.3	0.34	N/A	13.9	N/A	7	14	
1987	323.0	0.37	N/A	13.8	N/A	11	18	
1988	322.9	0.32	N/A	13.7	N/A	14	6	44
1989	366.8	0.27	0.23	14.5	57.2	4	7	37
1990	347.3	0.26	0.24	14.2	59.2	6	5	27
1991	420.1	0.27	0.27	12.6	62.3	10	7	37
1992	382.8	0.22	0.23	14.1	53.2	5	6	33
1993	361.0	0.14	0.09	15.9	33.7	5	3	42
1994	290.5	0.03	0.07	14.7	10.4	4	7	66
1995	317.5	0.16	0.06	14.1	20.1	3	5	52
1996	106.2	0.21	0.25	13.8	49.3	2	9	20
1997	371.4	0.11	0.24	15.5	32.3	7	6	29
1998	141.5	0.10	0.11	15.5	15.4	5	8	12
1999	400.7	0.14	0.29	18.0	41.3	1	4	25
2000	331.9	0.05	0.11	19.6	16.0	2	6	7
Mean	**322.7**	**0.20**	**0.18**	**14.9**	**37.5**	**6**	**7**	**33**

%wild in 1986-87 were not estimated because hatchery fish were not marked before 1986.

Appendix E. Holter walleye tagging summary. Dangler tags used between 1988 and 1995; 1996 most walleye were tagged with both jaw and dangler tags; 1997-2000 all walleye tagged with jaw tags.

		NUMBER OF TAG RETURNS BY ANGLERS														
Year	# Tagged	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	Total	(%)
1988	100	6	2	1	6	4	5	1	1	0	0	1	0	0	**27**	**27.0**
1989	30		2	2	0	0	0	0	1	0	0	0	0	0	**5**	**16.7**
1990	121			3	10	16	7	3	2	1	0	1	0	0	**43**	**35.5**
1991	63				1	4	4	1	0	0	0	0	0	1	**11**	**17.5**
1992	42					2	1	1	0	0	0	1	0	0	**5**	**11.9**
1993	18						0	5	0	0	0	0	0	0	**5**	**27.8**
1994	19							0	0	1	0	0	1	0	**2**	**10.5**
1995	284								5	10	4	5	7	2	**33**	**11.6**
1996	212									7	5	11	5	1	**29**	**13.7**
1997	230										4	4	2	0	**10**	**4.3**
1998	54											2	3	0	**5**	**9.3**
1999	69												5	3	**8**	**11.6**
2000	91													9	**9**	**9.9**
	Totals	**6**	**4**	**6**	**17**	**26**	**17**	**11**	**9**	**19**	**13**	**25**	**23**	**16**	**192**	

150 of the 230 walleye tagged in 1997 were from fish relocated from Canyon Ferry

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