

Dworshak Steelhead Trout Mitigation Program
Idaho Fishery Resource Office
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Background: Dworshak National Fish Hatchery (DNFH) was started in 1969. Hatchery was constructed by the Corps of Engineers to mitigate for construction of Dworshak Dam, dam closed 1970. Dworshak Dam blocked off the North Fork Clearwater River and the unique North Fork "B" run steelhead. DNFH was built to rear steelhead and resident fish to mitigate for the dam construction.

Following are the cultural units now at DNFH:

- 84 recirculating-type Burrows ponds (17' x 75')
- 128 inside nursery tanks (3' x 16')
- 58 vertical stack egg incubators
- 204 egg colander units
- 12 rainbow raceways (8' x 75')
- 3 adult holding ponds (17' x 75')
- 30 spring chinook salmon raceways (8' x 80') - these are under the Lower Snake River Compensation Plan program - Not Dworshak mitigation

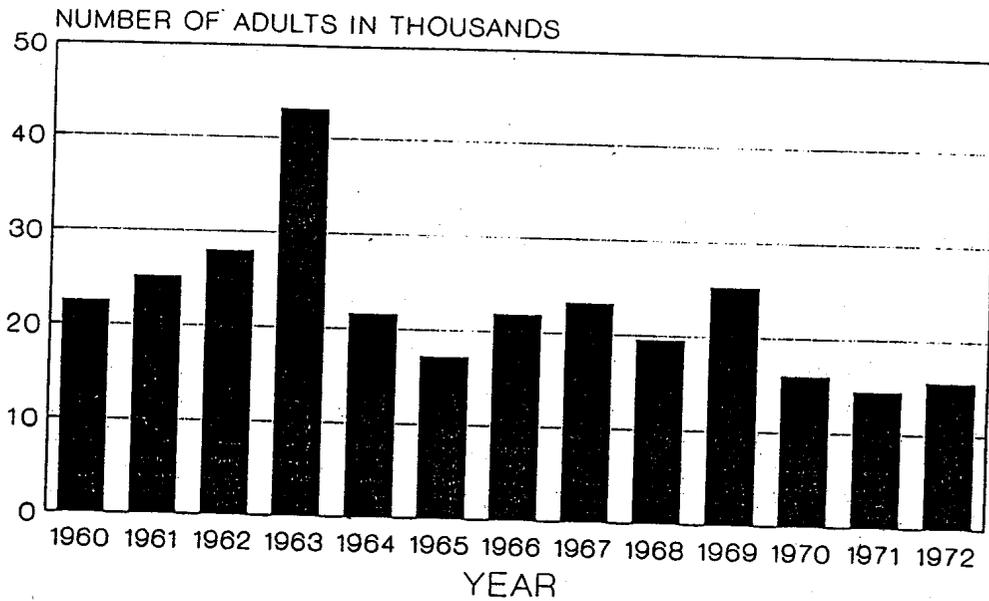
Steelhead mitigation for Dworshak Dam was calculated based on the Lewiston Dam counts (Figure 1), estimation of the percentage going into the North Fork Clearwater River and the expected survival of smolts released from DNFH to survive to adults. A thorough review of the mitigation record for DNFH is contained in Miller's (1987) "A Review of Dworshak National Fish Hatchery Mitigation Record." A goal of returning 20,000 adult steelhead back to the Clearwater River from releases at DNFH was established based upon an estimated 50-60 percent of Clearwater steelhead spawning in the North Fork Clearwater and historic high total returns recorded across Lewiston Dam.

Hatchery Operations: To achieve the 20,000 adult returns to the Clearwater, a release of 2.3 million smolts is the target goal. Figure 2 and Table 1 display the smolt releases for the past 6 years. As can be seen, we have not always made the 2.3 million target release goal; our lowest release in the past few years was 1.6 million released in 1985. When the hatchery was first rearing fish in the 1970s, the release size was 8 fish per pound, approximately 180 mm total length. As a result of size at release evaluation studies done by Ted Bjornn at the Idaho Cooperative Fishery Unit and by our Idaho Fishery Resource Office at DNFH, we have determined that a larger sized smolt return at a significantly higher rate. Our release size target is now 6 fish per pound, approximately 200 mm total length (Table 2).

