MONTANA FISH, WILDLIFE AND PARKS
FISHERIES DIVISION

JOB PROGRESS REPORT

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Project Title:	**STATEWIDE FISHERIES MANAGEMENT PROGRAM**	**Job Title:**	**SOUTH CENTRAL MONTANA WARMWATER FISHERIES INVESTIGATIONS**

Project Period: July 1, 1995 – June 30, 2000

ABSTRACT

Water conditions were generally favorable for warmwater fisheries in Region 5 during most of this reporting period. Precipitation levels were good during this period, and two years of above average snow pack caused serious flooding along the Yellowstone River. Good moisture helped fill ponds and reservoirs, and most of them maintained good water levels during this period. Drought conditions appeared to be returning to most of Montana in 2000 as this report period ended.

A list of species sampled, numbers, and average size data are summarized in tables for game and nongame species for most warmwater fisheries in the Region. Several strong year-classes of walleye produced a good walleye fishery in Bighorn Lake during this period. The walleye fishery in Bighorn Lake was supplemented by a rapidly developing smallmouth bass fishery, which could eventually become the primary fishery in the lake. Several new largemouth bass fisheries were established in ponds during this reporting period, and a number of previously stocked ponds were replanted to take advantage of improved water levels.

A new two-story warm/cold-water fishery was started with the introduction of tiger-muskies into Deadmans Basin Reservoir as a biological control on suckers. Public access was lost at Lebo Lake, the main tiger muskie lake in Region 5. Angling opportunities were expanded at Lake Elmo with the successful establishment of a stocked rainbow fishery on top of the existing warmwater fishery. This new urban trout fishery noticeably increased angler use at Lake Elmo.

Several factors came together to increase fish sampling efforts on the lower Yellowstone River, and data on thousands of game and nongame fish from the river were collected and summarized

for this report. A fish ladder was completed, and is being evaluated at Huntley Dam on the Yellowstone River below Billings. This ladder was an important first step in an ongoing effort to solve fish passage problems on the entire lower Yellowstone River.

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Water-level data for Bighorn Lake was obtained from the Montana Projects Office of the Bureau of Reclamation (USBR) in Billings and from summaries in their annual operating plans (USBR 1994, 1995, 1996, 1997, 1998). All data were collected and summarized using the USBR Hydromet system.

Electrofishing was conducted using a fixed-boom electrofishing boat powered by an outboard jet motor. Electrofishing equipment included a 6,500-watt generator and Coffelt VVP-15 electrofishing box. Direct current at 250 to 300 volts and 10-12 amps was used on most waters. Pulse AC current was utilized on some night electrofishing for largemouth bass. Walleye and largemouth bass electrofishing were conducted at night. Rivers were electrofished during the day.

Standard 125 ft floating and sinking experimental gill nets, along with various combinations of seines, trap nets, and angling, were used to sample the various warmwater fisheries throughout the region. Most nets were fished overnight.

Walleye and sauger were tagged with numbered Carland tags. Channel catfish and ling were tagged with numbered T-tags. Uncoded magnetic wire tags were inserted in the lower half of the base of the caudal fin in all species sampled from below Huntley Dam in the spring of 2000.

RESULTS AND DISCUSSION

Bighorn Lake

Water Levels

Water conditions in 1995 showed a major shift from the drought conditions and low lake levels that forced the closing of the Horseshoe Bend boat ramp by June 10,1994. Winter precipitation was normal, with the snowpack above Yellowtail Dam listed at 97% of normal by April 1. A very wet spring pushed the mountain snowpack to 125% of normal by late May, with snow still accumulating in Wyoming. This was the first spring that the Wyoming Area Office of the USBR was managing releases from the Wyoming Reservoir. Despite above normal snowpack, the Wyoming Area Office remained extremely conservative in their releases from Boyson and Buffalo Bill reservoirs until runoff actually started. This delay forced the Montana Area Office to hold down the lake level at Bighorn Lake in anticipation of the eventual inflow they expected from Wyoming. Once runoff started, inflow into Bighorn Lake increased dramatically. Despite starting at lower levels, the lake entered the exclusive flood pool by June 30. July inflow into Bighorn Lake was the fourth highest on record, which forced the USBR to increase releases into the Bighorn River to over 14,000 cfs. Bighorn Lake levels crested 6.3 ft into the exclusive flood pool before levels started to drop, and river discharges were reduced. Fall rains again increased inflows into Bighorn Lake, which forced another increase in river discharges to keep the lake from rising back into the exclusive flood pool.

The winter of 1995-1996 remained wet, with the snowpack accumulating well above normal. A cool spring, which delayed runoff, followed by a dry summer, resulted in Bighorn Lake levels peaking approximately 5 ft below full pool.

The winter of 1996-1997 was again very wet, and mountain snowpack for the Bighorn drainage was 148% of normal on February 1. A cool, wet spring delayed snowmelt. When runoff started, it was accompanied by heavy rains, which resulted in major flooding on the Yellowstone River. Lake levels entered the exclusive flood pool on June 16 and eventually rose 11.7 ft into the flood pool. This level was the second highest ever recorded in Bighorn Lake. The lake level did not drop back into the joint use pool until September 2, despite river releases of over 11,000 cfs. The 1997 annual runoff into Bighorn Lake was the third highest ever recorded.

Bighorn Lake played an important flood-control role again in 1998. Winter snowpack was near normal, but late winter snow and warm temperatures pushed inflow into Bighorn Lake up to 135% of normal in April. River releases were increased to 5,000 cfs by the end of April. When it became evident that flooding was going to be a problem on the Yellowstone River, releases into the Bighorn River were cut back. The lake gradually filled, entering the exclusive flood pool on July 10. After peak flows passed in the Yellowstone, releases into the Bighorn River were again increased. Bighorn Lake rose approximately 2.5 ft into the exclusive flood pool. Lake levels remained in the exclusive flood pool until August 20, thanks to higher-than-normal inflows resulting from summer rains.

Spring Electrofishing

All walleye egg-taking operations were suspended on Bighorn Lake after 1994, which greatly reduce electrofishing efforts on the lake. Limited spring electrofishing has been continued in the Ok-A-Beh/Box Canyon area to monitor walleye populations. All of this electrofishing was conducted at night.

Three nights of electrofishing in 1996 caught 195 walleye, including several different size groups (Table 1). Numerous 6 to 9 in walleye, another smaller group of 10 to 12 in immature walleye, and a group of 14 to 19 in walleye (which included many mature fish) were captured. There was also a smaller group of mature fish 20 in and longer. The largest walleye captured was a 29.5 in spent female, which weighed 11.5 lb. All of the females collected on April 18 were green. One ripe female, along with several green females, were captured on April 25. Only four females were collected on May 1, and they were all spent.

Three nights of electrofishing in the spring of 1997 produced 96 walleye (Table 1). There was a very strong group of walleye in the 10 to 12 in size-range, and another smaller group of 4 to 9 in fish. Only 10 mature walleye were captured. They ranged from 19.6 in to 32.2 in, with the largest fish being a gravid female weighing 15.9 lb. No mature walleye were captured on April 22. All of the mature females collected on April 28 and May 1 were green. No ripe or spent females were handled in 1997.

Only two nights of electrofishing were conducted on Bighorn Lake in the spring of 1998. These two nights produced a catch of 108 walleye (Table 1). Small (6 in-8 in) walleye were strongly represented in this sample along with another strong group of 12 to 17 in walleye. Numerous 20 in plus walleye were also captured in 1998 with the largest fish being a gravid female weighing 8.75 lb and measuring 27 in long. Electrofishing was conducted on April 20 and 23, with numerous ripe males and gravid females being collected both nights. No ripe or spent females were captured.

Two nights of electrofishing in the spring of 1999 produced 159 walleye (Table 1). Only a few smaller walleye (less than 9 in long) were captured. Walleye from 9 to 13 in long were the strongest size group represented in this sample. Mature males ranged from 14.4 to 20 in, while most mature females were just over 20 in long. The largest walleye captured in 1999 was a 29.5 in, 11.3 lb ripe female. One ripe female and numerous ripe males were captured on April 15. The second night of electrofishing didn't occur until May 13, when all the females and most of the males were spent.

Table 1. Numbers and size-range of walleye captured during spring electrofishing in Bighorn Lake from 1996 through 2000.

Number	Average length (in)	Average weight (lb)	Length range (in)
	1996		
195	11.0	0.90	4.4-29.7
	1997		
96	11.7	0.91	4.6-32.2
	1998		
108	14.1	1.35	6.3-27.0
	1999		
159	14.5	1.48	5.0-29.5
	2000		
140	18.0	2.33	8.6-25.6

Two nights of electrofishing in the spring of 2000 caught 140 walleye (Table 1). Only two walleye less than 9 in long were captured along with a small group of fish between 9 and 12.5 in. The majority of walleye collected in 2000 ranged from about 19 to 22 in in length, with the largest fish being a 23.8 in gravid female weighing 5.40 lb. The first night of electrofishing on April 24 appeared to hit right in the middle of the spawn. Sixty-nine percent of the mature females collected were still green, while 20% were spent. The remaining 11% were ripe. The sex

ratio on this trip was almost 3.5 females for every male collected. Most of the males were ripe, but three spent males were also captured. On May 4, ten of the 12 mature females captured were spent; one was ripe, and one still green. The sex ratio was about equal on the second night, and all males were ripe. The surface-water temperature at 11:15 P.M. on April 24 was 46° F. By 10 P.M. on May 4, the water temperature had increased to 56° F.

Based on the number of younger year-classes of walleye that seem to be working their way through the system, the future of the walleye fishery on Bighorn Lake looks good.

Other Gamefish Sampled

Several other game species were collected from Bighorn Lake incidental to spring electrofishing for walleye (Table 2). As in the past, the number of sauger captured at the lower end of the reservoir during the spring was minimal. Only three sauger were collected during the five years of electrofishing (Table 2). One was a 24.5 in, 4.7-lb, gravid female collected in 1988.

Brown trout numbers were way up in both 1996 and 1997 with a good size-range of fish represented in both samples. The largest brown trout collected during this sampling period was a 23.3 in fish weighing 4.28 lb. Brown trout over 20 in long were captured each year except 1998. Ling numbers were also up in the 1997 sampling, with a number of 4 to 6 in ling present in the sample, indicating good ling reproduction in 1996.

Smallmouth bass were captured for the first time during spring electrofishing in 1997. Two smallmouths were captured during three nights of electrofishing. Since that time, the smallmouth bass population appears to be expanding rapidly in Bighorn Lake. In 1999, two nights of electrofishing produced 16 smallmouth bass ranging from 4.1 in to 12.8 in long. The largest bass weighed 1.18 lb.

Smallmouth bass numbers took a major jump in 2000 when two nights of spring electrofishing captured 77 smallmouth. This was more than half the total number of walleye collected during the same period. This sample was strongly represented by two size-groups of smallmouth, one between 7 and 8.5 in and a second around 11 to 12.5 in. The largest bass captured in the spring of 2000 was a 14.4 in smallmouth that weighed 1.94 lb. If smallmouth bass numbers continue to expand as they have the past few years, they could become the primary gamefish in Bighorn Lake.

Eight larger black crappie were also captured in the spring of 2000. Crappie are scattered throughout the lake, but are often concentrated in small areas. It is difficult to say whether crappie numbers were up in 2000, or the limited sampling happened to find an area where they were concentrated.

A bluegill sunfish was captured during the spring of 2000. Green sunfish have been captured in Bighorn Lake in the past, but this was the first time a bluegill was documented. It is difficult to say where this fish came from, how many are in the lake, or how they will do if they become established in the lake.

Walleye Stocking

The normal walleye planting request for Bighorn Lake has been 4 million fry and 200,000 walleye fingerlings per year. The Miles City Fish Hatchery has been able to meet or exceed this request each year. Total requests for both fry and fingerlings were met in 1995. In 1996, the first shipment of 4 million fry from Miles City appeared to be in very poor condition by the time they were planted. Extreme water-temperature changes, from being iced at the hatchery to the very warm conditions experienced at the lake, were too much for these smaller fish. Due to these problems, a second 4 million fry were planted a few days later. Fish in the second plant looked good. Between an abundant egg supply and good success with fingerling production, the hatchery ended up with extra fingerlings for Bighorn Lake in 1996. A total of 551,000 fingerlings were stocked into the lake, which was more than twice the normal request. The 1997 walleye plant again exceeded the request with 4 million fry and 301,000 fingerlings. The normal walleye request was met in 1998 and 1999.

Table 2. Numbers and size-range of fish, other than walleye, captured during spring electrofishing in Bighorn Lake from 1996 through 2000.

Species	Number	Length-range (in)
	1996	
Brown trout	44	6.0-20.2
Rainbow Trout	8	6.3-18.7
Burbot (Ling)	2	9.8, 17.2
Sauger	1	16.1
	1997	
Brown trout	32	6.0-23.3
Burbot (Ling)	29	4.8-22.6
Smallmouth bass	2	4.9, 5.4
	1998	
Brown trout	7	6.5-16.6
Rainbow trout	3	11.2-18.3
Burbot (Ling)	9	4.5-20.5
Sauger	2	14.6, 24.5
Smallmouth bass	1	10.3

Table 2. (Continued) Numbers and size-range of fish, other than walleye, captured during spring electrofishing in Bighorn Lake from 1996 through 2000.

Species	Number	Length-range (in)
	1999	
Brown trout	5	6.7-21.7
Burbot (Ling)	6	7.3-16.7
Smallmouth bass	16	4.1-12.8
	2000	
Brown trout	5	5.8-21.0
Burbot (Ling)	6	8.3-20.3
Smallmouth bass	77	6.5-14.5
Black crappie	8	9.1-11.2
Bluegill sunfish	1	3.1
Lake chub	1	4.7

Walleye Tagging and Movement

A total of 224 walleye and 3 sauger were tagged in Bighorn Lake during spring electrofishing between 1995 and 1999. Anglers returned twenty-six, or 11.6 %, of these tags later in the year they were tagged or in subsequent years (Table 3). The highest walleye exploitation rate observed during this period, with these limited data, was 20%. Two of 10 walleye tagged in 1997 were recaptured in the following 3.5 years. Twelve of the 72 walleye tagged in the spring of 1999 were returned through June of 2000, for an exploitation rate of 16.7%.

Most of the tagged fish were recaptured in the same year they were tagged. Only 3 fish were recaptured two or more years after being tagged. Eleven of the 26 tagged fish had moved less than 5 miles from the point of tagging. Only two fished moved 15 or more miles with the greatest movement recorded being 17 miles. One 14.9 in walleye, tagged on April 15, 1999, was recaptured in the Bighorn River below the dam in December of 1999.

Fall Sampling

A series of six sinking gill-nets were fished at standard locations between Little Bull Elk Creek and the dam each fall, except 1996. Walleye catch rates ranged from a low of 4.5 walleye per net in 1995 to 11.3 walleye per net in 1997. Sauger catch-rates ranged from 0.33 sauger per net in 1999 to a high of 3 sauger per net in 1998 (Table 4).

The largest walleye captured in the fall was a 22.7 in fish that weighed 4.48 lb. A 23.5 in sauger captured in 1998 weighed 5.50 lb. Other sport fish captured included yellow perch, brown trout, channel catfish, ling and smallmouth bass (Table 4). The smallmouth bass captured in 1997 was

the first smallmouth netted in the fall. This timing corresponded with the first smallmouth captured during spring electrofishing in 1997. Smallmouth-bass catch-rates jumped to two fish per net in the fall of 1998, and were almost that high in 1999. Bass are generally difficult to catch in any nets, so these catch-rates are an indication of a high smallmouth bass density in the lower end of the reservoir.

No fall gill-netting was conducted in 1996. On September 10, however, an evening was spent electrofishing and hook-and-line sampling in the vicinity of Barry's Landing, to evaluate the developing smallmouth fishery. Ten species of fish were collected, including 26 smallmouth bass (Table 5). These smallmouth ranged in length from 2.4 to 11.6 in, and it appeared there were three or four distinct size-groups represented. This was the first sampling on Bighorn Lake that showed the smallmouth bass were well-established and appeared to be reproducing.

An important factor in the rapid expansion of the smallmouth bass population in Bighorn Lake may have been the concurrent development of a new forage base in the lake. Wyoming Game and Fish introduced spottail shiners into Bighorn Lake as forage in the fall of 1988. Forage fish sampling with Wyoming through 1992, showed the spottail were established and spreading through the lake. However, densities remained low downstream of the Horseshoe Bend area. Spottail shiners prefer shallow littoral areas of a lake, so it is unlikely they will ever do very well in the Montana portion of Bighorn Lake. The eight spottails collected during fall electrofishing in 1996 were the first spottails collected since 1992. Based on their size, they all appeared to be adult fish.

Beginning in the early 1990's, Montana Fish, Wildlife & Parks (FWP) became interested in finding a forage fish for Bighorn Lake with a more pelagic life style, which could do better in the deep-canyon section of the reservoir. An Environmental Assessment (EA) was started in 1991 to look at the introduction of emerald shiners into Bighorn Lake as forage. After talking with biologists in Wyoming about their success with emerald shiners in some of their other reservoirs, the idea was dropped, and the EA was not completed. In September 1992, two emerald shiners were collected in a beach seine at Horseshoe Bend, indicating that emerald shiners were moving into the lake from up-river. No standard forage fish sampling was conducted in the Montana portion of Bighorn Lake between 1992 and 1996. Thirteen emerald shiners collected in the fall of 1996 were the first documentation that emeralds were becoming well-established in the Montana end of the lake. By the summer of 1997, huge schools of emerald shiners started to show up all over the lake. Emeralds have been extremely abundant in the lake each summer since. Huge schools of emeralds hang near the surface, often close to shore or back in the end of bays, where they provide ideal forage for the developing smallmouth-bass population. No stomachs were collected, but it is likely emerald shiners are also providing important forage for many other species in the lake.

Warmwater Ponds and Reservoirs

Water conditions and precipitation rates during most of this report period were generally favorable for ponds and reservoirs in Region 5. Some exceptions did occur, such as the Musselshell River Drainage, where precipitation remained below normal for much of this period.

The winter of 1999–2000 was dry statewide and moisture conditions looked poor going into the summer of 2000.

Table 3. Summary of tag-return data for walleye and sauger tagged in Bighorn Lake between 1995 and 1999.

Year tagged	Number tagged		Number of tags returned by year				
	Walleye	Sauger	1995[1/]	1996[2/]	1997	1998	1999
1995	65		7				
1996	56	2		1	1 (sgr)[3/]	2	
1997	10			1			1
1998	21	1				1	
1999	72						9[4/]

[1/] One tag from 1992 and six from 1994 also returned in 1995
[2/] Two tags from 1994 returned in 1996
[3/] Sauger
[4/] One caught-and-released fish was caught a second time

Table 4. Numbers and sizes of fish species captured in standard fall gill-net series (6 nets) fished in Bighorn Lake from 1995 through 1999.

Species	Number	Avg. length (in)	Avg. weight (lb)	Length-range (in)
		1995		
Brown trout	5	17.4	1.75	15.1-19.0
Walleye	27	14.6	1.28	9.3-20.8
Sauger	12	16.4	1.53	14.5-19.3
Burbot (Ling)	2	-	-	13.8, 17.1
Channel catfish	1	28.5	-	-
Yellow perch	7	5.9	0.10	5.6-6.5
White sucker	2	-	-	16.5, 17.8
Shorthead redhorse	3	16.4	2.03	14.8-17.8
Carp	2	-	-	19.6, 21.1
Stonecat	2	-	-	6.3, 6.6
Crayfish	8	-	-	-

Table 4. (Continued) **Numbers and sizes of fish species captured in standard fall gill-net series (6 nets) fished in Bighorn Lake from 1995 through 1999.**

Species	Number	Avg. length (in)	Avg. weight (lb)	Length-range (in
		1997		
Brown trout	10	16.3	1.68	7.6-23.2
Walleye	68	14.2	1.09	7.7-22.7
Sauger	17	17.0	1.70	13.7-21.5
Burbot (Ling)	12	19.8	1.75	13.8-25.1
Channel catfish	1	28.6	-	-
Smallmouth bass	1	10.3	-	-
Yellow perch	10	8.9	0.34	7.6-10.0
White sucker	1	16.8	-	-
Shorthead redhorse	5	11.5	0.67	10.4-12.0
River carpsucker	1	15.2	-	-
Carp	3	13.5	1.26	12.7-14.2
Crayfish	17	-	-	-
		1998		
Brown trout	8	19.3	2.54	18.0-21.0
Mountain whitefish	1	15.9	-	-
Walleye	46	14.8	1.26	8.0-21.8
Sauger	18	18.0	2.20	14.0-23.5
Channel catfish	1	21.0	-	-
Smallmouth bass	12	10.7	0.84	7.4-14.1
Yellow perch	16	6.6	0.12	5.6-8.9
Shorthead redhorse	4	11.8	0.75	10.7-12.8
River carpsucker	1	18.6	-	-
Longnose sucker	8	15.2	1.45	13.3-16.7
Carp	9	16.6	2.22	14.4-20.9
Crayfish	11	-	-	-
		1999		
Brown trout	5	20.0	2.99	18.2-21.2
Walleye	36	12.8	0.80	8.7-20.1
Sauger	2	-	-	18.9, 19.8
Burbot (Ling)	2	-	-	23.3, 25.0
Smallmouth bass	7	9.0	0.39	7.4-11.9
Yellow perch	14	8.1	0.29	6.7-8.9
Shorthead redhorse	6	14.4	1.29	12.0-16.6
Longnose sucker	3	11.8	0.70	11.4-12.6
Carp	5	16.5		15.1-17.9
Crayfish	8	-	-	-

Table 5. Numbers and sizes of fish species captured by hook-and-line sampling and electrofishing near Barry's Landing on Bighorn Lake on September 10, 1996.

Species	Number	Avg. length (in)	Avg. weight (lb)	Length-range (in)
Brown trout	2	-	-	18.2, 21.5
Rainbow trout	1	13.4	-	-
Walleye	1	10.3	-	-
Sauger	3	9.9	0.23	9.9
Smallmouth bass	26	6.3	0.18	2.4-11.6
Largemouth bass	4	4.8	0.08	2.7-6.1
Black crappie	1	5.0	-	-
Yellow perch	1	4.9	-	-
Emerald shiner	13	2.0		1.6-3.1
Spottail shiner	8	3.3	-	3.0-3.5

A total of 102,773 largemouth bass were stocked in Region 5 waters between 1995 and the spring of 2000. Seven new, privately-owned bass ponds were planted for the first time. Nine other private ponds were planted to supplement existing populations or to reestablish populations that had been lost. Four public waters received annual or periodic bass plants during this period.

Lake Elmo was the only water in Region 5 to receive channel catfish plants during this period. Lake Elmo is scheduled to receive channel catfish every year, but a reliable catfish source has been hard to find. A total of 29,871 channel catfish were stocked in three different plants in 1996, 1998 and 1999. These catfish ranged from 2.5 in to 3.5 in when planted, which was smaller than desired, but the only size available.

In addition to the walleye plants already discussed under Bighorn Lake, approximately 100,000 walleye fingerlings were planted into Cooney Reservoir each year.

Tiger muskies were the only other warmwater fish planted in Region 5 during this report period. One new tiger muskie population was started in the region during this time, while public access to the most popular tiger muskie lake in the region was lost. An EA was completed in the spring of 1998 to allow the introduction of tiger muskies into Deadmans Basin Reservoir in the Musselshell Drainage. The purpose of this plant was to provide biological control on the large sucker population in this trout reservoir, while providing a secondary trophy fishery for tiger muskies. Plants of 1,500 tiger-muskie fry (2.5 in) in the spring, followed by a second plant of 1,000 advanced fingerlings (6–9 in) in late summer, were made in 1998 and 1999. This same program is continuing in 2000, with 1,500 fry being planted in June.

Lebo Lake was scheduled to receive tiger muskies in 1998 to supplement fish planted in the early 1990's. Tiger muskies were being raised in the Miles City hatchery when public access was lost

at the lake, and these plants were then canceled. Broadview Pond, the only other tiger muskie fishery in Region 5, received a plant of 150 6.6 in tiger muskie in 1998, to add a new year class to the existing population.

Public Waters

Anita Reservoir. Two floating and two sinking gill-nets were set overnight in Anita Reservoir on June 6, 1996. One of the floating nets was gone the next day when crews returned to pull them. The three remaining nets caught seven fish including two black crappies, two carp, a longnose sucker, a white sucker, and a stonecat. The crappies were 6.8 and 7.1 in long.

Anita was not sampled in 1997. A floating and sinking gill-net, and three trap-nets, set overnight on May 27, 1998, caught 15 different species of fish (Table 6). Gamefish captured included one 10.7 in largemouth bass, one 20.3 in channel catfish, and numerous black crappie and yellow perch. Crappie appeared to be successfully reproducing in Anita, as several hundred 2 in to 3.5 in crappie were captured. A group of 141 larger crappie averaged 7.5 in long. Channel catfish have never been stocked into Anita Reservoir, so the catfish that was captured probably came from the Yellowstone River via the Huntley Project irrigation ditch. Beach seining and an electrofishing run around the lake after dark caught the same fish species as the gill nets, except electrofishing produced one 8.2 in brown trout, and seining captured five emerald shiners. Eighteen largemouth bass, ranging from 2.7 to 17.3 in, were captured while electrofishing. The largest bass weighed 3.23 lb. Anita Reservoir is scheduled to receive 10,000 largemouth bass each year, but plants were canceled in 1998, 1999, and 2000 due to low water. Anita Reservoir was almost totally dewatered by mid-June 2000.

Arapooish Pond. Arapooish was not sampled in 1996, but angling at the pond in July produced 12 largemouth bass in the 11 to 12 in size-range, several 7.5 to 8 in bass and a couple of 2 in bass. Numerous other 2 in and 7 to 8 in bass were observed. Sixty-two minutes of night electrofishing on April 5, 1997, captured 177 largemouth bass ranging from 7.9 to 13.0 in in length. Twenty-six of these bass were over 12 in long. Arapooish was not sampled in 1998 and 1999, but visual observation and contact with anglers indicated the bass were doing well, with several size classes present. Visual observation on May 15, 2000, found numerous largemouth bass in the 7 to 9 in range, as well as some larger spawning fish along the shoreline. These spawners appeared to be 14 to 16 in long and probably weighed well over a pound.

Arapooish is totally self-sustaining and has not been stocked in a number of years. Bighorn County continues to maintain an aeration system in the lake each winter, which has been working well to prevent winterkill.

Table 6. Numbers and size of fish species captured in gill nets and trap nets set overnight at Anita Reservoir in May of 1998.

Species	Number	Avg. length (in)	Avg. weight (lb)	Length range (in)
Largemouth bass	1	10.7	-	-
Black crappie	141[1/]	7.5	0.22	5.6-8.7
Pumpkinseed sunfish	12	4.8	-	4.0-5.6
Yellow perch	17	5.7	-	3.5-8.5
Channel catfish	1	20.3	-	-
Shorthead redhorse	48	11.1	0.65	6.2-16.7
White sucker	43	13.6	1.04	7.2-15.8
Longnose sucker	24	10.5	0.47	7.5-14.8
River carpsucker	8	17.8	3.59	11.8-20.7
Carp	5	9.3	-	4.7-15.6
Goldeye	10	11.2	0.62	6.3-14.3
Stonecat	3	7.5	0.18	6.5-8.1
Black bullhead	4	7.7	0.32	7.5-8.1
Flathead chub	2	7.2	0.14	6.9-7.4
Hybognathus sp.	21	5.5	-	4.3-7.1

1/ Several 2-3½ in crappie were netted but not measured.

Broadview Reservoir. Broadview Reservoir was sampled each spring using a combination of gill nets, trap nets and a 100-ft seine, in an effort to monitor the tiger muskie population and to follow other changes in fish populations. Total catches and average sizes of all fish collected during this sampling are summarized in Table 7.

Tiger muskies were captured each sampling period except the fall of 1998. In most cases, only one tiger muskie was captured in each net series, although three were netted in the spring of 1997. Tiger muskies were stocked into Broadview Reservoir between 1991 and 1993, when 500 to 600 6-in-plus tiger muskie were stocked annually. An additional 150 6.6 in tiger muskie were planted in Broadview in the summer of 1998, to provide another year class in the population. A 17.2 in tiger muskie, captured in the fall of 1999, was from the 1998 plant. Based on this single fish, it appeared that growth rates for this later plant were similar to the excellent growth rates observed when tiger muskies were first introduced.

All remaining tiger muskies netted during this period were fish from the first three years of stocking. The two tiger muskies captured in the spring of 1999 were the largest sampled from Broadview to date. One fish was 35.2 in and weighed 9.1 lb; the second was 34.5 in long, but weighed 9.3 lb. A single tiger muskie captured in the spring of 2000 was 32.6 in long and

Table 7. Numbers and sizes of fish species netted from Broadview Reservoir during spring and fall sampling between 1995 and 2000.

Species	Number	Avg. length (in)	Avg. weight (lb)	Length range (in)
		1995 – Fall (10/25)		
Tiger muskie	4	25.8	4.32	24.7-27.7
Rainbow trout	13	11.4	0.67	9.3-13.3
Black crappie	5	6.3	-	2.6-7.6
Carp	2			4.8, 7.6
		1996 – Spring (5/23)		
Tiger muskie	7	25.0	5.45	24.6-33.0
Rainbow trout	10	11.9	0.61	9.5-13.6
Black crappie	8	7.0	-	2.7-8.6
Carp	50	10.1	-	3.5-14.8
Lake chub	8	4.1	-	3.5-4.8
Flathead chub	1	7.7	-	-
		1996 – Fall (10/24)		
Tiger muskie	7	30.6	6.86	27.2-32.7
Rainbow trout	18	8.7	0.28	7.4-9.8
Black crappie	19	7.0	-	2.4-8.5
Largemouth bass	1	12.5		-
Carp	22	6.0	-	2.5-12.0
Lake chub	1			4.5
		1997 – Spring (5/15)		
Tiger muskie	3	29.8	6.56	26.1-33.3
Rainbow trout	6	9.6	0.29	8.9-10.3
Black crappie	50	7.4	0.22	4.5-9.5
Largemouth bass	2	-	-	3.4, 9.4
Carp	50	8.6	0.41	3.0-22.9
Fathead minnow	8	2.4	-	1.9-2.9
		1997 – Fall (9/12)		
Tiger muskie	1	32.8	7.62	-
Black crappie	92	3.1	0.01	2.0-9.0
Largemouth bass	9	3.7	-	1.9-9.8
Carp	40	6.6	0.19	3.3-11.4
Lake chub	1	2.0	-	-
Fathead minnow	2	-	-	1.8, 2.1

Table 7. (Continued) Numbers and sizes of fish species netted from Broadview Reservoir during spring and fall sampling between 1995 and 2000.

Species	Number	Avg. length (in)	Avg. weight (lb)	Length range (in)
		1998 – Spring (5/20)		
Tiger muskie	1	33.5	8.55	-
Rainbow trout	2	-	-	12.7-14.1
Black crappie	48	5.7	0.20	2.9-9.9
Carp	100	8.5	0.34	3.7-12.8
Lake chub	1	4.4	-	-
Fathead minnow	26 1/	2.7	-	2.3-3.0
	1/ Additional 48 fathead minnow not measured			
		1998 – Fall (9/24)		
Rainbow trout	118	6.4	0.08	3.7-12.8
Black crappie	68	4.9	0.08	2.7-11.2
Largemouth bass	2	-	-	5.0, 5.9
Carp	19	9.1	0.69	4.7-24.2
		1999 – Spring (5/20)		
Tiger muskie	2	-	9.20	34.5, 35.2
Rainbow trout	4	6.8	0.07	5.1-8.2
Black crappie	179 1/	4.0	-	3.5-10.0
Largemouth bass	1	11.9	-	-
Carp	61	8.4	0.37	4.9-23.7
Fathead minnow	10	2.3	-	2.0-2.7
	1/ 855 3.5-4.5 in crappie not measured			
		1999 – Fall (10/7)		
Tiger muskie	1	17.2	1.03	-
Black crappie	118 1/	4.4	-	3.9-5.3
Largemouth bass	10	3.1	-	2.6-5.3
Carp	29	8.2	0.18	6.5-11.7
Lake chub	3	3.1	-	2.3-4.3
	1/ 1,559 4-5 in crappie not measured			
		2000 – Spring (5/19)		
Tiger muskie	1	32.6	8.70	-
Black crappie	206	4.5	-	3.8-9.9
Carp	19	7.6	0.21	6.4-11.1
Flathead chub	1	-	-	6.4

weighed 8.7 lb. The first "legal-sized" (30 in+) tiger muskie was netted in Broadview in 1994. This fish was 31.1 in long and weighed 7.0 lb.

Although Broadview Reservoir contains plenty of forage, some factor, perhaps the size of the reservoir, appears to be limiting growth of the larger tiger muskie. Based on netting data, it appeared that tiger muskies in Broadview peaked and quit growing at just under 10 lb. There could be some larger fish in the pond, but if so, they have been avoiding the nets. Anglers do catch an occasional tiger muskie at Broadview, but fishing has generally been very slow at best. Sizes of angler-caught fish have been comparable to netted fish.

Tiger muskies were stocked into Broadview in hopes of providing some biological control on black crappie and carp in the reservoir. Although tiger muskie prefer soft-rayed fish, like suckers, as food (Engstrom-Heg et al. 1986), it was hoped they would key into the spiny-rayed fish if they were the only forage available. Initial short-term results after the tiger muskies were first introduced, indicated the tiger muskies were providing the desired impacts (Frazer 1995). The average size of 84 crappie netted in the spring of 1995 was 7.2 in, which was a big improvement from previous stunted populations. The average size of carp increased, while catch rates declined. This pattern did not hold for the long term. The average size of crappie remained around 7 in for awhile, but strong recruitment of young crappie into the population, beginning in 1997, caused a major decline in the average size of the crappie collected (Table 7). A very strong year class of crappie was observed in both the spring and fall of 1999, and continued on into the spring 2000 sample (Table 7). Broadview Reservoir does produce an occasional large crappie, but it does not appear that even a combination of largemouth bass and tiger muskie is providing enough predation to keep crappie recruitment in check.

Broadview is scheduled to receive 4,000 largemouth bass per year, and largemouth were stocked every year during the survey period except 1995. Bass plants were also canceled early in 2000, due to very low water levels in the pond. Bass are difficult to sample with any kind of net, and only three bass were captured during this survey. The largest bass was 12.5 in long and was collected in the fall of 1996. The remaining bass were small fish captured the same year they were planted.

