

**TRAPPING, SPAWNING, AND TREND SURVEYS OF BONNEVILLE CUTTHROAT
TROUT AT MANNING MEADOW RESERVOIR, 2004**

A Sport Fish and Native Cutthroat Trout Restoration Project

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November 2004

Introduction

This report provides results for the year 2004, the 13th consecutive year Bonneville cutthroat trout were trapped and spawned at Manning Meadow Reservoir, and makes comparisons among all years for spawning, trapping, and trend-netting activities. Bonneville cutthroat trout were introduced into the reservoir with transplants from Pine Creek in 1990 and 1991. Eggs were collected from spawning trout for the first time in 1992. Trout were trapped at either the reservoir inflow or at the spillway outflow. Eggs were taken manually from wild trout and incubated, hatched, and reared at state facilities.

Methods

The inflow trap was set on 10 June and operated until 23 June, 2004. The reservoir spilled for several weeks during early June and some fish were also trapped at the outlet. Spawning trout were trapped at these locations where they were attracted to moving water. The inlet trap included compartmentalized pens where fish could be collected, sorted, and held until spawning. Utah Division of Wildlife Resources personnel or other government agency volunteers were stationed at the reservoir for 24 hours per day while the inflow trap was in operation.

Spawning was conducted on June 16 and 23. The overall project and schedule was supervised by Glenwood Fish Hatchery personnel. Spawning was conducted by personnel from Egan Fish Hatchery. All fish were sorted and ripe fish were spawned using standard state methods. Females were spawned 10 fish at a time, with enough fish spawned to easily exceed 20 paired matings. Females and males were spawned at a ratio of about 2:1 or 1:1, depending on availability of ripe males. Five males were deemed a sufficient minimum to fertilize eggs from 10 females. Eggs were water hardened for at least an hour and then transported to the Fish Lake isolation station for incubation. Loa Hatchery personnel were responsible for egg care during incubation, until the eggs were fully eyed and then moved to the Glenwood Fish Hatchery for further rearing.

Disease certification was completed as required by standard protocol, including a 60-fish lethal sample and ovarian fluids from 60 females. Disease work was conducted by personnel from the Fisheries Experiment Station, Logan, Utah. Part of the lethal sample for disease certification was obtained from gill-net surveys conducted concurrently with spawning activities. The remainder of the 60-fish sample was taken from the spawning trap. Gill-net surveys were used to compare population trend data and condition of fish among years.

Data was recorded and tabulated to keep records on spawning times, number of trout trapped, number of fish spawned, size of trout, and number of eggs taken. In addition, data was recorded on relative fish densities and condition (K_{TL}) of fish in the reservoir to allow adjustments in

reservoir stocking rates and management of the brood stock. Measurements and estimates of various parameters are presented, at times, in English and metric units. English units were generally used to facilitate comparisons among fish culture aspects of the project. Trend data was reported in metric units, allowing consistency in comparisons among related data.

Results and Discussion

Spawning during 2004 occurred during mid-June, about mid-range for all years that spawning was conducted at Manning Meadow Reservoir (Table 1). Total number of eggs taken was the third highest for all years, but less than in 2001 and 2002 (Tables 2 and 3). The project was completed by spawning on two days, scheduled a week apart, compared to some years when eggs were collected over 3 weeks. Total number of trout trapped peaked in 2001 at 1,809 and decreased to 546 in 2004. Size of trout and number of eggs per female continued to increase through 2004 (Figure 1), reaching the highest values since 1994-1995, although lengths were mistakenly not recorded for 2004. Reservoir stocking since 1998 was adjusted to reduce overall fish density, increase mean age and size of trout, and maximize egg-taking potential. Since trend netting data was first conducted in 2000, mean fish length increased from 296 to 385 mm and mean weight more than doubled from 280 to 709 g (Table 4). Also, condition improved from 1.05 to 1.24 (Figure 2).

Of concern, however, the overall gill-net catch was only 7 fish per net-night in 2004 (Table 4). Catches of 20-30 trout per net-night are considered good with higher values thought to be excessive enough to impair growth and condition of trout. Fish density at Manning Meadow Reservoir during the years from 2000 to 2002 was higher than desired but then suddenly dropped to a level that caused some concern in 2003 and remained low in 2004. Trends in trout numbers collected in the spawning trap, overall increases in average fish size, and increased mean condition verified a substantial reduction in reservoir fish density. Although a reduction in density was a management objective, caution needs to be taken to avoid further reductions in fish numbers.

Discontinued stocking of “holdovers” (age 1 fish held over-winter in the hatchery) since 1998 was the main means of reducing overall trout abundance (Table 5). Since then, replacement of the reservoir brood stock was totally dependent on stocking of “fry” (age 0 fish stocked the same year eggs are taken). Fry are deemed a better alternative to stocking holdovers (providing that survival is adequate) because: (1) fry minimize any potential selection on the brood stock due to hatchery rearing; (2) they have an appearance similar to wild trout with little fin damage compared to holdovers; and (3) stocking of fry minimizes the chance of inadvertently stocking other nonnative trout from a hatchery source compared to holdovers because they spend substantially less time in the hatchery. Stocking of fry during 2003 and 2004 was increased to 20,000 fish or more in attempt to stabilize fish numbers and avoid continued decreases in overall size of the spawning population. It is recommended that an annual stocking rate of 20,000 fry be evaluated over the next few years.