As all fish culturists know, however, the capacity of a facility is really measured in pounds of fish produced. DNFH's estimated maximum production is 450,000 lbs. Dworshak has produced this amount in most years (Table 2). In 1989 significant production was shifted to Hagerman NFH because of problems with IHN.

Not all of DNFH's production is released at the hatchery. At the present time, we have a program of releasing 1.2 million smolts at the hatchery and the remaining, estimated 1.1, million off-station primarily into the South

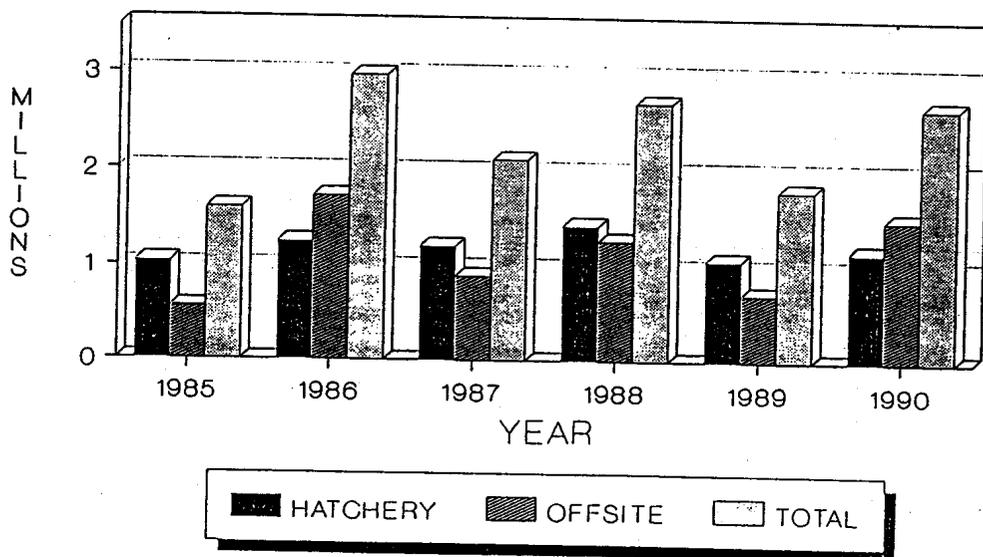
LEWISTON DAM SST COUNTS ADULTS 1960-1972



COUNTS RAN FROM JULY 1 TO JUNE 30

Figure 1. Number of adult steelhead counted over Lewiston Dam by run year.

SST SMOLT RELEASES CLEARWATER 1985-1990



1989 INCLUDES SOME HNFH PRODUCTION

Figure 2. Releases of Dworshak NFH stock steelhead smolts to the Clearwater drainage, 1985-1990.

Table 1. Releases of Dworshak NFH stock steelhead smolts to the Clearwater drainage, 1985-1990.

SITE	1985	1986	1987	1988	1989	1990
AMERICAN R.	162,111	247,695	41,527	56,885	0	209,847
CROOKED R.	42,235	140,820	200,162	201,325	109,898	214,633
NEWSOME CR.	95,286	212,188	202,857	190,708	103,273	210,836
LEGGET CR.	0	8,904	0	0	0	0
RED R.	0	0	0	0	0	0
MAIN STEM S.F.	0	746,584	298,070	165,055	143,803	287,830
S. FORK SUM	299,632	1,356,191	742,616	613,973	356,974	923,146
CLEAR CR.	145,206	165,483	156,552	254,898	257,348	374,040
LOLO CR.	0	0	0	200,425	0	0
ELDORADO CR.	121,284	204,662	0	200,806	109,480	199,700
LEWISTON						
OFF SITE SUM	566,122	1,726,336	899,168	1,270,102	723,802	1,496,886
DIRECT RELEASES	1,035,573	1,249,696	1,206,580	1,429,513	1,073,900	1,166,664
TOTAL	1,601,695	2,976,032	2,105,748	2,699,615	1,797,702	2,663,550

Table 2. Pounds of steelhead smolts stocked from Dworshak NFH, by year, size, number and size, 1985-1990.

YEAR	DNFH	OFFSITE	TOTAL	NO./LB.
1985	150007	72002	222009	7.2
1986	190104	249611	439715	6.7
1987	382820	164523	547343	5.5
1988	235331	199144	434475	6.2
1989	212709	62475	275184	5.1
1990	181350	218793	400143	6.6

Fork Clearwater River (Table 1). Purpose of the off-site releases has been two-fold. First, to extend and spread the sport fishery for the Clearwater River. Secondly, to attempt to supplement natural production in the South Fork drainage and into Lolo Creek, a tributary about 10 miles upstream from the confluence of the North Fork Clearwater River.

