PROGRESS REPORT OF NATIONAL FISH HATCHERY PROGRAMMING AND EVALUATION ACTIVITIES PUGET SOUND AND COASTAL WASHINGTON, 1988-1989

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PREFACE

The purpose of this report is to provide an annual update of hatchery programming changes and evaluation activities. Although this report contains some analysis of existing data and recommends changes to programming activities, the intent is to provide periodic updates and not comprehensive analyses of the various programs. Rather, individual reports will be generated that will encompass many years of data concerning individual programs and will provide detailed analysis of the results. Those reports will normally address specific evaluations and will be generated by U.S. Fish and Wildlife Service, Fisheries Assistance Office, Olympia, Washington.

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INTRODUCTION

This report contains information regarding August 1, 1988 - July 31, 1989 hatchery programming and evaluation activities at Makah, Quilcene, and Quinault National Fish Hatcheries (NFH) (Figure 1). This information has been compiled using the hatchery evaluation database system (FRED) designed by the Olympia Fisheries Assistance Office (USFWS, 1988). Much of the data collected using this system will allow extensive correlation of rearing variables to survival estimates in subsequent species-specific in-depth reports. A general summary of the various types of data routinely collected at each facility is presented in Appendix A. More detailed information may be obtained from the Olympia Fisheries Assistance Office (FAO).

QUILCENE NATIONAL FISH HATCHERY

FALL CHINOOK

Fall chinook have not been propagated at Quilcene NFH since the mid-1970's when the program was discontinued due to poor adult contribution and return (Knudsen et al. 1989). However, two broods of Nooksack chinook (84 and 86), brought into Quilcene to supplement the spring chinook program, were later suspected of being fall chinook. Electrophoretic analysis of the 1986 Nooksack adult return, performed by Washington Department of Fisheries (WDF) personnel, indicated that the fish were most likely Nooksack fall chinook (Bill Graeber, WDF, pers. comm.). The resulting fingerlings were released into the Dosewallips River in 1987 to prevent contamination of the Quilcene spring chinook program.

The 1984-brood chinook received from Nooksack were also assumed to be falls and steps were taken to remove their progeny from returning broodstock. Spawn timing similar to the 1986 brood was evidence that these were fall chinook. This group had been reared to term and released directly from the hatchery as yearlings in 1986. Scale analysis, run timing, and mark presence in adults returning to the hatchery were used to distinguish fall-return fish in 1987 and 1988 resulting from that 1984 release. Any fish identified as falls were not spawned, to insure that no contamination of the spring-runs occurred. A total of 58 fall chinook returned at age four in 1988. The fish were excessed to Point No Point Treaty Council (PNPTC) tribes.

Discussion/Recommendations: Other fall chinook activity at Quilcene included the temporary rearing of juveniles for WDF. Over-escapement of fall chinook to Hoodsport and George Adams hatcheries occurred during the 1988 return. Since WDF desires to improve sport fishing in Puget Sound, we were asked to hatch and rear some of the fall chinook excess from their Hood Canal facilities. We accepted approximately 700,000 eggs and successfully reared and transferred the resulting 659,993 fry to George Adams Hatchery in June, 1989. If time and space are available, we should cooperate with this type of program, if requested.

SPRING CHINOOK

Restoration of Puget Sound spring chinook continues to be a high U.S. Fish and Wildlife Service (Service) priority. Working with state and tribal agencies, our goal is to restore particular Puget Sound stocks until they will sustain direct harvest. Development of a spring chinook brood run at Quilcene NFH is an important part of this restoration effort. Problems with low survival rates still exist however, (Hiss et al, 1988). An important step was made this year through development of the Hood Canal Production Evaluation Program (HCPEP), which includes a 6-year evaluation of spring chinook at Hood Canal facilities (Point No Point, et.al., 1989). This proposal was developed by PNPTC, Service, and WDF, and documents temporary production deviations from the Hood Canal Salmon Management Plan. The most important change at Quilcene is addition of Soleduck spring chinook and the transfer of some Quilcene spring chinook to Hood Canal Hatchery. Some Soleduck spring chinook will also be reared along with Quilcene springs at Hood Canal Hatchery. This combination will allow a comparison of relative success of rearing and release strategies of the two stocks at two locations.

Releases and Transfers: The hatchery released 120,924 yearlings on May 10, 1989 at 17.2 fish/pound (Table 1) and transferred 95,000 fingerlings to Hoodsport Hatchery on May 23, 1989 to meet our commitment to the HCPEP. Nearly all fish released were coded wire tagged as a US/Canada spring chinook indicator stock. In addition, three tag codes were used to evaluate two antibiotics applied during rearing to control bacterial kidney disease (BKD) (Brunson et.al. 1988). Specific tagging information is presented in Appendix B. An additional 90 yearlings were transferred to Marrowstone Research Station for investigation of BKD influence during saltwater rearing.

Terminal Area Returns, 1988: A return of 38 males and 81 females was recorded at the hatchery during 1988. Most fish were bio-sampled; resulting age structure and length information are presented in Table 2. Most returning fish were age five. The total run fell far short of our escapement requirement of 500.

Terminal Area Returns, 1989: During the spring and summer of 1989 we monitored returning adults in the Big Quilcene River by conducting snorkel surveys (Table 3). Our objectives were to estimate abundance, determine timing, document poaching, determine possible broodstock collection sites, and identify a possible return of five-year-old fall chinook. The first survey on April 17 showed one spring chinook in the river. Approximately half the return had entered the system by mid-June with some fish showing poaching wounds. Virtually all of the run had entered the system by August 11 (Table 3). No broodstock capture efforts were conducted in the river. Some chinook did enter the river later in the season that were identified as fall chinook (August 17). However, they did not enter the hatchery.

Coded Wire Tag Recoveries: All returning hatchery fish were sampled for coded wire tags. Sixteen tags were recovered, representing seven different codes Tag recoveries occurred in Canadian and Washington waters for several tag groups in 1988 (Table 4). Tagged fish from seven groups contributed to both British Columbia and Washington fisheries. Tag code 5-18-32 is estimated to

have contributed 10 recoveries to California as well. Eight other tag codes were not recovered in any reported fisheries in 1988. However, the data is preliminary and recoveries could be forthcoming. Release information about these tag groups may be found in FAO (1985), Kenworthy (1986), and Zajac (1988).

Discussion/Recommendations: After staff from Quilcene NFH and Olympia FAO visited with WDF personnel and discussed successful spring chinook programs at their Soleduck, Nooksack, and Minter Creek/Hupp Springs facilities, we modified our adult holding and juvenile rearing procedures (memorandum to Regional Office, June, 1989). These procedures reduced our rate of adult female mortalities in holding ponds. The proposed adult holding facility should improve our success in this area, also. We hope that juvenile rearing will improve as well.

We tested two antibiotics (Brunson et al. 1988) for treating BKD in 1988-brood spring chinook. Preliminary results indicate that both treated groups survived better than the control during hatchery rearing. A report is pending that will include the Marrowstone study as well where both treated and untreated fish are being reared in saltwater tanks to compare survival rates.

We are rearing approximately 20,000 (10,000 Soleduck and 10,000 Quilcene) juveniles to a larger size at release than usual because we expect that larger sizes at release will increase survivability. This is possible because of the apparent success experienced using antibiotics to control BKD. Prior to initiation of the antibiotic program, larger fish at release suffered more BKD, probably negating any increased benefit expected from releasing larger fish. All groups will be coded wire tagged with different codes to evaluate these procedures.

We have continued to recommend 1) fishery restrictions (area closures, season dates, and revised maximum catch lengths), including a proposed early closure of the Quilcene River sport steelhead season to reduce incidental catch of spring chinook and 2) increased enforcement to reduce poaching (Hiss and Zajac, 1987). However, coded wire tag recovery data indicates that neither fishery contribution nor hatchery returns are particularly strong. A model developed by FAO to predict the influence of various parameters on the spring chinook run shows that we must increase the natural survival rate to make a substantial difference in fishery contribution and return to the hatchery. However, both supplementation with outside stocks and increased fishery regulation could help as well (Hiss et al. 1988).

Perhaps public education is another step we could take. Hatchery staff have welcomed school groups and on occasion have visited schools to explain the importance of the Quilcene spring chinook program. We could also publish and distribute informational leaflets as WDF has done with their White River spring chinook program (Appendix C). In the meantime, we will continue our efforts to improve our adult return through fish health management, input to development of fishery regulations, maintenance of spring timing by removing returning fall chinook, and participation in HCPEP.

COHO

Releases and Transfers: Coho production included 753,390 yearlings and 331,273 fingerlings released on-station (Table 1), 266,900 fingerlings transferred to WDF (Table 5) for seeding under-utilized tributaries in the area, and 60,000 eyed eggs transferred to Chimacum High School. A portion of the yearling release was coded wire tagged to update our knowledge of distribution and survival. Specific tagging information is presented in Appendix B.

Terminal Area Returns, 1988: Coho returns provided sufficient spawners to meet program needs for 1988. Escapement to the hatchery was 3,534 fish. Of this return, 360 fish were passed upstream to utilize available habitat. Catch records show 1,738 coho were harvested in area 12A net fisheries, 34 in Big Quilcene River net fisheries, and 620 in the Big Quilcene River sport fishery (preliminary) (Lee Hoines, WDF; Peter Dygert, PNPTC; pers. comm.) for a total of approximately 2,392 fish.

Discussion/Recommendations: Although the catch in 12A was low, return records and analysis of historical tag studies (Knudsen et al. 1989) indicate that the Quilcene coho program continues to be successful. Subtle changes in hatchery practices and marine environment have probably caused contribution and distribution differences not accurately represented by earlier tagging. Consequently, tagging was initiated with progeny from the 1987 return to assess current contribution rates and distribution patterns and will continue with broods 88 and 89. This tagging is also required for comparison to Quilcene Bay net pen releases as detailed in the HCPEP.

During years when shortfalls occur in the spring chinook program, we request permission from the Hood Canal Management Plan cooperators to increase our yearling coho program from the allowed level of 250,000 to more fully utilize our production capacity. We have permission to release 700,000 smolts in 1990. Future coho production adjustments are allowed within the HCPEP.

During recent years egg eye-up has averaged about 85% and has become a concern to the staff. They suspect that debris from broken eggs is interfering with fertilization (Larry Telles, USFWS, pers. comm.). To correct the problem, the staff used a bicarbonate of soda rinse on some eggs before fertilization. This procedure was tested in Canada. Results show 93% eye-up rate for rinsed eggs compared to 84% for unrinsed eggs in 1987 and 93% for rinsed and 85% for unrinsed eggs in 1988. The staff plans to continue this procedure.

The eyed egg transfer from Quilcene to SUBASE Bangor was discontinued in 1988. Instead, Bangor will receive eggs from George Adams state facility, where excess fish and eggs are common because of terminal harvest difficulties. Consequently, George Adams is usually a much more available source than Quilcene.

CHUM

Releases and Transfers: A total of 1,901,704 chum fry were released at Quilcene NFH (Table 1) consisting of both Quilcene and Walcott stocks.

Releases at Walcott were discontinued in 1986 for harvest management reasons. No Walcott eggs were available to supplement the Makah chum programs this year.

Terminal Area Returns, 1988: Adults returned to both Quilcene NFH and Walcott Slough. Records show a return of 875 males and 601 females to Quilcene and 797 males and 635 females to Walcott Slough. Bio-sampling was conducted at both sites with 28.6% of the return sampled at Quilcene and 27.9% at Walcott. Scale analysis showed age four predominated at Walcott and age three at Quilcene (Tables 6 and 7). Walcott Slough returns appeared more successful than Quilcene for all ages (Table 8). This could be due to differential harvest rates. Also, we do not know counts of fish remaining in the Big Quilcene River and Walcott Slough after spawning operations are completed. Therefore, return rates presented underestimate actual return rates. This precludes a statistical comparison.

The Quilcene and Walcott programs also contributed to Puget Sound net fisheries. Run reconstruction estimates indicate approximately 3,000 Walcott chum and 2,000 Quilcene chum were caught in terminal area net fisheries (Jim Ames, WDF. pers. comm.).

Discussion/Recommendations: Although releases are no longer made at Walcott, returns occurred during 1987 and 1988 and are expected in 1989. Interestingly, since no release was made at Walcott in 1986 (85-brood), no three-year-olds were expected to return to Walcott in 1988. However, 514 three-year-old chums did return (Table 8). Hatchery personnel have reported natural spawning in the slough area after hatchery spawn operations have concluded for the season. Also, genetic stock identification performed by WDF in 1985 shows that Quilcene and Walcott stocks are slightly different, even though the Quilcene run was initiated with Walcott stock. This may suggest that other Hood Canal chum stocks are entering the Walcott Slough trap and are subsequently used for broodstock. Regardless of the origin, these returns should be utilized to supplement Makah NFH and tribal programs as requested.

Coded wire tagging has not been done with chum at either facility. However, a reasonable evaluation may be possible using run reconstruction estimates, catch records, and escapement data. The feasibility of performing such an evaluation in the future should be considered.

MAKAH NATIONAL FISH HATCHERY

Restoration of coastal stocks of salmon and steelhead are a high Service priority. Successful programs were being realized at Makah NFH with coho and steelhead, and the chinook program appeared to be improving. However, a major setback was experienced when routine coho broodstock disease sampling performed by Olympia Fish Health Center (OFHC) on February 17, 1989, resulted in the discovery of viral hemorrhagic septicemia (VHS), heretofore never found in North America. Through a series of meetings between state, federal, and tribal agencies, fish health protection groups, and consultation with European experts, it was decided to destroy all stocks of fish on February 23, 1989 and to chlorinate the hatchery by June 13, 1989. Since the origin of the disease at Makah was unknown, it was also decided to prevent any further adult passage

above the hatchery during the remainder of the 1988 return and to install a downstream screen trap (attached to existing weir) to prevent any outmigration of potentially infected adults and juveniles from the Sooes watershed. This trap was installed on the existing weir during the week of April 3, 1989. No adults will be allowed upstream of the hatchery during the return in 1989, as well. We have estimated that the cost of the lost coho, chinook, and steelhead to commercial, sport and Indian fisheries is over 3.4 million dollars due to VHS (memo February 21, 1989). A further detailed chronology of the VHS-related events and recommendations will be available from OFHC (report pending).

A major program change is that there will be no adult upstream passage and juveniles will be released from Makah NFH into the Waatch and Sooes watersheds only. Also, the incubation of Hoko fall chinook and steelhead has been discontinued at Makah. The changes will remain in effect until more is known about the VHS situation.

FALL CHINOOK

The fall chinook program remains the highest priority at Makah NFH. Return numbers have continued to improve and the Makah Tribe has continued its program support by not allowing a directed fishery upon the run in 1988. However, all brood-year 1988 progeny were destroyed as required to control the spread of VHS. No replacement stocks were located. Consequently, the run building process will be slowed and significant gaps will exist in the adult cycles for many years.

Releases: No releases or coded wire tagging occurred.

Terminal Area Returns, 1988: The hatchery return totalled 566 fish including 70 age two, 28 age three, 405 age four, and 63 age five fish. A small number of fish not needed for broodstock was passed upstream (prior to finding VHS). This group included 13 males and seven green females. Bio-sampling of 91.1% of the fish indicated returning males and females were predominately four-year-olds (Table 9). The first fish entered the hatchery on September 21 and 50% entered by mid-October (Figure 2).

Coded Wire Tag Recoveries: All returning hatchery fish were sampled for coded wire tags, resulting in 22 tags, representing six different codes. Two recoveries of code 5-17-47 occurred in Canadian net and troll fisheries. No other tag codes were recovered in any of the reported fisheries in 1988. However, the data is preliminary and recoveries could be forthcoming. Release information about these tag groups can be found in Kenworthy (1986) and Zajac (1988).

Downstream Trap: No fall chinook adults or fry were caught.

Discussion/Recommendations: Although one entire brood was destroyed because of VHS, we should maintain the native stock integrity by allowing the immediate gap in the adult cycle to recover naturally with returning multiple age classes. To supplement this native stock with a foreign stock could jeopardize our run rebuilding efforts.

No adults will be passed upstream in the near future as a requirement of the VHS classification. