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1998 STATEWIDE FISH STOCKING PROGRAM

PUT-GROW-AND-TAKE

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INTRODUCTION

Cabinet Gorge Fish Hatchery (CGFH) is located on the south bank of the Clark Fork River in Bonner County, Idaho, approximately eight miles southeast of the community of Clark Fork. The CGFH was constructed in 1985 and was co-funded by Washington Water Power (WWP), Bonneville Power Administration (BPA), and Idaho Department of Fish and Game (Department). The primary purpose for CGFH is to produce late-spawning kokanee salmon *Oncorhynchus nerka kennerlyi* fry for release into Idaho's Lake Pend Oreille. Kokanee fry are needed to mitigate for the loss of wild kokanee recruitment caused by hydroelectric power projects in the Pend Oreille watershed. The kokanee fry release is timed to coincide with cycles of zooplankton blooms.

The CGFH is staffed with two permanent employees. Thirty-three months of temporary labor are available for use during the year. Housing accommodations include two residences for the permanent staff and crew quarters for two temporary employees.

Water Supply

Cabinet Gorge Dam is located about one mile upstream from the CGFH. After its completion in 1952, artesian springs began appearing along the Clark Fork River at the present site of the hatchery. The CGFH water supply consists of approximately 4.4 cfs from a spring and approximately 20 cfs from a well field. The temperatures of the lower spring and upper well field vary inversely with each other over a 12-month period. The cooler water from the lower springs (pumps #7 and #8) were utilized to incubate eggs. A mixture of the two water sources allowed incubation and early rearing water temperatures to be maintained around 50°F (range 44°F to 51.5°F). Production water ranged from 38.8°F to 49.3°F.

The CGFH utilizes six pumps to move water to a common headbox. The lower spring and upper well field water serves the 31,000 cubic feet (cf) of rearing space in the hatchery building and the 1,500 cf of space in the adult holding ponds.

Rearing Facilities

Rearing facilities at the CGFH include 192 upwelling incubators and 64 concrete raceways. The incubators are 12 inches in diameter by 24 inches high with a maximum capacity of 140,000 kokanee eggs each. In addition, a total of 30 upwelling incubators, which are 6 inches in diameter and 18 inches high, are available. The smaller incubators have a maximum capacity of 30,000 kokanee eggs. The 6-inch incubators may also incubate up to 6,500 fall Chinook salmon eggs. The 64 concrete raceways have rearing space of 31,000 cf. The hatchery building encloses approximately one-third of each raceway. The adult kokanee holding area consists of two holding ponds (10-ft x 30-ft each) at the head of the fish ladder. Additional adult holding is available in three holding ponds (10-ft x 30-ft each).

PRODUCTION

Between January 1, 1998 and December 31, 1998, CGFH produced a total of 3,914,255 fish weighing 9,460 lbs (Appendix 1). On January 1, 1999, a total of 8,955,972 Lake Pend Oreille kokanee salmon eggs and newly hatched fry were on hand (Appendix 2). In addition, a total of 2,195,206 early kokanee salmon fry, 97,073 fall chinook salmon fry, and 928,838 rainbow trout eggs and newly hatched fry were on hand.

A total of 8,435 lbs of feed produced 8,607 lbs of gain for an overall feed conversion of 0.98. Total production cost (less capital outlay) was $222,220.00 resulting in a cost per lb of fish of $23.49, cost per inch of fish of $0.0299, and $56.77 per thousand fish (Appendix 1).

Lake Pend Oreille Kokanee

General Rearing

Fertilized eggs were brought to the CGFH and disinfected in 100-ppm PVP iodine for 10 minutes. After enumeration by volumetric displacement, the green eggs were placed into upwelling incubators until eye-up. At eye-up the eggs were shocked, sorted and counted with the Jensorter JHC-114 model sorter. Fry were allowed to swim out of the incubators into the raceways at 1,500 to 1,520 temperature units (TUs). All fry were thermally mass marked via temperature manipulation in the raceways. Feed training began at 1,700 to 1,720 TUs.

Kokanee were feed trained at approximately 50°F using Rangen Trout and Salmon starter for 17 days. Feed training continued from the 18th day to the 34th day utilizing a 50:50 mix of Trout and Salmon starter and Trout and Salmon starter #1. On day 35 the fry were placed on Trout and Salmon starter #1 only. The fry remained on Trout and Salmon starter #1 until they reached an average size of 800 fish per pound. The fry were then placed on Trout and Salmon starter #2 for the remainder of the rearing season. Release size objectives have changed from about 1.3 fry inches (1986) when the CGFH began operations to the present request of a 2-inch average size at release. To meet the request, the CGFH capacity has been reduced from 30 million fry to 16 million fry.

Egg collection lasts over two months, and a cross-section of the run is required for each release strategy. Growth rates were not manipulated during the 1998 season to achieve a universally sized 2-inch fry. The fish were reared using 38 monthly temperature units per inch of growth. For the fourth consecutive season, fish were not taken off feed or overfed to attain the average 2-inch size parameter at release. After approximately six weeks of feed training, the fry were extended in the raceway, and water temperatures were lowered to emulate natural production in Lake Pend Oreille.

A total of 2,909,071 kokanee fry were produced at an average length of 1.89 inches and an average weight of 496 fish per lb. These fish gained 5,350 lbs from 4,917 lbs of feed, resulting in a conversion rate of 0.92:1.0. Fish feed production cost was $26.20 per lb, $0.0301 per inch, and $58.43 per thousand for Lake Pend Oreille kokanee. Whatcom Lake kokanee production cost was $21.34 per lb, $0.0225 per inch, and $42.29 per thousand.

Survival of green eggs to feeding fry for Lake Pend Oreille kokanee was estimated at 76.9% (1997, 83.9%). Survival from first feeding to release was estimated at 98.1% (1997 98.8%), resulting in survival from green egg to release of 75.0% (1997 82.9%). The Lake Whatcom kokanee eggs were received at eye-up. Survival of eyed-eggs to feeding fry was estimated at 97.5%. Survival from first feeding to release was estimated at 98.2%, resulting in survival from eyed-egg to release of 95.7%.

Fish Marking

To evaluate the success of a kokanee stocking program in Lake Pend Oreille, an otolith marking (Volk, et al. 1990) program was initiated at CGFH. All kokanee fry received a thermally induced otolith mark.

Otolith marking normally occurs between eye-up and button-up stages, but plumbing at CGFH precluded normal procedures due to its inability to accommodate supplying two water sources of different temperatures to the incubating eggs and sac fry. The incubation vessels, however, allowed for volitional swim-up of fry into separate rearing raceways, which were plumbed to accommodate a marking program. This situation provided the impetus to attempt marking fry at the end of the button-up.

Analysis of pre-release voucher specimens (Grimm, et al. 1998) verified the presence of a recognizable otolith mark on all thermally treated fry. The thermal marks (T-marks) from the 1997 brood were unambiguous and easy to recover from both the pre-release vouchers and the trawl specimens.

Two factors contributed to the success of the T-marking and recovery of the T-marks. The first was the ability to manipulate water sources separately in each raceway without affecting the water in the other raceways. The second was the small (less than ten days) spread of the egg takes that were in each raceway. These factors allowed CGFH personnel to thermally treat groups of fry that collectively were at the same developmental stage. That is important because it places the otolith pattern in relatively the same geographic region of the otolith, making examination for and recovery of the mark much easier.

Creating and recovering the T-mark for the 1996 and 1997 CGFH kokanee brood was successful. Adjustments to spacing between thermal events will be made to the 1998 brood T-marking effort to create artificial patterns less similar to natural daily increments patterns.

Trawl surveys in Lake Pend Oreille were conducted during September 1998. Twelve trawl hauls were made in each of three sections of the lake. There were 100 age-0 and 100 age-1 fry collected and sent to the Washington Department of Fish and Wildlife otolith lab for analysis. By examining the otoliths, they were able to determine wild fry from hatchery fry. Hatchery fry made up 67% of the age-0 samples while wild fry made up the remaining 33%. Hatchery fry made up 36% of the age-1 sample while wild fry made up the remaining 64%.

The success of the program has been encouraging. The most beneficial part of the program is that it is cost effective. A total of 2.9 million fry were T-marked and no additional costs were required. In the years to follow, it will be possible to improve estimates of these year classes of fish in Lake Pend Oreille.

Fish Liberation

On June 16-17, 1998, 2,483,740 kokanee fry were released into Sullivan Springs. No fry were released into the Clark Fork River during the summer of 1998.

Numbers at release were based upon Jensorter counter/sorter inventory numbers at eye-up, minus mortality. All fish were off feed for three full days before inventory pound counts were taken. Pound counts were completed on all raceways three days prior to fish being loaded onto the transport vehicles. All raceways were displaced onto the transport trucks during the Sullivan Springs release to double-check inventory numbers. Weight displacements were performed to support current fish inventory numbers on hand at the time of release.

The Sullivan Springs release group was transported in one Department tanker (3,000-gal capacity). Loading densities of small fish in the tankers was kept below 0.60 lbs per gal. Fish were planted below the bridge on the access road to the Department patrol cabin. One tanker made four releases during the period of June 16 through 17, 1998.

Other Species

On April 30, 1998, a total of 748,316 rainbow trout were transferred to the Hagerman State Fish Hatchery. The fry averaged 480.9 fish per lb and had attained a length of 1.72 inches. In addition, on April 30, 1998, a total of 159,299 kamloop trout were transferred to the Hagerman State Fish Hatchery. The fry averaged 585.7 fish per lb and had attained a length of 1.62 inches.

On June 16, 1998, a total of 11,436 fall Chinook salmon were planted into Deadwood Reservoir, a total of 17,141 fall Chinook salmon were planted into Lucky Peak Reservoir, and a total of 16,692 fall Chinook salmon were planted into Arrowrock Reservoir. The fish averaged 55 fish per lb and had attained a length of 3.92 inches.