For adult spawning it takes approximately 3700 fish to fulfill all egg requirements. Present egg takes are about 9-10 million eggs. This represents a need of 5 million for DNFH and 5 million for other programs, i.e., Magic Valley, and the new Clearwater Hatchery. If we succeed in overcoming some of the IHN problems at Dworshak, we hope to drop these egg needs down and subsequently the number of adults needed for spawning. The reason we need 3700 fish is that we attempt to spawn 1:1 male to female and with 70-80 percent of the run as females, we have to take in about twice as many fish to get adequate number of males. About 90 percent of our run is comprised of 2-salt fish, with about 5 percent 1-salts and 5 percent 3-salt fish. These percentages particularly the 1-salts do vary from year to year. In the last few years, 1-salts have varied from around 1 to 15 percent.

Mitigation Accomplishments: I believe the DNFH steelhead program can be classified as highly successful. Basically the program has rebuilt the steelhead fishery of the Clearwater River both sport and tribal. However, Dworshak's success with the steelhead program did not come overnight. It has taken 20 years to get where we are now. I believe for the first 10 years we were on the "learning curve" increasing our knowledge and ability to rear steelhead in the hatchery. So those of you in the Lower Snake River Compensation Plan (LSRCP) program don't get discouraged and don't expect instant results. The LSRCP program has only been going for about 10 years or less at most facilities and at least for spring chinook we are still learning how to rear this species.

Adult hatchery steelhead returns to the Clearwater River for the past 6 years are shown in Table 3. In 4 of the last 6 years we have met our 20,000 adult fish goal. Note the 1990 estimated total number of 43,862 hatchery steelhead I believe is about 9,000 fish too high. The total number is derived by adding up all the fish that returned to racks (Dworshak and Kooskia NFH's), the number estimated harvested by sport fishermen, the number estimated harvested by tribal fishermen and the estimated number that are unharvested that remain in the river. Other than direct hatchery rack counts, the other figures are estimated by sampling and statistical expansion. I believe that in 1990 the sport fishing harvest estimate was too high by about 9,000 fish.

Sport fishermen harvest about 50 percent of the fish that enter the Clearwater River (Table 4). The hatchery needs of 3700 fish to maintain a spawning ration of about 1:1 have been met in the past 6 years (Table 4). Although we have gotten the needed adults every year, we were pretty close (to the minimum) in 1988 where the sport fishery was closed for a period of time to assist in increasing the hatchery rack returns. There is also a Nez Perce tribal harvest in the North Fork Clearwater adjacent to DNFH's fish ladder and in Clear Creek near Kooskia NFH. The tribal estimated harvest in the Clearwater is about 1500-2000 steelhead annually.

Table 3. Estimated Dworshak NFH adult steelhead returning to the Clearwater River by return year, 1985-1990.

RETURN YEAR	CLEARWATER TOTAL
1985	37,628
1986	15,002
1987	28,296
1988	16,112
1989	22,566
1990	43,862 *

*Number may be about 9,000 fish too high because of overestimate of the telephone survey for harvest.

Table 4. Sport harvest and rack returns of Dworshak NFH steelhead returning to the Clearwater River, 1985-1990.

RETURN YEAR	DNFH RACK	SPORT HARVEST
1985	14,018	19,410
1986	4,462	7,240
1987	5,286	15,800
1988	3,764	8,748
1989	6,041	11,347
1990	10,548	27,954 *

*Number may be about 9,000 fish too high because of overestimate of harvest.

The return rate for steelhead smolts released at Dworshak are considered good. From tag return data and total return estimates, I have calculated a 1.0-1.5 percent return rate to Lower Granite Dam. This in turn reflects a 0.50 to 0.75 percent return to DNFH. If we back our return rates down the river to estimate adult survival back to the mouth of the Columbia River, I have estimated a survival rate of 3-4 percent. This survival rate, I believe, can be considered good!

An interesting study we are involved with is the return rate of DNFH steelhead to different locations in the Clearwater system. We coded-wire tagged and branded fish for the 1987 release year and released them as follows:

Group 1 - released at DNFH (approximately 72 miles upstream of Lower Granite Dam).

