MONTANA FISH, WILDLIFE AND PARKS
FISHERIES DIVISION

JOB PROGRESS REPORT

State:	**MONTANA**	**Element 1:**	**FISHERIES MANAGEMENT**
Project No:	**F-78-R-3, 4, 5, 6**	**Job No:**	**3531**
Project Title:	**STATEWIDE FISHERIES MANAGEMENT PROGRAM**	**Job Title:**	**SOUTH CENTRAL MONTANA COLDWATER FISHERIES INVESTIGATIONS**

Project Period: July 1, 1996 – June 30, 2000

ABSTRACT

Cooney Reservoir management direction to maintain a mixed trout/walleye fishery continues on schedule. From 1996 through 2000, 417 larger walleyes averaging 23.7 in and 6.12 lbs have been tagged in Cooney. As of mid-July 2000, anglers have taken 8.5% of these tagged walleyes. Walleyes appear to be controlling the sucker population through effective cropping of nearly all sub-adult suckers, thus preventing recruitment. A large Merwin trap fished in Cooney for 18 days in April 2000 took 2892 white suckers ranging in length from 11.8 to 20.3 in. Black crappie numbers in Cooney have been held in check due to predation by walleyes and harvest by anglers. Annual rainbow stocking rates have been increased from 100,000 in the late 1980's to 150,000 from 1990 through 1995, to an average of 200,000 since 1996. In spite of this increase, winter carryover has steadily declined due to heavy angler harvest coupled with walleye predation on the rainbows.

To better understand angling patterns, use, harvest success, methods and attitudes, a creel census was run on Cooney during the peak summer use period from July 4, 1998 to September 7, 1998. Ninety-eight percent of the angling use at Cooney was by residents and 94% of the use was by anglers living within 60 miles of the reservoir. Boat anglers outnumbered shore anglers about three to one (76% to 24%). Boat anglers were more successful at catching both trout and walleyes, taking 2.1 trout and 1.5 walleyes to every one caught from shore. Catch rates for all species combined were 0.94 fish per hour for shore anglers, and 1.51 for boat anglers. combined shore and boat angler catch rates were 1.27 for all fish caught, and 0.48 for all fish kept.

East and West Rosebud and Emerald lakes have been planted with rainbows since 1990. Brown trout prey heavily upon all other fish species found in these lakes. It appears that unless rainbows are at least 8.0 in at planting, their chance of surviving brown trout predation is minimal. A creel census was run on the three lakes from July 18, 1995 through September 4, 1995. During that 49-day period, West Rosebud and Emerald lakes combined received 1001 angler-days pressure for a catch rate of 0.97 fish per hour. During the same period, a voluntary trailhead creel census was also run for anglers using the West and East Rosebud drainages within the Absaroka-Beartooth Wilderness.

One hundred eighty-three of the 318 alpine lakes with fish located in the Absaroka-Beartooth mountains were surveyed from 1995-1999. An additional 11 high mountain lakes located within the Crazy Mountains were also surveyed during that period.

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Absaroka-Beartooth Wilderness Area volunteer angler report form.

PROCEDURES

Existing Fish, Wildlife & Parks (FWP) water rights and water reservations for the Yellowstone and Missouri Rivers are protected through FWP review of new water use permit applications.

Stream banks and channels are protected from poorly designed projects through FWP administration of the Stream Protection Act and participation in the Natural Streambed and Land Preservation Act.

Water discharge permits issued by the U.S. Environmental Protection Agency (EPA) and the Montana Department of Environmental Quality are reviewed, and comments are offered. Timber sale plans, grazing allotment management plans, environmental assessments and environmental impact statements are also reviewed to ensure adequate protection, mitigation, and compensation of fisheries resources.

Stream-dwelling trout population densities are monitored using electrofishing methods described by Vincent (1971). Other electrofishing surveys are conducted as needed to address specific needs using standard methods. Spot creel checks are conducted to determine catch rates and angler satisfaction with regulations. Regulations are adjusted as necessary to help achieve desired fish population levels. In an effort to improve access to the upper Musselshell River, riverfront properties that become available for sale are investigated for potential as fishing access sites.

Lake and reservoir trout populations are monitored through standardized gillnet sets, trap netting, and electrofishing surveys. Two to five temporary employees working from mid-July to September collect fisheries information from high mountain lakes using a standardized sampling protocol (Stiff, 2000) to update our lake computer database, and for periodic updates to the drainage management plans. Angler success is assessed through spot creel checks by fisheries and enforcement personnel. Gill nets, trap nets and night electrofishing were used to monitor the development and success of the Cooney fishery. In addition, to better understand use, harvest success, methods and attitudes, a creel census was run during the peak use period from July 4, 1998 to September 7, 1998. (Appendix 1). Stocking rates and strategies are adjusted as necessary to maintain desired angler catch rates.

A creel study to gather fisheries and angler use information about East and West Rosebud and Emerald Lakes was initiated on July 18, 1995, and went through September 4, 1995 (Labor Day). The cooperative creel project, jointly sponsored by the U.S. Forest Service (USFS) and FWP, was also designed to monitor use in other Absaroka-Beartooth Wilderness waters at main trailheads into the East and West Rosebud Drainages; and to compare the amphibian and invertebrate populations in a lake with fish and a fishless lake.

Sampling protocol involved sampling only angling visitors to East and West Rosebud and Emerald Lakes. Creel surveys were done on most weekends and all holidays, whereas weekday sampling was done on a pre-determined stratified random schedule. Twenty-eight days during the 49-day creel period were surveyed, 46% weekend days and 54% week days. In most cases, the daily creel totals were for all anglers fishing the lake on a particular sampling day. The creel clerks made a special attempt to interview anglers who were done fishing for the day in order to get completed trip information. For this study, since West Rosebud and Emerald Lakes are located close together, creel information for these two lakes is combined. In the 1999 statewide mail survey, angling pressure on Emerald Lake was 1406 angler days and 3065 on West Rosebud Lake.

Twelve of the 28 sampling days were spent on East Rosebud Lake and 16 were spent on West Rosebud and Emerald Lakes. Daily angler interviews on East Rosebud Lake ranged from 0 to 19 for a total of 116 contacts. Daily interviews on West Rosebud and Emerald Lakes ranged form 1 to 47 for a total of 357 contacts. In addition to harvest information, each angler was asked several questions on demographics, fishing experience and angling satisfaction. To determine total estimated angling pressure, the average number of anglers per day of the week was multiplied by the number of those days during the 49-day creel period, and these totals were then combined. Estimated total fish harvested during the 49-day creel period was determined by multiplying total estimated angling pressure, times the total number of each fish species harvested per angler, and these totals were then combined.

In addition to the angler interview and census processed by the creel clerk, a voluntary trailhead creel was conducted for the same 7-week time period to gather information about fishing the waters in the same two drainages within the Absaroka-Beartooth Wilderness Area (copy of volunteer angler report card included in Appendix 2). Upon completion of their trip, anglers were asked to deposit their complete cards in boxes at the trailhead and mail them to FWP, or give them to a USFS or FWP employee. In addition to information about waters fished and catch statistics, wilderness anglers were asked to answer several questions about possible management change and a question about overall satisfaction with their latest fishing trip.

Fishing access site acquisition and development for streams and lakes throughout the region are prioritized in coordination with Parks Division personnel. High intensity recreational use of Cooney Reservoir requires intensive management of fishery resources and recreational facilities. Information and education efforts are directed toward encouraging use of other lake and reservoir resources.

RESULTS AND DISCUSSION

Cooney Reservoir

Cooney Reservoir is one of the most heavily fished waters for its size in Montana. Its close proximity to Billings, Laurel and many smaller towns, along with its two-story trout/walleye fishery, draw many anglers and other recreationists. Fishing pressure estimates collected from our statewide mail survey (FWP, 1997, 1999) decreased 8%, from 42,853 angler-days in 1997, to 39,386 by 1999. Recent improvements to roads and recreational facilities at Cooney have also contributed to increased use.

Management of Cooney as a mixed walleye/trout fishery has been surprisingly successful (Poore and Frazer 1990, 1991, 1995). In most waters, this combination has not worked well. Rainbow trout area stocked into Cooney annually, and walleye, first introduced in 1984, have been planted every year since except for 1987, 1988 and 1989. No walleyes were planted during these three years in an attempt to evaluate spawning success.

Mean length of rainbow trout collected in fall sampling has remained fairly consistent since 1995, varying from 12.5 to 13.7 in. The number of rainbows sampled during fall has varied from 20 in 1999 to 62 in 1995 (Table 1). Increase in the mean length of rainbows over winter varied from 1.2 to 2.7 in between 1995 and 1999, and averaged 1.8 in.

Night electrofishing has proven a more successful and less lethal method for collecting rainbow trout in the spring than sampling with gill nets. Approximately equal electrofishing effort expended in 1996, 1997, 1998 and 1999 sampled 88, 60, 46 and 42 rainbows, respectively. Increasing the stocking rate from 100,000 rainbows in 1989 to an average of 150,000 fish each year beginning in 1990 and extending through 1995, improved angler harvest. Rainbow stocking rates from 1996 through 2000 have varied from 158,376 to 269,181 annually, and averaged 199,974. In spite of the increased stocking rates, winter carryover of rainbows has shown a steady decline probably due to a combination of increased harvest by anglers and predation by a maturing walleye population. In order to maintain acceptable angler harvest rates and provide winter carryover for ice anglers, stocking rates in Cooney will probably have to be at least 200,000 5.8-6.2 in rainbows. Another alternative would be to stock trout at a larger size than the 5.8-6.2 in average size rainbows now being planted. A Wyoming Fish and Game study conducted on several North Platte Reservoirs containing a mixed rainbow/walleye population found heavy predation on 5-7 inch rainbows (Maurakis and Yule 1997). Wyoming managers found they had to stock 9 in rainbows to avoid most walleye predation. Stocking larger trout is much more costly; hatchery production costs escalate rapidly with each additional inch of growth.

TABLE 1. Numbers and length ranges of fish species sampled in Cooney Reservoir from 1995 to 2000.

DATE	METHODS	RAINBOW TROUT	BROWN TROUT	SUCKERS	WALLEYE	BLACK CRAPPIE	RAINBOW LENGTH RANGE IN INCHES	RAINBOW AVG LENGTH IN INCHES	WALLEYE LENGTH RANGE IN INCHES	WALLEYE AVG LENGTH IN INCHES (lb)
9/28/95	3 Gill nets	45	2	105	94 6	1	10.3-16.4	12.4	7.3-15.0 19.7-29.4	11.2 (0.49) 25.9 (7.90)
	4 Traps	17		51	0	21	11.0-17.1	13.3		
	TOTALS	62	2	156	100	22	10.3-17.1	12.5	7.3-29.4	12.1
4/18-25/96	Electrofishing	88	6	0	343 162	7	10.0-18.4	13.7	11.2-15.9 16.0-31.4	14.6 25.5
10/15/96	4 Gill nets	50	5	82	76 2	0	11.8-17.8	13.7	6.9-15.7 17.3-22.3	11.5 19.8 (3.5)
10/15/96	3 Traps	6	0	68	1 1	59	12.8-15.9	14.2	14.4 19.9	14.4 19.9 (2.3)
	TOTALS	144	11	150	585	66	10.0-18.4	13.9	6.9-31.4	17.6
4/15-23/97	Electrofishing	60	41	0	196 135	2	10.7-18.6	15.2	6.3-15.9 16.0-31.2	13.6 22.8 (5.5)
10/7/97	4 Gill nets	56	0	53	118 7	0	10.9-19.0	12.6	8.8-14.9 16.0-25.9	11.0 18.9 (2.6)
10/7/97	3 Traps	0	0	155	3	1			11.3-14.2	12.8
	TOTALS	116	41	208	459	3	10.7-19.0	13.9	6.3-31.2	15.8
4/13-21/98	Electrofishing	46	0	0	42 144	1	10.3-19.8	15.3	11.2-15.8 16.0-32.4	14.4 22.5 (5.1)
10/20/98	4 Gill Nets	57	0	79	51 7	0	9.5-17.2	12.5	7.0-15.1 16.3-34.0	11.5 23.1 (6.0)
10/20/98	4 Traps	2	0	166	2 1	4	13.7-14.4 28.4-28.4	14.1 28.4 (11.8)	9.9-14.4	11.5
	TOTALS	105	0	245	247	5	9.5-19.8	13.5	7.0-34.0	19.0
3/25-4/27/99	Electrofishing	42	1	0	129 57	0	11.0-18.2	14.4	10.9-15.8 16.6-28.6	13.1 22.5 (4.8)
10/13/99	4 Gill Nets	19	1	79	33 2	0	11.9-16.8	13.6	9.5-15.0 16.2-16.8	11.3 16.5 (1.3)
10/13/99	4 Traps	1	1	104	5 1	4	11.8	11.8	12.0-15.8 18.0-18.0	13.6 18.0 (1.8)
	TOTALS	62	3	183	227	4	11.0-18.2	12.3	9.5-28.6	15.8

TABLE 1. Numbers and length ranges of fish species sampled in Cooney Reservoir from 1995 to 2000.
(Cont.)

DATE	METHODS	RAINBOW TROUT	BROWN TROUT	SUCKERS	WALLEYE	BLACK CRAPPIE	RAINBOW LENGTH RANGE IN INCHES	RAINBOW AVG LENGTH IN INCHES	WALLEYE LENGTH RANGE IN INCHES	WALLEYE AVG LENGTH IN INCHES (lb)
4/19&4/23/2000	Electrofishing	10	1		48	5	6.0-17.5	12.7	10.2-16.2	12.2
4/6-27/2000	Merwin	3	1	2976	143	4	5.1-14.1	8.3	10.2-31.5	14.8 (1.4)
	TOTALS	13	2	2976	191	9	5.1-17.5	10.5	10.2-31.5	17.3
	SIX-YEAR TOTALS	502	59	3918	1809	109			21.3-31.0	25.0 (6.65)

Forty-three white suckers per fall sinking gill net were taken in 1995, followed by 34 in 1996, 22 in 1997, 19 in 1998, and 28 in 1999. From 1995 through 1999, gill netting took only one white sucker less than 8 in, 17 from 8-12 in and 313 over 12 in. Average sucker size continues to increase following the introduction of walleyes (Figure 1), while the numbers sampled in gill nets has remained about the same over the past five years, averaging 29 suckers per net. From 1991 to 1994 the average white sucker catch per fall sinking gill net was 32.

Catch of suckers per trap net set in the fall has varied from a low of 13 in late September 1995 to 52 in October 1997. While the number of suckers sampled with trap nets has fluctuated considerably, the average size of suckers sampled has gradually increased similar to the trends seen in the gill net data. Suckers sampled with trap nets increased from a mean length of 13.7 in during 1995 to 16.6 in for 1999.

From April 6 through April 27, 2000, a large 1/4 in mesh Merwin trap was fished in Cooney Reservoir near the mouth of Red Lodge Creek. The trap was fished continuously except for three days when high winds shifted it out of position. The Merwin trap worked very well for catching suckers, with 2,892 white suckers and 84 longnose suckers captured during the 19 days it was fished. White suckers ranged in length from 11.8-20.4 in and averaged 17.1 in; whereas, the longnose suckers ranged from 8.9-18.2 in and averaged 15.6 in. Even though 2,976 suckers were marked (fin clips) and released, only 100 suckers were recaptured over the 19 day period. One reason for the low numbers of recaptures was the movement of many white suckers up into Red Lodge Creek for spawning. Even though the Merwin trap has small mesh capable of catching small suckers, the smallest taken was 8.9 in, which is additional evidence of how effectively the walleye population in Cooney is controlling recruitment into the sucker population.

Longnose sucker populations have been slowly increasing each year in Cooney, from a low of one sampled during 1995 to a high of 38 captured in 1999. Even though they are increasing, of the 3,918 total suckers sampled over the last six years, only 172 (4.4%) have been longnose, with the remaining 3,746 (95.6%) being white suckers.