Historically, Broadview reservoir was a popular trout reservoir. It produced some nice trout until carp were introduced in the 1970's. Broadview is no longer on the program to receive trout plants, but it is still stocked with rainbow when unallocated trout become available. Rainbows were stocked into Broadview in 1995, 1996 and 1998. Two plants were made in 1995: a spring plant of 1,018 4.6 in rainbows, and a fall plant of 782 10.9 in fish. Adipose fins were clipped on the larger fish planted in September. All rainbows netted in the fall of 1995 were clipped fish from the fall plant. Six of the 10 over-wintered rainbow netted in the spring of 1996 were clipped, while 4 were not. The unmarked 4.6 in 1995 spring plants had almost caught up in size with the larger rainbow planted in the fall. Approximately 5,100 5 in rainbow were planted in Broadview in June 1996. Eighteen of these fish netted in the fall, averaged 8.7 in long. Six rainbow netted in the spring of 1997 averaged 9.6 in long (Table 7). No rainbows were netted in the fall of 1997, but two rainbows were sampled in the spring of 1998. These fish had to have survived at least two winters in Broadview Reservoir. They were 12.7 in and 14.1 in long. Approximately 5,200 rainbows averaging 5.5 in long were stocked into Broadview on

September 23, 1998. This was the same day fall nets were set in Broadview. This unfortunate overlap accounted for the large rainbow catch recorded that fall (Table 7). Four rainbows were captured in the spring of 1999, while none were netted in the fall of 1999 or spring of 2000. Water levels in Broadview were very low going into the winter of 1999. Although no general problems with winterkill were observed, these low water conditions may have been enough to eliminate all remaining rainbows from the pond.

Carp continued to do well in Broadview despite the tiger muskies, and average size remained fairly consistent (Table 7). Carp numbers may have been down some in the spring of 2000, which could be a result of the low winter water levels. Water levels were low enough in the spring of 2000 that the scheduled largemouth bass plant was canceled.

Deadmans Basin Reservoir. Deadmans Basin was added to the Region 5 list of warmwater fisheries when tiger muskies were planted into the reservoir in 1998. Deadmans Basin is a 1,900-acre, off-stream, storage reservoir in the Musselshell Drainage, located approximately 9 miles west of the town of Ryegate. Deadmans has been managed as a trout and kokanee salmon fishery in the past, and this will remain the primary focus at Deadmans in the future. A detailed discussion of the coldwater fishery at Deadmans Basin can be found in Poore and Frazer, 2000.

Deadmans Basin was a very popular trout fishery in the late 1970's and early 1980's. The primary goal of the tiger muskie plant was to rebuild this popular trout fishery to the levels seen in the late 1970's. A secondary goal was to develop a limited warmwater trophy fishery in Deadmans.

A detailed EA, completed in the spring of 1998, discussed all aspects of this tiger-muskie plant (Frazer 1998). The first tiger muskies were planted into Deadmans on June 4, 1998, when 1,500 2.5 in tiger muskies were planted. This was followed with a second plant of 1,000 6 to 9 in fish on September 2. This same stocking plan was continued in 1999 and 2000. In 1999, 1,700 1.25 in tiger muskies were planted in June, followed by 1,000 4.5 to 7 in fish in July. Another 1,500 2 in tiger muskies were planted in June 2000, with a second plant of larger fish planned for later in the summer. The initial plan was to plant tiger muskies for three years, then monitor changes in the sucker and trout populations. The goal of this stocking program is to reduce sucker numbers by about 50%, but not totally eliminate them. This plan would maintain a consistent food supply for the tiger muskies and, hopefully, minimize predation on the stocked trout and salmon.

A 100 ft X 1/4 in beach seine was used on June 22, 1998, to look for small forage and for tiger muskies. Six seine hauls around the lake caught three tiger muskies between 3.4 and 3.8 in long. A total of 127 forage fish, including white suckers, longnose dace, fathead minnows, shorthead redhorse suckers, and lake chubs, and 239 small (2.1 to 5.7 in) stocked rainbow were captured. All but 18 of the forage fish, along with the three tiger muskies, were caught in a single seine haul in the back of a small bay that had some vegetation. Available forage for the small tiger muskie appeared to be very limited throughout most of the reservoir. A second seining attempt in mid-September caught one 7.7 in tiger muskie, probably from the September plant. Some small suckers and small carp were found scattered around the lake. All of these small fish were found in association with the very limited vegetation growing in bays and shallow shoreline areas.

A standard series of four floating and four sinking gill nets set in October 1998 caught one tiger muskie. This fish was 17.2 in long and weighed 1.20 lb. Growth rate for this fish was similar to the growth rate observed when tiger muskies were first introduced into Lebo Lake. If we assume this fish was 2.5 in long when stocked on June 4, it was growing at a rate of just over 0.1 in per day. Three tiger muskies were captured in the standard gill-net series in May 1999. These fish were 14.7 in, 17.4 in and 17.6 in long and weighed 0.65, 1.18, and 1.32 lb respectively. The two larger fish were probably from the 1998 spring plant, while the smaller fish was from the summer plant.

Four seine hauls with the 100-ft seine in September 1999 caught one 10.5 in tiger muskie. The presence of other small forage fish was again very limited around the lake. No tiger muskie was captured in the standard gill net series in the fall of 1999, even though two year-classes of tiger muskies were present in the lake. The standard series of eight gill nets set on May 15, 2000 was very productive, catching a total of 11 tiger muskies. One tiger muskie was 15.0 in long and weighed 0.72 lb. This fish was probably from the 1999 summer plant. The remaining 10 tiger muskies ranged from 22.7 to 25.9 in long, with an average length of 24.8 in. The mean weight of these 10 fish was 3.85 lb with the heaviest fish weighing 4.57 lb. This growth was excellent, and all of the fish were in good condition. These larger fish were just the right size to start utilizing a majority of the larger suckers found in Deadmans, so this good growth should continue. Some of these tiger muskies should reach the 30-in minimum-size limit by the fall of 2000.

The water outlook is very poor for the Musselshell Drainage in 2000, and it is predicted Deadmans Basin will be drained as far as possible by mid-summer. This extreme drawdown, which will concentrate all fish in a much smaller volume of water, could have several effects on the Deadmans fishery. Concentrating all the forage fish for the predators, could reduce the sucker population at a faster rate than desired. Predation could also be increased on the rainbow and kokanee in the reservoir. On the positive side, the larger tiger muskies in Deadmans could experience exceptional growth rates this summer. Because the water will be pulled away from all available cover along the shorelines, there will be no place for smaller fish to hide, which could significantly reduce survival of the 2000 tiger-muskie plants. The small forage these fish need to get a good start in the lake may not be available, and the small tiger muskies may become forage themselves.

Lake Elmo. The fishery at Lake Elmo underwent a major change during this report period. Rainbow trout were planted into Lake Elmo for the first time in 1998. As discussed in the previous report (Frazer 1995), angling use at Lake Elmo increased significantly when the fishing pier was completed in 1994. This increase was minor, however, compared to the increase in use experienced once rainbows were introduced. Lake Elmo is being managed as an urban fishery to provide as much recreational opportunity as possible for a variety of anglers. Although the rainbows have become a major attraction for anglers at the lake, the warm- and cool-water species in Lake Elmo are still an important component of the fishery.

Fish populations in Lake Elmo are normally sampled each spring and fall using a combination of gill nets and trap nets. Only sampling in the fall of 1995 was missed during this reporting period. Because Lake Elmo is directly connected to the Yellowstone River via the "Big Ditch," any fish

species found in the Yellowstone can end up in Lake Elmo. The variety of fish species captured during each netting period, and size data on these fish, are presented in Table 8.

The primary sport fish in Lake Elmo, besides rainbow trout, are largemouth bass, channel catfish, black crappie and yellow perch. Lake Elmo also contains a population of pumpkinseed sunfish. Most of these fish are too small to be much of a sport fish, but they do provide some recreational opportunities, especially for the younger anglers using the lake.

Largemouth Bass. Largemouth bass were stocked into Lake Elmo almost every year between 1984 and 1995 in an attempt to develop a self-sustaining bass fishery. Stocking rates were varied widely over the years in an effort to find the combination needed to develop this fishery. Despite these endeavors, a good bass fishery has never developed at Lake Elmo. Past electrofishing in the fall found large numbers of small (recently planted) bass, but it appeared over-winter survival of these small fish was poor. Based on these results, the stocking of small largemouth bass into Lake Elmo was discontinued after 1994. Approximately 700 4.5 to 5 in bass were stocked into Lake Elmo in 1995, and bass plants may continue in the future if larger bass become available.

Lake Elmo is no longer being actively managed for largemouth bass, although some resident bass still remain in the lake. Several small, largemouth bass were netted in the fall of 1998 and again in the fall of 1999 indicating that some natural reproduction is occurring (Table 8). Anglers still catch an occasional largemouth, and a 4.25 lb largemouth was found dead along the shoreline of the lake in the spring of 2000, indicating there are still some nice bass present in the lake.

Table 8. Numbers and sizes of fish species netted from Lake Elmo during spring and fall sampling between 1995 and 2000.

Species	Number	Avg. length (in)	Avg. weight (lb)	Length range (in)
		1996 – Spring (5/29 and 6/14)		
Largemouth bass	1	10.0	-	-
Black crappie	6	6.6	0.19	5.9-8.8
Channel catfish	14	12.7	0.83	8.9-20.8
Yellow perch	230 (+393)*	4.0	-	3.0-8.1
Pumpkinseed sunfish	24	3.5	-	1.2-4.8
Longnose sucker	61 (+4)*	11.4	0.91	5.0-17.2
Shorthead redhorse	14	16.1	1.62	14.2-17.9
White sucker	97 (+125)*	12.0	0.86	4.4-16.8
Crayfish	2	-	-	-
		1996 – Fall (10/24)		
Largemouth bass	1	3.0	-	-
Black crappie	19	4.7	-	2.9-8.9
Channel catfish	4	10.9	0.38	10.3-11.7
Yellow perch	71	6.2	0.10	3.9-7.4
Brown trout	1	23.2	4.52	-
Longnose sucker	11	13.4	0.90	11.1-14.4
Shorthead redhorse	2	-	-	11.7, 16.6
White sucker	112	13.3	0.93	4.9-17.5
		1997 – Spring (5/27)		
Black crappie	6	3.6	-	1.5-12.6
Channel catfish	13	14.0	0.97	12.0-21.2
Yellow perch	62	6.5	0.13	5.7-7.3
Arctic grayling	3	7.2	0.13	6.8-7.5
Pumpkinseed sunfish	17	4.4	0.07	3.4-5.1
Longnose sucker	38	13.0	0.93	8.3-14.8
Shorthead redhorse	18	16.0	2.48	8.1-19.3
White sucker	99	13.3	1.01	9.8-16.7
Fathead minnow	32	2.8	-	2.4-3.2
Lake chub	12	3.4	-	2.4-4.4

* Numbers in brackets were fish counted but not measured.

Table 8. (Continued) **Numbers and sizes of fish species netted from Lake Elmo during spring and fall sampling between 1995 and 2000.**

Species	Number	Avg. length (in)	Avg. weight (lb)	Length range (in)
		1997 – Fall (9/15)		
Black crappie	103	5.8	-	2.4-10.6
Channel catfish	17	14.7	1.07	9.5-19.6
Yellow perch	51	5.7	-	2.2-9.1
Brown trout	1	-	-	11.0
Pumpkinseed sunfish	9 (+81)*	3.2	-	1.5-3.8
Longnose sucker	13	14.0	-	9.4-15.2
Shorthead redhorse	2	-	-	6.9, 17.2
White sucker	19 (+38)*	13.4	-	11.6-14.6
Carp	2	-	-	17.9, 18.1
Fathead minnow	233	-	-	1.5-2.5
Crayfish	1	-	-	-
		1998 – Spring (5/14)		
Black crappie	105 (+5)*	8.1	0.26	2.9-11.5
Channel catfish	2	-	-	13.7, 16.2
Yellow perch	118 (+50)*	5.6	-	2.5-9.6
Rainbow trout	9	6.8	0.15	6.2-7.2
Pumpkinseed sunfish	21 (+5)*	3.6	-	2.0-4.2
Longnose sucker	26	13.4	0.14	6.6-17.6
Shorthead redhorse	13	15.9	0.38	13.5-18.2
White sucker	54 (+194)*	14.5	0.13	7.7-16.8
Fathead minnow	100 (+)	-	-	2.5-3.0
		1998 – Fall (9/16)		
Largemouth bass	6	3.0	-	2.5-3.3
Yellow perch	5	3.7	-	3.6-3.8
Rainbow trout	1	9.3	-	-
Pumpkinseed sunfish	22	3.3	-	2.8-3.9
White sucker	1	4.2	-	-
Carp	6	17.3	-	12.7-21.4
Fathead minnow	1	3.2	-	-

* Numbers in brackets were fish counted but not measured.

Table 8. (Continued) Numbers and sizes of fish species netted from Lake Elmo during spring and fall sampling between 1995 and 2000.

Species	Number	Avg. length (in)	Avg. weight (lb)	Length range (in)
		1999 – Fall (10/7)		
Black crappie	364	5.2	-	4.2-13.4
Channel catfish	3	9.4	-	4.5-15.2
Yellow perch	123	5.0	-	3.5-11.3
Rainbow trout	24	10.2	-	9.1-11.5
Pumpkinseed sunfish	95	3.3	-	2.1-5.8
Longnose sucker	14	13.2	-	7.8-15.4
Shorthead redhorse	23	7.9	-	6.3-17.6
White sucker	57	13.3	-	7.8-15.5
Carp	1	19.7	-	-
Fathead minnow	1	3.5	-	-
Crayfish	2	-	-	-
		1999 – Spring (5/26)		
Black crappie	26	5.3	-	4.7-11.0
Channel catfish	8	15.9	1.55	13.2-18.9
Yellow perch	17	5.1	-	4.1-10.6
Rainbow trout	35	8.7	0.30	7.1-12.5
Pumpkinseed sunfish	96	3.7	-	3.0-5.2
Longnose sucker	16	14.5	0.98	13.1-16.1
Shorthead redhorse	19	12.5	0.96	6.9-19.8
White sucker	71	13.4	0.93	8.2-15.7
		1999 – Fall (9/7)		
Largemouth bass	3	3.4	-	3.1-3.7
Black crappie	43	6.7	-	2.5-8.2
Channel catfish	9	15.5	1.89	7.1-20.5
Yellow perch	322	6.3	-	3.2-7.4
Rainbow trout	35	9.2	0.29	7.3-10.7
Pumpkinseed sunfish	119	3.9	-	3.1-4.9
Longnose sucker	5	6.3	-	4.4-9.4
Shorthead redhorse	3	8.5	-	6.8-11.5
White sucker	31	14.1	1.08	4.2-16.3
Mountain sucker	1	7.0	-	-
Flathead chub	1	5.9	-	-

* Numbers in brackets were fish counted but not measured.

Table 8. (Continued) Numbers and sizes of fish species netted from Lake Elmo during spring and fall sampling between 1995 and 2000.

Species	Number	Avg. length (in)	Avg. weight (lb)	Length range (in)
		2000 – Spring (5/24)		
Channel catfish	4	18.1	2.12	16.5-18.8
Yellow perch	44	6.5	0.12	5.9-7.7
Rainbow trout	32	9.3	0.33	7.9-13.0
Pumpkinseed sunfish	18	4.7	-	4.0-5.8
Longnose sucker	40	8.9	0.17	5.4-15.9
Shorthead redhorse	16	11.5	0.21	6.9-17.4
White sucker	207 (+187)*	13.9	-	5.4-16.3
Carp	1	16.8	-	-
Fathead minnow	1	3.2	-	-
Lake chub	1	3.6	-	-

* Numbers in brackets were fish counted but not measured.

Black Crappie. Crappie were first stocked into Lake Elmo in the 1930's, and have been part of the fishery since. With the exception of crappie being transferred into the lake in 1989 from Lake Josephine, and in 1992 from Tongue River Reservoir to supplement the existing population, the Lake Elmo crappie population has been maintained through natural reproduction.

Crappie catch-rates in nets varied widely from year to year and even between spring and fall samples in the same year (Table 8). Lake Elmo usually holds a few nice-sized crappies, like the 13.2 in, 1.32 lb fish captured in the fall of 1998. However, the average size of crappie captured is generally small. Higher net catch-rates for crappie result from strong year classes of young fish, which drive down the average size on the better sampling years. Crappie catch-rates jumped significantly in the fall of 1997, with 103 crappies collected (Table 8). This sample was dominated by age 2 fish. Approximately 60% of the sample was composed of 7 to 8.5 in crappies, while the remaining 40% was 2.5 to 3 in fish. This larger size group of fish comprised over 96% of the crappie sampled in the spring of 1998, resulting in the largest average size for crappie recorded during this reporting period. A number of these larger crappies were caught by anglers fishing off the pier during the spring and early summer. Although 18 crappies 10 in and longer were netted in the fall of 1998, the average size for the large sample of crappies netted in the fall declined, due to the dominance of a strong year-class of smaller fish. This strong year-class comprised most of the crappies sampled in 1999, and should have resulted in a strong year-class of larger crappies in the spring of 2000. No crappie of any size was netted in the spring of 2000 (Table 8), although anglers fishing off the pier in the spring did catch some larger crappies.

Very few smaller crappies have been netted from Lake Elmo since the fall of 1997, indicating recruitment to the Lake Elmo crappie population has been poor for several years.

Channel catfish. Channel catfish were first stocked into Lake Elmo in 1984. From 1988 until 1995, channel catfish were stocked annually. Catfish sources became less reliable after 1995, and plants were missed in 1995 and 1997 (Table 9). Channel catfish were collected in each net series fished in the spring and fall between 1996 and 2000, except for a fall set in 1998. Because no catfish were captured in this set, the nets were reset about three weeks later and three catfish were caught.

Catfish catches ranged from 2 fish in the spring of 1998 to 17 fish in the fall of 1997 (Table 8). Catfish netted during this reporting period ranged from 4.5 to 21.2 in long. The largest catfish, captured in the spring of 1997, weighed 3.09 lb. Catfish over 20 in long were captured in three of the nine netting periods, and fish greater than 18 in, in six of the nine sets. The average size of catfish netted has generally been increasing over time, with the four catfish netted in the spring of 2000 averaging 18.1 in long (Table 8). Channel catfish continue to be a popular sport fish in Lake Elmo, and they provide an opportunity for anglers to catch a larger game fish while at the lake. Anglers who specifically fish for catfish are usually quite successful once water temperatures begin to warm in the spring.

Table 9. History of channel catfish plants into Lake Elmo.

Date	Number Planted	Mean length (in)
9/21/84	5,000	1.0
9/17/88	11,700	4.0
9/14/89	5,000	3.5
9/14/89	15,000	3.9
9/20/90	6,600	3.6
9/16/91	5,800	3.4
9/23/92	7,800	2.9
9/15/93	7,800	3.2
9/08/94	7,520	3.8
11/07/96	1,400	2.8
7/20/98	13,471	3.3
7/20/99	15,000	2.4

Yellow Perch. Yellow perch have been a major component of the fishery at Lake Elmo for a long time. They continued to be one of the most numerous sport fish collected from the lake during this survey period (Table 8). Although perch probably provide as much or more recreation than any other fish species in the lake, Lake Elmo seldom produces any larger perch for anglers. Sampling results during this study period indicated that forage availability might be a major factor controlling yellow perch growth.

Like crappie, yellow perch numbers in Lake Elmo fluctuate greatly depending on the strength of new year-classes recruited into the population. A very strong year-class of 3.5 to 4 in perch was observed in the spring of 1996 (Table 8). Most of these fish were one-year-old perch from a strong 1995 year-class. This year-class of perch remained an important part of the Lake Elmo perch population through 1998 and even into the spring of 1999. They exhibited very good growth rates and, as a result, contributed some large perch to the fishery in 1998 and 1999. Normally it is rare to capture a perch in Lake Elmo over 8.5 in long (Frazer 1990, 1992, 1995). Spring netting in 1998, however, captured 19 yellow perch greater than 8.5 in and 11 perch greater than 9.0 in long. Fall netting in 1998 captured 15 perch greater than 9.0 in and 12 greater than 10.0 in long. The largest perch was 11.3 in and weighed 0.62 lb. If perch of this size could be produced in Lake Elmo on a regular basis, it would be one of the most popular fisheries in the area.

The presence of these larger perch in Lake Elmo corresponded to a major increase in small forage fish observed in 1997 and 1998. Spring netting in 1997 captured 32 fathead minnows and 12 lake chub along with young-of-the-year (YOY) crappie (Table 8). Fall netting captured 233 fathead minnows and YOY perch and crappie. To further evaluate the forage situation, four seine hauls with a 30-foot seine in early October 1997 captured several hundred fathead minnows, along with small perch, pumpkinseed sunfish, and suckers. Normal netting in the spring of 1998 captured over 100 fathead minnows. Predators like perch and crappie appeared to take full advantage of this available forage as indicated by the large fish captured in 1997 and 1998.

Three seine hauls in September 1998 only captured one fathead minnow, and only one fathead minnow was captured during normal netting in early October. No fathead minnows or other small minnows were captured during spring or fall netting in 1999 (Table 8). Only one fathead minnow and a lake chub were captured in the spring of 2000. Sizes of perch and crappies declined with this reduction in forage. Maintaining a strong forage base in Lake Elmo could be the missing link needed to continually produce larger perch and crappies in the lake.

Netting results indicated strong year-classes of perch were produced in both 1997 and 1998 and some production occurred in 1999. Most of the large perch sampled in the fall of 1999 were 6 to 7.5 in fish. These were the same age of perch that were 9 in long in 1998, following a couple of years of good forage.

Trout and Grayling. Rainbow trout were first stocked into Lake Elmo in April 1998 at about 6.5 in long. Nine rainbow were netted during May (Table 8). Additional rainbow plants were made in September 1998. Most of the 25 rainbow captured during fall netting appeared to be from the spring plant. These rainbows averaged 10.2 in long with the largest fish measuring 11.5 in. Rainbows were planted in the spring and fall of 1999 and again in the spring of 2000;

they became common in most net samples. Rainbows are successfully over-wintering in Lake Elmo, and have provided a tremendous amount of recreation for many anglers. The largest rainbow netted to date was 13.0 in long and weighed 0.64 lb.

An experimental plant of 8,400 arctic grayling was made through the ice into Lake Elmo in January 1997. These were fish that were raised as part of a research project at the U.S. Fish Technology Center in Bozeman, and were not committed to any other water. Three grayling were collected in nets in the spring of 1997. They averaged 7.2 in long and appeared to be in good condition. No additional grayling have been reported from sampling or from anglers since that time.

One brown trout was collected during fall netting in 1996 and another in 1997 (Table 8). These fish probably entered Lake Elmo from the Yellowstone River via the Big Ditch. Other species of fish collected from the lake during this survey period included pumpkinseed sunfish and several species of suckers.

Lake Josephine. A total of 19 different fish species were collected from Lake Josephine during this sampling period (Table 10), with white suckers being the most common species collected. This lake is in the flood plain of the Yellowstone River, and it actually became part of the Yellowstone in 1997, when the river flooded and inundated the lake. As a result of this periodic flooding, Lake Josephine can be expected to contain any fish found in this section of the Yellowstone River.

Largemouth bass were first planted into Lake Josephine by FWP in 1987 to supplement a resident bass population. Since 1989, 10,000 largemouth have been stocked every other year, when available, to supplement natural reproduction in the lake. Largemouth bass are difficult to sample with nets, so few bass were collected during this survey period (Table 10). The largest bass captured was an 11.0 in caught in 1996. Anglers continue to report catches of 5.0 lb and larger bass from Lake Josephine on a fairly regular basis. In the past, bass have been sampled more effectively in Lake Josephine using a boom-mounted electrofishing boat; however, recent improvements at the park have made it impossible to launch a larger boat in the lake. As a result, no electrofishing was conducted during this period.

Crappies were the most common sportfish collected from Lake Josephine during this survey period (Table 10). They were small, with the largest being only 8.0 in long. The largest average size for crappie netted during this period was 7.0 in during 1996. Yellow perch were also common in most samples, but again their average size was small. Both pumpkinseed and green sunfish were also present in Lake Josephine, with the largest sunfish sampled during the survey period being a 5.7 in green sunfish. Although none of these fish reach larger sizes, they all contribute significantly to the lake's recreational opportunities, especially for younger anglers.

A 4.8 in bluegill sunfish captured in Lake Josephine in the spring of 2000 was the first ever reported from the lake. Bluegill were not legally planted into Lake Josephine or any local waters, and they are not found in the Yellowstone River, so it is likely this fish came from an illegal transplant. A self-sustaining bluegill population could become established in the future if enough fish were illegally planted into the lake. Bluegill would normally be a better sunfish species to

have in a lake than pumpkinseed or green sunfish, because they have the potential to grow to a larger size. Bluegill will hybridize with the other sunfish, however, and will likely just add to the existing stunting problem in the lake.

Walleyes were illegally planted into Lake Josephine in the early 1990's. Two walleyes were netted from Lake Josephine in 1993, with one additional netted in 1994. Three walleyes were captured during this survey period, with two 13 in walleyes being netted in 1998 and a 20 in walleye in 1999 (Table 10). These data indicated that there were at least two different year-classes of illegal walleyes in the lake.

The channel catfish population appeared to be doing very well in Lake Josephine. Catfish were planted annually into Lake Josephine between 1991 and 1994. Due to concerns about contaminating the genetics of the wild Yellowstone catfish with hatchery fish from mid-west or southern states, no catfish have been stocked since 1994. Catfish netting catch-rates remained high throughout the survey period, with a good size-distribution of fish being captured (Table 10). No age analysis was conducted on the catfish, but based on size-distribution and numbers, it appeared that catfish were successfully reproducing. The largest catfish captured was a 19.1 in, 2.54 lb fish netted in the spring of 2000. More anglers are starting to key into the catfish fishery, and it is becoming an important part of the lake fishery.

Lake Josephine also contains a population of trophy-sized fish, which are not normally considered a sport fish. The current Montana state record for river carpsuckers is 3.50 lb. The average size of the river carpsuckers netted from Lake Josephine during most years approached

Table 10. Numbers and sizes of fish species netted from Lake Josephine between 1995 and 2000.

Species	Number	Avg. length (in)	Avg. weight (lb)	Length range (in)
		1995 (6/7) [1/]		
Largemouth bass	9	4.4	-	2.5-6.7
Black crappie	1	5.3	-	-
Channel catfish	1	6.2	-	-
Yellow perch	2	-	-	5.7, 6.0
Pumpkinseed sunfish	18	3.2	-	1.4-4.8
Green sunfish	3	3.1	-	1.5-4.2
White sucker	6	3.0	-	2.2-4.3
Crayfish				

[1/] Fish captured in one 100 ft seine haul pulled as part of a kids education program.

Table 10. (Continued) Numbers and sizes of fish species netted from Lake Josephine between 1995 and 2000.

Species	Number	Avg. length (in)	Avg. weight (lb)	Length range (in)
		1996 (6/6)		
Largemouth bass	1	11.0	-	-
Black crappie	119 (+199)*	7.0	0.18	2.1-8.0
Channel catfish	16	9.8	0.36	5.1-14.7
Yellow perch	53	5.9	0.08	5.3-6.6
Pumpkinseed sunfish	24 (+)	3.7	-	2.3-5.1
Green sunfish	12 (+)	3.0	-	1.2-5.7
Longnose sucker	1	7.0	-	-
Shorthead redhorse	4	12.9	-	12.6-13.5
White sucker	307 (+209)	9.7	-	6.5-14.1
Mountain sucker	3	6.3	-	5.5-7.4
River carpsucker	9	21.7	5.43	18.2-24.4
Carp	2	-	-	11.0, 22.6
Flathead chub	21	6.1	-	3.9-7.2
Crayfish	3	-	-	-
		1998 (6/3)		
Black crappie	22	6.8	0.17	4.6-7.7
Channel catfish	36	11.4	0.48	8.8-16.6
Yellow perch	44	5.9	-	5.4-6.3
Pumpkinseed sunfish	11	4.3	-	3.0-5.2
Walleye	2	-	-	13.1, 13.3
Shorthead redhorse	3	9.4	0.36	8.2-10.4
White sucker	165	10.3	0.45	6.8-16.8
River carpsucker	3	17.9	3.47	14.5-22.1
Carp	1	5.1	-	-
Stonecat	5	7.9	0.21	6.4-9.2
Flathead chub	1	5.1	-	-
Lake chub	1	5.8	-	-
Crayfish	1	-	-	-

* Numbers in brackets were fish counted but not measured

Table 10. (Continued) **Numbers and sizes of fish species netted from Lake Josephine between 1995 and 2000.**

Species	Number	Avg. length (in	Avg. weight (lb)	Length range (in)
		1999 (6/3)		
Largemouth bass	1	6.3	-	-
Black crappie	79	6.6	-	2.5-8.4
Channel catfish	27	13.3	0.80	10.3-16.9
Yellow perch	16	6.1	0.11	5.4-6.6
Pumpkinseed sunfish	8	3.7	-	1.8-4.7
Walleye	1	20.0	-	-
Longnose sucker	8	6.4	-	3.7-12.0
Shorthead redhorse	13	10.4	0.52	6.0-14.0
White sucker	228	11.0	0.55	5.2-13.2
River carpsucker	26	19.4	3.86	14.3-24.0
Carp	2	-	-	6.9, 9.0
Stonecat	7	7.1	0.22	5.8-9.4
Goldeye	6	12.5	0.67	11.5-13.4
Hybognathus sp.	19	4.0	-	3.6-5.0
Crayfish	2			
		2000 (6/6)		
Black crappie	36	6.2	0.15	1.1-8.0
Channel catfish	30	14.4	0.98	11.9-19.1
Yellow perch	17	6.0	0.08	5.3-6.4
Pumpkinseed sunfish	2	-	-	3.8, 4.4
Green sunfish	1	4.3	-	-
Bluegill sunfish	1	4.8	-	-
Brown trout	1	17.7	-	-
Longnose sucker	2			7.6, 13.1
Shorthead redhorse	8	9.7	0.33	8.5-10.9
White sucker	239	11.2	0.56	6.3-13.8
River carpsucker	7	17.4	2.74	14.4-21.0
Carp	6	13.3	1.23	10.0-16.2
Black bullhead	1	7.3	-	-
Flathead chub	3	5.7	0.05	5.4-5.9
Hybognathus sp.	5	4.4	-	3.8-5.4

* Numbers in brackets were fish counted but not measured

or exceeded this state record (Table 10). Eight of the nine river carpsuckers netted in 1996 exceeded the state record, with the largest fish weighing 7.80 lb. Sixteen of the 26 river carpsuckers netted in 1999 were 3.5 lb or larger. The largest fish weighed 6.70 lb.

A few small minnows are normally captured during sampling at Lake Josephine (Table 10). Small bass, crappies, yellow perch and sunfish all contribute to the forage base in the lake, but with the large number of small panfish present in the lake, it is unlikely forage will ever become abundant enough to grow larger perch or crappie.

Other Waters

Lebo Lake. Lebo Lake is a private lake that allowed limited public access until the fall of 1997. At that time the landowners, tired of litter and trespass problems, closed the lake to all public access. The lake was netted in 1995, 1996, and 1997; sampling was then discontinued with the loss of access.

Only five tiger muskies were netted during this period (Table 11). All of these fish exceeded the 30-in minimum size-limit, with the largest fish measuring 37.0 in and weighing 14.0 lb. Two more tiger muskies, about 10 lb each, escaped from the nets in 1997 before they could be pulled into the boat. The tiger muskies continued to control the white-sucker population through this period. Sucker catch-rates increased slightly in 1997, with some smaller suckers present in the sample. By 1997, angler harvest and natural mortality had significantly reduced the number of tiger muskie that remained from the initial stocking in 1988, 1989, and 1991. The fish that remained were large and were probably keying into larger forage. Lighter predation on the young suckers may have been allowing some recovery in the sucker population. Plans were to stock additional tiger muskies into Lebo Lake in 1998 to help maintain control of the sucker population, and also explore stocking an additional forage species into the lake, but both of these plans were canceled when access was lost.

The rainbow trout planted into Lebo Lake in 1993 continued to show phenomenal growth in the absence of sucker competition (Table 11). Two rainbows netted in 1995 weighed 9.1 and 9.8 lb respectively. No rainbows were netted in 1996 or 1997, indicating most of them had grown old and died by the end of 1995. Two large brown trout were netted in 1996 and 1997.

Table 11. Numbers and sizes of fish species netted from Lebo Lake between 1995 and 1997.

Species	Number	Avg. length (in)	Avg. weight (lb)	Length range (in)
		1995 (10/23)		
Tiger muskie	1	30.3	6.20	-
Rainbow trout	2			23.4, 26.0
White sucker	4	15.9	1.76	14.3-17.3
		1996 (10/22)		
Tiger muskie	1	34.2	9.20	-
Brown trout	1	25.0	6.80	-
White sucker	8	11.3	-	2.9-16.8
Fathead minnow	1	2.4	-	-
		1998 (6/3)		
Tiger muskie 1/	3	35.5	11.55	34.4-37.0
Brown trout	1	27.2	9.15	-
White sucker	20	10.7	0.72	3.7-18.4
Fathead minnow	3	1.6		0.82-2.2

1/ Two more tiger muskies around 10 lbs each escaped from nets before they were boated.

Warmwater Streams

Lower Bighorn River

The lower four miles of the Bighorn River, from Manning Dam downstream to the confluence with the Yellowstone River, was electrofished in the spring of 1996, 1999, and 2000 to look for sauger, walleye, and ling. A number of different fish species were observed, but only game species and some minnows were netted and measured. Only one sauger was captured during these three years, while walleyes were captured each year (Table 12). Two ling were netted in 1999, and a third one was observed but not captured. One ling was captured in 2000. Both rainbow and brown trout were still fairly common in this section of the river. Electrofishing occurred later in 2000 than in the previous two years, and water temperatures were warmer, which may explain why channel catfish were only captured in 2000 and not in 1996 or 1999.

Table 12. Size-range and average length of fish collected by electrofishing on the Bighorn River between Manning Dam and the Yellowstone River during 1996, 1999, and 2000.

