Hatchery Vol 25

RESIDENT HATCHERY

DEVELOPMENT PLAN

1990-2000

CONTENTS

EXECUTIVE SUMMARY

Resident hatcheries will need an average capital improvement investment of $517,000 per year, over the next ten years, to meet current fish management requests and maintain hatcheries in a respectable condition.

Total resident hatchery annual operating costs will increase from 2.6 million dollars to 4.6 million dollars over the next 11 years with a projected annual inflation rate of 5 percent (see Table 12).

Changes in the number of hatchery personnel will depend largely on the future development of a warmwater hatchery, reopening the Sandpoint Hatchery, and construction of the Kootenai Sturgeon Hatchery. Up to 5 additional permanent positions may be needed.

Fish production is projected to become more diverse with the addition of coolwater and warmwater fish, plus more species and strains of coldwater fish. Total poundage produced is expected to remain nearly the same, while total numbers produced are expected to increase to nearly 40 million fish. An estimated 1 million 8- to 10-inch rainbow trout are projected to be replaced by 5 million 4- to 7-inch rainbow, cutthroat, and rainbow x cutthroat hybrids.

Major program changes in resident hatcheries which could help to improve Idaho's fisheries are as follows: 1) utilize all hatcheries at 75 to 100 percent capacity throughout the year; 2) development of at least one disease free rainbow trout broodstock; 3) development of a coolwater-warmwater fish hatchery; 4) reduction of fish loss due to disease and bird predation; 5) development of isolation rearing units at two hatcheries; and 6) increase the capacity statewide for kokanee production.

The prioritized capital improvement summary details construction projects by year and estimated cost. Individual hatchery projects have been spread out over several years to help balance costs. Should money be available through bonding, these subprojects could be combined (see Table 1).

Table 1. Prioritized capital improvement summary by budget year.

Year		Hatchery and Project Description	Estimated Cost
1991	1)	Hayspur - construction of spawning and incubation building and upgrade water system	$512,000
	2)	Grace - establish source for potable water	20,000
	3)	Nampa - replace one pump and add packed column aerator	10,000
		All hatcheries - emergency repairs	50,000
		Total	592,000
1992	1)	Hagerman - enclose 14 to 16 large raceways with bird netting and install raceway crosswalks	$60,000
	2)	Hagerman - install baffles in small and medium raceways, raceway and water line repair	80,000
	3)	Ashton - repair main production raceways, install baffle cleaning system, wire for electrical aerators, replace settling pond outlet structure	100,000
	4)	Ashton - enclose upper raceway sections with wind and shade protection	40,000
	5)	Nampa - install additional standby generator and replace one pump with packed column	50,000
		All hatcheries - emergency repairs	50,000
		Total	380,000
1993	1)	Nampa - enclose "A" raceways with wind and shade Protection (140' x 80') and replacement of two pumps	$100,000
	2)	Grace - enclose water supply canal	150,000
	3)	Nampa - enclose "B" raceways with bird netting and install additional pump and packed column	40,000
		All hatcheries - emergency repairs	50,000
		Total	340,000

Table 1. Prioritized capital improvement summary by budget year cont'd.

Year	Hatchery and Project Description	Estimated Cost
1994	1) Ashton - construct isolation incubation and early rearing unit for mountain lake fish and other specialty fish	$40,000
	2) Nampa – expand incubation and early rearing facilities	150,000
	3) Nampa – enclose "C" raceways with bird netting	100,000
	4) Mackay - develop isolation incubation and early rearing facilities	50,000
	All hatcheries – emergency repairs	50,000
	Total	390,000
1995	1) Hayspur - replace hatchery building and fingerling production raceways	$708,000
	All hatcheries - emergency repairs	50,000
	Total	758,000
1996	1) Henrys Lake – construct amulti-purpose building for trapping, spawning, an office-reception area and crews quarters	$150,000
	2) Mackay - install aerators on main production raceways with standby generator	95,000
	3) Hagerman - replace oldest residence	60,000
	All hatcheries - emergency repairs	50,000
	Total	355,000

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Table 1. Prioritized capital improvement summary by budget year cont'd.

	Hatchery and Project Description	Estimated Cost
1997	1) Grace - replace main production raceways and replumb cleaning drains direct to settling basin	$600,000
	2) Grace - replace oldest residence	60,000
	All hatcheries - emergency repair	50,000
	Total	710,000
1998	1) Hagerman - Riley Creek water treatment and production unit modification	$450,000
	All hatcheries - emergency repair	50,000
	Total	500,000
1999	1) Clark Fork - replace intermediate raceways and develop additional well	$450,000
	2) Clark Fork - replace oldest residence	60,000
	All hatcheries - emergency repair	50,000
	Total	560,000
2000	1) Cabinet Gorge - develop intermediate well field	$250,000
	2) Regrade and asphalt hatchery entrance roads	225,000
	3) Hayspur - replace oldest residence	60,000
	All hatcheries - emergency repair	50,000
	Total	585,000

INTRODUCTION

This resident hatchery plan will serve as a guide for future hatchery maintenance and development. It is intended as an information source for fish managers and administrators and as a planning tool for the Fisheries Bureau.

Information on hatchery facilities, current fish production levels, and projected fish production found throughout this report w 11 serve as the foundation for future development. This report is not intended to provide a description of every detail of resident hatcheries but rather to highlight those items needing budgetary and administrative attention.

FUTURE DIRECTION OF RESIDENT HATCHERIES

The hatchery programs most needed to implement long-term improvement in resident fisheries in Idaho are as follows:

1) Utilize all hatchery facilities at 75 to 100 percent capacity through the year.

2) Development of rainbow trout broodstock.

3) Increased capacity statewide for kokanee production.