Cooney Reservoir was drained in 1981 to raise the height of the dam, and only a few large suckers remained in the lake following the completion of this project. Over the next two to three years, these large suckers produced many small suckers. By 1984, when walleyes were introduced, Cooney was again dominated by small white suckers (Figure 1). After three years, the walleyes grew large enough to eat the suckers; since 1987 walleyes have consumed nearly all the suckers produced each year. Even though walleyes are consuming the yearly recruitment into the sucker population, the average size of the remaining adult suckers is increasing, causing the total biomass of white suckers in Cooney to more than double since walleyes were introduced into the lake. This increase in the numbers and average size of white suckers in Cooney may actually benefit the walleyes. The larger the suckers, the more offspring they produce, which in turn provides more forage for the walleyes. As long as there is enough recruitment of larger suckers from the tributary

streams to maintain the size of this spawning population in Cooney, this walleye/sucker, predator/prey balance will likely be maintained. If not, both populations may crash in the future, as these older suckers age out of the population.

Electrofishing has been the only effective method found for sampling brown trout in Cooney. Ninety percent of the 98 brown trout sampled over the past six years in Cooney has been captured using electrofishing, and the majority of these browns were taken in and around the mouths of Willow and Red Lodge creeks and along the face of the dam. The 98 brown trout ranged in length from 3.8 to 15.7 in with a mean of 8.2 in.

Between 1995 and 2000, a total of 112 black crappies have been taken by all sampling methods combined. These fish ranged in length from 2.1 to 13.2 in with a mean of 5.9 in. The crappie population structure in Cooney is bimodal with numerous 2 to 3 in fish, some 10 to 13 in fish and few intermediate sized fish. This bimodal structure is probably due primarily to walleye predation. As with the sucker population, walleyes are eating the small crappies thus preventing recruitment into the adult population. An additional population control factor on crappies is harvest by anglers.

Night electrofishing was used to monitor walleye spawning activity each spring from 1992 through 2000. In 1996, we began tagging spawning walleyes over 16.0 in long with a stainless steel wire inserted through the skin just behind the dorsal fin. Retention of these tags from 1996 through 2000 appears good. One hundred fifty-two walleyes averaging 26.1 in and 7.85 lb were tagged in 1996 followed by 108 (22.56 in and 5.07 lb) in 1997, 124 (22.0 in and 5.03 lb) in 1998, 34 (25.0 in and 6.19 lb) in 1999, and 53 (22.5 in and 5.04 lb) in 2000. To date, 471 walleyes averaging 23.7 in and 6.12 lb have been tagged. Our primary reason for tagging the larger walleyes in Cooney was to monitor harvest by anglers. As of July 15, 2000, 40 (8.5%) walleye tags have been returned by anglers, and these fish were all removed from the population. An additional 36 (7.5%) tagged fish were recaptured and released during electrofishing and netting operations from 1996 through July 2000. Another five (1%) tagged walleyes were reported as caught and released by anglers.

Although scattered walleyes have been sampled at various locations around the lake, most of the spawning activity is concentrated near the three tributaries. Each year a few ripe walleyes are found in and around the mouths of Willow Creek and Chapman Creek, but movement up Willow Creek is usually blocked by beaver dams near the mouth, and Chapman Creek is too small for fish to move up any distance. Most spawning activity is concentrated in the lower end of Red Lodge Creek just upstream from where it enters Cooney Reservoir. Spawning fish seem to prefer an area of gravel bottom and shelf rock with a depth of one to two feet. Being somewhat dependent on lake levels and stream flow, this area is usually the upper limit of access with our large electrofishing boats. In 1998, we used a smaller electrofishing boat to access the shallower water of Red Lodge Creek up to the USGS gage station, located about a half mile further upstream, and found spawning walleyes. Although most of the walleyes were located within a quarter mile of the lake, we found

a few upstream at least a half mile, and some walleyes probably move even further upstream to spawn. In 1999, water levels were so low in Cooney we could not get our large electrofishing boat into Red Lodge Creek, so we were forced to use a small electrofishing boat to sample the stream.

Although walleye spawning activity has been documented in Cooney for a number of years, there has been little evidence that they have been particularly successful. After initial plants of walleyes in 1984 through 1986,we discontinued planting for three years to evaluate spawning success and recruitment. Because we found little evidence of natural recruitment into the population, we again started planting walleye into Cooney in 1990, and they have been planted each year since. For the past ten years, we have been stocking 100,000 1.2 in fingerling walleye annually. This changed in 2000 when, due to hatchery shortages, we planted 69,000 fingerlings. Future stocking plans call for a reduction to 50,000 fingerlings annually.

Numbers of larger walleyes (fish over 16.0 in) sampled over the past five years in fall netting, usually conducted in mid-October, have varied from 3 to 8. Growth and survival of smaller walleyes (6.3-15.9 in) from fall sampling remains good, and the number sampled has ranged from 38 to 121. During all five years, fingerlings planted in June at 1.2-1.4 in grew to a minimum length of 6.3 in by October, which is 1.1 in below the minimum size sampled (7.4 in) during the previous four years. Winter survival and carryover appears adequate to maintain recruitment into the adult population. Low water tends to concentrate the small fish in an open basin with very little structure or hiding cover, making them very vulnerable to predation by large walleyes and harvest by anglers.

From 1991 through 1995 the walleye population in Cooney had a bimodal structure with good numbers of small and large walleyes but few fish between 14.0-20.0 in. Of 639 walleyes sampled at all seasons and by all sampling methods from October 1991 to July 1995, only 14 walleyes (2%) within this size range were taken (Poore and Frazer 1995). Since that time, the walleye population structure has shifted to a more normal length frequency distribution. Of 1,809 walleyes, sampled between July 1995 and July 2000 by all sampling methods, 601 (33%) have been between 14.0 and 20.0 in. Of these 1,809 walleyes, 1,229 (68%) have been less than 16.0 in and 580 (32%) have been larger than 16.0 in.

Walleyes sampled while electrofishing tend to be somewhat larger than those taken with various combinations of nets. Of 1,256 walleyes taken while electrofishing from July 1995 through July 2000, 730 (58%) were less than 16.0 in and 526 (42%) were larger than 16 in. In contrast, of the 553 walleyes sampled with nets during the same time period, 499 (90%) were less than 16.0 in, and only 54 (10%) were larger than 16.0 in. This difference can be partially explained because electrofishing focuses on sampling the adult spawning walleye population.

A Merwin trap was set near the mouth of Red Lodge Creek, where many spawning walleyes were moving. Of 143 walleyes caught in the trap, only 27 (19%) were over 16.0 in and 116 (81%) were less than 16.0 in. Although the Merwin trap caught many suckers and a moderate number of

walleyes, tending the trap was labor-intensive. Electrofishing done to coincide with the peak of spawning activity in Red Lodge Creek is a far more efficient way to sample walleyes during the spring in Cooney. Spawning walleyes are concentrated in a relatively small area and in shallow water where electrofishing is quite effective.

Numbers of larger walleyes (over 16.0 in) sampled by all methods have been declining yearly from a high of 165 in 1996, to a low of 55 in 2000. This trend probably reflects increased angler harvest due to the heavy fishing pressure Cooney receives.

One of the primary reasons for introducing walleyes into Cooney was to help control an expanding sucker population which competes with trout for food and space. In addition to controlling suckers, walleyes have nearly eliminated lake chubs from Cooney along with mountain whitefish. Chubs were abundant prior to 1984 when walleyes were introduced. Walleyes also appear to be controlling the black crappie and brown trout populations. Crayfish are also preyed upon by walleyes at certain times. Walleyes have already exploited all available forage species in Cooney and, in the case of white suckers, have harvested the entire year class each year since 1990. They have also been foraging at certain times on rainbow trout. This foraging occurs primarily in the spring when rainbows are first stocked into the lake. One way to minimize this walleye predation is to time the stocking of rainbows to coincide with the peak of walleye spawning activity. When spawning, walleyes tend to move away from the stocking locations and do not feed much. Predation on rainbows is also lessened somewhat because trout grow fast and are soon large enough to be out of the forage size range for most walleyes. Because they are zooplankton feeders, the Arlee strain of rainbows suspend in the water column away from the bottom where most walleyes forage.

Other factors influencing the forage available for walleyes in Cooney Reservoir are the tributary streams which provide a constant influx of fish. Fish species which enter Cooney from Red Lodge Creek and Willow Creek include white and longnose suckers, mountain whitefish, lake chubs and brown trout. All these species live and spawn in these tributaries and move in and out of Cooney. Both tributaries have a history of spring flooding which, combined with high intensity rainfall throughout the summer, flushes many fish into Cooney. In addition, any reproduction in excess of the streams' carrying capacity would likely end up in the reservoir.

Recreational use on Cooney is incredibly heavy for its 778 acre size (approximately 50 man-days per acre in 1999), and will undoubtedly continue to increase with the recently completed improvements to roads, camping facilities and boat launching areas. To avoid conflicts with other recreational users and to fish for the larger walleyes in Cooney, more anglers are fishing at night. Increasing the numbers of rainbows stocked into Cooney from 100,000 to 150,000 and now to 200,000 has improved the trout fishery and should provide better carryover into the winter and spring fishery. This increase has not resulted in a decline in trout growth, which has remained good over the past six years. At this point, the two-story trout/walleye fishing is still doing fairly well and is providing a tremendous amount of fishing opportunity. Maintaining the present fishery is a delicate balancing act that requires constant monitoring and management.

Deadmans Basin Reservoir

Changes in water level management implemented in the early 1990's, along with normal moisture, helped maintain good water levels in Deadmans Basin through most of this report period. Deadmans was near full pool at the start of the irrigation season each spring from 1995 through 1998. Water levels dropped to approximately 47% of full pool by the end of the irrigation season in 1996, but good precipitation helped refill the reservoir again by the next spring. Conditions began to change in 1998. A dry winter in 1998-1999 left Deadmans approximately 7,000 acre feet below full at the start of the 1999 irrigation season. Drought conditions have continued in the Musselshell Drainage since that time and water levels dropped to about 45% of full pool by the end of the irrigation season in 1999. Following another dry winter, the reservoir was only about 76% full with 55,000 acre feet of water when irrigation demands started in May 2000 (two weeks earlier than normal). Heavy irrigation demands had drawn Deadmans down to 40% of full by the end of June 2000, with predictions that all available irrigation water would be gone by late summer.

We sampled Deadmans Basin during May and October each year from 1996 through 2000 utilizing a standardized set of four floating and four sinking gill nets. We found eight different fish species during this period, with white suckers being the most common species captured in the spring, and kokanee salmon generally being the most common species in the fall (Table 2).

White sucker catch rates ranged from 17.5 to 49.6 per net. The highest catch rate occurred in the spring of 1999, when the sample contained numerous smaller suckers. Historically few white suckers under 8 in long have been collected from Deadmans Basin, yet approximately 58% of those netted in the spring of 1999 were less than 8 in long, and 16 % were between 6 and 7 in. Scales were not collected from these suckers for aging, but using the average size at different ages listed for white suckers in Fishes of Montana (C.J.D. Brown, 1971) indicates that most of these smaller suckers were probably 3 years old. Deadmans Basin's fill patterns and water levels during the previous 3 to 4 years didn't vary enough to explain the strong recruitment of young suckers documented in 1999. The Musselshell River flooded in 1997, perhaps introducing a large impulse of small suckers into Deadmans from the river. A few longnose suckers, shorthead redhorse suckers and carp were also collected at various times during standard netting, but the highest catch rate for any species was only 2.1 longnose suckers per net in the fall of 1997 (Table 2).

Kokanee catch rates ranged from a low of only 2.5 per net in the spring of 2000 to a high of 62.4 per net in the fall of 1999 (Table 2). The 1999 kokanee catch rate was one of the highest catch rates experienced since kokanee were first planted into Deadmans. Almost all of these kokanee were
mature fish. Most of these mature fish were 4-year-old fish based on scale data collected during the spring of 1999. This older age was reflected in the large average size reported for this sample (Table 2). The strong year class observed in 1999 resulted from a normal plant of 100,000 kokanee in the spring of 1995.

Table 2. Summary data for fish species captured in standardized spring and fall gill net series set in Deadmans Basin Reservoir from 1996 through Spring 2000.

Species	Number Caught	Catch Per Net	Avg Length (in)	Avg Weight (lb)	Length Range (in)
			Spring 1996		
Rainbow trout	24	3.0	12.7	0.72	9.5-16.7
Brown trout	8	1.0	20.5	3.23	14.4-23.3 (4.84 lb)
Kokanee	128	16.0	10.3	0.40	6.8-13.7
White sucker	153	19.1	12.0	0.71	6.8-16.1
Longnose sucker	2	0.25	-	-	11.7, 12.7
			Fall 1996		
Rainbow trout	55	6.9	10.0	0.42	6.3-15.8
Brown trout	5	0.6	20.9	4.40	16.2-29.5 (11.6 lb)
Kokanee	343	42.9	12.0	0.63	6.4-16.3
White sucker	136	17.0	11.7	0.68	6.1-15.4
Longnose sucker	14	1.8	12.1	0.68	9.0-16.5
Shorthead redhorse	2	0.25	-	-	8.1, 10.8
			Spring 1997		
Rainbow trout	33	4.1	11.3	0.50	8.5-15.8
Brown trout	2	0.25	-	-	15.8, 19.7
Kokanee	42	5.3	10.5	0.41	6.5-15.4
White sucker	195	24.4	11.6	0.61	6.5-15.0
Longnose sucker	9	1.1	11.6	0.53	9.5-14.4
Shorthead redhorse	1	0.1	-	-	15.8
			Fall 1997		
Rainbow trout	53	6.6	10.1	0.41	6.5-16.5
Brown trout	3	0.4	20.5	3.88	13.1-27.5 (7.2 lb)
Kokanee	88	11	13.3	0.78	7.8-15.4
White sucker	214	26.8	10.7	0.57	6.0-15.5
Longnose sucker	17	2.1	11.4	0.60	8.1-16.3
Shorthead redhorse	2	0.25	-	-	10.6, 12.0
Carp	5	0.6	5.6	0.10	4.4-6.9

Table 2. (Continued) **Summary data for fish species captured in standardized spring and fall gill net series set in Deadmans Basin Reservoir from 1996 through Spring 2000.**

Species	Number Caught	Catch Per Net	Avg Length (in)	Avg Weight (lb)	Length Range (in)
			Spring 1998		
Rainbow trout	65	8.1	11.5	0.52	8.9-14.7
Brown trout	8	1.0	21.4	3.40*	17.0-23.9
Kokanee	62	7.8	11.6	0.53	6.7-15.2
White sucker	187	23.4	12.6	0.91	6.1-15.8
Longnose sucker	8	1.0	11.5	0.54	9.2-13.5
* Average weight for 6 fish					
			Fall 1998		
Rainbow trout	107	13.4	11.0	0.48	6.8-15.5
Brown trout	3	0.4	20.3	3.96	17.5-24.3 (7.0 lb)
Kokanee	295	36.9	13.2	0.78	5.0-16.1
White sucker	225	28.1	9.7	0.48	2.8-16.1
Longnose sucker	3	0.4	12.9	0.82	12.0-14.3
Shorthead redhorse	2	0.25	-	-	8.0, 17.3
Carp	2	0.25	-	-	4.6, 5.4
Tiger muskie	1	0.1	-	-	17.2
			Spring 1999		
Rainbow trout	87	10.9	11.8	0.56	8.9-14.2
Brown trout	6	0.75	22.3	6.52	14.9-29.7 (13.1 lb)
Kokanee	72	9.0	11.8	0.57	8.1-14.7
White sucker	397	49.6	9.2	0.40	2.7-16.3
Longnose sucker	10	1.3	11.7	0.64	9.3-15.7
Tiger muskie	3	0.4	16.6	1.05	14.7-17.6
			Fall 1999		
Rainbow trout	71	8.9	11.3	0.49	7.0-14.8
Brown trout	3	0.4	18.8	3.73	9.8-25.3 (7.45 lb)
Kokanee	499	62.4	14.0	0.86	9.5-16.1
White sucker	140	17.5	11.3	0.61	2.1-15.4
Longnose sucker	4	0.5	10.9	0.49	7.8-15.5
Shorthead redhorse	7	0.9	11.1	0.68	5.9-17.1
Carp	1	0.1	-	-	3.5

Table 2. (Continued) **Summary data for fish species captured in standardized spring and fall gill net series set in Deadmans Basin Reservoir from 1996 through Spring 2000.**

Species	Number Caught	Catch Per Net	Avg Length (in)	Avg Weight (lb)	Length Range (in)
Spring 2000					
Rainbow trout	35	4.4	12.0	0.52	8.7-14.9
Brown trout	4	0.5	-	-	10.5, 19.9*
Kokanee	20	2.5	12.4	0.61	10.7-13.7
White sucker	143	17.9	13.1	0.94	6.7-15.8
Longnose sucker	2	0.25	-	-	10.5-16.2
Carp	7	0.9	23.3	7.11	19.2-28.7
Tiger muskie	11	1.4	23.9	3.56	15.0-25.9

* Two brown trout approximately 10 pounds each released without length or weight

Rainbow catch rates ranged from a high of 13.4 per net in the fall of 1998 to only 3 trout per net in the spring of 1996. Rainbow catch rates were higher in the fall than in the spring every year except 1999 (Table 2). As in the past, spring rainbow samples were dominated by 2-year-old fish with a few 3-year-olds. Six percent of the rainbow captured in the spring of 1998 were 4-year-old fish. Historically, it has been rare to find any rainbow trout over 3 years old in Deadmans. Normally 2-year-old rainbow have comprised the bulk of the summer fishery with few of them remaining to be captured in the fall. Fall net samples during this study period were again dominated by young-of-the-year and 1-year-old rainbows. A few 2-year-old rainbows were captured in the fall, and 1998 was the only year when any 3-year-old rainbows were captured in the fall.

Average sizes of rainbow trout remained fairly consistent through the sampling period. The average size in the spring was usually larger than in the fall due to the higher percentage of older fish in the spring sample. The largest rainbow captured was a 16.7 in, 1.46 lb fish netted in the spring of 1996. Rainbows longer than 15 in were netted in the spring and fall during 1996 and 1997, and in the fall of 1998. No 15 in rainbows were captured during 1999 or the spring of 2000.

Deadmans Basin's reputation for producing nice-sized brown trout was reaffirmed during this report period. Several brown trout over 10 lb were netted along with other 4 to 7 lb fish (Table 2). An 11.6 lb brown trout was captured in the fall of 1996. Three brown trout weighing 9.9, 12.1 and

13.1 lb were netted in the fall of 1999, and two brown trout around 10 lb each were released in the spring of 2000 without being weighed. Most of the larger brown trout were lightly hooked in the gill nets and were successfully released alive.

The normal stocking request for Deadmans Basin is 50,000 McConaughy rainbow trout, 150,000 Arlee rainbows and 100,000 kokanee salmon. This request was met each year during this study period except 1999, when no kokanee were available for Deadmans due to problems with the egg supply in the hatchery. As a substitute, an additional 50,000 Arlee rainbows were planted.

Tiger muskies were stocked into Deadmans Basin in 1998 as a biological control for the large sucker population in the reservoir. The primary goal of this program was to improve the trout and kokanee fisheries in Deadmans by reducing competition from suckers.

A detailed Environmental Assessment, completed in the spring of 1998, discussed all aspects of this tiger muskie plant (Frazer 1998). On June 4, 1998, 1,500 2.5 in tiger muskies were planted, followed by a second plant of 1000 6 to 9 in fish on September 2. In 1999, 1,700 1.25 in tiger muskies were planted in June followed by 1000 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 was to reduce sucker numbers by about 50% and maintain enough to serve as food for tiger muskies while keeping predation on the stocked trout and salmon to a minimum.

Four tiger muskies were captured in seine hauls in 1998, three following the spring plant and one following the summer plant. One tiger muskie was netted in the standard gill net series in the fall of 1998. This fish, probably one of the 2.5 in fish planted in the spring, was 17.2 in long and weighed 1.20 lb. Three tiger muskies were captured in gill nets in May 1999. These fish were 14.7, 17.4 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. No tiger muskies were captured in the standard gill net series in the fall of 1999, but the spring 2000 net series was very productive. Eleven tiger muskies were captured in eight nets (Table 2). One tiger muskie was 15.0 in long and weighed 0.72 lb (probably from the 1999 summer plant). The remaining 10 tiger muskies ranged from 22.7 in 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. These fish experienced excellent growth and were all in good condition. The larger fish were the right size to start utilizing a majority of the larger suckers found in Deadmans, so good growth should continue.

Results are too preliminary to tell what impacts the tiger muskies were having on the sucker population in Deadmans, but the average size of the white suckers netted in the spring of 2000 was larger than previous years (Table 2). This increase in average size could indicate that tiger muskies have already removed many of the smaller suckers from Deadmans Basin.

A more detailed discussion of the tiger muskie program for Deadmans Basin is presented in the warmwater progress report (Frazer 2001). While the main goal of this program was to improve the salmonid fishery in Deadmans, the tiger muskie plant should also provide a limited warmwater trophy fishery.

Yellowtail Afterbay Reservoir

Two floating and two sinking gill nets were set in the Afterbay Reservoir on June 12, 1996. Four species of fish were captured including rainbow trout, brown trout, ling and white suckers. Ten rainbows averaged 13.0 in long and ranged from 12.2 to 17.6 in. The largest rainbow weighed 2.20 lb. The only brown trout captured was 16 in long, while the two ling were 15.7 and 18.2 in long. The ling and brown trout were from the main reservoir above Yellowtail Dam, because neither species is stocked in the Afterbay. The 14 white suckers averaged 14.4 in long.

Four gill nets set in the Afterbay in October 1998 caught six species of fish (Table 3). This was the first time channel catfish were recorded in nets from the Afterbay Reservoir. Channel catfish are common in Bighorn Lake, and must have passed through the dam as do yellow perch and walleye. Rainbow trout catch rates were up slightly in 1998, but still in the range seen in previous years.

Several changes have been made in the stocking program for the Afterbay Reservoir since the switch from Arlee rainbow to wild strain rainbow in 1983 and 1984. This switch was made to prevent the inadvertent stocking of domestic rainbows into the wild rainbow trout population in the Bighorn River downstream. Originally the wild rainbows were stocked as 4 to 5 in fish in the spring, but a large percent of these fish immediately headed downriver through the re-regulation dam. Plants were then switched to 8 in fish later in the summer in an attempt to keep more rainbows in the Afterbay. This new stocking program appeared to improve retention somewhat, but reservoir operations still caused serious fish escapement. The U.S. Bureau of Reclamation drains most of the Afterbay Reservoir in mid-October every other year to monitor spring seeps around Yellowtail Dam, as part of their dam safety program. These large drawdowns force many of the fish in the Afterbay through the re-regulation dam and into the Bighorn River.

Beginning in 2000 the stocking program for the Afterbay will be modified again to try and improve the Afterbay fishery, while reducing potential impacts on the Bighorn River fishery. The 20, 000 Eagle Lake rainbows scheduled for the Afterbay in 2000 will be held until after the BOR drawdown in October. Future plants into the Afterbay will be made every other year, when larger fish will be planted after the October drawdown. Rainbows will no longer be stocked into the Afterbay during the summer before a scheduled drawdown.

Table 3. Number and sizes of fish species captured in four gill nets set in the Afterbay Reservoir, October 1998.

Species	Number Caught	Avg. Length (in)	Avg. Weight (lb)	Length Range (in)
Rainbow trout	15	11.4	0.64	9.4-15.4
Walleye	1	-	-	11.2
Yellow perch	1	-	-	5.8
Channel catfish	2	-	-	12.8, 18.1
White sucker	61	13.3	1.40	6.2-20.1
Longnose sucker	1	-	-	14.6

East Rosebud Lake

Through the years, East Rosebud Lake has been stocked with rainbow trout, brown trout, Yellowstone cutthroat trout, and brook trout. From 1986 to 1989, McBride cutthroat trout were planted because they had shown superior reproductive performance in various other Beartooth lakes with physical characteristics similar to those of East Rosebud Lake. Growth and survival of McBride cutthroat was also poor (Poore and Frazer, 1991). Predation by brown trout, downstream movement into the outlet stream and upstream movement are three factors influencing cutthroat numbers in the lake. Because McBride cutthroat failed to provide a satisfactory fishery in East Rosebud Lake, 6,000 DeSmet rainbows were planted each year from 1990 through 1995. To check on the relative success of the DeSmet strain rainbows, a creel census, the results of which are discussed later in this report, was run during the summer of 1995. Beginning in 1996, a total of 6,000 Arlee strain rainbows have been planted each year (except 1997) in three plants, starting in late May and continuing through late July. In 1997, 6,000 McBride cutthroat were stocked.

Four gill nets set in East Rosebud Lake during the spring of 1996, 1997 and 1998 (Table 4) took 3 (12.5 in average), 7 (12.1 in average) and 6 (12.6 in average) rainbow trout. Eight of the cutthroat trout planted in 1997 were taken in 1998 netting. Growth of both the DeSmet and Arlee strain rainbows was better than for McBride cutthroat, but survival was relatively poor for all three. In 1996, 1997 and 1998, and for the past 21 years, brown trout have been the dominant trout sampled. Mountain whitefish were the most abundant species in the nets, followed by brown trout and longnose suckers.

Predation by brown trout appears to control all the other fish populations in East Rosebud Lake. The smallest sucker sampled was 7.2 in with a mean of 13.8 in; the smallest whitefish, 7.6 in

with a mean of 11.0 in. In earlier studies (Poore and Frazer 1990), 17 in brown trout from East Rosebud Lake had 9 to 10 in cutthroat in their stomachs. Indications are that the brown trout are foraging heavily upon the Arlee rainbows just as they did on DeSmet rainbows and McBride cutthroats.

Emerald Lake

Emerald Lake, a shallow mesotrophic lake, contains a mixed population of brown trout, brook trout, mountain whitefish and longnose suckers. From 1986 through 1989, McBride cutthroat were stocked in an effort to produce a self-sustaining fishery. As in East Rosebud Lake, growth and survival of McBride cutthroats in Emerald Lake with an established brown trout/brook trout population was poor. DeSmet strain rainbows were selected to replace the McBride cutthroat and 1,500 were planted each year from 1990 through 1995. To discover the relative success of planting DeSmet rainbows, a creel census (discussed later in this report) was run during the summer of 1995. Beginning in 1996, 1,800 Arlee strain rainbows have been planted each year except for 1997 when McBride cutthroat were substituted. The plants are spread over three time periods from late May through late July.

Gill nets set in Emerald Lake over the past three years (Table 4) took no cutthroat and only two rainbows. Electrofishing in a section of West Rosebud Creek located three miles downstream from Emerald Lake in the spring of 1998 took one cutthroat trout. As in past years, brown trout and brook trout were more abundant in the nets than rainbow or cutthroat trout during all three years. The smallest fish sampled during the period was a 6.9 in brown trout. Fifty-eight mountain whitefish ranging from 7.4 to 18.3 in were sampled over the three years. As in East Rosebud Lake, over-winter survival of planted DeSmet and Arlee strain rainbow trout was poor, indicating brown trout and brook trout along with angler harvest are controlling fish populations in Emerald Lake.

West Rosebud Lake

West Rosebud Lake contains a mixed population of brown trout, brook trout, mountain whitefish and longnose suckers. Based on the same considerations used for East Rosebud Lake and Emerald Lake, McBride cutthroat were also selected for West Rosebud Lake and, as in the other two lakes, failed to achieve the desired management objectives. Therefore, 2,500 DeSmet strain rainbow were also planted into West Rosebud Lake each year from 1990 through 1995. To investigate the relative success of planting DeSmet rainbows, a creel census (discussed later in this report) was also run during the summer of 1995 on West Rosebud Lake. Beginning in 1996, 3,000 Arlee strain rainbows were planted each year, except 1997 when cutthroat were stocked. These plants are spread over three time periods from late May through late July.

Three gill nets set in the spring of 1996 and 1997 took no cutthroat, but in the spring of 1998, three gillnets took 11 cutthroat (9.6 to 12.2 in) from the 1997 plant. Also taken were 17 rainbows

of the approximate 6,000 stocked over the three-year period. One hundred twenty-two brown trout caught during the same period outnumbered rainbows and cutthroat combined more than 4 to 1. Forty-six mountain whitefish, ranging from 10.5 to 20.4 in with a mean of 16.1 in, and 13 brook trout from 10.0 to 15.2 with a mean of 13.2 in were the only other species taken in significant numbers. A 9.6 in brown trout was the smallest fish sampled. An abundance of brown trout, as shown by the netting data, makes it very difficult for small fish of any species to survive in West Rosebud Lake. Of the three lakes just discussed, West Rosebud Lake is the one most dominated by brown trout.

McBride cutthroat from five years of plants in West Rosebud, Emerald and East Rosebud Lakes have all shown poor growth and survival. In addition, no evidence of natural reproduction or spawning fish has been found. Similarly, survival of DeSmet and Arlee strain rainbows has also been marginal, although growth has been better than exhibited by the cutthroat. The pattern of effective cropping of sub-adult fish of all species by a well-established brown trout population is a dominant influence in all three lakes. Brown trout dominance evident in these lakes and all waters with similar physical features and fish populations, makes development of another self-sustaining fishery very difficult. One clear pattern shown in the netting data is the larger the average size of the fish at planting time, the better the survival rate (Poore and Frazer 1995). It appears that planting fish larger than a minimum of 8.0 in in these lakes with a well established predatory brown trout population is necessary to insure improved survival and carryover.

In addition to the competition with brown trout and brook trout, the fisheries in all these lakes receive relatively heavy fishing pressure. Although brown trout are the most abundant and successful species in these lakes, they are relatively difficult for anglers to catch, so most of the pressure and harvest is concentrated on the more easily caught cutthroat, brook and rainbow trout Because up-to-date information on fishing pressure, harvest, catch rates, angler preferences and attitudes, and hatchery fish returns was lacking for these three lakes, we initiated a creel study in July 1995.

TABLE 4. Results of netting surveys in four lakes during 1996-1999.

LAKE	DATE	NO. GILL (OR TRAP) NETS	RAINBOW TROUT	BROWN TROUT	CUTTHROAT TROUT	BROOK TROUT	MOUNTAIN WHITEFISH	LONGNOSE SUCKERS	WHITE SUCKERS	LAKE CHUBS
East Rosebud	5/22/96	4	3 (0.75) [1] 11.9-13.4 (12.5)[2]	16 (4) 9.5-20.3 (12.6)	-	-	16 (4) 7.6-12.4 (10.6)	2 (0.50 18.5-20.4 (19.4)	-	-
Emerald Lake	5/30/96	1	2 (2) 8.0-12.0 (10.0)	6(6) 9.8-14.8 (12.6)	-	5 (5) 10.4-13.5(12.2)	6 (6) 7.4-17.5 (14.9)	-	-	-
West Rosebud	5/30/96	3	-	11 (3.7) 11.5-17.1 (14.6)	-	2 (0.7) 13.3-14.4(13.9)	11 (3.7) 14.4-19.1 (16.5)	4 (1.3) 12.0-17.8 (15.1)	-	-
East Rosebud	5/5/97	4	7 (1.8) 10.3-13.7 (12.1)	613 (3.3) 12.1-23.1 (16.0)	-	-	16 (4) 10.4-13.2 (11.4)	2 (0.5) 14.4-17.2 (15.8)	-	-
Emerald Lake	5/6/97	1	-	12 (12) 7.5-16.4 (13.8)	-	1 (1) 12.5 (12.5)	16 (16) 14.4-17.8 (16.2)	-	-	-
West Rosebud	5/6/97	3	13 (4.3) 9.9-14.1 (11.8)	63 (21) 6.4-16.7 (12.8)	-	4 (1.3) 10.0-13.9(12.5)	21 (7) 10.5-20.4 (15.5)	10 (3.3) 14.0-18.9 (15.9)	-	-
East Rosebud	5/1/98	4	6 (1.5) 9.4-14.5 (12.6)	11 (2.7) 9.7-20.3 (15.7)	8 (2) 8.9-12.2 (10.6)	-	19 (7.3) 8.1-12.4 (11.0)	21 (5.3) 7.2-20.6 (13.1)	-	-
Emerald Lake	4/30/98	1	-	12 (12) 6.9-16.8 (11.3)	-	1 (1) 12.5 (12.5)	36 (36) 11.9-18.3 (16.3)	1 (1) 15.0 (15.0)	-	-
West Rosebud	4/30/98	2	4 (2) 9.7-12.8 (11.8)	48 (24) 7.3-17.8 (13.6)	11 (5.5) 9.6-12.2 (10.8)	7 (3.5) 10.3-15.2(13.2)	14 (7) 13.2-18.2 (16.8)	2 (1) 16.0-17.6 (1.68)	-	-
Otie Reser-voir	10/7/99	2 (trap)	5 (2.5) 20.8-21.3 (20.9)	-	-	-	-	-	100 (50) 4.8-18.1(7.1)	72 (36) 1.8-2.7(2.4)

[1] Total Number Sampled (catch per net)

[2] Length Range (Mean Length) in inches

West Rosebud and Emerald Lakes Creel Survey

Most of the use on the West Rosebud and Emerald lakes is by Montana residents (Table 5), with 90% of that use from people living within the three closest counties. Of the 357 people interviewed, those who had fished these lakes before had been fishing them for an average of 14 years.