On June 18, 1998, a total of 52,300 fall chinook salmon were planted into Coeur d'Alene Lake. The fish averaged 55 fish per lb and had attained a length of 3.92 inches.

On June 16, 1998, a total of 75,295 kokanee salmon were planted into Lucky Peak Reservoir. The fry averaged 485.78 fish per lb and had attained a length of 1.9 inches. The fry originated from Lake Whatcom stock.

On June 19, 1998, a total of 144,190 kokanee salmon were planted into Salmon Falls Creek Reservoir; a total of 125,304 kokanee salmon were planted into Island Park Reservoir; and a total of 70,824 kokanee salmon were planted into Ririe Reservoir. In addition, a total of 9,715 kokanee salmon were distributed into Deep Creek, Devil's Creek, and Montpelier Reservoirs. The fry originated from Lake Whatcom stock.

HATCHERY IMPROVEMENTS

Repairs and Improvements

- Occupational Safety and Health Administration (OSHA) safety materials were purchased and installed during the 1998 season. Metal grating was installed in the hatchery building for wheelchair access. The hatchery bathroom sink and handrail were modified to comply with changing regulations. In addition, the piping under the sink was insulated and an elevated toilet seat was made available. A new concrete slab was installed at the main entryway to the hatchery for handicap access. Handicap signs were installed to direct handicap vehicles to designated parking areas.

- The residence #2 wooden deck was improved and a sliding glass door was installed in the master bedroom.

- Residence #1, residence #2, and the generator #2 building were painted during the summer of 1998.

- Two new shelves were installed in the hatchery bathroom cupboard.

- Raceway baffle storage racks were constructed and installed in the feed storage building. In addition, a new tool rack was installed.

- A new Cabinet Gorge Fish Hatchery brochure was designed and made available for distribution. Local clubs donated the funding for the set-up and printing of the brochures. A total of 7,000 brochures were on hand at the hatchery during the fall of 1998.

- A total of three ball valves were replaced in the hatchery building during the fall of 1998.

- Eleven new adult fish measuring boxes were constructed at the hatchery and donated to weigh stations that serve the Lake Pend Oreille Idaho Club. Two additional boxes remain at the hatchery.

- All four 50 H.P. turbine motors had oil changes during the summer of 1998.

- All department vehicles, tractors, and small engines were serviced regularly and repaired as needed.

- Back-up generator #1 was load tested weekly and maintenance checked daily during operations. Generator #2 was operated weekly (with no load) and load tested monthly (with pump #8 only).

- The pac column by the upper adult holding ponds was modified to adequately degas the 4-6 CFS of water. The original pac column was far from adequate for the volume of water passing through it.

- A modification to the Sullivan Springs/Granite Creek catwalk was completed during the fall of 1998. The catwalk was completely rebuilt and safety guardrails were installed.

- All of the CGFH fire extinguishers received annual servicing. In addition, the Stancraft boat engine fire extinguisher was serviced.

- All of the upwelling incubators were standardized to eliminate old, experimental incubators that had been modified during previous years. All incubator manifolds were rebuilt, perforated plating checked, and floor maintenance buffing pads checked. New pads were purchased and installed in a large portion of the incubators. The remaining incubators will have new pads installed during the 1999 season.

- A total of 128 square feet of additional shelving was installed adjacent to the upper adult holding ponds. The area will supply hatchery personnel with additional space for the storage of materials and supplies.

- Generator #1 was load tested on September 2, 1998 by Intermountain Generator Service. In addition, generator #1 was serviced (oil, antifreeze) after the load testing was completed.

- Supplies for the new headbox catwalk were received during 1997. The new catwalk was installed during the summer of 1998. The electrical conduit supplying power to the alarm system was modified so that the project could be completed.

- Pumps 2-8 had the electrical contacts checked, cleaned, and replaced if necessary in the fall of 1998. Cedar Street Electric of Sandpoint, Idaho performed the work.

HATCHERY RECOMMENDATIONS

Inadequate amounts of available warm water (50°F) during the production months remain the limiting factor for fish production. Although the upper well field can yield up to 20 cfs, it is too cold during the production cycle. Warmer water from the lower springs must be added to temper the upper well field water. Unfortunately, only 4.4 cfs is available from the lower springs. It has been proposed that an additional pumping station be installed on the lower spring's pipeline to help lift or push the water up to the CGFH headbox. The additional station could add approximately 1.6 cfs of warm water to the current system. The lower springs collect approximately 6 cfs of available water but the means to pump it is unavailable. Currently, generator #1 backs up a total of 19.4 cfs (pumps #8, #7, #6, #5, and #4) and a total of 7.2 cfs is backed up by generator #2 (pumps #3 and #8).

FISH SPAWNING

Fish Trapping

The Clark Fork River fish trap was in operation from August 26, 1998 to December 29, 1998. The first adult kokanee entered the trap on September 25, 1998, and trapping and spawning continued through the end of December. There were 3,876 adult kokanee trapped. Spawntaking records indicated 34.65% (50% in 1997, 70 fish trapped) of the spawning run was female (1,058). From August 26, 1998 to October 12, 1998 the trap was used to collect and sample bull trout. A total of 38 adult bull trout were trapped, tagged, and released.

The Sullivan Springs trap was in operation from October 19, 1998 to December 28, 1998. The Sullivan Springs trap collected 88,120 adult kokanee salmon. Of these, 10,614 adults were passed above the trap to spawn naturally in Sullivan Springs Creek. Spawntaking records showed that 37.36% (24.75% in 1997) of the run was female (27,497).

Spawntaking and Eggs Received

Clark Fork River kokanee spawntaking began on November 9, 1998 and continued to December 23, 1998. Spawntaking activities occurred from November 4, 1998 to December 24, 1998 at the Sullivan Springs collection facility.

A total of 8,955,972 green fertilized kokanee eggs were collected during the 1998-1999 spawning season. Of those, 324,926 (7,851 in 1997) were obtained from 1,058 female kokanee at CGFH, and 8,631,046 (593,810 in 1997) were obtained from 27,497 female kokanee at the Sullivan Springs trap.

FISH FEED

The fish produced during 1998 were fed a total of 8,435 lbs of feed. All fish feed was acquired from Rangen Inc. The overall conversion was .98 lbs of feed to produce one lb of fish, not including the weight of mortality (Appendix 2).

PUBLIC RELATIONS

The surrounding communities recognize the CGFH as the major contributor of kokanee to the Lake Pend Oreille fishery. The importance of this local fishery to the local economy is presently estimated at over five million dollars. The CGFH has been the focus of many radio, television, and newspaper stories in recent years. With the decline of kokanee numbers in recent years, even more attention is focused on the CGFH. Because of the popularity of the lake and its attractions, tourism is a booming business, and we have people from all over the world visiting the CGFH.

A total of 300 people signed our guest registration book during 1998. An estimated 550 visitors toured the CGFH during the 1997 season. In addition, tours were given to school groups and other organizations.

The CGFH held an open house on May 16, 1998. It was the second open house since the CGFH began operations in 1986. A total of 50 people toured the CGFH on that Saturday. Most of them were local residents from Northern Idaho, Western Montana, and Eastern Washington.

ACKNOWLEDGMENTS

The CGFH staff would like to thank the Cabinet Gorge Dam personnel for their continued cooperation with hatchery operations. Thanks also to the Lake Pend Oreille Idaho Club, Bonner County Sportsmen's Association, numerous volunteers, and various regional and hatchery Department personnel for their cooperation during the spawning season.

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APPENDIX

Appendix 1. Production summary for Cabinet Gorge Fish Hatchery, all species, 1998.

Species	Number	Pound	Length	Fish/ Lb.	Feed Fed	Feed Cost	Annual Cost	Cost/lb of fish	Cost/1000 fish	Cost/inch of fish	Conv.
PDO kokanee	403,771	900	1.94	448	896	$ 578.49	$ 23,593.06	$ 26.20	$ 58.43	0.0301	1.08
Whatcom kokanee	2,505,300	4,965	1.88	505	4,022	$ 2,597.89	$ 105,951.41	$ 21,34	$ 42.29	0.0225	0.89
Wash.FC	94,989	1,710	4.93	56	2,025	$ 1,308.02	$ 53,345.87	$ 31.20	$ 561.60	0.1433	1.24
CdAFC	2,580	57	5.32	45	78	$ 50.07	$ 2,041.83	$ 35.82	$ 791.41	0.1880	1.41
Rainbow trout	748,316	1,556	2.73	481	1,188	$ 767.13	$ 31,286.16	$ 20.1	$ 41.81	0.0243	0.90
Kamloops trout	159,299	272	2.63	586	228	$ 147.16	$ 6,001.67	$ 22.06	$ 37.68	0.0233	0.96
Totals/Average	3,914,255	9,460	2.55	353.5	8,437	$5,448.76	$222,220.00	$26.12	$255.54	0.07	1.08

Appendix 2. Lake Pend Oreille kokanee spawntaking summary, 1998.

Spawntaking Site	Total Fish	Females Spawned	Green Eggs	Fecundity	Percent Females
Sullivan Springs	88,120	27,497	8,631,046	314	37.36%
Cabinet Gorge	3,876	1,058	324,926	307	34.65%
Totals/Average	**91,996**	**28,555**	**8,955,972**	**314**	**35.41%**

Total fish includes male/female prespawn mortality.