4) Development of isolation rearing units at two hatcheries.

5) Development of a coolwater-warmwater fish hatchery.

6) Reduction of fish loss due to disease and bird predation.

Utilization of all hatchery production units throughout the year would allow for increased production at minimal cost. Table 4 shows that several of our hatcheries are at only partial capacity during summer through fall. Fish managers are being informed of the production potential and alternate stocking plans will be explored.

Development of rainbow trout broodstock will consistently provide a well adapted, good quality fish for stocking. Commercial egg sources commonly inbreed and intensively select their broodstock for progeny that grow and survive well in a hatchery environment. A least two, and possibly three, strains of rainbow trout broodstock should be developed to provide fish for specialized stocking needs see Hayspur Hatchery). Hayspur strain rainbow will serve as our primary egg source.

Increased production of early, mid-fall, and late spawning kokanee is needed for South Idaho. This increased kokanee production will be accomplished by changing production scheduling of rainbow trout catchables and increasing incubation and early rearing facilities.

Development of isolation rearing units at Ashton and Mackay will greatly aid the flexibility of statewide fisheries programs. The greatest danger in experimenting with fish from outside existing programs is the chance of introducing a new fish disease. A small egg and fry isolation unit at Ashton would allow experimentation on other fish species and strains for mountain lake stocking. Isolation units can be incorporated into the Mackay Hatchery to allow for disease testing and experimentation with introduced strains.

Development of a multi-purpose coolwater and warmwater hatchery would enhance these fisheries statewide. Commercial sources have proven to be unreliable in terms of numbers and size of fish available at a certain time of year, and quality of these fish has been unpredictable in terms of disease, overall condition, and obtaining strains of fish that survive and grow well in Idaho waters.

Channel catfish production offers the greatest opportunity to enhance warmwater fisheries statewide with virtually minimal effect on native fish. In addition, warmwater lakes and reservoirs are well distributed relative to the major population centers in Idaho. Fish management requests for channel catfish are currently 100,000, 8-inch fish, with projected numbers increasing to 300,000 by the year 2000. In addition, smallmouth bass, largemouth bass, tiger muskie, walleye, and sturgeon need to be produced in limited numbers (see Table 10).

Site selection for a warmwater hatchery should be investigated during fiscal year 1990. Design work can be completed during 1991-92. Construction should be pursued following 1992.

Reduction of fish loss due to disease and bird predation is being accomplished at Hagerman and Nampa. This is being accomplished with improvements of the water quality and enclosing raceways with bird netting (see Hagerman and Nampa hatchery summaries).

HATCHERY SUMMARIES

This section will give a summary of each hatchery, listing information on the water source, present fish production, and special needs or unique features of each hatchery. Tables are included at the end of this section to summarize the information.

Each hatchery description is not intended to be a complete synopsis but rather to highlight the special features and those major items needing attention during the next ten-year period.

HAGERMAN HATCHERY

Hagerman has approximately 47 cfs of 59°F spring water, making it our largest resident fish producer. In addition, the hatchery is supplied with 60-80 cfs of Riley Creek water. Riley Creek is largely formed by springs above Hagerman National Hatchery which is located approximately one-half mile upstream from our hatchery. Because the majority of the Riley Creek water is first used at Hagerman National Fish Hatchery, the ammonia levels often exceed acceptable standards (0.0125 ppm unionized ammonia) when the water enters our hatchery. Treatment of Hagerman National Fish Hatchery effluent is being investigated. Disease pathogens, feral trout, leaves, algae, and other debris are also a continuous problem associated with Riley Creek.

Hagerman is capable of approximately 520,000 lbs. of fish production in the current operating mode. One-half of this production is accomplished with the use of Tucker Springs water and one-half with the use of Riley Creek water. We are currently enclosing Tucker Springs which should be completed by December 1, 1989. By January 1, 1990, the fingerling raceways should be enclosed with bird netting. This should greatly reduce the fish pathogen loading in the hatchery building and fingerling raceways. Eventually, we intend to make the portion of the hatchery that is supplied with Tucker Spring water disease free.

Fish production at Hagerman for 1986-1987 was as follows:

Catchables	1,318,698	at	486,918 lbs.
Fingerlings	1,712,655	at	32,445 lbs.
Total production			519,363 lbs.
Feed conversion			1.42
Total cost			$302,100
Cost/1,000 fish			$99.67
Cost/lb.			$0.57

Improving the quality of the Riley Creek water presents the greatest challenge at Hagerman. Several options are being investigated:

1. Installation of a screening device to keep leaves, algae, large fish and other debri from entering the hatchery intake.

2. Treatment of Hagerman National Fish Hatchery effluent.

3. Water quality treatment facilities at hatchery intake.

4. Reduce fish rearing densities on Riley Creek portion of hatchery.

5. Discontinue use of Riley Creek.

These options will be evaluated over the next two years.

Capital improvements needed at Hagerman:

1. Enclose 14 to 16 large raceways with bird netting.

2. Install baffles in small and medium raceways.

3. Pipe Tucker Springs water directly to each rearing unit to eliminate open head box.

NAMPA HATCHERY

Nampa has between 18 and 38 cfs of 59^0F pumped artesian well water. It is our second largest resident fish producer. With the future installation of more efficient pumps, water flows in the 30 to 40 cfs range could be available year around.

Fish production at Nampa for 1986-1987 was as follows:

Catchables	658,433	at	209,822 lbs.
Fingerlings	661,838	at	34,365 lbs.
Total production			244,187
Feed conversion			1.52
Total cost			$201,900
Cost/1,000 fish			$153.07
Cost/lb.			$0.83

Hatchery efficiency is being improved by increased utilization of eggs arriving in the April-June period and stocked during September-November.