During the 49-day duration of the creel, the lakes received an estimated 1001 angler days of fishing pressure. For comparison, fishing pressure for the two lakes for the entire year in 1997, from the statewide angling pressure survey, was 2907 (1365 for West Rosebud Lake and 1542 for Emerald Lake). The average number of hours fished per angler was 3.13 for a total of 3133 hours fished and a catch rate of 0.70 fish per hour. The estimated total fish catch of 2192 was made up of 1272 rainbow trout, 544 brown trout, 93 cutthroat trout, 216 brook trout, 50 mountain whitefish, and 17 other. Of these 2192 fish, an estimated 889 were harvested. Stocked rainbow and cutthroat trout made up 62% of the total angler catch, even though brown trout outnumbered them over five to one from the past three years of gill netting data. Anglers released 59% of all fish taken.

Of the 194 return anglers who expressed an opinion, 60% felt the fishing had not changed or had improved, while 40% felt the fishing had gotten worse. Of the 352 anglers who expressed an opinion, 81% (284) were satisfied with their fishing experience ,while 19% (68) were not satisfied.

Table 5. Summary of creel census information collected from West Rosebud and Emerald lakes from 7/18/95 through 9/4/95.

Day	Date	Anglers	Hours	Fish	Fish/hr	RB	LL	CT	EB	MW	Other	Caught	Kept
Tuesday	7/1	1	4	5	1.25	2	3	0	0	0	0	5	5
Wednesday	8	6	24	12	0.5	6	5	0	0	1	0	12	9
Thursday	7/1	8	22	24	1.09	8	13	2	1	0	0	24	3
Saturday	9	31	106	109	1.02	74	21	1	12	1	0	109	35
Monday	7/2	26	58	39	0.67	32	3	0	0	4	0	39	10
Sunday	0	27	62	74	1.19	58	16	0	0	0	0	74	23
Thursday	7/2	9	22	8	0.35	4	0	0	4	0	0	8	6
Saturday	6/2	44	202	196	0.97	165	8	20	3	0	2	196	85
Saturday	4	45	114	25	0.22	9	13	0	1	1	0	25	16
Thursday	7/3	7	13	17	1.31	1	16	0	0	0	0	17	0
Sunday	0	34	80	33	0.41	7	18	1	2	4	1	33	17
Saturday	8/3	24	67	43	0.64	22	9	0	10	2	0	43	23
Tuesday	8/5	15	60	38	0.63	14	21	1	1	1	0	38	18
Wednesday	8/1	14	51	34	0.67	16	10	8	0	0	0	34	12
Friday	2	19	88	35	0.39	11	15	0	9	0	0	36	22
Sunday	8/1	47	145	89	0.61	25	23	0	34	4	3	89	33
	7												
	8/2												
	0												
	8/2												
	6												
	829												
	8/3												
	0												
	9/1												
	9/3												
	16	357	1118	781	Av=0.70	454	194	33	77	18	6	781	317

RB – Rainbow Trout
LL – Brown Trout
CT – Cutthroat Trout
EB – Brook Trout
MW – Mountain Whitefish

Fish Population By Catch:
RB = 58.0%
LL = 24.8%
CT = 4.0%
EB = 9.8%
MW = 2.0%
Other = 0.7%

Anglers kept 40.6% of all fish caught

Other Survey Results:
1st time fishing at W. Rosebud = 143 (1st time anglers were only asked if they were satisfied with their experience.)
1. Changes in the fishing noticed by anglers:
Fishing has not changed = 86
Fishing has gotten better = 30
Fishing has gotten worse = 78
20 anglers did not express an opinion

2. Do you remember catching more rainbow or cutthroat in the past?
RB = 146
CT = 16
LL = 31 (These anglers offered brown trout as by far the most frequently caught fish in their experience.)
21 people surveyed said that they did not recall or could not say.

Montana Residents = 274 (76.7%)
By County

Yellowstone	= 226	(82%)
Stillwater	= 14	(5.0%)
Carbon	= 9	(3.0%)
Custer	= 6	(2.0%)
Rosebud	= 5	(1.8%)
Park	= 5	(1.8%)
Dawson	= 4	(1.4%)
Missoula	= 1	(0.3%)
Gallatin	= 1	(0.3%)
Fergus	= 1	(0.3%)
Bighorn	= 1	(0.3%)
Roosevelt	= 1	(0.3%)

3. Were you satisfied with your fishing experience?
YES = 284
NO = 68

Out of State = 83 (23.3%)

5 people surveyed did not give straight yes or no answers.

West Rosebud Drainage Voluntary Creel Card Survey

Participation in the voluntary card survey appears quite low with only 37 responses (Table 6) at a trailhead that receives heavy summer use. Anglers reported fishing an average of 2.37 hours for an overall catch rate of 2.2 fish per hour. Anglers reported keeping 41.7% of the fish they caught, which is high when compared to the East Rosebud volunteer creel where anglers only reported keeping 14.5% of fish caught. The high percentage of rainbow trout (60.4%) in the creel along with the creel card information indicates that most of the fishing pressure is concentrated on the Mystic-Island-Silver Lake complex and interconnecting stream system. These waters contain most of the rainbow trout located within the upper drainage.

Another series of questions on the creel card asked anglers about fish harvest limits, which are liberal when compared to most wilderness areas (combined limit of 10 trout). Sixty-eight percent felt current limits were satisfactory, and 67% said limits should be reduced to five fish in some areas. Respondents had a 50%/50% split on the question asking should limits be reduced to five fish in all areas of this wilderness. When asked if their latest wilderness trip met their expectations, 85% responded "yes."

East Rosebud Lake Creel Survey

Most of the use on East Rosebud Lake is by Montana residents with 78% of that use from people living within the three closest counties (Table 7). Unlike West Rosebud and Emerald Lakes which are surrounded by public USFS lands, most of the land surrounding East Rosebud Lake is privately developed land with numerous cabins. Of the 116 total people interviewed during the creel census, 36 (31%) were cabin owners from around the lake. Of the 116 interviews, those who had fished the lake before had fished it an average of 14.7 years.

During the 49-day duration of the creel, the lake received an estimated 378 angler days of fishing pressure. For comparison, fishing pressure for the entire year in 1997 from the statewide angling pressure survey was 303 angler days. The reason this figure seems low is that much of the lower East Rosebud Drainage, including numerous cabins around the lake, burned in a wildfire during 1996. Following the fire, use in this part of the drainage dropped. The average number of hours fished per angler during the 1995 creel was 2.74 hours, for a total of 1,033 hours fished and a catch rate of 0.97 fish per hour. The estimated total fish catch of 1,009 was made up of 443 rainbow trout, 254 brown trout, 117 cutthroat trout, 120 brook trout, 39 mountain whitefish and 36 other. Of these 1,009 fish, an estimated 169 were harvested, and the rest were released. Stocked rainbow and cutthroat trout made up 56% of the total angler catch, even though brown trout outnumbered them around two to one from the past three years of gill netting data. Anglers released 84% of all fish caught, whereas on West Rosebud and Emerald Lakes they released 59%. Of the 64 return anglers who expressed an opinion, 81% felt that fishing had not changed or had improved, while 19% said the fishing had worsened. Of the 106 anglers who expressed an opinion, 79% (84) were satisfied with their fishing experience, while 21% (22) were not satisfied.

Table 6. Summary of West Rosebud Drainage voluntary creel card survey from 7/18/95 through 9/4/95.

Dates	Anglers	Hours	Fish	Fish/hr	RB	LL	CT	EB	Other	caught	kept
7/18 - 22	9	15[1)]	79	5.26	31	1	44	0	3	79	7
7/23 - 29	3	24	14	0.58	12	0	2	0	0	14	5
7/30 - 8/5	3	9	19	2.11	10	0	4	0	0	19	14
8/6 - 12	1	5	5	5	0	0	0	0	5	4	
8/13 - 19	2	6	4	0.67	0	0	4	0	0	4	2
8/20 - 26	1	2	2	1	1	0	0	1	0	2	2
8/27 – 9/2	9	30[2)]	69	2.3	57	2	5	2	3	69	46[3)]
Totals	37	87	192	2.2 avg	116	3	59	3	6	192	80

1) 4 cards did not have the hours recorded correctly
2) 2 cards did not have the hours recorded correctly
3) No data given for # kept on one card (EB)

RB – Rainbow trout
LL – Brown trout
CT – Cutthroat trout
EB – Brook trout

Fish Population By Catch:
RB = 60.4%
LL = 1.5%
CT = 30.7%
EB = 1.5%
Other = 3.1%

Question Portion Results:

1. Current limits are satisfactory:
YES = 13
NO = 6
no answer given = 1

2. Limits should be reduced to 5 fish in all areas of this wilderness:
YES = 9
NO = 9
no answer given = 2

3. Limits should be reduced to 5 fish in some areas only:
YES = 5
NO = 10
no answer given = 5

4. Did your latest wilderness trip meet your expectations?
YES = 17
NO = 3 (reasons given: No fish, people are taking all of the bigger fish, fishing not as good as expected)
no answer given = 0

Anglers kept 41.7% of all fish caught

8 of the 28 creel card participants did not fill out the question portion.

Table 7. Summary of creel census information collected from East Rosebud Lake from 7/18/95 through 9/4/95.

Day	Date	Anglers	Hours	Fish	Fish/hr	RB	LL	CT	EB	MW	Other	caught	kept
Sunday	7/23	18	32	19	0.59	8	2	2	6	0	1	19	5
Tuesday	7/25	4	7	2	0.28	1	1	0	0	0	0	2	2
Saturday	7/29	11	25	10	0.4	2	7	1	0	0	0	10	0
Friday	8/4	18	56	60	1.07	37	18	1	0	3	1	60	7
Sunday	8/6	6	26	39	1.5	21	5	3	10	0	0	39	21
Tuesday	8/8	0[2]	0	0	0							0	0
Sunday	8/13	9	43	47	1.09	39	1	0	0	1	6[3]	47	4
Friday	8/18	10	22	34	1.54	2	0	28	3	0	1[4]	34	0
Saturday	8/19	19	51	29	0.56	11	10	1	5	2	0	29	2
Thursday	8/31	4	15	38	2.53	9	15	0	12	2	0	38	4
Saturday	9/2	10	26	26	1.0	4	16	0	1	3	2[5]	26	5
Monday	9/4	7	15	6	0.4	2	3	0	0	1	0	6	2
	12 days	**116**	**318**	**310**	**0.97 avg**	**136**	**78**	**36**	**37**	**12**	**11**	**310**	**52**

RB – Rainbow trout
LL – Brown trout
EB – Brook trout
MW – Mountain whitefish

2) No anglers, high winds
3),4),5) Golden trout from Sylvan and Lake of the Falls

Fish Population By Catch:
RB = 43.0%
LL = 25.0%
CT = 11.6%
EB = 11.9%
MW = 3.8%
Other = 3.5%

Montana Residents = 86 (74.2%) By County:
Yellowstone = 67 (77.9%)
Carbon = 6 (6.9%)
Stillwater = 5 (5.8%)
Gallatin = 3 (3.4%)
Madison = 1 (1.1%)
Missoula = 1 (1.1%)

Out-of-State = 30 (25.8%)

Anglers kept 16% of all fish caught

Other survey Results:
1st time fishing at E. Rosebud = 52 (1st time anglers were only asked if they were satisfied with their experience)

1. Changes in the fishing noticed by anglers:
Fishing has not changed = 37 \ (81%)
Fishing has gotten better = 15 /
Fishing has gotten worse = 12 (19%)

2. Do you remember catching more rainbow or cutthroat trout in the past?
RB = 52
CT = 90
5 people surveyed sad that they did not recall or could not say.

3. Were you satisfied with your fishing experience?
YES = 84 (79%)
NO = 22 (21%)
10 people surveyed did not give straight yes or no answers

East Rosebud Drainage Voluntary Creel Card Survey

Participation in the voluntary card survey appeared quite low with only 41 responses at a trailhead that usually receives heavy summer use. Anglers reported fishing an average of 4.12 hours for an overall catch rate of 3.2 fish per hour (Table 8), which is about one fish an hour better than

was reported for the West Rosebud Drainage. Anglers reported keeping 14.5% of the fish they caught, which compares to 41.7% for the West Rosebud Drainage. Brook trout made up 35.8% of the fish caught, which may help explain the high catch rate and high release rate, because brook trout tend to overpopulate and stunt in many lakes.

Another series of questions on the creel card asked anglers about fish harvest limits, which are liberal in the Absaroka-Beartooth Wilderness when compared to many wilderness areas (combined limit of 10 trout). Eighty-three percent of anglers said current limits were satisfactory, and 67% felt limits should not be reduced to five fish in some areas. Sixty-seven percent of anglers did not want to see the limit reduced to five fish in all areas of the wilderness. When asked if their latest wilderness trip met their expectations, 87% said "yes."

Fish Versus Fishless Lake Study

The third objective of this three-part project was to compare amphibian and invertebrate populations in two similar high mountain lakes—one with fish and the other fishless. For this study, two lakes located on the Line Creek Plateau were selected: Line Lake, located just inside the Montana state boundary, and Lower Highline Lake, located just inside the Wyoming state boundary. Line Lake, which has been stocked with cutthroat trout since 1958, is located within the Clarks Fork Drainage, whereas "fishless" Lower Highline Lake drains into Wyoming Creek, a tributary of Rock Creek.

This project was initiated in September 1995 with the gill netting of both lakes. Netting in "fishless" Lower Highline Lake confirmed the lake had a thriving population of longnose suckers. Consequently, we selected the next Highline lake upstream in this ten-lake system for the "fishless" lake, and netted no fish. We now had three different lakes for comparison: a lake with trout (Line Lake), a lake with suckers (Lower Highline Lake), and a fishless lake (Upper Highline Lake). Physical and chemical characteristics of all three lakes are fairly similar (Table 9). All three lake are located above timber line in the transition area between sub-alpine and alpine ecological zones. The two Highline Lakes have a faster water exchange rate than Line Lake.

A search of the shoreline and surrounding area at all three lakes found no amphibians. Plankton samples taken in all three lakes were inadvertently misplaced. Plans for fall of 2000 include re-sampling plankton and other invertebrates in all three lakes. This information will be included in the next D-J report.

Table 8. Summary of East Rosebud Drainage voluntary creel card survey from 7/18/95 through 9/4/95.

Dates	Anglers	Hours	Fish	Fish/hr	RB	LL	CT	EB	Other	caught	kept
7/18 - 22	1	2	13	6.5	0	0	12	1	0	13	3
7/23 - 29	11	46	184	4.0	28	12	41	21	83[4]	184	19
7/30 - 8/5	8	27[1]	100	3.7	20	0	21	58	1	100	8
8/6 - 12	7	45	90	2.0	18	1	12	50	9	90	16
8/13 - 19	5	13[2]	96	7.4	3	0	31	56	2	96	20
8/20 - 26	3	10[3]	37	3.7	2	0	30	5	0	37	8
8/27 – 9/2	6	28	47	1.7	12	0	18	12	5	47	8[5]
Totals	41	172	567	3.2 avg	83	13	165	203	100	567	82

Comments:
1) 7 of the "other" were GT from Sylvan Lake
2) 1 card did not have the hours recorded correctly
3) 2 cards did not have the hours recorded correctly
4) 1 card did not have the hours recorded correctly
5) 11 fish did not have data on whether or not they were kept
*"Other" on the creel cards is an unspecified category

RB – Rainbow trout
LL – Brown trout
CT – Cutthroat trout
EB – Brook trout
GT – Golden trout

Fish Population By Catch:
RB = 14.6%
LL = 2.2%
CT = 29.1%
EB = 35.8%
Other = 17.6%

Anglers kept 14.5% of all fish caught

Question Portion Results:

1. Current limits are satisfactory:
YES = 25
NO = 5
no answer given = 1

2. Limits should be reduced to 5 fish in all areas of this wilderness:
YES = 10
NO = 20
no answer given = 1

3. Limits should be reduced to 5 fish in some areas only:
YES = 19
NO = 9
no answer given = 3

4. Did your latest wilderness trip meet your expectations?
YES = 27
NO = 4 (Reasons given: fish were too small (2), lousy fishing, fishing not as good as expected)
no answer given = 0

11 of the 41 creel card participants did not fill out the question portion.

Table 9. Physical, chemical and biological characteristics of three Absaroka-Beartooth Mountain lakes.

Lake	Elevation (feet)	Area (acres)	Maximum depth (feet)	Fish Species	Fish Management	pH	Conduct-ivity (mhos)	Alkalinity (ppm)	Total hardness (ppm)	Total Phosphate	Volume of Plankton (cc/m^3)	Number of Plankton per m^3	Comments
Line Lake	9,680	4.7	26	McBride cutthroat trout	Stocked every 4 years at 150/acre	6.2	55	40	17	0.05	23.50	18,668	Plankton samples 7/6/79 Gammarus abundant
Lower Highline Lake	9,900	3.2	19	Longnose suckers	Fish of unknown origin	6.3	50	90	25	0.10			
Upper Highline Lake	10,000	2.5		Fishless	None	6.3	50	90	25	0.10			

Absaroka-Beartooth & Crazy Mountain Lakes

The Absaroka-Beartooth Wilderness Area, established in 1978, encompasses 930,584 acres and contains more area over 10,000 feet in elevation than any other area in the U.S. It rates as one of the top four or five wilderness areas in the country, receiving about 320,000 visitor-days of use

each year. The Absaroka-Beartooth Wilderness Area (A-B), and lands immediately adjacent, contain 948 high mountain lakes, 318 of which contain fish and 630 that are barren. Approximately 204 of these lakes have self-sustaining fisheries, and 114 are stocked. Stocking schedules vary from yearly in some of the more heavily used areas, to once every 6 to 10 years in lakes managed for trophy fisheries.

Pat Marcuson, during the time he worked for FWP out of Red Lodge, gathered a tremendous amount of information on the A-B lakes and created a massive database. He also developed fisheries management plans for each major drainage. Since that time, a computer database containing the latest information on the lakes with fisheries, has been developed. Two to five temporary employees, working from mid-July to September, collect fisheries information used to update the high mountain lake computer database, and for periodic updates to the drainage management plans. Fisheries management plans originally developed in 1980 for all the A-B mountain lakes were updated with the latest information available and reissued in 1991. We are presently in the process of again updating these drainage management plans. A separate management plan is available for all the lakes located in each major drainage of the A-B mountain range. From 1995 through 1999, a total of 183 lakes were surveyed in the A-B mountains, and the findings are included in Appendix 2. In addition, during 1995, 1997 and 1999, a total of 11 mountain lakes were surveyed in the Crazy Mountains (Appendix 2). Additional information about each mountain lake—including amphibian surveys, fish health, parasites, spawning potential, angler use, access, food habits, management recommendations and sampling protocols—is included in yearly mountain lake reports (Stiff 1995, 1996, 1997, 1998 and 1999).

Recently, increased controversy has surfaced over stocking fish in wilderness areas. Some wilderness coordinators and other groups have expressed views that fish stocking may be a threat to wilderness integrity. Some have advocated that all stocking in wilderness areas be stopped. The present system used in the A-B mountains has worked well for many years and has provided countless hours of fishing enjoyment for wilderness users. Surveys have shown that fishing is the primary wilderness activity for many users. Other reasons for fish planting in wilderness lakes include maintaining genetic refuges for sensitive species, improving genetics of fish populations by preventing hybridization of native species, establishing new populations in suitable lakes and supplementing reproduction and recruitment of a native species in lakes with limited spawning habitat.

In the A-B wilderness, over 66% of the lakes remain fishless. Any proposal to stock a fishless lake would be accompanied by an in-depth environmental assessment and extensive public involvement.

Musselshell River

Flows in the Musselshell River were adequate during most of this study period. Flow levels came up early in the spring of 1996 and remained above average through most of the summer. The Musselshell River experienced very high flows in the spring of 1997, rising in April and peaking in June. A peak instantaneous flow of 3,720 cfs was measured at the USGS gage station in Harlowton on June 12. The mean flow for June was 1,703 cfs at Harlowton, which was more than three times normal.

Above-normal precipitation in 1997 reduced irrigation demands in the Musselshell Drainage. This reduced demand, along with above-normal flows, helped fill the three storage reservoirs on the Musselshell system. Conditions turned dry in the Musselshell Drainage in 1998, and irrigation demands increased, but releases of stored water from the three irrigation reservoirs helped maintain good river flows through the summer. Precipitation levels were good enough during the winter to allow all reservoirs to refill most of the way before the 1999 irrigation season. Dry conditions continued in 1999, but reservoir releases helped maintain fair river flows through the summer. All the reservoirs were seriously dewatered, however, by the end of the irrigation season. The Musselshell River was seriously dewatered during the winter of 1999 as a limited water supply was diverted to try and refill depleted reservoirs. Despite this effort, all the reservoirs entered the 2000 irrigation season well below full pool. A dry spring caused irrigators to start calling for water earlier than normal in 2000. River levels were very low at the start of irrigation, and sections of the river probably would have gone dry by early summer without supplementation of stored water. With low initial water levels and increased irrigation demands, all three storage reservoirs were forecast to be out of water by late summer causing river levels to drop again.

Mark/recapture estimates are normally conducted every other year on a 1.25-mile section of the Musselshell River near Selkirk Fishing Access Site. Two rainbow trout and 112 brown trout were marked on May 13, 1996, but spring runoff started before the recapture run could be completed, so an estimate was not obtained. The brown trout ranged from 6.8 to 17.3 in with an average length of 12.8 in. The two rainbows were 8.6 and 9.2 in long.

A mark/recapture effort completed in May 1997 estimated a population of 249 9.0 in. and longer brown trout per mile in the Selkirk section. Three-year-old brown trout comprised the largest percent of this population (Table 10). Several 1-year-old brown trout were marked during this effort, but none of these fish were recaptured, so an estimate was not possible on these smaller fish. The 3-year-old brown trout averaged almost 14 in long while the 4-year-old fish averaged 15.7 in. (Table 10). These data showed an estimated population of 92 age 4 and older brown trout per mile in this section of river, providing a good fishery on 15 in and longer trout.

Table 10. Estimated number of brown trout, 9.0 in and longer, and average length (by age) in the Selkirk section of the Musselshell River, May 1997.

Age Class	Estimated No./Mile	Avg. Length (in)
2	18	9.8
3	138	13.9
4	89	15.7
5 & older	3	17.9
Total	249	

Another mark\recapture estimate was completed in May 1999. Recapture rates were good enough to provide a reasonable estimate on all brown trout 4 in and longer. One-year-old trout comprised the largest part of this population (Table 11). The estimated population of brown trout 9.0 in and longer declined from 249 per mile in 1997 to 216. Four-year-old fish dominated the larger brown trout population in 1999, which increased the number of larger fish in the fishery. Anglers should have found close to 100 17 in and larger brown trout per mile in this section of the Musselshell River in 1999. These numbers may decline significantly with the low winter flows seen in 1999, and the low flows expected in 2000.

Rainbow trout numbers have never been numerous in this section of river. Three rainbow trout were captured each year during electrofishing efforts in 1997 and 1999. Rainbows collected in 1997 were 9.5, 10.0 and 13.4 in long. All three rainbows collected in 1999 were over 14 in long.

Table 11. Estimated number of brown trout, 4.0 in and longer, and average length (by age) in the Selkirk section of the Musselshell River, May 1999.

Age Class	Estimated No./Mile	Avg. Length (in)
1	260	4.7
2	21	9.8
3	73	14.0
4	117	17.4
5 & older	2	19.0
Total	474	

Cooney Reservoir

Continue monitoring the status of trout/walleye fishery with gill nets, trap nets and electrofishing. Electrofishing done to coincide with the peak of spawning activity in Red Lodge Creek is a far more efficient way to sample walleyes during the spring in Cooney. Spawning walleyes are concentrated in a relatively small area and in shallow water where electrofishing is quite effective. Follow development of the black crappie population and its effect on the rainbow trout fishery. Follow growth rates and carryover of planted rainbow trout, and adjust stocking to maintain desired levels. Follow harvest of larger walleyes and implement more restrictive regulations if necessary.

East and West Rosebud and Emerald Lakes

Continue planting rainbow trout at a minimum size of 8.0 in to maintain these fisheries. Periodically monitor growth, survival and spawning activity, and adjust stocking rates to maintain desired growth rates and carryover.

Absaroka Beartooth and Crazy Mountain Lakes

Continue monitoring the status of fish populations in selected lakes and continue stocking to maintain management objectives as outlined in mountain lake management plans. Update mountain lake management plans with the latest information collected over the past ten years. Adjust stocking rates and management direction, based on the latest findings from lake surveys. Re-sample plankton and invertebrate populations in Line Lake and two Highline Lakes.

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WATERS REFERRED TO:

ABSAROKA-BEARTOOTH LAKES

Albino	5-22-7126-03
Alpine	5-22-7143-03
Anchor Lake	5-22-7148-03
Anvil Lake	5-22-7163-03
Aquarius Lake	5-22-7168-03
Arch Lake	5-22-7170-03
Arapooish Lake	5-22-7169-03
Avalanche Lake	5-22-7196-03
Barrier Lake	5-22-7220-03
Beauty Lake	5-22-7243-03
Big Butte Lake	5-22-7249-03
Black Canyon Lake	5-22-7280-03
Blacktail Lake	
Bob Lake	5-22-7310-03
Bowback Lake	5-22-7313-03
Bridge Lake	5-22-7330-03
Broadwater Lake	5-22-7350-03
Burnt Gulch Lake	5-22-7385-03
Canyon Lake	5-22-7424-03
Cataract Lake	5-22-7446-03
Chrome Lake	5-22-7455-03
Cliff Lake	5-22-7462-03
Companion Lake	5-22-7504-03
Corner Lake	5-22-7532-03
Courthouse Lake	5-22-7540-03
Curl Lake	5-22-7630-03
Davis Lake	5-22-7652-03
Desolation Lake	5-22-7677-03
Dick Lake	5-22-7690-03
Dollar Lake	5-22-7693-03
Dude Lake	5-22-7700-03
Duggan Lake	5-22-7697-03
Echo Lake	5-22-7718-03
Elk Lake	5-22-7756-03

ABSAROKA-BEARTOOTH LAKES (Continued)

Elk Lake	5-22-7757-03
Emerald Lake	5-22-00CT-03
Favonius Lake	5-22-7922-03
Fly Lake	5-22-7923-03
Fossil Lake	5-22-7924-03
Fox Lake	5-22-7938-03
Glacier Creek Lake	5-22-7981-03
Glacier Lake	5-22-7980-03
Golden Lake	5-22-7987-03
Goose Lake	5-22-7994-03
Great Falls Creek Lake	5-22-8015-03
Green Lake	
Heather Lake	5-22-8058-03
Imelda Lake	5-22-8156-03
Indian Knife Lake	5-22-8159-03
Japer Lake	5-22-8180-03
Jordan Lake	5-22-8203-03
Kaufman Lake	5-22-8225-03
Kersey Lake	5-22-8274-03
Kookoo Lake	5-22-8310-03
Lake Abundance	5-22-7112-03
Lake Aries	5-22-7173-03
Lake At Falls	5-22-8330-03
Lake Gertrude	5-22-7966-03
Lake McKnight	5-22-8612-03
Lake of the Clouds	5-22-8338-03
Lake of the Winds	5-22-8344-03
Lake of the Woods	5-22-8347-03
Lake Pinchot	5-22-8890-03
Lake Surrender	5-22-8350-03
Lake Wilderness	5-22-9772-03
Leaky Raft Lake	5-22-8368-03
Leo Lake	5-22-8370-03
Lightning Lake	5-22-8372-03

ABSAROKA-BEARTOOTH LAKES (Continued)

Line Lake	5-22-8428-03
Little Face Lake	5-22-8444-03
Little Glacier Lake	5-22-8446-03
Little Lightning Lake	
Little Washtub Lake	5-22-8450-03
Lone Elk Lake	5-22-8460-03
Lonesome Lake	5-22-8465-03
Lower Aero Lake	5-22-8526-03
Lower Arch Creek Lake	5-22-8530-03
Lower Basin Lake	5-22-7223-03
Mariane Lake	5-22-8587-03
Marsh Lake	5-22-8589-03
Martin Lake	5-22-8592-03
Mermaid Lake	5-22-8662-03
Mosquito Lake	5-22-8730-03
Mountain Goat Lake	5-22-8739-03
Mountain Sheep Lake	5-22-8740-03
Mouse Lake	5-22-9545-03
Narrow Escape Lake	5-22-8770-03
Nemidji Lake	5-22-8783-03
North Picket Pin Lake	5-22-8880-03
Nugget Lake	5-22-8815-03
Oly Lake	5-22-8825-03
Oveer lake	5-22-8937-03
Pablo	
Pentad Lake	5-22-8872-03
Phantom Lake	5-22-8876-03
Picasso Lake	5-22-8877-03
Princess Lake	5-22-8932-03
Production Lake	5-22-8935-03
Prospect Lake	5-22-8936-03
Rainbow Lake	5-22-8960-03
Rainbow Lake #2	5-22-8946-03
Rainbow Lake #3	5-22-8946-03
Rainbow Lake #4	5-22-8946-03
Raven Lake	5-22-8972-03

ABSAROKA-BEARTOOTH LAKES (Continued)

Rimrock Lake	5-22-9002-03
Rock Tree Lake	5-22-9033-03
Rough Lake	5-22-9038-03
Scat Lake	5-22-9097-03
Sedge Lake	5-22-9118-03
Shadow Lake	5-22-9142-03
Shelter Lake	5-22-9160-03
Silt Lake #2	5-22-9182-03
Silt Lake #3	5-22-9182-03
Silver Lake	5-22-9185-03
Silver Run #43	5-22-9186-03
Silver Run #44	
Silver Run #47	
Sioux Charley Lake	5-22-9198-03
Skeeter Lake	5-22-9208-03
Slough Lake	5-22-9254-03
South Picket Pin Lake	
Spaghetti Lake	5-22-9332-03
Speculator Lake	5-22-9333-03
Spider Lake	5-22-9335-03
Star Lake	5-22-9338-03
Stash Lake	5-22-9340-03
Stephanie Lake	5-22-9342-03
Summerville Lake	5-22-9360-03
Sundance Lake	5-22-9364-03
Sunken Rock Lake	5-22-9590-03
Surprise Lake	5-22-9582-03
Swamp Lake	5-22-9385-03
Timberline Lake	5-22-9478-03
Triangle Lake	5-22-9487-03
Triangle Lake	5-22-9488-03
Triangle Lake	5-22-9489-03
Trout Lake	
Upper Aero Lakes	5-22-9618-03
Upper Arch Creek Lake	5-22-9622-03
Unnamed Lake CF 0899	5-22-9586-03
Unnamed Lake RC 059	

ABSAROKA-BEARTOOTH LAKES (Continued)

Weasel Lake #46	5-22-9726-03
Weasel Lake #51	5-22-9725-03
Weeluna Lake	5-22-9729-03
West Boulder Lake	5-22-9730-03
W Fishtail Creek lakes #41, 41A	5-22-9732-03
Widowed Lake	5-22-9759-03
Wiedy Lake	5-22-9760-03
Wood Lake	5-22-9799-03
Wounded Man Lake	5-22-9828-03
Wrong Lake	5-22-9831-03
Zimmer Lake	3-22-9842-03

CRAZY MOUNTAIN LAKES

Blue Lake	5-22-7306-03
Campfire Lake	5-22-7420-03
Cascade Lake	5-22-7448-03
Cave Lake	5-22-7449-03
Crazy Lake	5-22-9632-03
Granite Lake	5-22-0062-03
Hidden Lake	5-22-7910-03
Lower Twin	5-22-9525-03
Pear Lakes	5-22-8871-03
Upper Twin	5-22-9526-03

OTHER LAKES

Cooney Reservoir	5-22-7518-05
East Rosebud Lake	5-22-7714-03
Emerald Lake	5-22-7812-03
Otie Reservoir	5-22-8833-03
West Rosebud Lake	5-22-9744-03
Highline Lakes (Wyoming)	No Codes

STREAMS

Chapmans Creek	5-22-1092-01
East Rosebud Creek	5-22-2254-01
Musselshell River	5-22-4350-01
Red Lodge Creek	5-22-4886-01
Rock Creek Sec 3	5-22-4956-01
West Rosebud Creek	5-22-6804-01
Willow Creek	5-22-6916-01
Wyoming Creek	5-22-6993-01

MONTANA FISH, WILDLIFE AND PARKS
FISHERIES DIVISION

JOB PROGRESS REPORT

State:	**MONTANA**	**Element 1:**	**FISHERIES MANAGEMENT**
Project No:	**F-78-R-5**	**Job No:**	**3531/3561**
Project Title:	**STATEWIDE FISHERIES MANAGEMENT PROGRAM**	**Job Title:**	**COONEY RESERVOIR ANGLER SURVEY INVESTIGATIONS**

Project Period: July 4, 1998 – September 7, 1998

ABSTRACT

Cooney Reservoir is one of the most heavily fished waters for its size in Montana. Its close proximity to Billings, Laurel and several smaller towns, along with its two-story trout/walleye fishery draws many anglers and other recreationists. In order to better understand angling patterns, harvest success, methods and attitudes, a creel census was run during the peak period from July 4, 1998 to September 7, 1998.