1998 ANNUAL PERFORMANCE REPORT

State of: Idaho

Program: Fisheries Management F-71-R-23

Project I: Surveys and Inventories

Subproject I-G: Upper Snake Region

Job: Henry's Lake

Title: Lowland Lakes Investigations

Contract Period: July 1, 1998 to June 30, 1999

ABSTRACT

The 1998 spawning operations at Henrys Lake produced 1,399,939 eyed cutthroat trout eggs and 408,695 eyed hybrid trout eggs. Cutthroat trout in the Hatchery Creek run averaged 444 mm and hybrid trout averaged 445 mm. Brook trout spawning and the supplemental stocking program was discontinued in 1998. Catch composition in six net nights of gillnetting at Henrys Lake was 62% cutthroat, 15% hybrid, 20% brook trout, and 3% Utah chubs.

Pathology tests did not detect *Myxobolus cerebralis* in Henrys Lake cutthroat trout in 1998.

Preliminary genetic analyses of the Hatchery Creek spawning run (one-day, 60 fish sample in late April) indicate that most cutthroat trout are introgressed at some level with rainbow trout. Because many of the hybrids are F2 or greater backcrosses with cutthroat, phenotypic traits were not useful for distinguishing pure cutthroats from hybrids in the spawning run. Additional genetic samples taken throughout the run will be required to fully describe the level of introgression and develop management strategies to enhance the genetic purity of the hatchery run. Genetics samples from naturally produced fry in three major spawning tributaries were not analyzed in time for inclusion in this report.

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METHODS

Henrys Lake

Spawning Operation

The Hatchery Creek fish ladder was opened on March 2 and remained in operation until May 4. Fish ascending the ladder were identified as cutthroat or hybrid trout and enumerated. A sub-sample of approximately 10% of each group was measured (fork length - mm). Hybrid trout were produced with cutthroat trout eggs and Kamloops rainbow trout sperm obtained from Hayspur Hatchery. Cutthroat trout males and females were spawned to produce cutthroat trout for supplemental stocking in Henrys Lake and other Idaho fisheries.

Disease samples were taken from the cutthroat spawning run. Ovarian fluids were collected from cutthroat (seven-fish pooled samples) during spawning at Henrys Lake Hatchery. All samples were sent to the Eagle Laboratory for analysis.

Due primarily to budget constraints, and concerns for Yellowstone cutthroat conservation, the brook trout spawning and supplemental stocking program was discontinued.

Genetic Analysis

Genetic status and purity of Henrys Lake Yellowstone cutthroat trout have not been assessed. The past history of non-native trout introductions, and 30 years of viable hybrid stocking would suggest that Henrys Lake cutthroat are likely introgressed at some level. Regardless, phenotypically "pure looking" cutthroat are still common, and the existing stock remains well adapted to the system. In 1995, natural recruitment provided an estimated 70% of the cutthroat population in the lake. Describing the current genetic status of the hatchery and naturally-spawning components will help us define the population as a whole, and its contribution to present Yellowstone cutthroat distribution. A comprehensive genetic inventory, including tributaries, will help us identify and prioritize potential Yellowstone cutthroat conservation projects.

On April 23, near the end of the Hatchery Creek spawning run, we sacrificed 60 adults at the fish ladder for genetic analysis. Hatchery personnel used phenotypic traits (i.e., coloration, spotting pattern, scale size) to select 20 putative pure Yellowstone cutthroats, 20 F1 hybrids (produced at the ladder in previous years), and 20 fish with intermediate characteristics. Each fish was euthanized and photographed. We recorded a variety of readily observable phenotypic traits (Appendix A) for each fish. Liver, heart, eye, and muscle tissue were removed from each fish, placed in labeled bags, and stored on dry ice. We also clipped one pelvic fin from each fish and placed

them in individually labeled vials containing lysis buffer solution. Samples were analyzed by University of Idaho staff at the Aquaculture Research Institute. Tissue samples were used for protein electrophoresis, and fin clips were used to assess mitochondrial DNA (mtDNA) patterns.

From mid-July through mid-September, we collected naturally produced cutthroat trout fry that were emigrating from Howard, Targhee, and Duck creeks back to Henrys Lake. Individual fry were placed in labeled vials containing lysis buffer, and transported to the Aquaculture Research Institute. Fry samples were not analyzed in time for inclusion in this report.

Gillnetting

As part of routine population monitoring, on May 19-20 gill net samples were collected from six standardized locations (total six net nights). Nets were set at dusk and retrieved the following morning. Captured fish were identified as to species, measured, and weighed.

Tributary Fry Trapping

In 1998 we began preliminary efforts to quantify natural production from key tributaries to Henrys Lake. From July 14-16 we installed Krey-Meekin fry traps near the mouths of Targhee, Howard, Timber, and Duck creeks. Traps were monitored daily through early September (Howard, Timber, and Duck creeks) or early October (Targhee Creek). Captured fry were enumerated, and a sub-sample measured (total length - mm). When catch rates were sufficient, we estimated trap efficiency by marking and releasing fry 100 m to 200 m above the traps. Fry were marked by immersion in a solution of Bismark brown dye (.75 g in 3-4 gal water) for 20 min. Marked fry were held in live cages overnight to assess mortality, and then released above the trap. Recaptures were so noted on subsequent days. Where possible, we estimated total fry emigration past the trap by dividing catch by efficiency.

Limnology

Late winter (January, February 1999) under-ice dissolved oxygen concentrations were assessed at three established sampling sites throughout Henrys Lake. Data from previous years were compared to 1999 data to describe trends in winter oxygen depletion and risks of winter kill.

Sterile Hybrids

In March 1996, Research personnel heat-shocked approximately 70,000 rainbow x cutthroat hybrid eggs to induce triploidy (Dillon and Alexander 1997). Another 30,000

hybrid eggs served as controls. All were reared at Ashton Hatchery. Blood work indicated 46% triploidy in treatment groups. Treatment and control fish were given left and right pelvic fin clips, respectively. Two thousand of each group were stocked into the East Harriman Pond in September 1996.

In March of 1997, Research personnel modified heat-shock treatments and again attempted to produce triploid hybrids. These fish were reared along with controls at Grace Hatchery. One treatment (27°C, 10 minutes after fertilization, 10 minute duration) provided a 70% triploidy rate. Treatment and control fish were given left and right pelvic clips, respectively, and stocked (2,000 each) into the East Harriman Pond in September 1997.

In March 1998 we continued heat-shock experiments using six different treatments with a range of timing and temperatures. Fertilized eggs were separated into lots of 1,000 to 2,600 eggs and poured into small screen trays prior to heat shocking. For each timing variation (10, 20, 25, and 30 min after fertilization), one control egg lot was taken and subjected to the same handling, but was not heat-shocked. One additional egg lot served as a handling control, and was fertilized, water-hardened and incubated in a manner similar to normal production eggs. Eye-up rates were evaluated for each treatment, and test lots were hatched and reared at Grace Fish Hatchery. In late July, blood samples were taken from 30 fish in each treatment group and evaluated for ploidy level.

We sampled the East Harriman Pond in August 1998 to assess relative performance of sterile triploid and control diploid hybrids from brood year 1996 and 1997. We used drift boat mounted electrofishing to collect fish. We recorded total length and clips of all hybrids, and took blood samples from each hybrid to verify ploidy level.

RESULTS AND DISCUSSION

Henrys Lake

Spawning Operation

A total of 4,677 cutthroat trout (2,380 males and 2,297 females) ascended the spawning ladder between March 3 and May 4. Hybrid trout totaled 5,418 fish, with 2,788 males and 2,630 females. Mean length for male and female cutthroat was 450 and 430 mm, respectively (Figure 4). Combined average cutthroat trout length was 444 mm. Hybrid trout males and females averaged 449 and 440 mm, respectively (Figure 5). Combined average hybrid trout length was 445 mm.

Cutthroat green eggs totaled 2,321,690 from 1,094 females for an average fecundity of 2,122 eggs per female. Eyed cutthroat eggs totaled 1,399,939 for an overall eye-up rate of 62%.

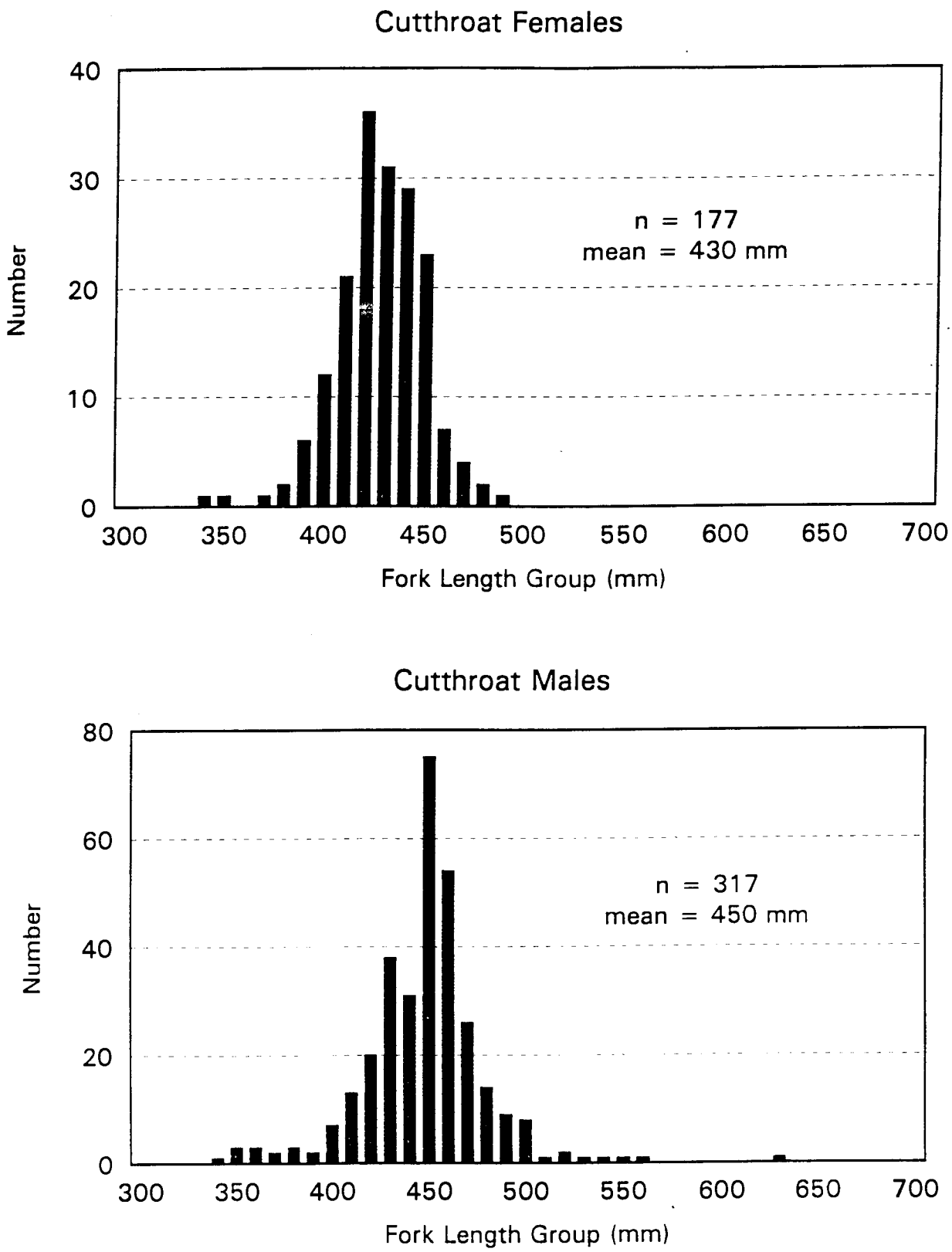
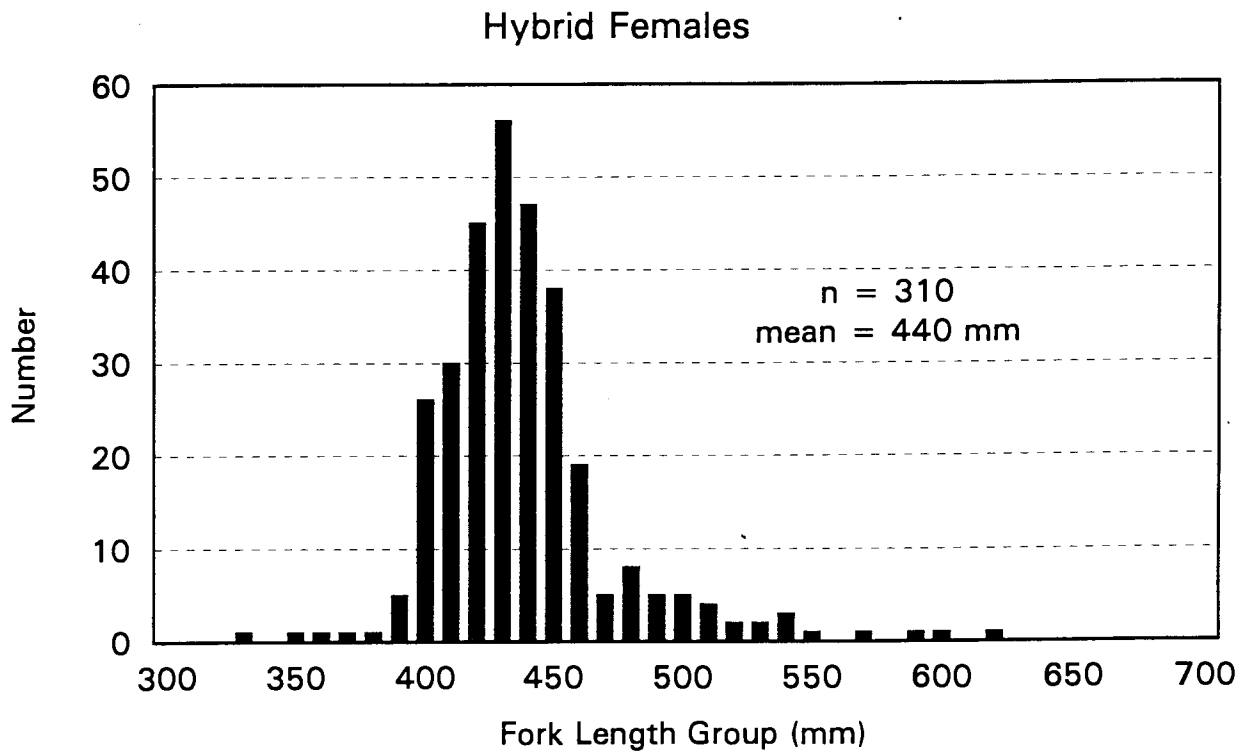


Figure 4. Length frequency of male and female cutthroat trout in the Henry's Lake Hatchery spawning run, 1998.



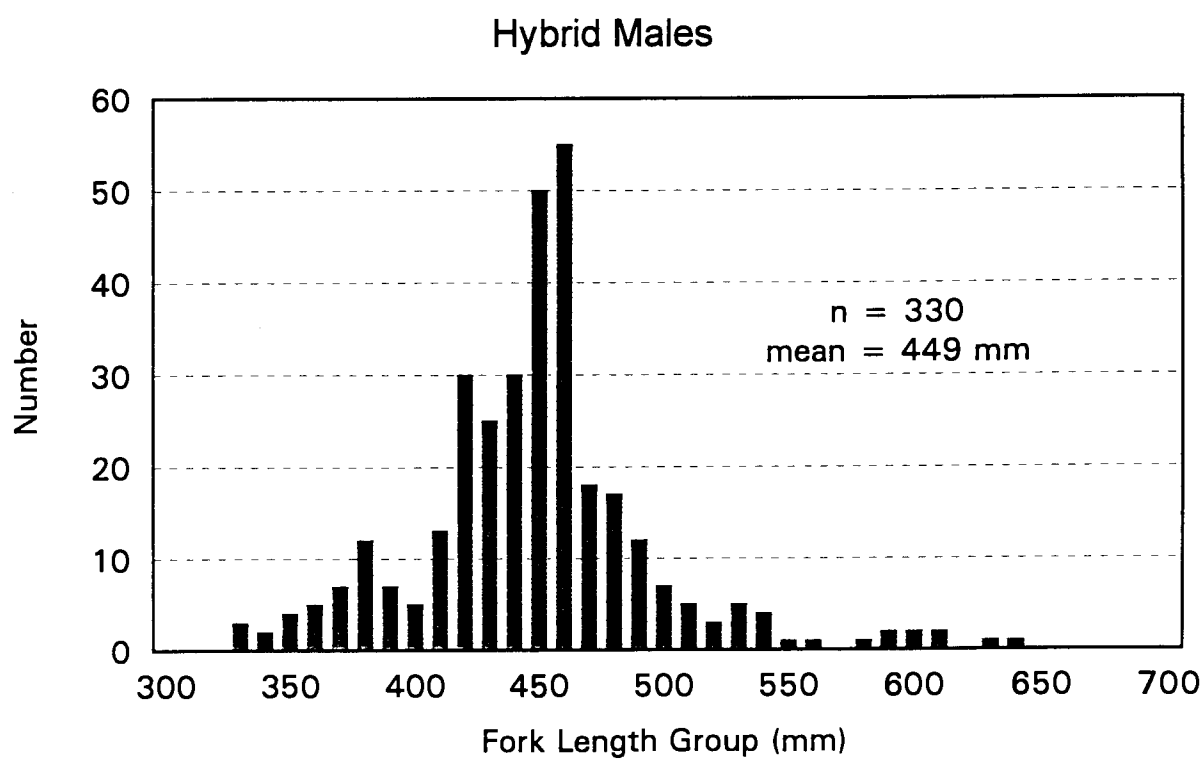


Figure 5. Length frequency of male and female hybrid trout in the Henry's Lake Hatchery spawning run, 1998.

Hybrid trout green eggs totaled 712,328 from 282 cutthroat trout females for an average fecundity of 2,526 eggs per female. Eyed hybrid trout eggs totaled 408,695 for an overall eye-up rate of 57%.

No brook trout eggs were taken in 1998.

Cutthroat trout ovarian fluid disease samples showed no viral pathogens, and a low level of potential bacterial pathogens. Only three of 180 egg lots tested positive and were culled.

Genetic Analysis

Protein electrophoresis results suggest a high occurrence of rainbow trout genetic material in the Hatchery Creek cutthroat-spawning run. Of the 20 fish that were phenotypically classified as pure cutthroat, only three were in fact genetically pure (Table 2). One of the 20 intermediate phenotypes was also genetically identified as a pure cutthroat trout. All of the 20 fish classified as hybrids were confirmed to be hybrids.

The readily observable phenotypic traits we recorded could not be used to reliably identify pure cutthroat trout. The two fish classified as cutthroat trout in the field and confirmed to be pure by electrophoresis, were phenotypically indistinguishable from many hybrids.

Although mtDNA was also analyzed for each sampled fish, these data are not useful to describe the level of introgression or hybridization in Henrys Lake. Because mtDNA is strictly maternally-inherited, and because the hybrid stocking program is maintained by crossing male rainbow trout and female cutthroat trout, almost all (59 of 60) of the sampled fish had cutthroat trout mtDNA (Table 2). This suggests that any historic rainbow trout stocking in Henrys Lake did not result in a significant hybridization event with native cutthroat trout. Rather, the current level of introgression is likely the result of stocking fertile F1 hybrids that have backcrossed with cutthroat trout in tributaries. Of the 56 hybrids identified, at least 37 were F2 or greater backcrosses, produced either by natural tributary spawners or by inadvertently using hybridized fish in the egg-taking operation. This underscores the importance of developing a sterile hybrid-stocking program to minimize the flow of rainbow trout genetic material.

Genetic analysis of naturally-produced fry from Howard, Targhee, and Duck creeks were not completed in time for inclusion in this report.

Because we sampled only a small segment of the Hatchery Creek spawning run, these genetics data do not represent the entire hatchery run or the lake population. The lake population is comprised of both hatchery and naturally produced fish, and may have discrete spawning populations in each tributary that could vary in genetic integrity. To better describe the genetic status of cutthroat trout in Henrys Lake, future genetic analyses should include fish sampled throughout the hatchery spawning run plus additional representative fish (adult spawners and emigrating fry) from major tributaries.

Table 2. Field identification and results of genetic analysis from fish sampled at the Henrys Lake Hatchery spawning station April 22, 1998.

ID number	Sex	Fork length (mm)	Field ID	Field notes	Allozyme loci	MtDNA	Genetic ID
98-01	M	370	YCT	suspect pure YCT	RBT/YCT	YCT	≥F1
98-02	F	430	HYB	suspect pure YCT	RBT/YCT	YCT	≥F2
98-03	F	520	HYB	suspect F1	RBT/YCT	YCT	≥F1
98-04	F	450	YCT	suspect pure YCT	RBT/YCT	YCT	≥F1
98-05	M	505	HYB	suspect pure YCT	RBT/YCT	YCT	≥F2
98-06	M	435	YCT	suspect pure YCT	RBT/YCT	YCT	≥F2
98-07	M	425	HYB	suspect pure YCT	RBT/YCT	YCT	≥F1
98-08	M	450	HYB	suspect pure YCT	YCT	YCT	YCT
98-09	M	485	YCT	suspect pure YCT	YCT	YCT	YCT
98-10	F	620	HYB	suspect F1	RBT/YCT	YCT	≥F2
98-11	M	435	YCT	suspect pure YCT	RBT/YCT	YCT	≥F1
98-12	M	495	HYB	suspect pure YCT	RBT/YCT	YCT	≥F2
98-13	M	435	YCT	suspect pure YCT	RBT/YCT	YCT	≥F1
98-14	M	445	YCT	suspect pure YCT	RBT/YCT	YCT	≥F2
98-15	M	425	YCT	suspect pure YCT	RBT/YCT	YCT	≥F1
98-16	F	420	HYB	suspect pure YCT	RBT/YCT	YCT	≥F2
98-17	M	430	HYB	suspect pure YCT	RBT/YCT	YCT	≥F1
98-18	M	505	YCT	suspect pure YCT	RBT/YCT	YCT	≥F1
98-19	F	435	HYB	suspect F1 or F2	RBT/YCT	YCT	≥F2
98-20	M	455	YCT	suspect pure YCT	YCT	YCT	YCT
98-21	F	425	YCT	suspect pure YCT	RBT/YCT	YCT	≥F2
98-22	F	435	YCT	suspect pure YCT	RBT/YCT	YCT	≥F2
98-23	M	415	HYB	suspect pure YCT	RBT/YCT	YCT	≥F1
98-24	M	440	HYB	suspect pure YCT	RBY/YCT	YCT	≥F1
98-25	M	390	HYB	suspect pure YCT	RBT/YCT	YCT	≥F1
98-26	M	565	HYB	suspect F1	RBT/YCT	YCT	≥F2

ID number	Sex	Fork length (mm)	Field ID	Field notes	Allozyme loci	MtDNA	Genetic ID
98-27	M	480	HYB	suspect pure YCT	RBT/YCT	YCT	≥F2
98-28	F	465	HYB	suspect F1	RBT/YCT	YCT	≥F2
98-29	F	500	HYB	suspect F1	RBT/YCT	YCT	≥F2
98-30	F	535	HYB	suspect F1	RBT/YCT	YCT	≥F2
98-31	F	445	HYB	suspect F1 or F2	RBT/YCT	RBT	≥F2
98-32	M	490	HYB	suspect pure YCT	RBT/YCT	YCT	≥F2
98-33	F	435	HYB	suspect pure YCT	RBT/YCT	YCT	≥F2
98-34	M	635	HYB	suspect F1	RBT/YCT	YCT	≥F2
98-35	F	430	YCT	suspect pure YCT	RBT/YCT	YCT	≥F2
98-36	M	465	YCT	suspect pure YCT	YCT	YCT	YCT
98-37	M	420	YCT	suspect F2 sure hybrid	RBT/YCT	YCT	≥F1
98-38	M	555	HYB	suspect F1	RBT/YCT	YCT	≥F2
98-39	M	460	HYB	suspect pure YCT	RBT/YCT	YCT	≥F2
98-40	F	415	YCT	suspect pure YCT	RBT/YCT	YCT	≥F1
98-41	F	600	HYB	suspect F1	RBT/YCT	YCT	≥F2
98-42	F	440	HYB	suspect pure YCT	RBT/YCT	YCT	≥F2
98-43	M	630	HYB	suspect F1	RBT/YCT	YCT	≥F2
98-44	F	-	HYB	suspect F1	RBT/YCT	YCT	≥F2
98-45	F	430	YCT	suspect pure YCT	RBT/YCT	YCT	≥F2
98-46	M	415	HYB	suspect F1	RBT/YCT	YCT	≥F1
98-47	F	430	YCT	suspect pure YCT	RBT/YCT	YCT	≥F1
98-48	F	460	YCT	suspect pure YCT	RBT/YCT	YCT	≥F2
98-49	F	480	YCT	suspect pure YCT	RBT/YCT	YCT	≥F2
98-50	F	430	HYB	suspect pure YCT	RBT/YCT	YCT	≥F2
98-51	F	510	HYB	suspect pure YCT	RBT/YCT	YCT	≥F2
98-52	F	425	HYB	suspect pure YCT	RBT/YCT	YCT	≥F2
98-53	F	415	HYB	suspect pure YCT	RBT/YCT	YCT	≥F2

ID number	Sex	Fork length (mm)	Field ID	Field notes	Allozyme loci	MtDNA	Genetic ID
98-54	F	465	HYB	suspect pure YCT	RBT/YCT	YCT	≥F2
98-55	M	610	HYB	suspect F1	RBT/YCT	YCT	≥F1
98-56	M	645	HYB	suspect F1	RBT/YCT	YCT	≥F1
98-57	M	410	HYB	suspect F1	RBT/YCT	YCT	≥F2
98-58	M	610	HYB	suspect F1	RBT/YCT	YCT	≥F1
98-59	F	500	HYB	suspect F1	RBT/YCT	YCT	≥F2
98-60	F	490	HYB	suspect F1	RBT/YCT	YCT	≥F2

Gillnetting

A total of 68 fish were collected in the six net nights. Catch composition was 62% cutthroat trout, 15% hybrid trout, 20% brook trout, and 3% Utah chub (Appendix C). Cutthroat trout ranged from 215 to 427 mm total length, hybrids from 178 to 475 mm, and brook trout from 220 to 505 mm. Brook trout contribution to gill net catches has increased from 3.4% in 1995 to 9.4% in 1996.

Tributary Fry Trapping

With the exception of the Howard Creek trap, catch rates for emigrating fry were low. Because of inadequate stream velocity, very few trout fry were captured in the Timber Creek trap, although fry were observed immediately above the trap site. Early catch rates in Duck and Targhee creeks were low, but improved after the traps were moved to higher velocity locations. In Howard Creek, the declining catch rate through the trapping period suggest that substantial fry emigration had already taken place by the time the traps were installed in mid-July (Appendix D).

A total of 3,259 fry were trapped in Howard Creek from July 14 to September 10 (Appendix D). Trap efficiency (three estimates) ranged from 11.4% to 21.0%, and estimated total emigration during this period was 17,727 fry. Fry ranged in size from 25 mm to 40 mm during emigration.

No fry were caught in Targhee Creek from July 15-29. A total of 1,109 fry were caught from July 30 to October 4 (Appendix D). Trap efficiency (one estimate) was 16%, and estimated total emigration was 7,100 fry. Fry ranged in size from 25 mm to 45 mm.

In Duck Creek, a total of 1,163 fry were sampled from July 15 to September 10 (Appendix D). Trap efficiency (one estimate) was 25%, and estimated total emigration was 5,483 fry. Fry sizes ranged from 25 mm to 50 mm.

As noted, these can only be considered partial estimates; considerable emigration likely occurred before the traps were in place. Because the traps were installed late, we could not characterize timing of emigration from the tributaries. Once traps were placed in areas with adequate velocity, trapping efficiencies were high enough (11 to 25%) to allow reasonable estimates of total emigration during the sampling period. Additional sampling, with traps installed by June 1, would help describe timing and more closely estimate total fry production in each important spawning tributary.

Limnology

Dissolved oxygen data for January and February 1999 are presented in Appendix E. Oxygen levels were sufficient to provide adequate overwintering habitat in Henrys Lake, and the aeration system was not used.

Appendix A. Sample data sheet used to record phenotypic traits of Henry's Lake fish used for genetic analyses.

Date:	Location:	Observer:
Fish ID #:	Fish Length:	Fish Sex:
Field ID:	Leaning:	Genetics ID:

	Yes	No	Strong	Moderate	Weak
Spots on head absent					
Round shaped spots					
Spot halo					
Red lateral band absent					
White tip fins absent					
Throat slash					
Jaw extends past eye					
Spots mostly above lateral line					
Spots concentrated near caudal ped.					
Mid to large spots					
Few spots					
Flat, bronze to olive gray body color					
Smaller, less visible scales					
Streamlined body shape					
Elongated head					

Appendix A. continued.

Date: Location: Observer:

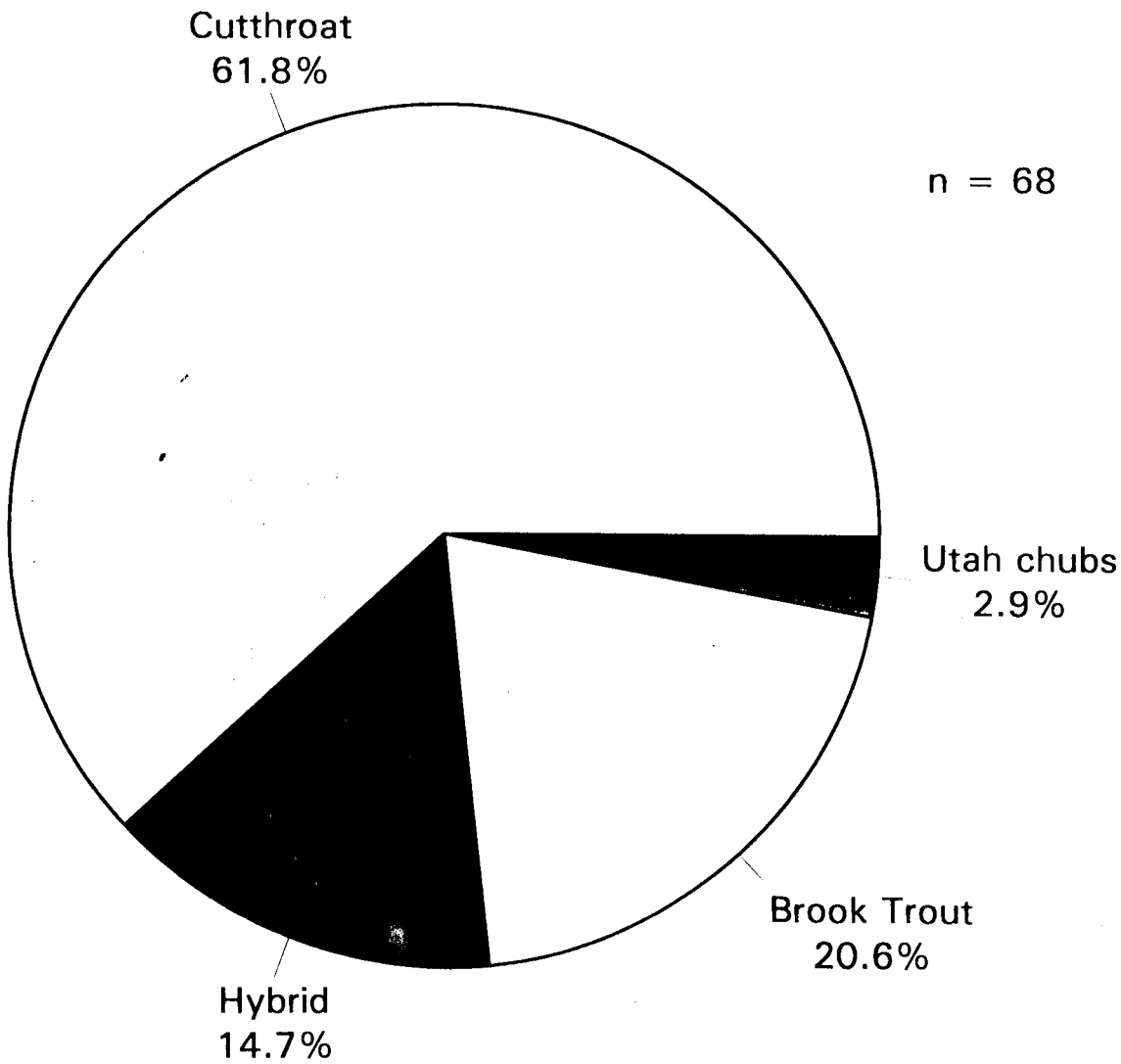
Fish ID #: Fish Length: Fish Sex:

Field ID: Leaning: Genetics ID:

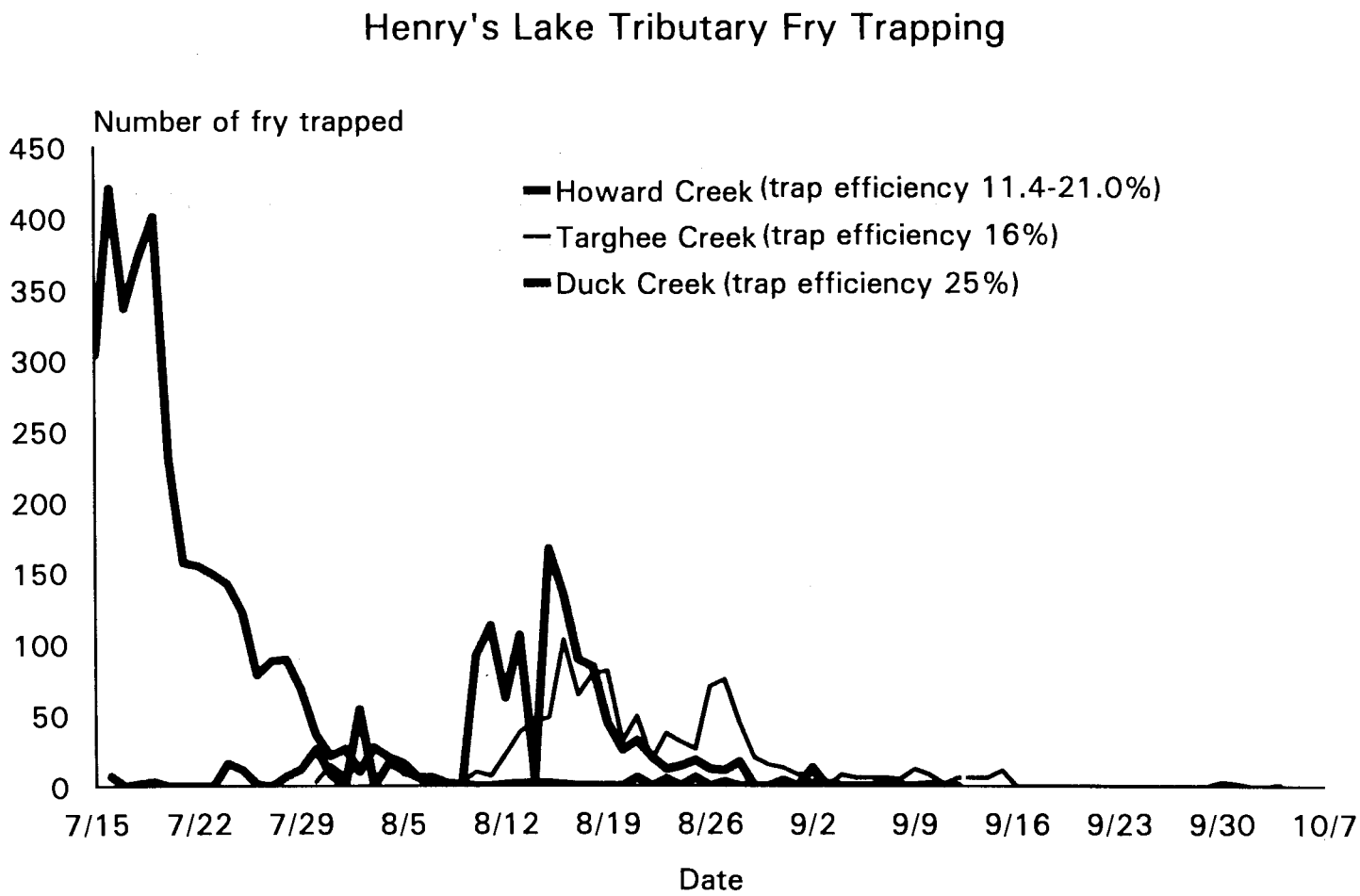
	Yes	No	Strong	Moderate	Weak
Spots on head absent					
Round shaped spots					
Spot halo					
Red lateral band absent					
White tip fins absent					
Throat slash					
Jaw extends past eye					
Spots mostly above lateral line					
Spots concentrated near caudal ped.					
Mid to large spots					
Few spots					
Flat, bronze to olive gray body color					
Smaller, less visible scales					
Streamlined body shape					
Elongated head					

Appendix B. Temperature (C) and dissolved oxygen (DO; mg/l) profiles at four sites on Island Park Reservoir, August 13, 1997.

	Near dam		SE of Bill's Island		W of Bill's Island		S of Goose Island	
Depth (m)	Water temperature (C)	Dissolved oxygen (mg/l)	Water temperature (C)	Dissolved oxygen (mg/l)	Water temperature (C)	Dissolved oxygen (mg/l)	Water temperature (C)	Dissolved oxygen (mg/l)
Surface	19.0	7.1	18.9	8.3	19.0	8.2	18.8	7.5
1	18.9	6.9	18.9	8.0	18.9	8.1	18.8	7.4
2	18.5	7.1	18.6	7.8	18.6	8.1	18.7	7.5
3	18.4	7.1	18.5	7.8	18.4	7.6	18.6	7.3
4	18.3	7.1	18.4	7.8			18.2	7.1
5	18.2	6.8	18.4	7.8			18.1	4.5
6	18.1	6.4	18.4	7.6				
7	17.8	5.4	17.7	5.7				
8			17.6	5.4				



Appendix C. Species composition in six net nights of gill netting in Henry's Lake, May, 1998.



Appendix D. Number of cutthroat trout fry captured in three Henry's Lake tributaries and associated trapping efficiencies.

Sterile Hybrids

The six experimental treatments in 1998 produced a range of triploidy induction rates (Table 3). The best treatment was 27°C, 10 min after fertilization, and lasting 20 min, and provided an estimated 97% triploidy rate. Eye-up rates were very poor for all treatment groups (20-50%; Table 3), but at least some of the mortality was apparently due to handling rather than the heat shocks themselves. Eye-up of eggs subjected to handling and heat-shock was 35% to 89% that of control eggs subjected to handling but not heat shock. Average eye-up of control eggs (handled) was only 69% that of non-handled controls.