Date	Species	Number	Avg. length (in)	Length range (in)
4/23/96				
	Brown trout	17	10.7	5.6-18.7
	Rainbow trout	2	-	8.5, 9.7
	Sauger	1	24.1	-
	Walleye	3	20.13	18.5-21.6
3/12/99				
	Brown trout	1	11.5	-
	Walleye	1	15.4	-
	Burbot (Ling)	2	-	19.1, 20.7
5/8/00				
	Brown trout	8	12.0	6.3-19.7
	Rainbow trout	1	12.5	-
	Walleye	2	-	24.9, 25.1
	Burbot (Ling)	1	-	21.7
	Channel catfish	2	-	19.8, 26.9
	Yellow perch	1	7.9	-
	Stonecat	1	7.6	-
	Flathead chub	2	-	3.0, 3.3
	Hybognathus sp.	4	4.6	4.4-4.8
	Emerald shiner	14	2.5	2.3-2.7

One day of survey-electrofishing was conducted on the Bighorn River downstream from Two Leggins Dam in September 1996. Again, only game species were netted, although numerous other fish species were observed. Trout were the most common gamefish in this section of river. Twenty-five rainbows ranging from 12.3 to 18.8 in, and 75 brown trout from 4.3 to 17.7 in were collected. Numerous YOY brown trout were collected, indicating some brown trout spawning may be occurring in this middle section of the Bighorn. Only one 18.8 in sauger was captured, and no walleyes. Two smallmouth bass, 10.3 and 10.6 in long, were also captured. Smallmouth bass were planted into the Bighorn between 1986 and 1992, so these two fish could have been from the last plant or were progeny of an earlier plant. Fourteen ling, ranging from 12 to 33 in, were also captured. Fin clips were taken from each ling for genetic analysis. The largest of these ling weighed 8 lb.

The section of the Bighorn River between Two Leggins Dam and the ramp at Two Leggins FAS was electrofished in the spring of 2000, and all species were netted (Table 13). Trout were again the most common gamefish collected. No sauger, walleye, or channel catfish were collected, but nine ling up to 3.90 lb were captured.

Musselshell River

The only fish sampling conducted on the warmwater section of the Musselshell River during this reporting period occurred on April 28, 1998. Approximately 1.25 mi of river, starting just below Krinko Dam (about 12 miles downstream of the town of Musselshell), was electrofished to find sauger. Fourteen species of fish were captured, but no sauger were seen (Table 14). The only gamefish captured were three channel catfish, two smallmouth bass, and a ling. Conductivity was high in the river, which reduced electrofishing efficiencies, especially in the deeper holes where the sauger were likely to be. The local warden reported that anglers were catching sauger in the area at that time, so the absence of sauger in the sample may have been due more to electrofishing inefficiencies than lack of fish.

Lower Yellowstone River

Interest in the fishery on the lower Yellowstone River from Billings downstream increased during this survey period. Concern about declining sauger numbers throughout their range increased interest in the sauger population. Sauger concerns placed additional emphasis on fish passage problems at low-head diversion dams, and also helped bring in support from USBR to study these problems. Huntley Dam downstream of Billings was seriously damaged by high flows in 1996 and 1997. As part of the repair on this USBR facility, the irrigation district was required to include fish passage in their reconstruction plans. This construction was completed in the winter of 1999-2000, and evaluation and modification of this fish passage is ongoing. An EA was completed in 1999, and Yellowstone cutthroat trout were reintroduced into the section of the Yellowstone River near Billings to develop an urban fishery for this native species.

The increased interest resulted in considerable effort being devoted to fish sampling on the lower Yellowstone River during this survey period. An eight-mile section of the river near Gritty Stone FAS (Figure 1) was shocked in the fall of 1995 to do a mark-recapture estimate on channel catfish. During five days of marking and four days of recapture, often using two boats, crews handled 609 channel catfish. These fish ranged from 9.8 to 29.6 in, with an average length and weight of 20.2 in and 3.32 lb. The largest catfish captured was 27.6 in long and weighed 11.75 lb. The log-likelihood estimate of the channel catfish population was 482 channel catfish between 15.0 and 26.9 in per mile in this section of river.

Several other gamefish were collected during this mark-recapture effort, including 15 sauger ranging from 18.4 to 25.3 in (Table 15). The largest sauger weighed 6.40 lb. No attempt was made to net the many non-game fish seen during this electrofishing effort.

Insert Figure 1

Table 13. Numbers and size-range of fish captured while electrofishing between Two Leggins Dam and Two Leggins boat ramp on April 27, 2000.

Species	Number	Length range (in)
Brown trout	19	6.2-21.5
Rainbow trout	7	7.5-15.5
Burbot (Ling)	9	15.1-27.7
Mountain whitefish	30	7.9-13.4
Goldeye	58	11.6-14.8
Carp	6	20.1-25.3
Longnose dace	1	3.2
Longnose sucker	100	7.3-20.1
White sucker	45	5.3-18.7
Mountain sucker	1	4.7

Table 14. Numbers and sizes of fish species captured while electrofishing 1.25 miles of the Musselshell River downstream of Krinko Dam on April 28, 1998.

Species	Number	Average length (in)	Length range (in)
Burbot (Ling)	1	14.7	-
Smallmouth bass	2	-	6.1, 7.9
Channel catfish	3	18.4	14.8-24.2
Goldeye	1	11.2	-
Carp	7	18.2	15.6-22.0
Shorthead redhorse sucker	43	12.9	4.7-18.2
River carpsucker	1	14.3	-
White sucker	11	11.1	8.4-13.2
Mountain sucker	3	5.7	5.3-6.1
Stonecat	22	5.8	3.7-7.0
Flathead chub	72[1/]	4.6	2.0-5.8
Longnose dace	12[2/]	-	2.5-2.7
Emerald shiner	1	3.0	-
Hybognathus sp.	1	2.0	-

1/ Only 10 flathead chubs were measured
2/ Only 2 longnose dace were measured

Table 15. Numbers and size of other fish species netted while completing a channel catfish mark/recapture estimate on the Gritty Stone section of the Yellowstone River from September 19 through October 11, 1995.

Species	Number	Avg. length (in)	Avg. weight (lb)	Length range (in)
Sauger	15	21.0	3.22	18.4-25.3
Smallmouth bass	2	-	-	7.3, 8.6
Ling	10	17.7	1.52	8.9-27.8
Black crappie	3	5.9	0.13	5.8-6.0
Rainbow trout	1	-	-	9.9
Brown trout	2	-	-	9.8, 13.3
Bigmouth buffalo	1	-	-	22.6

Several days of survey-electrofishing were conducted on the lower Yellowstone in 1996 to look for channel catfish and sauger. One day of electrofishing near Gritty Stone FAS captured 12 channel catfish from 20.9 to 26.9 in long. Two of these catfish had extensive scrapes over a large portion of their bodies, as if they had been ground between ice flows. A 12.4 in ling was the only other game fish captured. Electrofishing above and below Waco Dam on May 7 produced 10 channel catfish from 14.8 to 29.9 in long. These fish averaged 20.8 in and 4.1 lb. One rainbow, one brown trout, and one yellow perch were netted along with five bigmouth buffalo. These buffalo averaged 21.1 in and ranged from 18.0 to 23.4 in. Eleven channel catfish from 17.2 to 25.8 in long were shocked just downstream of Voyagers Rest FAS on September 18. One 11.4 in ling was the only other game fish seen.

Between September 19 and October 9, 1996, a section of the Yellowstone River from the mouth of the Bighorn River upstream to just over a mile below the Custer bridge was electrofished extensively using two electrofishing boats. An attempt was made to net every fish seen. Four days were spent marking all fish, followed by four more days of recapture efforts. Thirty species of fish were seen with 29 being captured (Table 16). Longnose dace were observed, but not netted.

A total of 4,884 fish were handled during these eight days of electrofishing. Channel catfish were the most numerous game fish captured, with 152 handled. Only 16 sauger were collected, while 36 walleyes were captured. Good population estimates were obtained for carp, shorthead-redhorse suckers, river carpsuckers, and white suckers, while a marginal Peterson estimate was calculated for goldeyes (Table 17). The large number of different species present in the lower Yellowstone River makes it very difficult to sample enough of any one species, even with a fairly intense effort, to allow for good estimates.

Table 16. Numbers and sizes of other fish species collected while electrofishing the Yellowstone River between Custer and the Bighorn River from September 19 through October 9, 1996.

Species	Number	Avg. length (in)	Avg. weight (lb)	Length range (in)
Sauger	16	16.9	1.75	13.3-24.2
Walleye	36	18.2	2.68	5.3-23.5
Smallmouth bass	17	8.4	0.71	2.2-17.0
Largemouth bass	3	7.5	0.32	4.3-9.3
Channel catfish	152	21.3	3.98	11.5-29.6
Yellow bullhead	3	7.4	0.19	7.2-7.6
Stonecat	6	5.9	0.09	4.3-7.3
Burbot (Ling)	6	14.8	1.01	5.5-21.3
Rainbow trout	4	14.3	1.19	12.1-16.9
Brown trout	14	9.9	0.54	4.2-18.6
Mountain whitefish	10	8.2	0.29	5.3-13.6
Black crappie	3	7.8	0.32	6.2-8.6
Yellow perch	2	-	-	5.6, 10.9
Pumpkinseed sunfish	1	3.6	-	-
Green sunfish	1	5.0	-	-
Longnose sucker	833	10.0	0.62	2.9-20.7
Shorthead redhorse	1,066	15.5	1.58	2.4-20.8
White sucker	720	11.3	0.72	1.9-18.8
River carpsucker	440	15.3	1.60	4.6-19.0
Mountain sucker	48	5.3	0.08	2.4-8.3
Goldeye	471	13.0	0.70	10.8-15.1
Bigmouth buffalo	8	23.5	7.65	21.0-29.9
Smallmouth buffalo	2	-	-	20.8, 25.1
Freshwater drum	10	15.8	2.26	13.7-19.6
Carp	472	21.4	5.07	6.1-29.3
Flathead chub	492	3.8	-	2.0-8.6
Fathead minnow	8	2.4	0.02	2.1-2.6
Lake chub	1	2.3	-	
Emerald shiner	39	3.2	-	2.7-3.5

Work on the Yellowstone River in 1997 and 1998 centered on evaluation of fish passage concerns at Huntley Dam, Cartersville Dam (near Forsyth), and Intake Dam (near Glendive). Electrofishing was conducted in cooperation with the USBR, FWP Region 7 fisheries crews, and FWP Biologist Bill Gardner's crew out of Great Falls. Considerable effort was devoted to marking fish in the vicinity of Huntley and Intake dams, with limited effort at Cartersville. A detailed report on this sampling and the results is covered in Helfrich et al. (1999), so it will not be covered in detail here.

Table 17. Population estimates calculated for several species of fish collected during mark/recapture on the lower Yellowstone River from Custer to the mouth of the Bighorn River from September 19 through October 9, 1996.

Species	Length-range (in)	Estimate (per mile)		Method
		Number	Pounds	
Carp	12.0-29.4	1,172	6,230.5	log-likelihood
Shorthead redhorse sucker	3.3-20.9	2,648	2,156	log-likelihood
River carpsucker	12.6-19.2	611	1,011	log-likelihood
Goldeye*	10.8-15.1	3,092	-	Peterson
White sucker	3.0-18.9	1,456	602	log-likelihood

* Poor estimate based on 2 recaptures

Thirty-seven species of fish were collected during this sampling effort (Table 18). Several of these species were only found downstream of Cartersville Dam, and have not been reported in the Region 5 section of the Yellowstone, at least during recent sampling. Over 5,400 fish were handled in 1997, and over 5,500 in 1998. Hopefully these data will provide the fisheries background data needed to help evaluate future fisheries projects designed to improve fish passage on the lower Yellowstone.