Nampa has the potential to produce 300,000 lbs. per year of high quality fish. Limiting factors -are: 1) water flow; 2) dissolved gas composition of water; 3) bird predation; 4) incubation and early rearing space.

Water Flow

Two additional pumps will be installed prior to February 1990, which should add approximately 5 to 10 cfs during low flow periods. As older existing wells wear out, they will be replaced with larger capacity pumps individually discharged into packed columns for degassing. We should develop the capability of pumping up to 35 cfs, if needed, during periods of low water table when natural artesian flow has stopped.

Dissolved Gas Levels

Nitrogen gas levels at Nampa often approach 1202 in the untreated water. The present degassing boxes located on the raceway head trough, plus the impeller pumps on each well, reduce the nitrogen gas to approximately 1102. When the two new pumps are installed this winter (1989), they will be supplied with packed columns, and as the pumps are replaced in the future, they should be supplied with individual degassing units.

Nitrogen gas levels should be below 1022 in sac-fry rearing units and below 1052 in all other production units.

Bird Predation

Bird predation continues to be a problem at Nampa, even though significant progress has been made. Improvements made to date have reduced egg needs by 200,000 per year. For most efficient production and continued production of disease-free fish, all raceways should be protected from bird predation.

Incubation and Early Rearing Space

Nampa has very limited indoor early rearing space. It is currently capable of starting approximately 200,000 fry on feed. However, from a total hatchery fish production standpoint, they have more outside rearing space available than water flow to fully utilize that space.

Nampa presently incubates eggs and feed trains fry in their outdoor "A"-ponds. For effective utilization of these raceways for feed training and early rearing, they should be completely enclosed with shading and bird netting, plus some type of wind protection. Cost of enclosing these raceways may approach $80,000.

AMERICAN FALLS HATCHERY

American Falls has **a** covered spring water supply that ranges in flow from 16 cfs to 26 cfs but normally runs between 18 cfs to 20 cfs of 55°F water. Nitrogen gas levels in untreated water exceed 1202, and dissolved oxygen levels are approximately 4 mg/1, but following treatment in packed columns, D.O. levels rise to 8 mg/1 and nitrogen gas is reduced to 105%.

Production facilities are in good condition. Construction of the hatchery building was completed in 1987 and the production raceways were completed in 1983. Bird netting over the raceways is in poor condition and will be replaced in 1989 and 1990.

No major construction is needed in the next ten years. Minor repairs of hatchery housing and public restrooms will be ongoing and covered by budgeting in the American Falls Hatchery budget.

American Falls has a unique fish mortality problem that occurs when the fish are being moved from inside to outside raceways. The disease seems to be caused by stress-related bacterial infections. Part of this may be due to the low level 104 to 105 percent nitrogen gas in the hatchery water supply. The disease is triggered when the fish are exposed to sunlight. The upper portion of the raceways will be shaded. Sloped baffles in the outside raceways may also help alleviate stress by providing additional shading, keeping the raceways cleaner, and helping to distribute the fish more evenly throughout the raceway. Aeration can be provided by installing a pump aerator in each raceway to further reduce nitrogen and elevate oxygen gas in the water. Aeration, shading, and baffles will be budgeted in normal hatchery budgeting.

Fish production at American Falls for 1986-1987 was as follows:

Catchables	487,194	at	180,306 lbs.
Fingerlings	279,480	at	6,625 lbs.
Total production			186,931
Feed conversion			1.29
Total cost			$143,10
Cost/1,000 fish			$186.57
Cost/lb.			$0.77

The American Falls Hatchery is currently a two person station but could best be operated as a three-person station. Eventually, this hatchery should be expanded to include three full-time positions.

MACKAY HATCHERY

Mackay has a cyclic water supply with a low of 16 cfs in March-April and a high of 22 cfs in August-September. Water temperatures have ranged from 52°F to 56°F but normally average54°F. The hatchery elevation is 6,400 ft, and 902 dissolved oxygen saturation of the 54°F water occurs at about 7.5 mg/l. Untreated water enters the main production raceways at about 70% D.O. saturation, and under normal fish loading, the water nearly maintains this saturation level as it falls between raceways. Adequate water head pressure is not available to aerate this water with gravity flow and pumped aeration has been avoided because of increased production costs. Pumped aeration or oxygen injection are alternatives that could be used to increase production if needed. Isolation facilities will be incorporated into the existing system. These isolation units will allow separation of newly introduced eggs or fish to minimize the risk of disease transfer to other fish on the hatchery.

Production facilities at Mackay are in satisfactory condition and should remain in working condition for the next ten years, with only minor repair.

Fish production at Mackay for 1986-1987 was as follows:

Catchables	117,786	at	52,455 lbs.
Fingerlings	3,153,454	at	125,890 lbs.
Tota production			178.345 lbs.
Feed conversion			1.14
Tota cost			$109.200
Cost/1,000 fish			$33.89
Cost/lb.			$0.61

Fry production space is limited at Mackay. However, if we stay in the current production mode, or show an increase in spring eggs, we should be able to cycle the fish through the hatchery building without major problems.

GRACE HATCHERY

Grace has a total water flow from two springs that varies from 9 cfs to 24 cfs at 52°F. Neither spring area is enclosed, but the hatchery has remained disease-free for several years. Both springs are located on private property and are currently not for sale. When either property does become available, we should make every attempt to purchase the spring and the land in the immediate watershed. Even if future landowners refuse to sell, we should continue to pursue an agreement to allow us to totally enclose both spring areas.

The spring water is delivered to the main production raceways through an open ditch. This ditch should be replaced with a large collection tile system to eliminate fish and watercress in the water system.