Although the best treatment produced 97% triploidy rates, providing 250,000 triploid hybrids for the Henrys Lake program will require better egg survival than observed in these experiments. Because cutthroat eggs and rainbow sperm are readily available, increasing hybrid egg can offset some reductions in survival take. Until egg survival is assessed in mass production lots of triploids, we recommend at least doubling the normal egg take for hybrids. Additionally, large-scale production techniques should include methods that minimize handling stresses. As survival data become available, future hybrid egg take can be adjusted accordingly.

We captured only two hybrids in the East Harriman Pond in 1998, one 424 mm fish from the 1996 plant and one 229 mm fish from the 1997 plant. The remaining catch was comprised of hatchery and wild rainbow trout (n=118) and one brook trout. Both hybrids were from heat shock treatment groups. Because of the low sample size, however, we did not attempt to confirm ploidy level.

The low catch of hybrids does not necessarily indicate poor survival. Because we sampled few fish from either the triploid or the control groups, we could not assess relative survival between groups. The East Harriman Pond has an unscreened outlet that allows fish to easily emigrate, and most of the fish sampled were recently stocked hatchery rainbow trout. Low catch rates for hybrids stocked the previous two years indicate that both triploids and controls may have simply emigrated from the pond.

Given the apparent level of introgression that has occurred in Henrys Lake cutthroat, moving forward with the sterile hybrid program is important. Stocking only sterile hybrids will reduce the flow of rainbow trout genetic material into the cutthroat population. Beginning in 1999, all hybrid eggs will be heat-shocked using the treatment described above. Additional eggs will be taken to compensate for the lower survival associated with heat shock. Assessment of triploidy induction rates and rearing performance will be coordinated with Research personnel. Finally, evaluation methods to assess triploid hybrid performance will be developed and incorporated into the Henrys Lake management program.

Table 3. Eye-up and triploidy induction rates for heat-shocked and control rainbow x cutthroat hybrid eggs. MAF = minutes after fertilization when heat shocks began; all treatments were for a duration of 20 min.

Treatment Group	# Eyed	# Dead	Total eggs	% Eye-up	% Triploidy
Handling control	4,988	2,117	7,105	70.2	-
10MAF control*	807	593	1,400	57.6	-
20MAF control	418	710	1,128	37.1	-
25MAF control*	755	940	1,695	44.5	-
30MAF control	1,160	931	2,091	55.5	-
26C 20MAF	472	1,017	1,489	31.7	52
26C 25MAF	959	1,462	2,421	39.6	17
26C 30MAF	1,292	1,318	2,610	49.5	20
27C 10MAF	202	798	1,000	20.2	97
27C 20MAF	363	941	1,304	27.8	86
27C 25MAF	691	1,622	2,313	29.9	80

*incubated in egg shipping tubes rather than trays

RECOMMENDATIONS

Henrys Lake

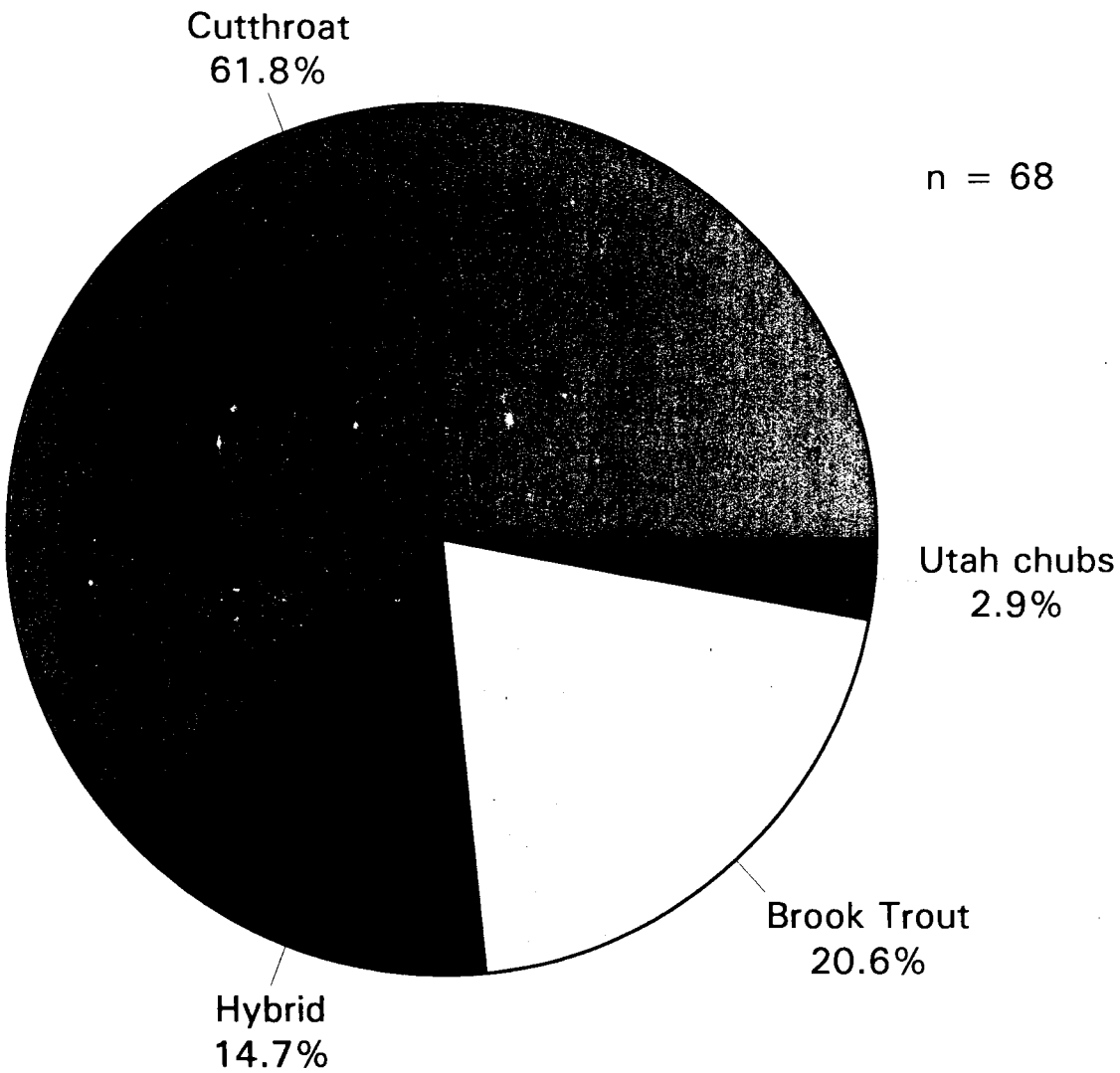
Continue annual standard gill net surveys to describe population trends. Use additional gillnetting and/or trapnetting to monitor distribution and status of Utah chub population.

For the hybrid stocking program, develop techniques to heat-shock all hybrids eggs to induce triploidy; and develop evaluation plans to assess triploid hybrid performance in Henry's Lake.

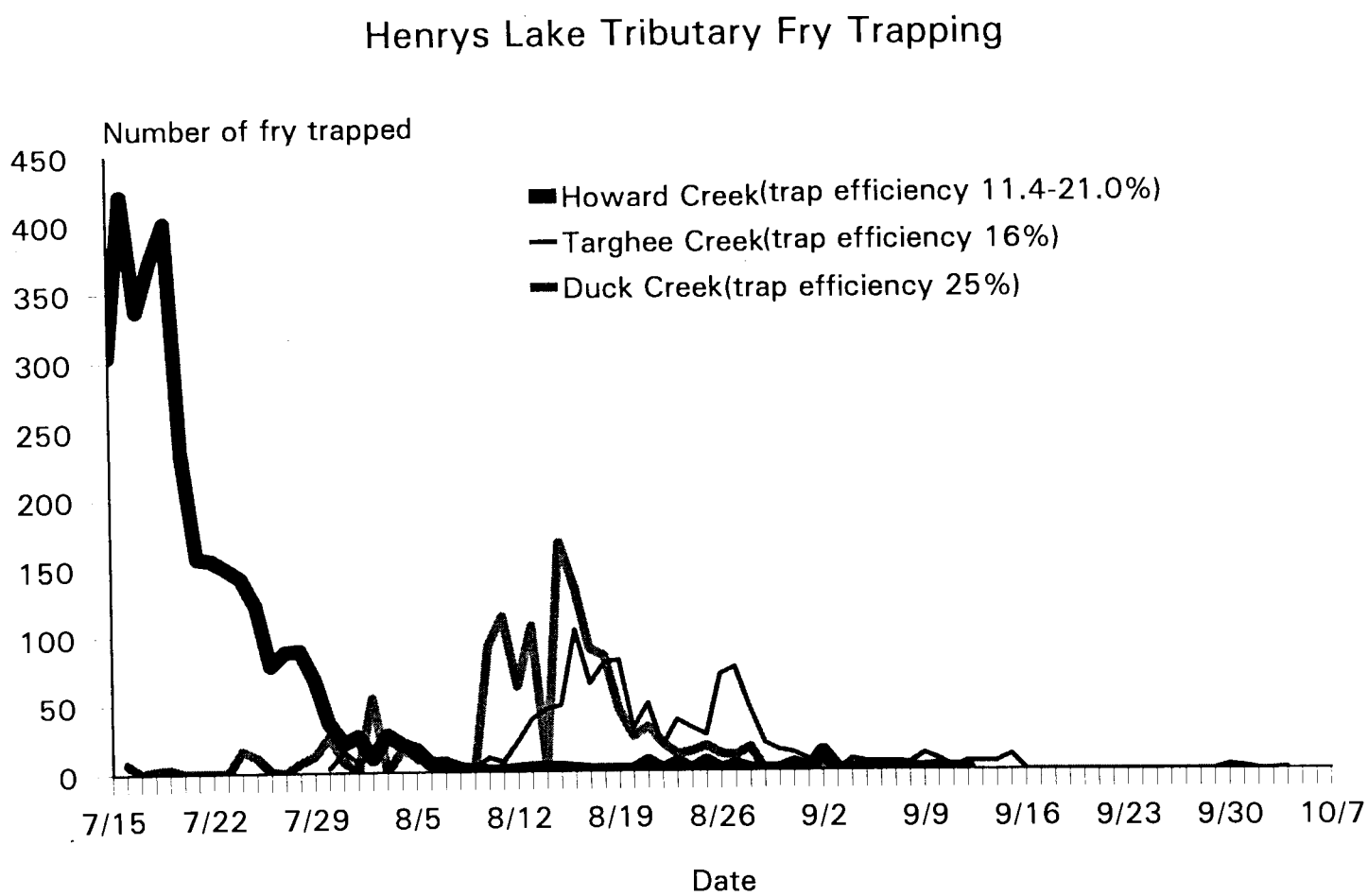
Continue genetic assessment of Yellowstone cutthroat in the hatchery run and in tributaries.