The angling survey consisted of 314 on-site interviews and a mail back survey for those anglers checked prior to trip completion. Another part of the survey involved total shore and boat angler contact at randomly selected hours and days. On-site interviews and/or angler counts were done on all weekend days and holidays, and during 55% of randomly selected week days.

Ninety-eight percent of the angling use at Cooney was by residents, and 94% of the use was by anglers living within 60 miles of the reservoir. Median age of anglers was 46.5 years. Male anglers made up 93% of the interviews and average years fishing experience was 35.7 years. Anglers interviewed had fished Cooney an average of 15.5 years and made 11.7 trips a year to the reservoir.

"Fishing close to home," followed by "chance to catch large fish" and "companionship with family and friends" were selected from a list as the primary reasons for choosing Cooney as a destination. Fifteen percent of the anglers interviewed were members of at least one conservation organization. When asked to comment about overall satisfaction with their Cooney fishing experience, 49% of anglers responded. Fifty percent of these comments were related to park facilities and roads, 33% to safety and enforcement and 17% to fishing.

Four-hundred nineteen gamefish (38% trout and 62% walleye) were checked during the survey. Forty-three percent of anglers interviewed were after any fish, while 36% were seeking walleyes and 21% were angling for trout.

For the 66 day duration of this survey, boat anglers outnumbered shore anglers about three to one (76% to 24%). Boat anglers accounted for 14,716 angling days pressure while shore anglers contributed 3,744 angling days (80% versus 20%).

Shore anglers kept 35% of the total fish they caught and released 65%, while boat anglers kept 37% and released 63%. The average shore angler caught 3.84 fish per trip compared to 6.54 for boat anglers. Boat anglers were more successful at catching both trout and walleyes, taking 2.1 trout and 1.5 walleyes to every one caught from shore. Shore anglers harvested 17% of the total number of fish removed from Cooney, i.e. 17% of the trout and 18% of the walleyes. Boat anglers accounted for 83% of the total harvest, i.e. 83% of the trout and 82% of the walleyes.

During this survey, catch rates for all species combined were 0.94 fish per hour for shore anglers and 1.51 for boat anglers. Catch rates for fish actually kept were 0.36 from shore and 0.57 from boats. Combined shore and boat angler catch rates were 1.27 for all fish caught and 0.48 for all fish kept.

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INTRODUCTION

Cooney Reservoir is a 778 acre on-stream irrigation storage project located at the confluence of Red Lodge, Chapman, and Willow creeks (Figure 1). Cooney Reservoir State Park is located within 60 miles of the majority of people living in Montana, including Billings and Laurel and the smaller towns of Red Lodge, Columbus, Bridger, Belfry, Fromberg, Absarokee, Joliet, Park City, Shepherd, Huntley and others. With more individual leisure time devoted to fishing and the use of boats and personal watercraft, recreational use at Cooney has grown steadily, making it the most heavily used lake or reservoir in the area. Recent improvements to roads and recreational facilities at Cooney have also contributed to increased use. Fishing pressure estimates collected from our statewide mail survey (MFWP, 1997 and 1999) increased 40%, from 30,670 angler-days in 1995 to 42,835 angler-days by 1997, and decreased 8% to 39,386 angler-days by 1999.

The two-story trout/walleye fishery in Cooney Reservoir is another reason the water receives so much fishing pressure. Walleyes, first planted in 1984 to help control a large sucker population, have done well. Many large walleyes have been harvested, including the former state record fish (16.38 lb) caught in 1996. Many anglers seeking walleyes at Cooney fish at night to avoid the daytime overcrowding, and because fishing for walleyes is usually better after dark. This night fishing results in additional fishing pressure not found on most state waters.

In order to help understand the unique set of circumstances that have made the two-story fishery in Cooney a qualified success, we decided to collect creel census information during the summer peak use period. With funding help provided by the statewide roving creel fund, the survey was run from July 4, 1998 through September 7, 1998 (Labor Day weekend). The five primary objectives of the Cooney creel survey included: collecting creel and angler use information, determining the ratio of trout versus walleye anglers, collecting harvest information on stocked rainbow trout and tagged walleyes, collecting information on walleye predation on stocked rainbow trout (stomach samples), and determining the ratio of shore versus boat anglers. The Cooney creel questionnaire (Appendix A) was also designed to gather information on angler demographics including age, sex, residence and additional information on gear preference, angling satisfaction, fishing experience, conservation club affiliations and reasons for selecting Cooney for fishing.

METHODS

Sampling protocol involved surveying only angling visitors to Cooney, and not those who were there only for other water-based recreation. In the 66 days from July 4 though September 7, 314 interviews were collected, which included ten from non-anglers. Anglers were interviewed in person by the creel clerk. Sequentially numbered questionnaires (Appendix A) were filled out for each angler actually fishing that day. Shore anglers were checked on site, whereas boat anglers were checked at the three boat ramps or, in a few cases, on the water with a boat. Because catch statistics

can only be generated from completed trip information, the creel clerk made a special attempt to interview anglers who were done fishing for the day. Anglers interviewed prior to completing their fishing trip were given a numbered mail-in card (Appendix A) for them to fill out when their trip was complete. Completed trip cards could be left in boxes placed at several locations around the lake or mailed back. The additional catch information from these cards was then matched with the corresponding numbered survey questionnaire forms to give completed trip data. Return rates for these completed trip cards was relatively low at 32% (48 returns from 152 cards issued). Completed trip information was collected outright for 164 interviews. With the additional 48 completed trips derived from the cards, 212 total completed trip surveys were obtained out of the 314 interviews (68%).

Creel surveys were conducted on most weekends and all holidays, whereas weekday sampling was done on a pre-determined random schedule. Forty days during the 66-day creel period were surveyed, 45% weekend days and 55% week days. The daily creel surveys were a sub-sample because it was not possible to sample all anglers during most days. In addition to the 314 creel survey questionnaires, counts were made of total shore anglers and boats at predetermined random hours. With a few exceptions, these counts were made on the same days creel information was collected. Forty-nine percent of these counts were made on weekends and holidays, while 51% came from weekdays. Although we concentrated on making the majority of angler counts during peak use periods, counts were also distributed throughout the 24-hour day. This distribution of effort was particularly important on Cooney due to the amount of night fishing that it receives. Actual angler counts per day ranged from one to five depending on the random schedule. Shore anglers per count period ranged from 0 to 22, while boat counts ranged from 0 to 28. The daily and hourly counts were then averaged to give a total average daily boat (8.5) and average daily shore angler (6.5) figure for the 66 day creel duration. To estimate total daily anglers per boat the 8.5 boats per day was multiplied by the average number of anglers per boat (2.3) derived from the creel questionnaire data.

RESULTS AND DISCUSSION

During the day, boat anglers normally slightly outnumbered bank anglers. The survey was unable to accurately quantify night shore angling because it was not practical to cover the entire shoreline at night. Night shore angling did occur, but appeared to be a very small component of use on Cooney. Highest counts of shore anglers were usually made between 10:00 a.m. to 11:00 a.m., whereas highest counts of boat anglers were made from 9:00 p.m. to 11:00 p.m. Thursday appeared to be the favorite day for serious shore anglers. Many of these anglers were retired, senior citizens who were there to avoid the crowds and boat traffic. For this group of anglers, Thursday was normally the quietest most relaxing and enjoyable time to use Cooney.

Angler Residence

Resident anglers (98%) outnumbered non-resident anglers (2%) by a large margin. These percentages are almost identical to those provided by the 1997 statewide fishing mail survey. Ninety-four percent of this use was by anglers living within 60 miles of Cooney. Seventy-four percent of this use was from Billings residents (61%) and Laurel (13%). Anglers from other areas of Montana made up only 4% of the use. The non-resident users represented the states of California, Florida, Washington and Wyoming. Clearly, Cooney Reservoir is heavily used by anglers from local communities. By comparison, nonresident anglers comprised 74% of the users on the Bighorn River in a 1992-93 creel survey (Frazer & Brooks, 1997).

Angler Profiles

The median age for anglers using Cooney Reservoir was 46.5 years with a range of 10-86 years. Male anglers made up 93% of those interviewed while 7% were female. Anglers interviewed had been fishing for an average of 35.7 years with a range of 1-81 years. Years of experience fishing Cooney ranged from 1 to 60 years with an average of 15.5 years. In an average year, anglers interviewed visited Cooney 11.7 times with a range of 1 to 100 trips. The average angler fishing at Cooney is a resident, middle-aged male with a lot of years fishing experience, who has considerable experience fishing Cooney and makes numerous trips each year.

Primary Reasons for Visiting Cooney

Seventy-four percent of people interviewed gave fishing as the primary reason for visiting Cooney that day. (Only angling visitors to Cooney were interviewed, not those there only for other water-based recreation.) Other reasons given included boating (8%), camping (10%), water sports (6%), and various other activities (2%). Many visitors interviewed were at the reservoir for a combination of recreational activities.

A closely related question gave six general reasons for selecting Cooney as a place to fish that day and asked anglers to select the top two. The general reasons and the anglers responses listed in order of importance follows:

1) Fish close to home	44%
2) Chance to catch large fish	14%
3) Companionship with family/friends	13%
4) Chance to catch several fish species	11%
5) Other	9%
6) Public access and good facilities	8%
7) Liberal fish limits	.3%

Responses listed by anglers under "other reasons" (number 5) included: to catch lots of fish, catch walleyes, catch trout, enjoy natural setting relaxing location, water-ski, and teach kids to fish.

By a margin of over three to one anglers selected fishing close to home as number one, followed by chance to catch large fish, companionship with family/friends and chance to catch several fish species as the primary reasons for selecting Cooney as a place to fish.

Group Size and Anglers Per Group

Group size of people interviewed ranged from 1 to 25 members with an average of 3.05 people per group. Anglers in a group interviewed ranged from 1 to 5 with an average of 2.27 anglers per group. On average, one person per group interviewed was a non-angler.

Shore Versus Boat Anglers

Anglers fishing from shore comprised 47% of those interviewed while boat anglers made up 52%. A small group (1%) fished from both shore and a boat.

Tackle Selection

Most Cooney anglers contacted during the survey used bait (57%) for fishing with a combination of bait and lures (26%) next followed by lures (17%).

Members of Fishing or Conservation Organization

One question asked anglers if they were members of any fishing or conservation organization, and if so, to list which ones. Forty-seven anglers interviewed (15%) were members of at least one organization and 2% belonged to more than one group. Individual organizations belonged to by a single angler ranged from 0-4. The thirteen fishing or other conservation organization affiliations reported during the survey are listed below along with the number of anglers who responded.

Organization	Responses
Walleyes Unlimited	14
North American Fishing Club	13
Rocky Mountain Elk Foundation	6
Bass Anglers Sportsman Society	5
Ducks Unlimited	4

Organization	Responses

Laurel Rod & Gun Club	4
Billings Rod & Gun Club	2
Pheasants Forever	2
National Rifle Association	2
Trout Unlimited	1
Nature Conservancy	1
Izaak Walton League	1
Wildlife Forever	1

Five anglers belonged to more than one organization.

Overall Satisfaction with Cooney Fishing Experience

This question on the survey, "Are you satisfied with your overall fishing experience on Cooney or do you feel there are problems that need to be addressed?" Yes ____ No ____, was poorly worded. It should have been broken into two separate questions. As worded, it is unclear whether people answering "yes" are satisfied with their fishing experience or they feel there are problems to address.

As worded, 96% of respondents answered yes with 4% answering no. Because of the poor wording, objective interpretation of these responses is impossible. Another part of this question, which gave space for people to make specific comments, provides a much better view of overall angler satisfaction. Forty-nine percent (143) of the people who responded to this question provided additional comments. Following is a list of the fifteen most prevalent comments to this question along with the number of responses.

Responses	Comments
33	Jet skis: rude/inconsiderate; too many; should be outlawed.
11	Fishing poor: no/few fish; fishing not as good as in past years.
11	Lights for boat ramp area
9	Outhouse problems; no toilet paper; small; improve sanitation.
9	Park too crowded.
7	Too much water in reservoir; hampers access.
6	Good facilities; nice improvements to park.
5	Inconsiderate boat drivers; coming too close to anglers.
4	Fees too high.
3	Plant more trees; create more shade.
3	Need more docks.
3	Riprap eroding bank in Willow Creek arm.

Responses	Comments
3	Add handicap access.
3	Establish no wake zone in Red Lodge Creek arm.
3	Need more safety enforcement: boating safety; jet ski safety.
2	Stock bass.
2	Spray knapweed.
2	Stock more 12 lb-14lb walleye.
2	Implement size limits for keepers
2	Waive park fee to fish.
2	Place picnic tables at more day-use areas.
2	Add cleaning station.
2	Pave roads all the way to lake.
2	Need more campsites.
2	Some boats running at night without lights.
2	Allow live minnows.
135	

Along with these 26 categories of most frequent comments made by 135 individuals, an additional eight comments were provided covering a number of other issues. Further analysis of the entire 143 comments shows 50% relating to Cooney Park facilities and roads, 33% relating to safety and enforcement issues, and 17% concerning fish and fishing issues. Twenty-five percent of the comments were directly related to issues involving jet skis.

FISH RELATED INFORMATION

Fish Data Collected During the Creel Census

Four hundred nineteen gamefish were weighed and measured during the creel survey. One hundred sixty rainbow trout (38%), averaged 11.5 in and 0.74 lb with the largest 19.4 in and 2.90 lb. Two hundred fifty-nine walleyes (62%), which averaged 10.9 in (no average weight) with the largest 30.89 in and 12.90 lb. The smallest rainbow trout kept by an anger was 4.0 in. Anglers reported catching and releasing up to 50 small walleyes (fish less than 11.0 in) in a day. Only sixteen walleyes over 15.0 in were kept by anglers during the creel survey.

Fish Species Sought by Anglers

Thirty-six percent of anglers interviewed were specifically seeking walleyes, while 21% were fishing for trout. Forty-three percent of anglers said they were fishing for any species they could catch. Only one angler said he was specifically fishing for crappies, a species present in Cooney in limited numbers. Anglers fishing from shore were more likely to be seeking trout than walleyes, 60% versus 40%. Just the opposite was true of boat anglers who were more likely to be after

walleyes than trout, 78% versus 22%. This difference is understandable because walleyes are generally more easily caught from a boat than from shore, and most serious walleye anglers have a boat. Conversely, trout are often easier to catch from shore than walleyes and a boat is not usually necessary to catch trout at Cooney. Cooney Reservoir has always been a popular location to catch trout, particularly for older anglers who generally have good access from shore.

Tag Returns for Walleyes

Using electrofishing equipment and nets, 383 larger walleyes were taken in Cooney and tagged with individually numbered tags from 1996 to 1998. These walleyes averaged 23.8 in and 6.26 lb. One objective of the Cooney creel was to collect harvest information on those tagged walleyes, but none were reported taken during the survey. Through 1998, total angling returns from Cooney have accounted for 30 (8%) of these tagged walleyes.