The hatchery building, and most of the other buildings, are old but in functional condition and are being well maintained. The fingerling raceways are new. The main production raceways have crumbling walls and badly need repair. They should be cosmetically patched within the next two years and replaced prior to the year 2000.

Fish production at Grace for 1986-1987 was as follows:

Catchables	376.299	at	119.920 lbs.
Fingerlings	102.098	at	4.840 lbs.
Total production			124,760
Feed conversion			1.37
Total cost			$140,60
Cost/1,000 fish			$294.14
Cost/lb.			$1.13

Grace Hatchery has been producing 350,000 Bear Lake cutthroat each year to maintain a spawning run and a fishable population in Blackfoot Reservoir. Egg quality from fish trapped in the Little Blackfoot River has been very poor. A new trapping site with better water quality is being established on the Blackfoot River.

HAYSPUR HATCHERY

Hayspur is presently being evaluated for total reconstruction in a multi-phase plan being developed by CH_2M Hill.

Phase One will involve construction of eight enclosed circular brood ponds and an aeration/degassing unit. This construction phase will allow for the production of up to 5 million eyed eggs shipped to other hatcheries throughout the year and approximately 2 million eyed eggs for Hayspur's production needs.

Phase Two proposes construction of a spawning/incubation building and enhancement of the water supply.

Phase Three will involve replacing the old hatchery building and the fingerling production raceways.

Phase Four would involve replacement of the main production raceways.

Each phase of development will require additional water-line installation and water aeration facilities. Completion of all four construction phases should occur over a 15-year period. Each phase of construction may have to be subdivided as funding dictates.

Fish production at Hayspur 1987-1988 was as follows:

Eyed eggs	2,000,00		
Catchables	232,000	at	63,000 lbs.
Fingerlings	700,000	at	12,000 lbs.
Broodstock	4,000	at	20,000 lbs.
Total production			95,000
Feed conversion			1.76
Total cost			$147,60
Cost/1,000 fish			$129.70
Cost/lb.			$1.94

ASHTON HATCHERY

Ashton has approximately 5 cfs of 50°F water. Although Ashton is a small hatchery, its location and the 50°F water temperature make it a valuable hatchery. This water temperature is optimal for high survival of eggs and fry produced from a variety of species and strains of trout and salmon.

The water supply at Ashton is enclosed, disease-free, and ideally suited for the production of fry and fingerlings. We should expand the number of indoor vats or enclose some of the outside raceways to fully utilize this production potential. An isolation unit should be built to prevent disease transfer from specialty fish brought into the hatchery.

The main production raceways are in need of some repair work. One outside wall is leaning inward and needs to be replaced. Other interior walls need considerable patching, but replacement should wait until all raceways. are rebuilt.

The settling pond needs a new outlet structure. When the outlet is replaced, it should be moved downstream to allow for increased settling area and allow additional space for future development.

Fish production at Ashton for 1986-1987 was as follows:

Catchables	59,595	at	21,485 lbs.
Fingerlings	1,959,767	at	16,559 lbs.
Total production			38,044
Feed conversion			1.19
Total cost			$82,100
Cost/1,000 fish			$40.66
Cost/lb.			$2.15

Ashton, because of its high water quality but limited quantity, would benefit from increased aeration capabilities. Outside raceways should be fitted with electrical outlets for Fresh-Flo aerators.

HENRYS LAKE HATCHERY

Henrys Lake Hatchery is serving as a combination egg-taking station, public information source, and fish management work station. The only hatchery function is to collect and eye cutthroat and brook trout eggs, and ship the eyed eggs to Mackay and Ashton.

Public relations is a very important part of the Henrys Lake operation. It is imperative that the hatchery be presentable and the personnel be receptive to the fishing public.

Fish management activities include creel census, various fish sampling programs, and working with landowners on enhancement of the tributary streams.

Eggs spawned at Henrys Lake for 1986-1987 were as follows:

Cutthroat	1,500,000	
Cutthroat	450,000	for hybrids, rbt sperm from Ennis NFH
Brook	250,000	

A complete plan for reconstruction will be developed when a land ownership agreement is reached with the North Fork Reservoir Company and the Sherwoods, who own the adjacent land.

Initial projections for reconstruction would involve replacing the spawning house, quarters building, and office-reception area with one multi-purpose building. Wallop-Breaux funding would be pursued for this reconstruction.

CLARK FORK HATCHERY

Clark Fork has approximately 3 to 10 cfs of stream water available for fish production, plus 0.3 cfs of well water. Average temperature of the stream water is 44.5°F, with an annual range of 33°F to 53°F. Well water temperature is a constant 45°F.

Disease pathogens, BKD and IPN, are present in the stream water but are not a major cause of fish mortality.

Clark Fork maintains our only captive Westslope cutthroat broodstock with an egg production potential of 2.5 million.

Fish production at Clark Fork for 1986-1987 was as follows:

Eyed eggs	2,000,000		
Fingerlings	2,958,153	at	7,976 lbs.
Feed conversion			2.39
Total cost			$109,400
Cost/1,000 fish			$36.98
Cost/lb.			$13.72

We will be evaluating the groundwater potential at Clark Fork and Cabinet Gorge hatcheries over the next two years. After this evaluation, a decision will be made on modifying the production capabilities of one or both of these facilities.

CABINET GORGE HATCHERY

Cabinet Gorge has a maximum of 24 cfs of pumped water available, with a temperature of 34°F to 64°F. Temperatures of each major water source vary inversely to each other throughout the year.

Fish production at Cabinet Gorge for 1987-1988 was as follows:

Kokanee Fry	13,027,000	at	28,670 lbs.
Feed Conversion			1.0
Total cost			$165,800
Cost/1,000 fish			$12.66
Cost/lb.			$5.75

Cabinet Gorge, along with Clark Fork Hatchery, is being evaluated for increased production potential. Construction needs at Cabinet Gorge include an extension of the existing ladder to the adult holding ponds, which is budgeted in FY90. An intermediate well field is needed for buffering the extreme temperatures of the main wells at Cabinet Gorge. Feasibility of this intermediate well field will be determined by the groundwater study.

KAMIAH REDISTRIBUTION STATION

Kamiah has one small raceway which hold approximately 10,000 catchable trout prior to redistribution. Although the raceway is in only fair condition, they are still functional and should remain so with only minor repairs over the next ten-year period. The water supply consists of approximately 100 gpm.

This site has no potential for expanded fish production and should be continued as a redistribution facility.

Mc CALL HATCHERY

McCall serves three functions in the resident hatchery program. Westslope cutthroat are trapped and spawned at Fish Lake with an egg yield which ranges from 300,000 to 600,000 annually. About two-thirds of Idaho's mountain lakes are stocked from McCall. Catchable trout are redistributed from McCall into area waters. These three jobs are completed by funding the Superintendent I position for six months each year and one six-month bio-aid position. No major renovation or program changes are expected in the next ten years.

SANDPOINT HATCHERY

Sandpoint has approximately 1.5 cfs of water from an open spring with an average water temperature of 45°F.

Fish production at Sandpoint for 1984-1985 was as follows:

Kokanee Fry	2,168,264	at	2,825	lbs.
Kamloops Fingerlings	32,111	at	664	lbs.
Cutthroat Fry	194,561	at	387	lbs.
Total Production			3,876	lbs.
Feed conversion			1.24	
Cost/1,000 fish			$18.91	
Cost/lb.			$11.68	

Sandpoint was closed following the 84-85 production year for a variety of reasons. Cost effectiveness of this hatchery is very poor. The cost per lb. and cost per 1,000 fish produced are among the highest of all our hatcheries. Natural groundwater flow is limited to about 1.5 cfs. Our cost per cfs to operate Sandpoint was $30,200 compared to a statewide average of $5,742.

Fish production units at Sandpoint consist of 18 cement troughs (13' x 2.5' x 3') and 2 raceways (100' x 5'x 2'). Buildings consist of one hatchery building, one garage-storage building, and a hatchery residence. The water supply pipeline runs about 2,100 feet from the spring located south of the hatchery.

MULLAN HATCHERY

Mullan has approximately 2.0 to 4.0 cfs of water from the Coeur d'Alene River system. Water temperatures range from a winter low of 33°F to a summer high of 56°F.

Fish production at Mullan for 1984-1985 was as follows:

Kokanee Fry	3,460,331	at	1,998	lbs.
Rainbow Fry	86,727	at	314	lbs.
Total Production			2,312	lbs.
Feed conversion			1.78	
Cost/1,000 fish			$13.05	
Cost/lb.			$20.03	

Mullan was operated during 1985-86 but no fish production occurred and the hatchery has been used only for catchable redistribution since 1987. Mullan has a history of very limited fish production because of a limited water supply, cold water temperatures, and water quality problems in the Coeur d'Alene River system. Approximately 70,000 catchables are redistributed from Mullan to the surrounding waters

during April through September each year. The hatchery is staffed by one bio-aide and is very popular- with Shoshone County residents as a tourist attraction.

The hatchery is owned by the Shoshone County Sportsmen's Association with limited funding from Shoshone County.

Mullan should not be reopened for fish production for the following reasons:

1. Ownership of buildings and grounds is by the Shoshone County Sportsmen's Association.

2. Start up costs would exceed $1,000,000 as reliable fish production would require a well field and new raceways. Without these improvements it does not warrant a full-time staff.

3. An average water temperature of less than 45°F limits fish growth.

4. Annual operating costs would exceed $100,000 if improvements were completed.

SUMMARY TABLES

Each hatchery has been evaluated and the construction projects listed in Table 1 have been designed to allow each hatchery to be at 75 to 100 per cent capacity for the majority of the year.

Table 2 summarizes the main hatchery functions, along with incubation and rearing facilities. In addition, several of our resident hatcheries operate traps as a source of eggs for statewide fish production.

Table 3 summarizes the basic water chemistry of our hatchery water sources. Most of our hatcheries have good to excellent water quality for fish production. Clark Fork and Cabinet Gorge have alkalinities which are near the lower limit for safe fish production, however, neither hatchery has had significant fish mortality because of the low alkalinity.

Table 4 presents the estimated percentage of total rearing capacity, by hatchery, by rearing unit type. Several of our hatcheries have production gaps, or periods of the year when they are at less than 100 per cent capacity. Our production scheduling will be changing to utilize these slack periods and put our hatcheries into full-time production.

Table 4 also shows what type of facilities are needed at a particular hatchery. For example: Nampa utilizes 100% of the incubation capacity available for most of the year but only for two months are the main production raceways at 100% capacity. We could remedy this situation by covering the "A" raceways and effectively make them into large incubation and start tanks.

Table 5 lists the number of catchables by region and water type. Future catchable production (shown in Table 8) will be adjusted to reduce our excessive hatchery springtime fish loads and increase our production of subcatchables for fall stocking in reservoirs. This will help to even out our fish loading throughout the year both in our hatcheries and also for our fish distribution tankers as well.

Catchables stocked by region and water type will also be compared with information obtained from the Angler Opinion Survey. Catchables stocked in streams will be intensively scrutinized to balance stocking levels with fishing intensity and provide the highest return to the creel. This will reduce the demand for increasing production while providing for better fishing opportunity.

