

# IDAHO

## FISH & GAME DEPARTMENT

Joseph C. Greenley, Director

Annual Report

EXPERIMENTAL ANADROMOUS FISH REARING AT  
THE HAYDEN CREEK RESEARCH STATION, IDAHO  
July 1, 1970-June 30, 1971



U. S. National Marine Service P. L. 88-309 Projects:

Project 1-57-D, Segment 1, Contract-2302 (Rearing)

Project 1-51-C, Segment 2, Contract-2383 (Construction)

By

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Experimental Rearing of Anadromous Fish at  
the Hayden Creek Research Station, Idaho

ABSTRACT:

Approximately 150,000 steelhead of the 1969 brood year were reared and released at Hayden Creek after one year in the raceways and the North Pond. These fish weighed out at an average of 11 per pound. A second 150,000 steelhead of the 1969 brood year, the smaller half of those graded, are still in the North Pond to be released in the spring of 1972 after two-year's growth. We plan to evaluate relative benefits of one-versus two-year rearing.

Some 205,000 spring chinook salmon (1969 brood year) were reared in one pond in 1970 and released in October, 1970, at 13 per pound and an average fork length of 148 mm. Approximately 83,200 of these were released directly at Hayden Creek while 122,000 were transported for release near Decker Pond. This project was paid for by DJ F-49-R funds in 1970 but is now a PL 88-309 function.

We had 201,000 spring chinook on hand in the North Pond on June 30, 1971 for release in October 1971.

During the 1970-71 year, the facility at Hayden Creek was improved by the construction of a 16 by 40 foot prefabricated metal building for feed and equipment storage, an approved sewer system, fences, road gravel, new automatic feeders, and landscaping improvements.

Submitted by:

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## GENERAL HATCHERY OPERATIONS:

The initial rearing program at the Hayden Creek Experimental Station began in 1966 on the basis of rearing steelhead trout on a one-year pond rearing-release cycle. We obtained steelhead eggs in April and May, hatched and reared them to fingerling size in raceways and placed them in the two 0.6 acre ponds in early October. We fed the fish in the ponds until the end of April the following year and released them directly into the Salmon River system.

After five years of experimentation in rearing techniques and evaluation of all phases of the rearing programs at Hayden Creek, we have modified operations to better utilize the facilities and to maximize smolt-adult returns to the station.

### Steelhead:

Considerable research has been done on steelhead trout smoltification. One common finding relates smoltification and seaward emigration to size. Hatchery-reared steelhead trout less than approximately 160 millimeters total length show less seaward emigration urge and survival to the ocean than fish over 160 mm.

In past rearing cycles at Hayden Creek, we have had difficulty rearing more than fifty to sixty percent of the pond populations to 160 millimeters or greater total length in a one-year rearing program. Also, to maximize growth we retained steelhead through April releasing them the first part of May. Severe supersaturation of nitrogen has been occurring in the Columbia River during May since 1968 and we suspected a survival disadvantage to smolts held that late.

We initiated an alternate pond two-year rearing program to rear a larger smolt. We can release the fish at an earlier date and rear the fish in a water temperature regime and for a time period more closely resembling natural conditions.

We initiated this program change in 1971 and plan to evaluate two-year rearing procedures for several rearing cycles.

Chinook Salmon:

In the initial rearing schedule, one pond remained free of steelhead from April through September each season. We now utilize the free pond to rear spring chinook salmon for fall release. The salmon appear to flourish in the pond environment and preliminary data indicates active seaward emigration after release.

PRODUCTION: 1970-1971

Steelhead-North Pond:

We put 152,000 steelhead in the North Pond in October, 1970. From October through April we recorded a total loss of 636 fish. The first part of May, 1971, we weighed out 6,541 pounds of steelhead at 11 per pound average weight for a total of 72,000 fish (47 percent). It appears, however, that the total smolt release may actually have been close to the 150,000 fish total put in the pond seven months earlier. Evidence points to a voluntary emigration of some 80,000 smolts from the pond over the outlet drum screen, apparently commencing the latter part of March. The escapement apparently occurred during the night hours. This same type of phenomenon was witnessed at a chinook salmon rearing pond on the Pahsimeroi River during this same period. During the dark hours, the hatchery superintendent reported 5,000 fish per hour at times jumping over the outlet drum screen, (Tom Levendofske, personal communication).