Group 2 - released at KNFH on Clear Creek (approximately 105 miles upstream of Lower Granite Dam).

Group 3 - released at Crooked River on South Fork Clearwater (approximately 170 miles upstream of Lower Granite Dam).

The return data is still incomplete with just the 1-salt and 2-salt returns back at this time. However, with only an estimated 5 percent of the returns expected as 3-salts, we can make some good conclusion based on the 1- and 2-salt returns. In Figure 3 you can see how hauling fish farther upstream reduces return percentage. For 1- and 2-salt returns, DNFH releases had a 1.7 percent adult return rate to Lower Granite Dam while the Clear Creek release had a 1.3 percent adult return and Crooked River a 0.7 percent return rate. Although most biologists would have concluded that hauling smolts farther upstream would decrease survival to adults, I don't believe most would have suspected it would be that dramatic. This points out that when we are outplanting smolts, particularly to provide a fishery, we should be aware that we may be significantly reducing survival rates.

Another area we are working on is steelhead broodstock management for DNFH. Since the mid-1970s we have been taking the spectrum of the run as it enters Dworshak for broodstock. We make sure that we get early arriving fish and late arriving fish. For the past 3 years we have been taking 400-500 fish in the fall and holding them over to spawn in the spring. Before that we were opening the ladder about the first of February and closing it after the first week in May. Now we take early fish in the fall and then close the ladder until about the first of February. We usually keep the ladder open until about the 10th of May. In 1984 we released marked smolts from three different spawning parentage, early, mid, and late spawning. We were wanting to determine the heritability of spawning time and if we should be concerned with the shift, we have seen in spawning time at DNFH. Since DNFH first started we have seen the peak spawning period shift earlier by about 1 to 1 1/2 months. We were also concerned about the extended fishing pressure on those fish that arrive to the Clearwater in the fall versus those that arrive later in the following spring. If we apply a 50 percent harvest pressure for 6 months to fall arriving fish and only a 2 month or less fishing pressure to spring arriving fish, we may be reducing the proportion of fall arriving fish in our

gene pool. This idea also revolves around the concept that steelhead that enter our ladder, from a fishery point of view, are failures. If no one has harvested them, is it because of chance or is it a result of our management of the spawning broodstock?

Figure 4 presents return data from our 1984 spawning time study. What I want to point out is that it looks like late arriving fish begot late arriving fish. From late spawning fish, 1st of May spawning, progeny returning did not show up at the hatchery until the last of March - first of April. Progeny of early arriving fish tended to arrive earlier than the other groups but not nearly as evident as the late spawners. We are further checking the arrival time heritability with a follow-up study which will be more definitive. We have branded some of the release groups so we can determine arrival time back to Lower Granite. We also captured some fish in the fall with rod and reel and reared progeny from this group to look at susceptibility to sport harvest as a characteristic that may be heritable. The rod and reel sampling also made for good inter-agency public relations. Asking people for assistance to go fishing for steelhead broodstock always got a good response. You would be surprised at the fishery expertise I discovered in the main offices of the various agencies. Of course, our Service had a few experts also.

This fall, 1990, we recorded the 2-salt branded fish back across Lower Granite Dam. Jerry Harmon's NMFS crew at the dam read these brands. Thus far it looks as if progeny from fall returning fish arrive back earlier to Lower Granite than the progeny from spring arriving fish. However, all data is fairly preliminary at this time. We do not have any information back on tagged fish in the harvest to see if there is a heritable factor associated with harvestable fish.

In closing I would like to reiterate that the steelhead mitigation program at DNFH can be considered a success story. We are accomplishing what we were programmed to do. Right now we are "tweaking" with the program to make sure we maintain the broodstock for the long term. We also are maintaining the evaluation program to document our mitigation record.

We have satisfied fishermen and I believe a good program going. There are a few problems with IHN, but, hopefully, the new nursery water supply direct from the reservoir will help solve this. We have the new Clearwater Hatchery coming on line and there will be a need for coordinating our steelhead program with that facility.

As others at the meeting have discussed much of our future evaluation needs are with chinook salmon. DNFH has a part of the LSRCP program as mentioned before. I believe we are still developing our fish culture techniques and management operations for chinook. We really haven't been in the chinook work as long as steelhead, particularly if we count some of our rainbow background as a part of the steelhead. We will get better at producing chinook and get better survival rates, but it will take a team effort and ongoing evaluation programs if we are to meet our goals for this species.