The abundance of holdovers (identifiable by fin condition) in gill-net samples and spawning traps declined to 23 % by 2004 (Table 4). Conversely, 77% of the fish observed during 2004 resulted from fry stocking. Holdovers were at least 7 years old -- the last time they were stocked was 1998 (Table 5). Trout reaching this age are unusual in most local sport fisheries and obviously the result of catch-and-release fishing regulations imposed at Manning Meadow Reservoir. The age and size distribution of the population also demonstrates that maximum size attained is a function of population density rather than fish attaining exceptionally old age.

A review of the stocking history, gill-net results, and spawning totals suggests that low numbers of spawning adults might occur for another year or two. After that, numbers should show some increase from the increased stocking rates of fry in 2003 and 2004. Prior to development of the native Bonneville cutthroat trout brood stock, which was initiated in 1990, Manning Meadow Reservoir was managed with Yellowstone cutthroat trout. A regular quota of 20,000 fry was stocked per year which produced and maintained a sizeable adult trout population. Our current stocking recommendation is based on the assumption that results will be generally similar for Bonneville cutthroat trout, given the same stocking rate as once used for Yellowstone cutthroat trout. Achieving balance among reservoir fish density, fish size and condition, and stocking rates will likely require some continual adjustments over time, but a “more or less” standard stocking rate should be attainable that will produce generally acceptable results.

Table 1. Bonneville cutthroat trout spawning times at Manning Meadow Reservoir, Utah 1992-2004.

Year	Trap operation dates		Dates spawned		Number days spawned	Lake water temperature (Fahrenheit)	
	Begin	End	First	Last		First spawn	Last spawn
1992	2 June	30 June	16 June	30 June	3	55	62
1993	21 June	6 July	22 June	6 July	3	62	62
1994	14 June	22 June	16 June	22 June	2	56	60
1995	3 July	11 July	5 July	11 July	2	60	62
1996	24 June	2 July	26 June	2 July	2	58	60
1997	23 June	1 July	25 June	8 July	3	59	62
1998	29 June	13 July	1 July	13 July	3	58	63
1999	18 June	6 July	22 June	6 July	3	58	62
2000	5 June	13 June	6 June	13 June	3	58	59
2001	12 June	20 June	14 June	20 June	2	58	61
2002	7 June	18 June	11 June	18 June	2	58	61
2003	13 June	25 June	18 June	25 June	2	55	57
2004	10 June	23 June	16 June	23 June	2	59	59

Table 2. Spawning totals at Manning Meadow Reservoir during 2004.

Date	Lake water temperature	Number females spawned	Number males spawned	Total eggs	Eggs per ounce	Mean number of eggs per female
16 June	59	133	69	170,488	318	1,282
23 June	59	90	87	86,496	318	961
Total	–	223	156	256,984	318	1,152

Table 3. Bonneville cutthroat trout spawning totals at Manning Meadow Reservoir for 1992-2004.

Year	Number of females spawned	Mean length (inches)		Total eggs	Eggs per fluid ounce	Mean number of eggs per female	Total number of trout trapped
		Female	Male				
1992	27	13.4	–	19,218	361	712	–
1993	61	15.2	–	61,148	328	1002	–
1994	45	15.8	–	57,000	345	1267	–
1995	218	13.5	14.4	176,896	383	811	–
1996	198	13.5	14.2	136,980	283	691	485
1997	141	14.4	14.8	92,603	368	657	271
1998	116	14.3	12.7	80,514	359	694	330
1999	296	12.4	13.1	198,895	420	672	744
2000	265	12.7	13.2	173,484	377	655	1099
2001	516	12.9	13.5	330,129	375	640	1809
2002	560	13.4	14.1	368,688	327	658	1310
2003	270	14.1	14.5	223,614	369	828	753
2004	223	–	–	256,984	318	1152	546

Table 4. Annual trend gill-net results at Manning Meadow Reservoir, 2000 - 2004 (CTSB = Southern Bonneville cutthroat trout).

Year	Number nets set overnight and (total CTSB caught)		Number CTSB caught per net-night	Mean total length (mm) (range)	Mean weight (g) (range)	Mean KTL	Number CTSB from "fry" stocking (%)	Number CTSB from "hold-over" stocking (%)
	Floaters	Divers						
2000	1 (79)	1 (86)	83	296 (187-391)	280 (67-596)	1.05	74 (45%)	91 (55%)
2001	1 (38)	1 (90)	64	310 (213-397)	320 (79-597)	1.07	84 (66%)	44 (34%)
2002	1 (46)	1 (72)	59	332 (220-380)	427 (119-636)	1.15	78 (66%)	40 (34%)
2003	1 (7)	1 (9)	8	359 (288-409)	596 (317-1050)	1.29	12 (75%)	4 (25%)
2004	1 (7)	1 (6)	7	385 (340-435)	709 (446-1056)	1.24	10 (77%)	3 (23%)

Table 5. Total number, size, and age of Bonneville cutthroat trout stocked in Manning Meadow Reservoir as brood stock replacement, 1990-2004. Transplants were of various sizes and ages, holdovers were age 1 (5-8 inches mean total length), and fry were age 0 (1.5-2.5 inches mean total length). Holdovers were stocked in June and July. Fry were stocked in October.

Year	Number fish stocked		
	Transplants	Holdovers	Fry
1990	469	-	-
1991	245	-	-
1992	-	-	-
1993	-	1,995	-
1994	-	1,999	4,648
1995	-	-	6,024
1996	-	-	5,060
1997	-	1,499	8,202
1998	-	2,008	9,506
1999	-	-	12,428
2000	-	-	12,001
2001	-	-	10,729
2002	-	-	-
2003	-	-	20,000
2004	-	-	24,515