The first of April, we noted a slump in the growth rate of the fish in both ponds, (Figure 1), when we expected an increase in growth rate with warmer springtime air and water temperatures commencing. This, we believe, reflects escapement of the larger, smolting steelhead and consequent decrease of the average size of the fish in the ponds.

This also leads us to suspect that poor survival and production figures for prior year's operations, where substantial unaccountable losses are shown, may be a result of the same escape phenomenon rather than actual mortalities. These findings make it difficult to present meaningful production figures for the station. We used 23,438 pounds of Idaho Dry Diet pelleted feed at a cost of \$2,109 to rear the steelhead in the North Pond. Upon release, the fish averaged 165 millimeters total length. Fifty-nine percent of the fish sampled were 160 millimeters or larger (Figure 2). We marked 38,800 steelhead at the release box with a left-ventral fin clip (Figure 3).

#### Steelhead-South Pond:

In October, 1970, we placed 152,000 steelhead fingerlings in the South Pond. Prior to planting both ponds, we graded the steelhead. The smaller grade fish went into the South Pond. These averaged 262 per pound as compared to 240 per pound for North Pond fish. These fish still remain in the pond and will be released as smolts in late March, 1972.

We noted a slump in the growth rate on these steelhead the first part of April, 1971, that corresponded with a similar slump noted in the North Pond steelhead (Figure 1). As the pond facilities are identical, it appeared that some steelhead escapement occurred from the South Pond. To estimate the number of fish left, we conducted a Petersen Index on the pond in June, 1971. We captured and marked 1,500 steelhead and returned them to the pond. A sample of 1,577 steelhead collected ten days later showed 18 marked fish.

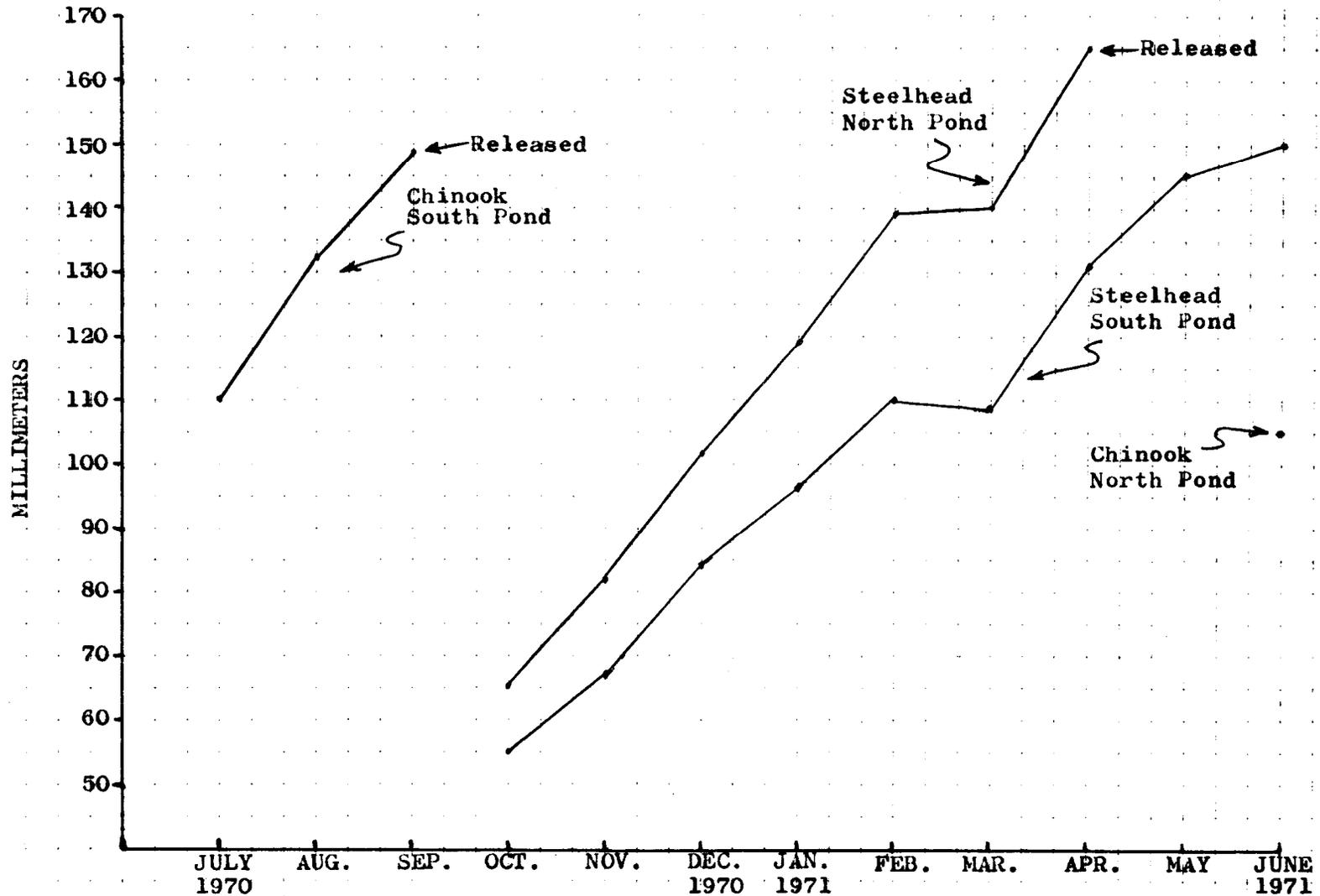


Figure 1. Growth rates of chinook salmon and steelhead trout reared in the Hayden Creek ponds during the period July 1, 1970 through June 30, 1971. Points on the curves represent average size at end of month. Steelhead-total length, chinook-fork length. Rate of growth slump at end of March, 1971, apparently reflects voluntary escapement of larger fish.