SST RETURN RATES NMFS TRAP AT LOWER GRANITE

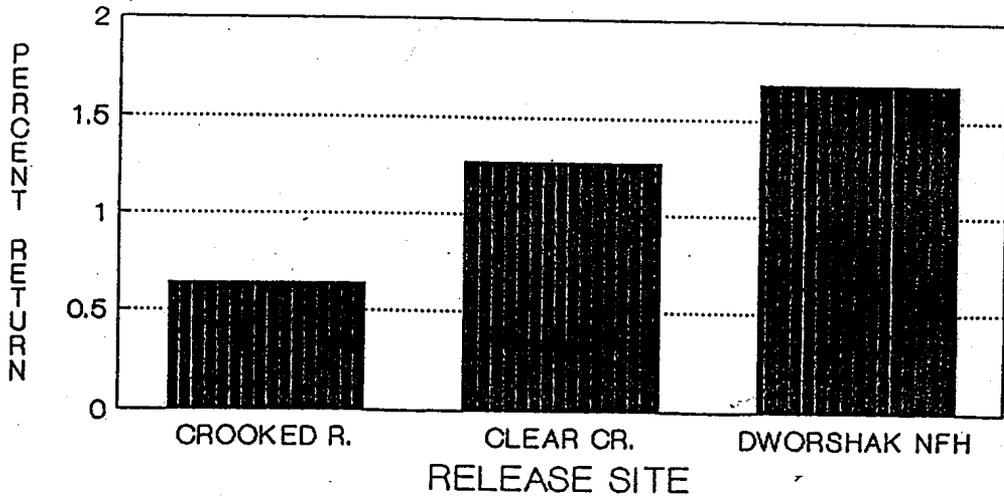


Figure 3. Adult return rates of coded-wire tagged and branded DNFH steelhead smolts released in 1987 at three different sites on the Clearwater River. Data incomplete, only 1- and 2-salt fish returned to date.

SST SPAWNING TIME, PROGENY VS PARENT

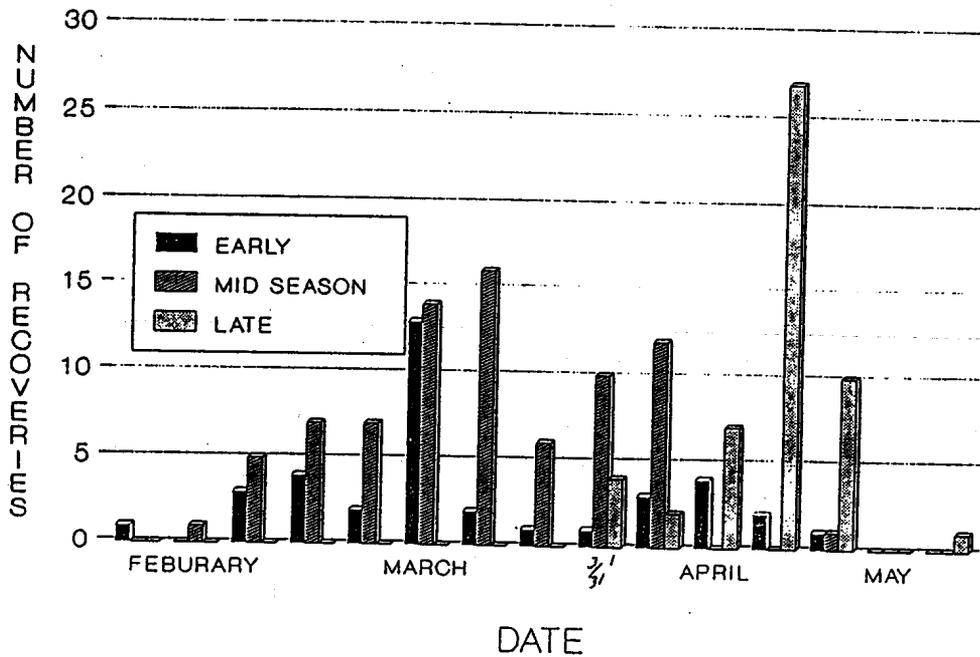


Figure 4. Spawning time of the progeny from three different parental groups - early, mid and late spawning. Release year 1984, adult return years 1986, 1987, and 1988. Dworshak NFH stock.