Table 6 lists lakes and reservoirs that are larger than 500 acres. These larger bodies of water may offer the greatest potential of replacing catchable stockings with fingerling or subcatchable fish.

Table 7 compares our hatchery production and costs, actual fish stocked by size category, and number of anglers with that of adjoining states. Our hatcheries produce catchables at a cost approximately equal to the Wyoming cost per fish and considerably lower than all other adjoining states. We also produce as many or more fish than Washington and Oregon, even though they have 2.5 times as many anglers. It is interesting to note, that Montana has reduced their "pure" put-and-take catchable plants to less than 100,000 fish. When this was initially done, the public went through about a two-year adjustment period when license sales sagged and people complained, but now their anglers are generally satisfied with the stocking program. A significant portion of their catchable production was switched to fingerlings and subcatchables that Montana uses to support their reservoir fisheries (personal communication-Thurston Dotson).

Our fry production is significantly greater than that of adjoining states, primarily because of our kokanee production from Cabinet Gorge. Washington and Montana are planning significant increases in their kokanee fry stocking, patterned after our program on Pend Oreille.

Tables 8, 9, and 10 project fish production needs through the year 2000. Major changes in trout production involve the reprogramming of "pure" catchable production into the more specialized production of catchables and subcatchables for each individual water. This will basically involve reducing our production of 3 per lb. catchables from 3 million to 2 million and increasing their mean size to 2.5 per lb. As "pure" catchable numbers are reduced, the production of subcatchables will be increased to support those fisheries. In addition, our production of kokanee, involving all three strains, will increase to over 25 million by the year 2000. Increases in westslope cutthroat production will be used primarily to enhance adfluvial populations in the large lakes of North Idaho.

Future requests for catfish increased from the current 100,000 for 1989 to a projected demand of 300,000 by the year 2000. Demands for smallmouth and largemouth bass, tiger muskie, and walleye are expected to remain about the same over the next ten years. The feasibility of supplementing the native sturgeon populations with hatchery production is largely unknown at this time. Limited stockings of hatchery reared sturgeon will occur over the next ten years on an experimental basis. This program will proceed cautiously due to concerns over the spread of disease to native stocks and the potential for loss of genetic variability in these remnant wild populations.

Table 11 is included to provide the fish managers a "users guide" to the relative production costs of various sizes of rainbow trout.

Table 2. Resident hatchery summary of personnel, rearing facilities available, and type of fish produced.

Hatchery	Mont perm/ temp	Incubators	Start tank vol (cf)	Interm rcwy vol (cf)	Raceway volume (cf)	Pond volume (cf)	Present functions (B)(C)(Fry)(Fing)	Additional egg sources and comments
American Falls	24/15	126 Heath Trays	2,600	None	40,000.	None	(Fing)(C)	None
Ashton	24/8	160 Heath Trays	745	6,368	6,552	None	(Fry)(Fing)(C)	Trap Kokanee from Island Park at Moose Creek
Clark Fork	36/23	160 Heath Trays	880	3,240	29,640	26,424	(Fry)(Fing)(B)	Westslope brood fish on station, Kamloops from Spring Creek, kokanee from Coeur d'Alene
Hagerman([1])	48/16	28 Upwellers	2,520	15,840	477,000	None	(Fing)(C)	([1])Tucker Springs
Hagerman([2])	48/16	None	None	None	253,200	None	(C)	([2])Riley Creek water 253,200 cf of rearing space is included in 477,000 total
Hayspur	36/7	136 Heath Trays	812	5,250	72,000	30,000	(Fing)(C)(B)	Golden Trout-Baker Lake; Brown trout-Magic Reserv. Rbt brood on station
Henrys Lake	12/7	160 Heath Trays	None	None	None	7,000	Egg Taking	None
Mackay	36/16	160 Heath Trays	816	9,600	51,200	none	(Fry)(Fing)(C)	None
Cabinet Gorge	24/26	192 Upwellers	33,300	None	None	(3,000 adult holding)	(Fry)(Fing K2)	Trap at hatchery for kokanee, bulltrout, and gerrards; trap late kokanee at Sullivan Springs
Grace	36/15	64 Heath Trays 10 Upwellers	936	12,960	50,400	None	(Fing)(C)	Trap at St. Charles and Little Blackfoot
Nampa	36/14	18 Upwellers	216	6,800	139,236	None	(Fing) (C)	Kokanee eggs from Deadwood Reservior;

Key: B = Broodfish
C = Catchable
Fing = Fingerling

Table 3. Summary of water quality at resident hatcheries.

Hatchery	Temperature	pH	Total hardness (ppm)	Alkalinity (ppm)	Flow (cfs)	Dissolved oxygen (ppm)	Nitrogen gas %	Comments
American Falls	55	7.2	n/a	175	16-26	4 raw water 8 thru packed columns	124% Raw water 105% thru packed columns	105.7% TOG (7/89) 102% TOG (5/89)
Cabinet Gorge	34-64	7.5	108	26-88	1-24	90-95% Sat. thru packed columns	TOG 101%	Highest N2 during cold water periods
Ashton	50	7.4	n/a	210	5-5.5	8.0-8.5		
Clark Fork								
Spring Creek	(33-53)	7.4	11	20	3-8	10.8	n/a	
Well	45	n/a	n/a	n/a	0.5	10.31	105%	
Hagerman								
Tucker Springs	59	7.1	n/a	137	47	8+		
Riley Creek	57-61	7.1-8.4	n/a	n/a	60-80	7-8		
Hayspur								
Artesian	52	8.0	n/a	195	2.6	8.4	110%+	Raw=108.6%, TRT=102.8% (10/89)
Loving Creek	32-70	7.2	n/a	195	18-24			
Spring	52-53	7-7.2	n/a	195	5.0	7.5	110%+	
Henrys Lake	46	7.1	n/a	102	1.0	9.0	TOG 100.7%	Measured in first tray of Heath stack (89)
Mackay	52-56	7.5-8	136	118	16-22	6-9		
Grace	52	7.3-8.2	n/a	308-340	9-24	8.3-10.2		
Nampa	59	8.0	238	244	17-35	7 raw water 8 thru packed columns	120% raw water 110% thru packed columns	116.5% Raw 106.4% Rcy Head 100.3% Incubators (10/89)

Table 4. Percentage of total capacity in use by month during annual production cycle.

Hatchery	J	F	M	A	M	J	J	A	S	0	N	D	Comments
Mackay	100	100	100	100	75	50	0	25	50	75	100	100	Incubation
	100	100	100	100	100	100	75	50	50	100	100	100	Start Tanks
	75	75	100	100	100	100	100	75	75	50	75	75	Intermediate Raceways
	50	75	100	100	100	100	75	75	75	50	75	75	Production Raceways
Hagerman	100	100	75	75	90	90	45	75	50	65	75	100	Incubation
	100	100	75	75	90	90	45	75	50	65	75	100	Start Tanks
	100	100	100	100	100	40	95	100	80	85	75	75	Intermediate Raceways
	90	100	100+	100+	100	75	**95**	25	15	40	50	70	Production Raceways

Table 4. Percentage of total capacity in use by month during annual production cycle con't.

Hatchery	J	F	M	A	M	J	J	A	S	0	N	D		Comments
Clark Fork	100	100	100	100	100	100	50	10	0	0	75	100	Incubation	
	100	100	100	100	100	100	100	70	70	80	100	100	Start Tanks	
	0	0	20	20	40	60	40	20	20	0	0	0	Intermediate Raceways	
	75	75	100	100	100	100	100	100	100	75	75	75	Production Raceways	
Grace	50	75	80	25	50	75	70	70	0	0	0	0	Vat Incubation	Heath open except May & June
	50	75	80	25	50	75	70	70	0	0	0	0	Start Tanks	with 25% and 60% respect'ly
	50	60	70	80	90	65	70	75	30	30	35	45	Intermediate	
	70	75	80	80	70	80	85	90	90	70	55	65	Large	
American Falls	33	0	60	90	90	0	0	0	0	0	33	33	Incubation	Water Peaks in June; Low in
	21	21	21	33	100	100	100	50	0	0	0	0	Start Tanks	February
	100	100+	100+	100	90	70	60	40	50	75	100	100	Raceways	Normal Cycle 13-26 cfs
Nampa	0	100	100	100	100	100	0	0	100	100	100	0	Incubation	200,000 egg lots
	0	100	100	100	100	100	0	0	100	100	100	0	Start Tanks	one-month/cycle
	50	65	65	75	90	10	10	70	35	10	10	25	A Raceway	
	70	100+	100+	60	60	55	40	30	30	30	30	45	B & C Raceways	

Table 4. Percentage of total capacity in use by month during annual production cycle con't.

Hatchery	J	F	M	A	M	J	J	A	S	0	N	D		Comments
Ashton	6	2	0	13	12	12	0	8	8	10	25	37	Incubation	
	100+	100+	100+	100+	100+	91	100+	84	2	0	0	22	Start Tanks	
	57	81	16	40	35	23	74	100	97	85	100+	35	Intermediate Raceways	
	0	0	100	100	50	60	40	10	0	0	0	0	Production Raceways	
Hayspur	20	0	0	0	0	0	0	0	5	20	100	100	Incubation	Hatchery will be at
	100	100	100	100	100	10	0	0	0	0	0	100	Start Tanks	100% capacity year-round
	30	75	100	100	100	30	0	0	0	0	0	10	Intermediate Raceways	when light control system
	35	35	35	100	100	90	75	60	35	25	30	35	Production Raceways	is functional
Cabinet Gorge	100	75	25	0	0	0	0	0	0	0	25	75	Incubation	Upwellers tie up inside
	100	100	100	100	100	10	100	0	0	0	25	75	Start Tanks	start tanks during
	0	0	25	30	100	10 0	100	0	0	0	0	0	Intermediate Raceways	incubation. Full raceways not tied up during incubation. Based on capacity year. Capacity at: 10 million 2.5" fish 15 million 2" fish 18 million is maximum Number for good feed training. 25 million 1.5" fish

Table 5. Number of catchables stocked by region and water type in 1988

Region	Streams	Lakes & reservoirs under 500 acres	Lakes & reservoirs 500 acres and over	Total
1	69,000	105,000	36,500	210,500
2	29,000	196,500	0	225,500
3B	186,050	122,900	318,000	626,950
3M	58,300	74,750	350,000	483,050
4	256,575	146,875	173,000	576,450
5	101,500	236,000	195,000	532,500
6I	162,250	24,500	206,000	392,750
6S	80,600	36,400	41,000	158,000
	943,275	942,925	1,319,500	3,205,700

Table 6. Lakes and reservoirs over 500 acres receiving catchable trout

REGION 1	
Cocolalla	13,000
Spirit Lake	10,000
Hauser	13,500
	36,500
REGION 2	
None	
REGION 3B	
Brownlee	100,000
C.J. Strike	60,000
Black Canyon	2,000
Lake Lowell	2,000
Lucky Peak	150,000
	314,000
REGION 3M	
Oxbow Res	20,000
Warm Lake	15,000
Cascade Res	300,000
Payette Lake	15,000
	350,000
REGION 4	
Salmon Falls Cr Res	50,000
Roseworth Res	20,000
Oakley Res	20,000
Lake Walcott	35,000
Anderson Ranch Res	10,000
Little Camas Res	20,000
Mormon Res	18,000
	173,000
REGION 5	
American Falls Res	80,000
Chesterfield Res	15,000
Blackfoot Res	100,000
	195,000
REGION 6I	
Ririe Res	82,000
Island Park Res	85,000
Mackay Res	39,000
	206,000
REGION 6S	
Redfish Lake	21,000
Alturas Lake	20,000
	41,000

Table 7. Comparison of hatchery production with adjoining states (1987).