Angling Pressure

For the 66 day duration of the creel survey on Cooney, boat anglers outnumbered shore anglers about three to one (76% to 24%) (Table 1). Average party size and average hours fished for boat and shore anglers were comparable. During the creel survey, boat anglers accounted for 80% (14,716 days) of the total angling pressure (18,460 days), with shore anglers making up 20% (3,744 days). During this 66 day period, Cooney received nearly 24 angling days pressure for each acre of lake surface. When you consider that for much of the year the surface acres of Cooney is often much less than the 778 at full pool due to irrigation drawdown, the actual pressure per surface acre is really much higher.

Table 1. Angling pressure and average number of boats, party size, hours fished and anglers per day for Cooney Reservoir from July 4, 1998 through September 7, 1998.

CATEGORY	BOATS	SHORE	TOTALS
Average number of boats per day	8.5	N/A	8.5
Average group size	2.3	2.1	N/A
Average hours fished per completed trip	1.9	2.4	N/A
Average number of anglers per day	19.9	6.3	26.2
Angling pressure (angling hours)	27,465	8,912	36,377
Angling pressure (angling days)	14,716	3,744	18,460

Fish Caught, Kept and Released

Anglers fishing from shore kept 75% of trout they caught and only 16% of the walleyes (Table 2). Shore anglers kept 35% of the total fish they caught while releasing 65%. The average Cooney shore angler caught 3.84 fish per trip.

Boat anglers kept 56% of the trout they caught and 24% of the walleyes. Boat anglers kept 37% of the total fish they caught while releasing 63%, which compares closely with shore anglers. The average boat angler caught about two times the number of fish taken by a shore angler per trip (6.54 versus 3.84). Boat anglers were more successful at catching both trout and walleyes, taking 2.1 trout and 1.5 walleyes to every one caught from shore.

Combining catch statistics for both shore and boat anglers shows 60% of the trout and 22% of the walleyes caught were kept while 40% and 78%, respectively, were released. The average angler fishing Cooney during the creel duration, combining boat and shore anglers, caught 5.62 fish per trip, kept 37% of these fish and released 63%. The high release rate for walleyes is another indication that Cooney contains a lot of walleyes smaller in size than the average angler desires to harvest.

Table 2. Comparison of fish caught, kept and released for anglers fishing from boats and shore throughout the Cooney creel survey.

	Average fish for each angler for completed trips		
Angling Method	**Fish Caught (Mean)**	**Fish Kept (Mean)**	**Fish Released (Mean)**
Shore Anglers:			
Rainbow Trout	1.26	0.94	0.32
Walleyes	2.57	0.41	2.16
Total	**3.83**	**1.35**	**2.48**
Boat Anglers:			
Rainbow Trout	2.66	1.48	1.17
Walleye	3.88	0.95	2.93
Total	**6.54**	**2.43**	**4.10**
Combined (Boat & Shore)			
Rainbow Trout	2.18	1.30	0.88
Walleye	3.43	0.76	2.67
Total	**5.61**	**2.06**	**3.55**

Catch Rates

Catch rates for all fish species combined of 0.94 fish per hour (fph) for shore anglers and 1.51 fph for boat anglers were quite good during the survey (Table 3). Catch rates for fish actually kept of 0.36 fph from shore and 0.57 fph from boats are still acceptable. Combined shore and boat angler catch rates of 1.27 fph for all fish caught and 0.48 fph for fish kept, are also quite good.

Because Montana waters with the trout/walleye combination are rare, several waters in Wyoming were selected for comparison of catch rates. Three Wyoming reservoirs located on the North Platte River system were chosen, including Seminoe, Pathfinder and Alcova (Maurakis & Yule, 1997). All three reservoirs have trout/walleye fisheries which have been extensively evaluated

through creel surveys. During 1996, Seminoe, Pathfinder and Alcova Reservoirs had yearly combined (boat-shore, all species) catch rates of 0.64, 0.32 and 0.48 fph respectively. For the July-August time period, which includes most of the Cooney creel duration, the catch rates were 0.78, 0.32 and 0.48 fph, respectively, for these three Wyoming reservoirs. One management objective on Alcova Reservoir is maintaining a catch rate of 0.5, which the Wyoming Game and Fish Department considers a "fast family fishery." Combined catch rates on Cooney of 1.27 for total fish caught exceeds this criterion. Even though many fish caught in Cooney are released, the combined fish kept catch rate of 0.48 fph during the survey, still meets this high 0.5 catch rate criterion.

Angler Harvest

Angler harvest statistics are also presented in Table 3. Shore anglers harvested 17% of the total estimated number of fish taken from Cooney, 17% of the trout and 18% of the walleyes. Boat anglers accounted for 83% of the total harvest, 83% of the trout and 82% of the walleyes.

Table 3. Catch rates and harvest information for Cooney Reservoir from July 4, 1998 through September 7, 1998.

Angling Method	Catch Rates for Fish Caught (Mean)	Catch Rates for Fish Kept (Mean)	Harvest (Total Numbers)
Shore Anglers:	Fish/Hour	Fish/Hour	
Rainbow Trout	0.28	0.21	1,794
Walleyes	0.66	0.15	1,494
Total	**0.94**	**0.36**	**3,288**
Boat Anglers:			
Rainbow Trout	0.59	0.33	8,877
Walleye	0.92	0.24	6,790
Total	**1.51**	**0.57**	**15,667**
Combined (Boat & Shore)			
Rainbow Trout	0.46	0.28	10,671
Walleye	0.81	0.20	8,284
Total	**1.27**	**0.48**	**18,955**

CONCLUSION AND SUMMARY

Although this creel survey on Cooney Reservoir was only run for 66 days, an estimated 18,460 angling days of fishing pressure occurred during that period. This figure represents 42% of the entire year's fishing pressure estimated for Cooney from the 1999 statewide mail survey of 39,386 total angling days. With limited time and money, this "snapshot creel census" provided a good profile of the predominantly resident summer angling population using Cooney at the time of this survey.

Of the five original objectives for the Cooney creel, including: collecting creel and angler use information, determining the ratio of trout versus walleye anglers, collecting harvest information on stocked rainbow trout and tagged walleyes, collecting information on walleye predation and stocked rainbow trout (stomach samples), and determining the ratio of shore versus boat anglers, all but one were achieved. No information was collected on walleye predation on stocked rainbow trout. Rainbow trout, usually stocked into Cooney during April, grow rapidly and by early July are too large for all but the larger walleyes to prey upon.

For the duration of this survey, boat anglers outnumbered shore anglers about three to one, and boat anglers accounted for 80% of the fishing pressure on Cooney. Boat anglers were more successful at catching both trout and walleyes, accounting for 83% of the trout and 82% of the walleyes harvested during this creel survey. Combined shore and boat angler catch rates of 1.27 fish per hour for all fish caught and 0.48 for all fish kept, are good when compared to other reservoirs. Wyoming Game and Fish Department considers a catch rate of 0.5 on their reservoirs a "fast family fishery."

As recreational use at Cooney has increased so have conflicts between and among different user groups. With its close proximity to Billings and Laurel and its location in an area with limited water based recreation, Cooney gets very crowded, particularly on warm summer weekends. The most common complaint heard from anglers involved jet skis. Cooney anglers have adapted in several ways to help alleviate conflicts and avoid the crowding. Many anglers, particularly those seeking walleyes, have shifted to night fishing while others fish during the week and at hours during the day when conflicting uses are less likely. In spite of the heavy recreational use and resultant conflicts at Cooney, anglers responding to this survey still visited the reservoir an average of nearly twelve times each year.

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Prepared by: Michiel Poore
Date: April 25, 2000

APPENDIX A

COONEY CREEL QUESTIONNAIRE

AND ANGLER SURVEY CARD

APPENDIX 2

Summary of data collected during 1995, 1996, 1997, 1998 and 1999 by gill nets and hook-and-line from alpine lakes in the Absaroka-Beartooth and Crazy Mountains

APPENDIX 2. **Summary of data collected curing 1995, 1996, 1997, 1998 and 1999 by gill nets and hook-and-line from alpine lakes in the Absaroka-Beartooth and Crazy mountains.**

1995 LAKE	DRAINAGE	CODE	SPECIES	STATUS	LAST STOCKED	SAMPLE DATE	NO. OF FISH	LENGTH RANGE (in)	LENGTH (in)	COMMENTS
Alpine Lake	BR	083	CT	?? >ST+	1989	8/10	32	7.2-14.0	10.6	Some spawning but continue stocking
Elk Lake	BR	035	CT	ST	1990	8/09	42	13.5-19.0	15.6	
Great Falls Creek Lake #53	BR	053	Barren			7/18	0			
Great Falls Creek Lake #55	BR	055	RB	SS		7/18	29	6.3-21.0	12.2	
Silver Lake	BR	167	RB	SS	1989	8/01	26	6.2-16.0	11.5	Swamp out with Yellowstone cutthroat.
Weasel Lake #46	BR	048	CT	SS	?	7/19	20	6.6-13.6	10.2	
Weasel Lake #51	BR	051	CT	ST	1987	7/19	23	11.3-16.0	14.2	
West Boulder Lake	BR	075	CT	ST	1987	8/01	28	11.4-13.8	12.7	
Aquarius Lake	CF	063	CT	SS	1977	8/14	5	11.4-12.2	11.9	
Broadwater Lake	CF	023	EB	SS	?	7/13	9	6.5-9.8	8.3	Poor growth/numbers water chemical analysis. See Curl/Broadwater
Curl Lake	CF	022	EB	SS	?	7/14	18	6.3-13.2	8.5	
Dollar Lake	CF	061	GR	SS		8/14	2	12.0-13.3	12.7	
Green Lake	CF	173	EB	SS		7/26	49	5.9-11.1	8.2	
Lake of the Clouds	CF	093	CT	ST	1990	9/15	22	8.8-13.7	11.5	Check scales for ages, reproduction
Line Lake	CF	246	CT	ST						
Lonesome Lake	CF	242	EB	SS		7/25	5	7.4-9.1	8.5	
Picasso Lake	CF	084	GT	?? >ST	1984	9/15	0			Day sample - Sample again in 1996. May be aging out.

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APPENDIX 2. (Cont.) **Summary of data collected during 1995, 1996, 1997, 1998 and 1999 by gill nets and hook-and-line from alpine lakes in the Absaroka-Beartooth and Crazy mountains.**

1995 LAKE	DRAINAGE	CODE	SPECIES	STATUS	LAST STOCKED	SAMPLE DATE	NO. OF FISH	LENGTH RANGE (in)	MEAN LENGTH (in)	COMMENTS
Queer Lake	CF	187	EB	?		7/26	7	6.3-12.0	7.8	
Round Lake	CF	008	CT EB	SS SS	? ?	8/25	4 19	8.6-11.5 6.2-14.1	10.0 9.8	
Sedge Lake	CF	062	CT GR	SS	?	8/14	17 0	5.5-16.7	10.4	
Star Lake	CF	014	CT	ST	1992	8/25	13	9.1-12.4	10.4	
Summerville Lake	CF	174	EB	SS	?	7/26	34	6.3-11.2	8.8	
Campfire Lake	Crazy Mountains	023	CT	ST >SS	1992	7/27	11	6.9-17.2	11.0	Several year classes. Check scales. Stop stocking.
Hidden Lake	Crazy Mountains	002	CT	?? >22	1978	7/25	6	7.8-17.3	12.5	Self sustaining. very fat.
Elk Lake	ER	006	EB	SS	?	7/06	25	6.5-9.0	7.5	
Rim Rock Lake	ER	007	RBxGTxCT	SS	?	7/06	13	8.4-14.0	10.9	
2 Highline Lakes (Wyoming)	RC	001	LNSU Barren	SS	?	9/06				
Kookoo Lake	RC	058	CT	ST	1994	7/19	14	12.5-20.0	17.0	10 year old remnants. Fish growth study.
Lake Gertrude	RC	048	EB	SS	?	7/11	18	7.0-11.0	8.5	
Lower Basin Lake	RC	041	EB	SS	?	7/14	2	13.8-14.5	14.2	Very few nice fish. Previously winter-killed.
Shadow Lake	RC	052	CT	ST	1991	6/28	1	10.3-10.3	10.3	Popular place but fish do poorly.
Silver Run Lake #43	RC	043	EB	?? ->SS	?	7/13	1	10.2-10.2	10.2	Migrate in and experience winter kill
Silver Run Lake #44	RC	044	EB	??	?	7/12	5	10.9-14.9		
Silver Run Lake #45	RC	045	Barren							

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1995 LAKE	DRAINAGE	CODE	SPECIES	STATUS	LAST STOCKED	SAMPLE DATE	NO. OF FISH	LENGTH RANGE (in)	MEAN LENGTH (in)	COMMENTS
Silver Run #46	RC	046	Barren							
Silver Run	RC	047	EB	SS	?	7/12	10	9.0-12.0	11.1	Only permanent population of Silver Run Lakes.
Sundance Lake	RC	050	CT	ST	1992		0			
Timberline Lake	RC	049	EB	SS	?	6/28 7/11	54	6.5-10.2	8.5	
Triangle Lake	RC	060	CT	ST	1994	7/19	2	12.5-20.0	16.3	10 year old fish, part of fish growth study lake.
Unnamed Lake below Timberline	RC	48A	EB	SS	?	7/11	33	6.5-10.1	9.0	
Heather Lake	Slough Creek	006	CT	SS		7/24	12	6.6-14.9	11.3	Native cutthroats.
Chrome Lake	SR	001	GR	?? ST	1991 1992	9/07	1	15.1-15.1	15.1	New fish. No reproduction.
Glacier Creek Lake	SR	017	EB	SS	?	8/22	138	5.7-1		
Goose Lake	SR	042	CT	SS	?	8/23	9	8.7-12.3	9.9	Stunted Brookies
Imelda Lake	SR	013	EB	SS	?	8/23	62	6.2-9.0	7.6	
Lake of the Woods	SR	049	CT	SS	?	8/24	32	4.5-15.3	9.3	
Lightning Lake	SR	102	GT	SS	1956	8/03	13	7.3-19.4	11.3	
Little Lightning Lake	SR	102A	GT	SS	?	8/02	41	5.8-16.1	9.0	May be over- populated
South Picket Pin Lake	SR	104	CT	ST	1993	9/6	1	16.3-16.3	16.3	Examine stocking density. Very few fish are present.

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Blacktail Lake	BR	091	CT	ST	1992	8/20	4	13.2-15.2	14.1	Could increase stocking # by 25/acre
Burnt Gulch	BR	026	CT	SS	1985	7/23	10	8.6-12.8	10.2	
Davis Lake	BR	087	CT	SS	1979	8/21	15	7.6-14.6	12.1	Reproduction occurring.
Lake McKnight	BR	090	CT	ST	1992	8/22	1	15.6-15.6	15.6	Restock when available.
Narrow Escape Lake	BR	004	CT	ST	1989	7/24	2	15.6-17.8	16.7	Restock in 1997.
Trout Lake	BR	037	CT	ST	1995	7/22	7	8.3-10.8	9.0	Was this lake stocked with larger fish?
Bob Lake	CF	012	EB	SS		9/12	10	6.4-8.5	7.4	
Companion Lake	CF	015	EB	SS		9/12	14	6.5-8.2	7.3	Outside A-B Wilderness. Possible site for rehab.
Dick Lake	CF	013	EB	SS		9/12	12	5.9-8.5	7.2	Healthy EB population.
Lower Aero Lake	CF	029	EB (CT)	SS		7/21	8	8.8-15.7	11.4	Fish are unhealthy.
Marsh Lake	CF	019	CT	ST	1991	7/03	6	13.0-16.5	14.7	No evidence of the previous Rb plant.
Mermaid Lake	CF	091	CT	ST	1990	8/28	3	13.4-14.7	14.1	
Mosquito Lake	CF	189	GR CT	?? ST	1992	9/15	0			Change stocking to cutthroat 133/acre 6-year cycle.
Pablo Lake	CF	083	GT	SS		8/27	8	6.6-9.1	8.2	Downstream movement from Picasso Lake.

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Picasso Lake	CF	084	GT	ST	1984	8/27	0			
Production Lake	CF	044	EB	ss		7/31	14	6.6-10.4	9.0	
Shelter Lake	CF	034	EB	SS		7/30	8	7.7-9.3	8.2	
Stash Lake	CF	055	CT	ST	1991	7/31	17	9.7-13.4	11.8	Reduce stocking to 75/acre.
Stephanie Lake	CF	089	CT	ST-SS	1990	8/28	20	9.1-14.3	12.3	Stop stocking.
Swamp Lake	CF	017	CT	?? ST	1991	7/02	8	13.4-15.8	14.9	No evidence of earlier GR plant.
Unnamed Lake	CF	089a	CT	SS		8/28	11	6.9-13.4	8.4	Movement downstream from Stephanie.
Wiedy Lake	CF	018	CT	?? ST	1995	7/02	6	12.1-14.4	13.1	No evidence of earlier GR plant.
Arch Lake	ER	043	CT	ST	1989	8/07	22	11.9-14.1	12.8	Small 6-year-olds. Reduce plant 75/A.
Fossil Lake	ER	025	CT	ST	1995	8/28	20	7.7-15.6	11.8	
Lower Arch Creek	ER	041	CT	SS	1971	8/07	7	10.9-15.6	13.1	
Upper Arch Creek	ER	042	CT	SS	1991	8/08	33	8.3-15.7	12.6	Fish are reproducing well. Stop stocking.
Dude Lake	RC	067	CT	ST	1991	7/09	21	10.3-15.2	13.3	Check scales for age Some reproduction may be occurring.
Kookoo Lake	RC	058	CT	ST	1994	7/09 9/04	24 23	6.9-13.4 7.7-16.7	9.0 10.3	Some reproduction occurring. Sample each year until fish age out
Triangle Lake	RC	060	CT	ST	1994	7/09 9/04	2 2	13.2-14.6 14.2-17.7	13.9 16.0	No sign of 1994 plant.

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Unnamed Lake	RC	059				9/04	0			Add to data base. CT sometimes move down from Triangle.
Lake Wilderness	SR	002	CT	SS	1984	8/13	13	9.3-14.1	12.3	
Sioux Charley Lake	SR	007	EB RB	SS		8/14	28	5.4-9.7	7.9	No Rb taken in sample.
Wood Lake	SR	003	CT	ST	1989	8/13	4	11.0-15.0	13.3	
Avalanche Lake	WR	011	CT	ST	1992	7/16	4	8.7-12.1	9.9	Small 4-year-olds. Reduce to 100/a.
Nemidji Lake	WR	029	CT	ST	1994	7/17	11	9.6-15.5	13.3	
Weeluna Lake	WR	030	CT	ST	1989	7/17	25	11.0-17.0	14.2	Check scales for age, possible reproduction.

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1997 LAKE	DRAINAGE	CODE	SPECIES	STATUS	LAST STOCKED	SAMPLE DATE	NO. OF FISH	LENGTH RANGE (in)	MEAN LENGTH (in)	COMMENTS
Narrow Escape Lake	BR	004	CT	ST-ST+	1989	7/22	9	10.2-14.9	12.0	Stock once more and check for reproduction.
Prospect Lake	BR	043	RB	??-SS	1989	7/16	12	7.6-11.0	9.0	Stock with cutthroats. "Swamp out Rbs."
Rainbow Lake #2	BR	018	RB	SS		7/23	19	6.4-13.5	10.2	
Rainbow Lake #3	BR	019	RB	SS		7/22	8	9.1-14.5	11.3	
Rainbow Lake #4	BR	020	RB	SS		7/22	14	6.2-12.1	9.4	
Silver Lake	BR	042	RB	SS	1989	7/15	39	6.3-18.0	10.9	Stock with cutthroats. "Swamp out Rb"
Albino Lake	CF	245	CT	ST	1995	7/9	3	9.6-12.0	10.5	Still ice covered.
Golden Lake	CF	236	CT	??-ST	1994	7/10	9	13.8-16.1	15.2	Large 3-year-olds.
Jasper Lake	CF	237	CT EB CT	ST SS SS	1990	7/10 10/1	4 5 2	14.3-16.2 9.4-17.1 7.9-16.0	15.4 11.7 12.0	Small 7-year-olds.
Kersey Lake	CF	060	LT	SS	1981		4	13.7-21.2	17.9	
Leaky Raft Lake	CF	033a	CT	ST-ST+	1992	8/12	21	10.0-13.7	12.2	Two age classes present.
Upper Aero Lake	CF	031	CT	ST	1994	8/12	0			No fish observed or taken.
Zimmer Lake	CF	028	CT	ST	1992	8/13	12	8.7-11.7	9.6	Small 5-year-olds.
Blue Lake	CM	009	RB	SS	1930	8/20	18	8.3-11.4	9.5	
Crazy Lake	CM	004	CT	ST	1994	8/20	9	6.8-12.7	9.7	Small 2-year-olds.
Granite Lake	CM	010	RB	SS	1930	8/19	6	7.3-13.2	9.6	

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Phantom Lake	ER	047	CT	SS		8/26	3	7.2-13.9	10.5	
Slough Lake	ER	046	EB	SS		8/26	5	7.9-10.9	9.4	
Bowback Lake	RC	065	CT	ST	1996	9/3	11	11.0-12.9	11.9	
Kookoo Lake	RC	058	CT	ST	1994	9/3	18	9.3-18.0	12.1	
Lake Abundance	SC	001	CT	ST	1996	8/22	11	6.3-16.3	10.3	
Barrier Lake	SR	066	GTxRB	SS		8/6	10	8.4-13.5	10.3	
Cataract Lake	SR	008	CT	ST	1991	8/28	1	17.0-17.0	17.0	
Goose Lake	SR	042	CT	SS		8/21	18	8.8-11.7	9.7	
Lake Surrender	SR	086	CTxRBxGT	SS		8/6	8	8.0-14.7	11.6	
Raven Lake	SR	087	CTxRBxGT	SS		8/6	7	5.8-11.2	9.0	
Wounded Man Lake	SR	072	RB	SS	1946	8/26	16	7.8-13.20	10.3	
Arrapooash	WR	032	CT	Barren SS		7/29	29	7.7-14.6	12.9	Probable errant plant?
Little Face Lake	WR	033	CT	Barren ST		7/29	6	9.7-10.6	10.1	Possible errant plant?
Nugget Lake	WR	025	CT	ST	1992	7/30	14	10.9-17.4	12.7	Keep with new plan.

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Bridge Lake	BR	036	CT	ST	1995	8/3	13	10.0-17.2	13.7	
Canyon Lake	CF	118	CTxRB	SS		7/15	3	13.0-16.8	15.0	Hybrids are mostly CT.
Cliff Lake	CF	146	GR	SS	1955	7/15	15	7.6-13.5	9.1	
Corner Lake	CF	007	CT	SS	1980	8/12	3	6.9-12.5	10.3	
			EB	SS		7/14	35	6.2-11.9	8.4	
			RB	SS			2	10.2-14.7	12.5	
							0			
Fox Lake	CF	074	GR	SS						
Little Washtub Lake	CF	051	GR	ST	1996	8/26	10	7.5-8.2	7.7	
Lone Elk Lake	CF	035	GR	??	1996					
			EB	SS		8/25	14	6.7-9.8	8.3	No sign of grayling. Probably eaten by EB? (Restock)
Lower Aero Lake	CF	029	EB	SS		8/11	64	5.1-14.3	10.7	
			CT	ST			1	17.4-17.4	17.4	Monitor population for disease.
Rough Lake	CF	036	EB	SS		8/25	29	5.9-11.4	8.7	
			GR	ST	?					No sign of grayling? Replant with grayling when available.
Surprise Lake	CF	054	CT	ST+	1993	8/26	7	8.9-15.7	11.4	
Upper Aero Lake	CF	031	CT	ST	1994	8/12	0			Appears barren. Possible disease problem.
Duggan Lake	ER	021	CTxGT	SS		8/19	4	8.7-16.7		
Echo Lake	BR	037	CT	SS		8/20	5	9.9-15.8		Fish numbers are down.
Lake at the Falls	ER	012	CTxGT	SS		8/19	11	6.9-14.9	9.5	
Martin Lake	BR	013	GT	ST	1992	8/19	1	15.4-15.4	15.4	Restock with Golden.

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Oly Lake	ER	028	Barren			8/21	0			EB have not moved downstream from Billy Lake yet.
Rainbow Lake	ER	008	RBxGT	SS		8/18	2	7.5-9.3	8.4	Fish numbers are down.
Scat Lake	ER	014	GT	ST	1992	8/19	0			1 fish sighted in outlet. Good spawning potential in outlet.
Black Canyon Lake	RC	033	CT	ST		8/25	45	6.2-14.2	8.5	
Chrome Lake	SR	001	GR	ST	1997	7/07	0			Mine runoff inhibits fish survival.
Favonius Lake	SR	056	CT	SS		7/22	7	6.7-11.3	9.2	
Goose Lake	SR	042	CT	SS		8/22	29	4.9-11.2	8.7	Fish are not doing very well - thin.
Jordan Lake	SR	062	CT	SS		7/21	8	8.5-14.4	11.3	
Lake Dianne	SR	064a	GT	SS		7/22	5	7.6-10.2	9.5	GT migrated down from Sunken Rock Lake.
Mouse Lake	SR	055	CT	ST+	1992	7/23	22	7.5-14.3	11.9	Some reproduction is occurring.
North Picket Pin Lake	SR	105	CT	ST	1995	8/16	2	14.9-17.3	16.1	
Pentad Lake	SR	059	CT	SS		7/22	31	8.0-14.4	11.4	
South Picket Pin Lake	SR	104	CT	ST	1997	8/16	28	7.0-9.5	8.5	
Sunken Rock Lake	SR	064	GT	ST	1992	7/22	0			Fish moved downstream.
West Fishtail Creek Lake #40	SR	040	GT	SS		7/8	4	9.4-13.2	11.9	GT moved down from above.
West Fishtail Creek Lake #41	SR	041	GT	ST	1992	7/8	0			Stock when available with GT.
West Fishtail Creek Lake #41a	SR	041a	GT	ST	1992	7/8	0			Stock when available with GT.

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APPENDIX 2. (Cont.) **Summary of data collected during 1995, 1996, 1997, 1998 and 1999 by gill nets and hook-and-line from alpine lakes in the Absaroka-Beartooth and Crazy mountains.**

1998 LAKE	DRAINAGE	CODE	SPECIES	STATUS	LAST STOCKED	SAMPLE DATE	NO. OF FISH	LENGTH RANGE (in)	MEAN LENGTH (in)	COMMENTS
West Fishtail Creek Lake #43	SR	043	GT	ST	1992	7/8	34	8.8-16.5	13.7	Fish are reproducing.
Princess Lake	WR	006	CT	SS		7/28	11	12.4-16.3	14.1	Moved down from above. No sign of grayling.

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APPENDIX 2. (Cont.) **Summary of data collected during 1995, 1996, 1997, 1998 and 1999 by gill nets and hook-and-line from alpine lakes in the Absaroka-Beartooth and Crazy mountains.**

1999 LAKE	DRAINAGE	CODE	SPECIES	STATUS	LAST STOCKED	SAMPLE DATE	NO. OF FISH	LENGTH RANGE (in)	MEAN LENGTH (in)	COMMENTS
Kaufman Lake	BR	076	GR CT	ST SS	1992	8/12 8/12	0 13	11.3-17.3	15.2	Grayling have disappeared.
Silver Lake	BR	042	RB	SS		8/11	10	9.9-15.0	11.4	Swamp out RB with YCT.
Speculator Lake	BR	045	CT	ST	1992	8/12	48	6.9-13.7	11.2	Reduce to 100/acre.
Anchor Lake	CF	124	GT	??	1991,92	8/25	0			Change to 8 year stocking schedule.
Big Butte Lake	CF	125	GT	??	1992	8/25	0			Change to 8 year stocking schedule.
Broadwater Lake	CF	023	EB CT	SS ??	1996,98	7/20 7/20	26 0	6.3-10.2	7.7	Stock next 4 years.
Curl Lake	CF	022	EB CT	SS ??	1996,98	7/20	45 0	6.3-11.0	8.2	Stock next 4 years.
Desolation Lake	CF	127	GT	??	1991,92	8/26	0			Change to 8 year stocking schedule.
Dollar Lake	CF	061	GR CT	SS>ST SS		7/21 7/21	3 19	11.9-14.4 6.0-10.5	13.3 8.0	No young grayling. Supplement stock of grayling.
Indian Knife	CF	113	GR EB	??/SS >??	1985	8/25 8/25	4 1	8.0-12.8 14.5-14.5	10.6 14.5	Where did EB come from?
Kersey Lake	CF	060	EB CT LT	SS SS SS	1981	9/23	9 0 0	7.2-11.8	9.7	
Lake of the Clouds	CF	093	CT	ST	1996	8/18	12	6.8-14.4	9.2	
Lake of the Winds	CF	100	CT	ST	1993	8/20	24	10.0-13.5	11.8	
Leo Lake	CF	079	CT	SS	1968	8/18	4	10.5-13.5	11.9	
Mariane Lake	CF	102	EB	SS		8/19	15	6.5-11.5	8.7	

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Rock Tree Lake	CF	104	GT	>ST	1991,92	8/19	0			Change to 8 year stocking schedule.
Sedge Lake	CF	062	CT GR	SS ??	1992,97	7/21 7/21	20 0	6.4-11.2	9.0	Restock with GR.
Skeeter Lake	CF	149	GR	ST	1992,97	7/07	5	10.4-11.1	10.6	
Spaghetti Lake	CF	150	GR	??>ST	1992,97	7/07	18	11.2-12.9	12.2	
Triangle Lake	CF	110	CT	ST	1995	8/25	7	11.0-12.9	11.6	
Unnamed Lake	CF	126	GT	->ST		8/25	0			
Widowed Lake	CF	123	GT	??		8/26	0			
Campfire Lake	CM	023	CT	??	1992	7/13	0			Sample in 2000.
Cascade Lake	CM	016	CT	??	1982	7/12	8	17.3-21.8	19.5	No sign of young fish.
Cave Lake	CM	018	GT	??>SS	1992	7/12	11	8.3-18.8	13.3	GT now reproducing.
Lower Twin Lake	CM	014	RBxCT GR	SS ??>ST	1991,92	7/14 7/14	3 0	12.0	12.0	Restock GR.
Pear Lake	CM	011	RB	ST	1992	7/12	8	9.5-13.6	11.9	Fish were thin.
Upper Twin Lake	CM	013	RBxCT GR	SS ??>ST	1991,92	7/14 7/14	4 0	7.4-13.2	10.9	Restock GR.
Emerald Lake (WY)	RC	008	CT EB	ST SS	1987	8/05 8/05	8 2	9.8-16.0 12.5-13.0	13.9 12.8	CT now reproducing.
Glacier Lake	RC	009	CT EB	ST SS	1994,97	8/30 8/30	27 13	6.7-14.5 8.3-12.0	10.0 9.8	
Little Glacier Lake	RC	007	CT EB	ST SS		8/05 8/05	0 15	6.9-9.9	8.0	Movement from Glacier Lake.

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Mountain Goat Lake	RC	011	CT	ST	1998	8/04	9	11.3-15.5	13.3	
Mountain Sheep Lake	RC	012	CT	ST	1976	8/04	24	12.5-15.8	13.5	Movement from Mountain Goat Lake.
Silt Lake #2	RC	054	CT	ST	1992,96	7/21	8	9.1-12.2	10.5	
Silt Lake #3	RC	055	CT	ST	1992,96	7/21	0			
Triangle Lake	RC	010	CT	ST	1993	8/03	2	6.0-13.8	9.9	
Anvil Lake	SR	036	CT	ST>ST+	1993	7/27	11	7.5-15.9	12.3	Some reproduction
Beauty Lake	SR	034	CT	SS	1968	7/27	11	8.7-13.9	10.6	
Courthouse Lake	SR	021	CT	ST	1995	7/28	2	21.0-22.3	21.7	
Fly Lake	SR	025	EB	SS		7/28	39	6.1-10.7	9.1	
Lake Aries	SR	029	EB	SS		7/28	18	6.1-9.5	7.9	
Sourdough Lake	SR	024	EB	SS		7/27	10	6.1-9.0	8.0	
Spider Lake	SR	026	EB	SS		7/27	24	6.2-11.9	8.5	
Wrong Lake	SR	020	CT	??>ST	1993	7/27	13	9.5-11.9	10.7	

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