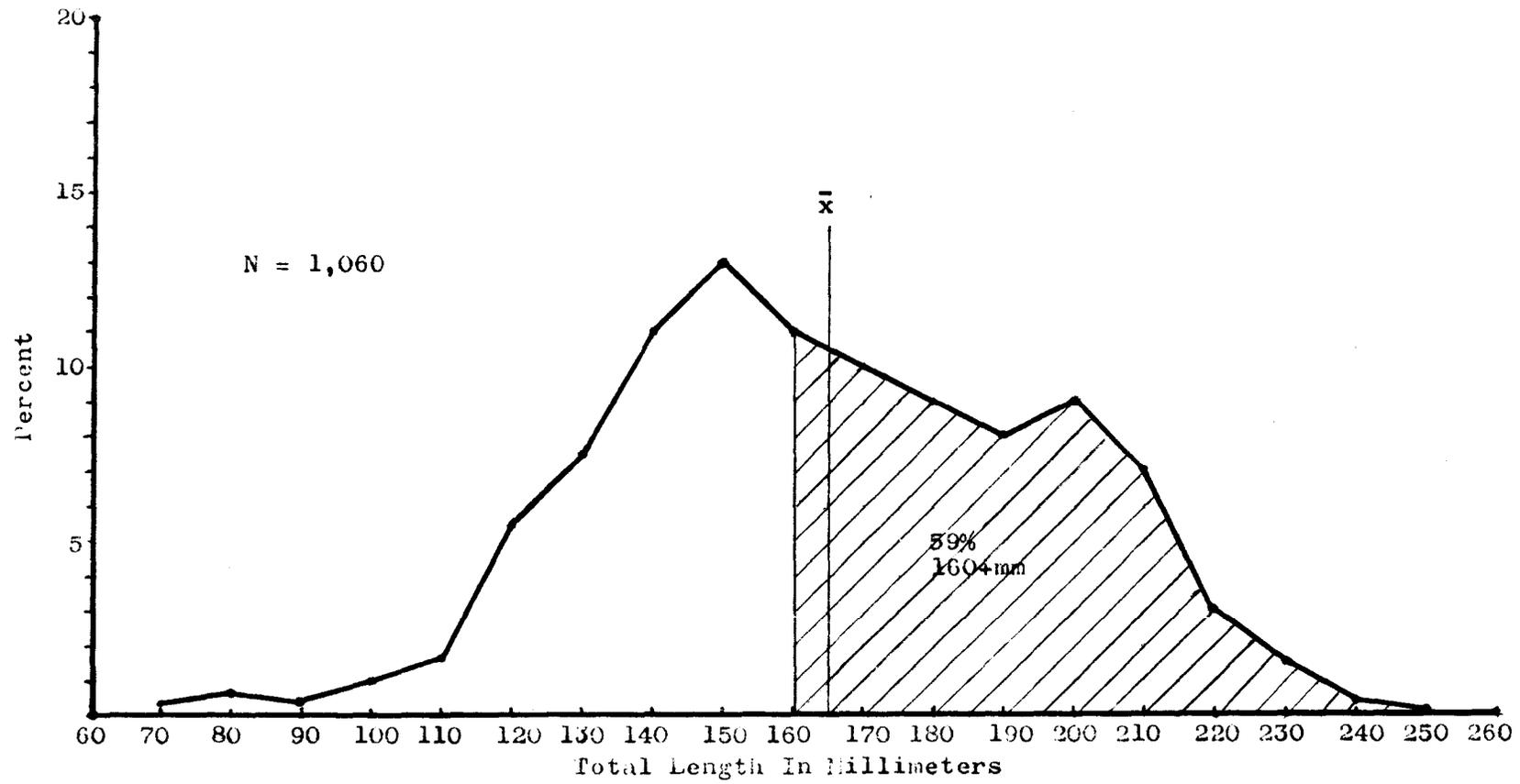


Figure 2. Length frequency of steelhead released from Hayden Creek North Pond, May, 1971.



Figure 3. Fifty-nine percent of the steelhead weighed out of the North Pond in May, 1971, exceeded 160 millimeters total length. We marked 38,800 of these with a left-ventral fin clip.

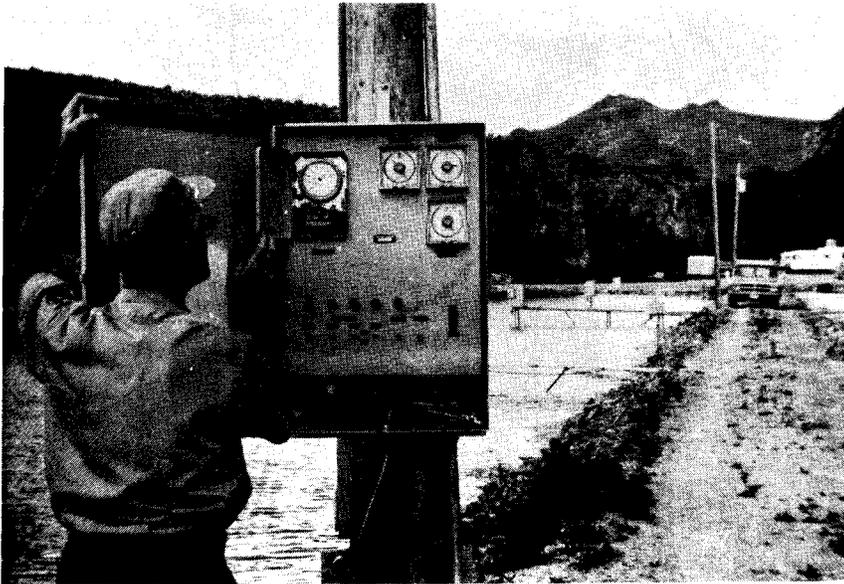


Figure 4. A new remote control unit allows us to activate all the feeders on a pond simultaneously.

This indicated that some 132,000 fish remained in the pond and that some 20,000 fish had escaped over the drum screen (13 percent).

On March 1, 1971, the South Pond fish averaged 110 millimeters total length compared to 139 millimeters for the North Pond fish. We would have expected fewer smolting fish in the South Pond due to the smaller size and indications are that only 13 percent left the South Pond versus 53 percent from the North Pond.

We have used feed schedules based on the 132,000 fish figure since June, 1971. We will count and/or weigh out all the fish from the South Pond in the spring of 1972.

Jump barriers will be placed on the outlet drum screens to prevent escape-ment in the future. As of June 30, 1971, the South Pond steelhead averaged 150 millimeters total length and 12 per pound.

#### Chinook Salmon-South Pond 1970:

In June, 1970, we placed approximately 209,000 spring chinook salmon fingerlings in the South Pond. These fish averaged 58 per pound,

We fed the fish some 18,650 pounds of Idaho Dry Diet throughout the summer months and released an estimated 205,000 the first part of October, 1970, at 13 per pound and 148 millimeters average fork length. This initial chinook rearing project was financed by Dingell-Johson funds, and all feed and personnel costs were paid for from AT-49-R monies. Of the 205,000 chinook reared in the South Pond in 1970, some 122,000 were transported and released in the upper Salmon River area as part of a DJ project. We released 83,200 of these chinook directly in Hayden Creek. Some 25,000 of these were marked with an adipose clip prior to release. It appears that the majority of these chinook emigrated downstream immediately after release in October. This could have possible survival benefits if these chinook migrate out of the Columbia prior

to heavy spring runoff flows and consequent high dissolved nitrogen levels.

A downstream migrant trap, located on the Lemhi River approximately 20 miles below the release site, collected 1,665 of these fish from October 1 through November 30, 1970. We operated the trap again in March and April, 1971, but collected no pond-reared chinook. In mid-November, 1970, Idaho Fish and Game Fishery Biologists at Lewiston, Idaho, reported large schools of these chinook in the lower Salmon and Snake River near Lewiston, (Terry Holubetz, personal communication). National Marine Fisheries Service personnel reported 75 of these chinook collected at downstream migrant trapping facilities at Ice Harbor Dam by mid-December, 1970, (Howard Raymond, personal communication).

We plan to continue the experimental program of summer-reared fall-released spring chinook salmon until we can evaluate adult returns.

#### Chinook Salmon-North Pond 1971:

In June, 1971, we placed some 201,000 spring chinook fingerlings, at 71 per pound, in the North Pond for release in October, 1971. As of June 30, 1971, these chinook averaged 44 per pound.

#### ADULT RETURNS: 1971

In the spring of 1971, only 15 adult steelhead entered the ladder and fish trap at the Hayden Creek Research Station. We expected few, if any, returns in 1971 because the 1967 release of Clearwater two-ocean stock and the 1968 release of Snake River one-ocean stock both returned in 1970. The 1969 release of Clearwater River stock is expected back as adults in the spring of 1972, (Table 1).

#### DISCUSSION:

Observing results on this project and other similar anadromous fish

Table 1. Summary of steelhead smolt releases and adult returns to the Hayden Creek Research Station since the initiation of the program in 1966.

STEELHEAD TROUT							
Brood Year	Year Released	Number Juveniles Released	Number Marked	Mark Used	River Race	Number Adults Ret. As: One-Ocean Fish	Two-Ocean Fish
1966	1967 (May)	180,000	22,800	LV	Clearwater	48 (1969)	46 (1970)
1967	1968 (May)	340,000	12,000	LV Clip	Snake	8 (1970)	10 (1971)
1967	1968 (May)	340,000	11,700	LV AD	Snake		
1968	1969 (May)	87,500*	26,700	LV Clip	Clearwater	5 (1971)	-- (1972)
1968	1969 (May)	87,500*	20,000	L Brand	Clearwater		
1969	1970 (May)	187,400*	55,000	LV	Clearwater, Lemhi, 1969 Return	-- (1972)	-- (1973)
1970	1971 (May)	72,000*	38,800	LV	Lemhi Weir, 1970 Return	-- (1973)	-- (1974)
CHINOOK SALMON							
1969	1970 (Oct.)	83,200	25,200	AD	Rapid River	-- (1972)	-- (1973)
1970	1971 (Oct.)	201,000	52,000	½D, Ad, LV	Rapid River	-- (1973)	-- (1974)

\* These figures represent actual numbers weighed or counted out of the ponds. Actual numbers released may be higher due to uncounted voluntary escapement.

rearing programs, and reviewing literature and reports from other fishery agencies and workers, it appears to me that unless eggs for subsequent smolt releases are obtained from adults returning from prior smolt releases, significant returns may not materialize.

It also appears that maximum returns may not be realized until the return of third generation adults. In the case of Hayden Creek, the third generation adults from the 1967 release of smolts will not return to the station until the spring of 1979, a period of 12 years. Too often, experimental reintroduction or rearing projects are initiated on an eight year or two-life-cycle basis. I feel this may not be sufficient to prove results. Projects may be abandoned when in reality the first basic steps have just been completed.

The offspring of the first few adults to return to a rearing station are the basic building stock. The numbers are generally low, but the progeny of these fish will be more adapted to the hatchery regimen of hatching-rearing-release-return than their parents. They would be more likely to return in greater numbers as adults; all lower river and passage conditions being equal. Their progeny should be even better adapted. Once the rearing capacity of the station is reached with at least third generation stock, maximum returns may be achieved. In the case of a two-year rearing program and two-ocean stock fish, it may take 15 years before third generation adults return. By that generation the fish should be as well adapted to that rearing program as any subsequent generations. Fluctuations in run numbers from that point on would most likely be a result of environmental and natural factors affecting the population after release from the hatchery.

It appears that any final evaluation of the success of the Hayden Creek pond rearing program before 1979-1980 may be premature. A flow-chart on progeny-adult returns is shown in Table 2.

Table 2. Projected timing of steelhead smolt releases--adult returns to the Hayden Creek Research Station. Final evaluation of the success of the pond rearing project before 1979 may be premature.

Stream of Origin	Original Smolts Released	1st Generation Adults Return (eggs)	1st Generation Smolts Released	2nd Generation Adults Return (eggs)	2nd Generation Smolts Released	3rd Generation Adults Return
Clearwater	1967	1970	1971	1974	1976	1979
Clearwater	1967	1970	1972	1975	1977	1980
Snake	1968	1970(end)	(blank years - 1976 and 1981)			
Clearwater	1969	1972	1974	1977	1979	1982
Lemhi and '69 Ret. & Clearwater	1970	1973	1975	1978	1980	1983
Lemhi and '70 Ret.	1971	1974	1976	1979	1981	1984

1st 3rd generation adults

CONSTRUCTION AND IMPROVEMENTS:

During the period July 1, 1970 through June 30, 1971, the following construction and improvements were accomplished:

- A. Completion of the new prefabricated metal building containing office, lab, shop, feed storage, shower and toilet facilities.
- B. Completion of associated cement walks and sills and perimeter fill.
- C. Installation of a new septic tank, sewer line, and drain field that meets all State Health Board requirements.
- D. Erection of a four strand steel post barbed wire fence around the perimeter of the hatchery property.
- E. Installation of a lifetime aluminum gate at the hatchery entrance.
- F. Installation and hookup of an automatic feeder remote control that allows simultaneous activation of all feeders on a pond, (Figure 3).
- G. Delivery and application of crushed shale to the sides and bottom of the adult holding pond.
- H. Erection of a steel cement-set flagpole.
- I. Smoothing, grading and shaping of the rear yard and filling with shale to provide additional storage and trailer parking area. A power pole was also erected and an electrical outlet wired in to provide power to trailers.
- J. Hauling and filling of top soil and yard gravel where needed.
- K. Planting of assorted shrubbery, trees and decorative plants in various locations around the station.

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