A section of the Yellowstone River from Huntley Dam down to the mouth of Pryor Creek was electrofished on March 11, 1999, to find an early run of sauger. No sauger were seen. The only gamefish observed were 18 rainbow trout from 5.0 to 21.0 in, 7 brown trout from 13.8 to 17.0 in, and two smallmouth bass 11.6 in and 12.0 in. Several other non-game species were observed, but there did not appear to be a concentration of any species below the dam at that time.

Another attempt was made to complete a mark-recapture estimate on channel catfish in the Gritty Stone Section (Figure 1) in the fall of 1999. A total of 279 channel catfish were marked in six days of electrofishing, often with two boats, between September 15 and September 23. Thirty-seven channel catfish were collected at the very upper end of the electrofishing section on October 4, the first day of recapture. Most of these fish came from a single hole. These fish did not appear to be in nearly as good condition as the fish marked a couple of weeks earlier, and none of them were marked. It appeared that they had just moved into the shocking section. No other catfish were even observed throughout the rest of the electrofishing section on October 4. Only one unmarked catfish was captured on the second day of recapture efforts. Apparently all

Table 18. Distribution and abundance of fish collected by electrofishing downstream and upstream of Huntley, Cartersville, and Intake dams.*

Species	Huntley Dam				Cartersville Dam		Intake Dam			
	July		September		September		July		September	
	Down	Up	Down	Up	Down	Up	Down	Up	Down	Up
Longnose sucker	173	74	37	128	27	29	2	7	6	8
White sucker	226	193	102	201	27	12	0	5	0	0
Shorthead redhorse	89	114	97	187	140	61	9	32	61	50
Mountain whitefish	35	4	7	26	1	0	0	0	0	0
Goldeye	155	229	72	139	42	12	174	678	261	462
Flathead chub	220	203	30	24	204	158	49	517	177	613
Hybognathus sp.	71	95	177	71	192	51	26	18	101	524
Carp	12	27	40	95	34	32	64	55	47	113
Mountain sucker	31	40	42	8	2	3	0	0	0	0
Burbot	1	0	3	0	0	1	2	17	6	8
Longnose dace	8	11	9	5	6	10	1	2	5	11
Emerald shiner	3	15	8	0	46	15	0	14	24	226
Channel catfish	1	1	9	17	4	7	5	36	19	99
Stonecat	2	8	4	0	0	1	0	8	1	4
River carpsucker	2	1	0	3	20	10	10	8	25	58
Smallmouth buffalo	0	1	1	0	3	6	4	1	21	12
Smallmouth bass	1	1	2	0	6	21	0	0	0	0
Yellow perch	0	1	2	3	0	0	0	0	0	0
Brown trout	1	9	6	9	0	0	0	1	0	1
Rainbow trout	6	2	5	3	0	0	0	0	0	0
Largemouth bass	0	1	1	0	0	0	0	0	0	0
Black bullhead	0	1	0	0	0	0	0	0	0	0
Bluegill	0	1	0	0	0	0	0	0	0	0
Mottled sculpin	0	0	0	1	0	0	0	0	0	0
Bigmouth buffalo	0	0	0	0	0	1	10	2	1	3
Blue sucker	0	0	0	0	1	0	6	14	16	6
Fathead minnow	0	0	0	0	2	1	0	0	0	1
Sauger	0	0	0	0	3	2	20	43	25	32
Walleye	0	0	0	0	0	0	0	1	0	1
Black crappie	0	0	0	0	0	1	0	1	0	0
Freshwater drum	0	0	0	0	1	0	27	7	7	7
Shovelnose sturgeon	0	0	0	0	0	1	3	2	16	5
Northern Pike	0	0	0	0	0	0	1	1	2	7
Sturgeon chub	0	0	0	0	0	0	0	2	11	19
Creek chub	0	0	0	0	0	0	0	0	0	4
Spottail shiner	0	0	0	0	0	0	0	0	0	1
Total fish	1,037	1,032	654	920	761	434	423	1,471	832	2,274

* Modified from Helfrich et al. 1999.

of the marked catfish had moved completely out of the electrofishing section, or into some sidechannel-area that couldn't be reached with a jet boat, during the two week period between marking and recapture. Because this electrofishing effort was focused on channel catfish, only game species or other unusual fish were netted during this sampling effort (Table 19). Fourteen sauger between 12.8 in and 20.7 in were captured during this effort.

Table 19. Numbers and sizes of fish species collected during an attempted channel-catfish, mark/recapture estimate in the Gritty Stone Section of the Yellowstone River from September 15 through October 5, 1999.

Species	Number	Avg. length (in)	Avg. weight (lb)	Length range (in)
Largemouth bass	6	5.0	0.17	2.7-11.5
Smallmouth bass	3	7.1	0.20	6.8-7.3
Channel catfish	310	21.3	4.34	15.4-30.1
Sauger	14	17.9	2.01	12.8-20.7
Yellow perch	22	7.7	0.25	3.9-10.2
Burbot (Ling)	24	21.2	2.13	13.2-28.8
Rainbow trout	17	10.2	0.51	7.7-14.8
Brown trout	27	12.7	0.89	7.8-20.3
Pumpkinseed sunfish	4	3.4	0.04	2.7-4.2
White crappie	1	4.6	-	-
Stonecat	1	4.9	-	-
Bigmouth buffalo	4	21.3	5.84	18.7-24.5

On September 24, 1999, the South Hills Section of the Yellowstone River, between the lower end of Riverfront Park and the Corette Steam Plant, was electrofished in anticipation of proposed Yellowstone cutthroat plants. Fourteen species of fish were collected (Table 20). Rainbow trout, brown trout, and mountain whitefish were the only game species captured in this section of the river. The trout ranged from 6.9 to 16.4 in long, and all were in good condition, indicating this river section contains the necessary food and habitat to support a trout population.

Huntley Irrigation District closed its headgate and began draining the main ditch system on October 4, 1999. That afternoon, the lift station settling basin near Ballantine was inspected to see what fish were present. The ditch was almost drained by late afternoon and several thousand fish were trapped in the settling basin pool. Thirteen species of fish were observed in the ditch along with some crayfish (Table 21). A few crappies and a couple of brown trout were the only gamefish observed. Other species could have been present in the bottom of the basin, but were not observed.

Six days were spent electrofishing below Huntley Dam between April 5 and June 8, 2000, in an attempt to mark as many fish as possible to help in evaluating the fish passage completed at Huntley Dam during the winter. USBR crews from Denver and Billings provided a second electrofishing boat during part of this effort. Approximately 1,150 fish of 17 different species were captured. All fish, except the smaller minnows, were marked with a coded-wire tag in the ventral half of the fish near the base of the caudal fin, or in the caudal peduncle. Marking efforts with the USBR, and recapture efforts above Huntley Dam, will continue throughout the summer. All of these data will be summarized and presented in a report prepared by a USBR biologist from Denver.

Table 20. Numbers and sizes of fish species captured while electrofishing in the South Hills Section of the Yellowstone River on September 24, 1999.

Species	Number	Avg. length (in)	Avg. weight (lb)	Length range (in)
Rainbow trout	26	11.2	0.68	6.9-16.1
Brown trout	11	12.0	0.78	10.0-16.4
Mountain whitefish	65	10.1	0.64	4.2-18.4
Longnose sucker	124	11.3	0.83	2.3-18.0
Shorthead redhorse	153	15.7	1.66	4.0-19.9
White sucker	157	11.7	0.76	1.8-17.2
River carpsucker	1	17.7	-	-
Mountain sucker	17	5.3	0.08	3.0-6.7
Goldeye	30	13.6	0.94	12.3-15.6
Carp	10	18.4	4.41	1.7-24.3
Flathead chub	4	3.4	-	2.7-4.0
Longnose dace	15	2.7	-	2.1-3.3
Emerald shiner	123	2.7	-	2.1-3.5
Hybognathus sp.	1	3.1	-	-

This electrofishing effort resulted in the capture of 115 ling through the end of June. Most of these ling were captured in April before spring runoff started. They ranged from 13.2 to 30.3 in long. All but the smallest were marked with numbered T-tags. Any fish too small for a T-tag received a coded-wire tag.

Table 21. List of fish species observed trapped in the settling basin of the Huntley Irrigation District ditch near Ballantine, when the ditch was drained on October 4, 1999.

Brown trout	Goldeye
Black crappie	Carp
Longnose sucker	Flathead chub
Shorthead redhorse	Emerald shiner
White sucker	Longnose dace
River carpsucker	Hybognathus sp.
Mountain sucker	Crayfish

MANAGEMENT RECOMMENDATIONS

Bighorn Lake

1. Continue to stock a combination of walleye fry and fingerlings into Bighorn Lake each year. Coordinate efforts with Wyoming Game and Fish to locate a walleye source for Bighorn Lake that is free from potential sauger contamination.

2. Continue to monitor the developing smallmouth bass fishery in Bighorn Lake, and evaluate needs for regulation changes as this fishery develops.

3. Continue to monitor the walleye population through spring electrofishing and fall gill-netting.

4. Continue annual spring meeting with Wyoming Game and Fish, the Bureau of Reclamation, and the National Park Service to discuss water levels and management options. Obtain the best water levels possible for the fishery that can still meet the requirements to sustain the fishery of the Bighorn River downstream from the dam and the concerns of the other agencies involved.

Warmwater Ponds and Reservoirs

1. Continue efforts to locate additional ponds suitable for planting and to obtain permission to stock them for public use.

2. Continue to monitor existing bass fisheries and stock additional largemouth bass where needed to supplement natural reproduction or to reestablish fisheries lost due to low water.

3. Continue efforts to increase fishing opportunities in warm- and cool-water lakes and ponds open to general public access.

    a) Work with local sportsmen's groups on habitat enhancement projects for these waters.

    b) Reevaluate the stocking and management program for Anita Reservoir in light of the poor water conditions that have been prevalent in recent years.

    c) Evaluate the need for additional regulations to protect heavily used fisheries such as the largemouth bass fishery in Lake Josephine.

    d) Evaluate the possibility of stocking tiger muskie into Lake Josephine and/or Lake Elmo. Complete EA's if these appear to be good management objectives.

    e) Complete an EA for and rehabilitate Broadview Reservoir during the fall of 2000 to take advantage of low water and remove all carp from the lake.

    f) Continue to monitor the tiger-muskie population in Deadmans Basin Reservoir to determine the impacts they are having on sucker populations in the lake. Adjust the stocking program as needed to obtain proper sucker control.

    g) Continue to communicate with landowners at Lower Glaston Lake and Lebo Lake, and reopen these waters to public access if the opportunity arises.

    h) Continue to sample fish populations in Lebo Lake, if permission can be obtained, to monitor changes in the sucker population as the tiger muskie disappear from the system.

Warmwater Streams

1. Continue to monitor fish populations in the lower Yellowstone River with emphasis on sauger, channel catfish, ling, smallmouth bass, and native nongame species.

2. Coordinate efforts with FWP Region 7 to obtain better creel data for sauger in the lower Yellowstone River, and adjust sauger regulations as needed.

3. Work with FWP Region 7 and the USBR on efforts to improve fish passage over diversion dams in the lower Yellowstone River.

4. Work with the USBR to evaluate use of the recently completed fish passage structure at Huntley Dam.

5. Increase efforts to sample warmwater fish populations in the Musselshell River downstream of Krinko Dam with emphasis on the spring sauger run.
6. Evaluate the potential of improving fish passage at diversion dams on the Musselshell River.

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