State	Number of Anglers	Fish Stocked			Catchable Production Cost
		Catchables (6"+)	Fingerlings (3"-6")	Fry (1"-3")	
Idaho	480,000	3.2 (9.5")	10	16	$1,000,000
Washington	1,200,000	2.5 (8")	12-13	3-7	$1,280,000
Oregon	1,200,000	2.4 (9.5")	9	1	$1,500,000
Montana	600,000	0.1 (10")	9	15 (14 Walleye)	N/A
Utah	440,000	1.6 (9.5")	3.5	1	$780,000
Wyoming	290,000	1.0 (9.0")	6.0	1.5	$302,000

Table 8. Fry and fingerling production requests for 1989 and estimated production for 2000.

Species	Size (inches)	1989 Request	2000 Estimate
Brook Trout	3"	121,000	121,000
Brown Trout	2"-5"	700,000	350,000
Bull Trout	2"-4"	50,000	100,000
Westslope Cutthroat	1"	1,800,000	200,000
Westslope Cutthroat	3"-6"	350,000	500,000
Henrys Lake Cutthroat	3"	1,300,000	1,300,000
Bear Lake Cutthroat	6"-7"	350,000	500,000
Lahonton Cutthroat	3"-6"	400,000	500,000
Gerrard Rainbow	3"-6"	20,000	100,000
Ri Rainbow	2"-7"	2,500,000	3,500,000
Coho	4"-6"	1,100,000	1,500,000
Fall Chinook	5"	50,000	30,000
Atlantic Salmon	6"-7"	0	5,000
Golden Trout	1"-1.5"	14,000	40,000
Grayling	1"-1.5"	30,000	50,000
Kamloops (domestic)	3"-6"	1,800,000	2,800,000
Kokanee KL	2.5"	12,000,000	20,000,000
Kokanee KE	3.5"	700,000	3,000,000
Kokanee KO	3.0"	300,000	2,500,000
Redband Rainbow	2"-3"	25,000	100,000
Rainbow X Cutthroat Hybrids	3"	325,000	1,500,000
Total		23,935,000	38,696,000

Table 9. Catchable Trout Production for 1989 and estimated production for 1990 and 2000.

Rbt		
1989	3,000,000	(3/lb)
1990	2,750,000*	(2.75/lb)
2000	2,000,000*	(2.5/lb)
	2,000,000	(4-40/lb)

*Replaced by increased production of 4,000,000 kokanee and 2,000,000 (4"-8") rainbows and domestic kamloops stocked in lakes and reservoirs over 500 acres.

Table 10. Warm and coolwater fish production requests for 1989 and estimated production for 2000.

Species	Size (inches)	1989 Requests	2000 Estimate
Channel Catfish	8-10	100,000	300,000
Smallmouth Bass	2-4	50,000	50,000
Tiger Muskie	8	14,000	25,000
Walleye	1	1,000,000	1,000,000
Sturgeon	12	0	20,000
Largemouth Bass	6	0	30,000
Total		1,164,000	1,425,000

Table 11. Equivalent Rainbow Trout Production Costs

Number of Fish	Total Length (inches)
9,803	3.0
7,191	3.5
3,543	5.0
1,000	9.4

Each of the above groups of fish cost $277.00 to produce in 1987. This table may be used by Fish Managers as a general guide to the relative "trade off" between sizes of fish produced in our hatcheries.

Table 12. Resident Hatchery Budgets

	(Actual) 1989	(Projected 5% Inflation) 2000
License Funded		
American Falls	168,100	287,451
Ashton	113,500	194,085
Clark Fork	146,600	250,686
Grace	170,300	291,213
Hagerman	324,200	554,382
Hayspur	158,600	271,206
Kamiah	9,000	15,390
Mackay	155,900	O[A]
McCall	51,300	87,723
Mullan	16,800	28,728
Nampa	225,200	385,092
Egg Taking	14,200	24,282
Fish Transport	294,400	503,424
Hatchery Construction	434,000	742,140
Total	2,282,100	3,635,802
Wallop-Breaux Funded		
Cabinet Gorge	194,800	333,108
Henrys Lake	46,900	80,199
Warmwater Fish	50,900	256,500[B]
Bear Lake	59,000	100,890
Mackay	0	266.589
Total	351,600	1,037,286
Grand Total	2,633,700	4,673,088

[A] – switched to Wallop-Breaux Funding

[B] – expanded to include hatchery operational costs

CONCLUSIONS

Stocking of resident hatchery fish in Idaho has often been an instant solution to fishery management problems. Fish managers have not been adequately staffed to intensively manage waters on an individual basis. As regional fish managers acquire adequate personnel to physically manage individual waters, the needs for hatchery fish will change and become more specific for each body of water. Demands for selected strains at a certain size and time will become more detailed. These demands will have to be balanced with the production capability of a multi-million dollar investment in resident hatchery personnel and facilities.

To operate efficiently, each hatchery should be near full production capacity on a year-round basis. Current fish production schedules require large numbers of fish to be stocked in May-June and limited stocking the remainder of the year. The potential of fall stocking should be fully explored to allow for optimal use of our resident hatchery facilities and improved fisheries.