Use existing winter oxygen data to develop a predictor of winter kill risk based on January dissolved oxygen levels winter aeration operations manual to provide guidelines for use of aeration system.

Continue assessments of natural recruitment from key tributaries; begin fry trapping by June 1.



Appendix C. Species composition in six net nights of gill netting in Henry's Lake, May, 1998.



Appendix D. Number of cutthroat trout fry captured in three Henrys Lake tributaries and associated trapping efficiencies.

INTRODUCTION

The Mackay Fish Hatchery is a specialty fish production facility located approximately 12 miles north of Mackay in Custer County, Idaho. The hatchery produces salmonids of various species and strains, from 1- to 16-inches in length, for statewide distribution. Funding is obtained under contract from the Wallup-Breaux Act for wages and from state license monies for fish feed and operational costs.

The hatchery is staffed with three full-time employees and two part-time employees who share 18 months of temporary time. Wages, including benefits, cost $115,700 for the permanent employees and $24,000 for the temporary employees, totaling $139,700 in personnel costs.

Included in the year's production were 16 lots of fish, comprised of 6 species and 11 different strains.

Rainbow trout *Oncorhynchus mykiss*
- Arlee (Ennis NFH, MT) (2 year classes)
- Kamloops (Troutlodge, WA)

Cutthroat trout *O. clarki*
- Westslope (McCall) (2 year classes)
- Henrys Lake

Brown trout *Salmo trutta*
- Crawford (Paint Bank SFH, VA) (2 year classes)

Rainbow x Cutthroat trout hybrids
- Henry's Lake cutthroat females x Hayspur SFH rainbow males

Kokanee salmon *O. nerka kennerlyi*
- Early (Payette Lk.)
- October (Roaring Judy Hatchery, CO)

Grayling *Thymallus arcticus*

WATER SUPPLY

Water for hatchery production is provided by three collection springs in an artesian area at the hatchery. The area is fenced off, has been dug out, and filled with cobblestones. The water volume available for hatchery production remained consistent with previous years. Flows ranged from 18- to 24-cubic feet per second (cfs). Lowest flows occur during February, while highest flows occur during July. Since the 1983 earthquake, temperatures have varied between the three different springs supplying the hatchery; one at 50°F, one at 51°F, and one at 54°F. Incubation temperature is 51°F.

HATCHERY IMPROVEMENTS

A Nampa company refurbished 19 of the early-rearing troughs. They repaired and sprayed new gel-coats on all of the troughs. A Boise firm repaired the stocking tank on the GMC truck. The tank was originally a milk tank intended for stationary use, not meant for transport. New plugs were made and installed for the wastewater piping system from the large raceways, making their use much faster and easier. A new system of fastening the belt feeders to its stands was implemented, making placement and removal much faster and easier. Shelves were built in the feed and utility room. An Arco Company truck, using state highway gravel, graveled the hatchery roadways.

FUTURE NEEDS

Residence #3 needs the old wood siding replaced. Residences #2 and #3 need garages built or upgraded. A fish-proof screen needs to be installed at the end of the large raceway tailrace to keep feral fish out of the tailrace.

FISH STOCKED

Fingerlings of various species and strains were stocked in five regions of the state (Appendix 1). These put-grow-and-take fish numbered 2,395,050 fish weighing 25,184 pounds.

Catchable rainbow trout (10 inches +) were stocked in the Upper Snake and Salmon regions. These put-and-take fish numbered 81,690 and weighed 45,150 pounds. Catchable brown trout, numbering 5,080 fish and weighing 3,500 lbs., were planted into Horsethief Reservoir.

The hatchery also reared 22,800 cutthroat, 11,500 rainbow, and 6,000 grayling fry for planting into twenty-nine high mountain lakes of the Magic Valley and Upper Snake regions. Four-wheelers, pack-stock, and foot travel were used to plant these fish.

The fish transport trucks assigned to Mackay Hatchery traveled on 83 fish stocking trips during the year, planting 94 different waters, and travelling 35,000 miles. Transport tankers assigned to Fish Transportation hauled seven loads of fish for the hatchery during the year.

FISH FEED

Fish feed used during the year totaled 89,644 pounds at a cost of $37,881. Feed conversion averaged 1.07 pounds of feed for every pound of fish produced. Feed cost per pound of fish produced was $0.45.

BioDiet, Rangen, and Sterling Silver Cup feed were used, depending upon the stock of fish and specifications of the feed contract. All feeds used and amounts are shown in Appendix 3.

FISH MARKING

Of the one million cutthroat planted into Henrys Lake, 101,200 were adipose-fin clipped prior to stocking. Of the 250,000 rainbow fingerlings planted into Island Park Reservoir, 60,000 were left ventral fin clipped. A crew of four did the clipping during the second week of August.

PUBLIC RELATIONS

Approximately 800 people toured the hatchery during the year. The hatchery's remote location does not attract large crowds of people. Most visitors come to fish in the diversion pond below the hatchery. Scheduled tours were given to Mackay and Arco elementary school classes, Boy Scout groups, and FFA groups. The hatchery is assisting Mackay High School in an aquaculture program. The hatchery crew and the local conservation officer participated in Idaho's "Adopt a Highway" litter control program. Six miles of Highway 93 along Mackay Reservoir are cleaned biannually. Assistance was also provided to the Hunter Education Program at Mackay School.

ACKNOWLEDGEMENTS

During 1998, the Mackay Hatchery crew included Adam Broussard, Bob Evans, and Jason Rheinhardt, Biological Aides. Without their excellent assistance, we could not have accomplished all that we did during the year. Their care and concern enabled the hatchery to produce the quality of fish we do. Mel Hughes, Fish Culturist, Mick Hoover, Assistant Hatchery Manager, and Phil Coonts, Hatchery Manager, round out the hatchery's personnel.

Appendix 1. Fish Production at Mackay Fish Hatchery, January 1 to December 31, 1998.

Species/ Strain	Lot Number	Source	Received as	Number/lbs Received or Carried Over	Yield Number/ Pounds	Destination
Arlee rainbow trout	7-EN-RA	Ennis NFH	eyed eggs	90,725/ 25,560	81,690/ 45,150	'98 catchables
Arlee rainbow trout	8-EN-RA	Ennis NFH	eyed eggs	129,000/ 1,000	100,657/ 35,545	'99 catchables
Arlee rainbow trout	8-EN-RA	Ennis NFH	eyed eggs	280,000/ eyed eggs	266,250/ 5,325	'98 Island Park fing.
Arlee rainbow trout	9-EN-RA	Ennis NFH	eyed eggs	174,000/ eyed eggs	~150,000 fry	'00 catchables
Henry's Lk cutthroat	8-U-ID-C3	Henry's Lk	eyed eggs	1,400,000/ eyed eggs	1,074,450/ 8,168	'98 Henry's Lk high mt lakes
rainbow X cutthroat	8-U-ID-RC	Henry's Lk Hayspur H.	eyed eggs	438,000/ eyed eggs	331,850/ 2,740	'98 Henry's Lk '98 Horsethief Res
westslope cuthroat trout	7-U-ID-C2	McCall H.	fry	18,993/ 311	18,700/ 935	'98 Payette Lk '98 Fish Lk
westslope cuthroat trout	8-U-ID-C2	McCall H.	fry	27,815/ 136	27,580/ 431	'99 Payette Lk
Crawford brown trout	6-PB-BN	Paint Bank SFH Virginia	eyed eggs	5,119/ 2,133	5,080/ 3,500	Horsethief Res
Crawford brown trout	7-PB-BN	Paint Bank SFH Virginia	eyed eggs	243,071/ 338	242,000/ 4,096	'98 Reg 4,5
Crawford brown trout	7-PB-BN	Paint Bank SFH Virginia	eyed eggs	6,900/ 8.6	6,722/ 2,585	'99 Camas Cr
Payette Lk kokanee	7-U-ID-KE	Payette Lk	green eggs	500,000/ 426	484,600/ 3,920	'98 Dworshak
Deadwood kokanee	8-U-ID-KE	Deadwood Res	green eggs	1,700,000/ green eggs	1,000,000/ 500	'98 Island Park '98 Lucky Peak
grayling	8-GR	Ashton SFH	fry	6,500/ 2	6,000/ 6.2	Reg 4,6 high mt. Lakes
Kamloops rainbow	8-Y-WA-K1	Troutlodge	eyed eggs	25,000/ eyed eggs	11,500/ 17	Reg 4,6 high mt. lakes

Approved by:

Virgil K. Moore, Chief
Fisheries Bureau

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State Fisheries Manager

Tom Frew
Resident Fish Hatcheries Supervisor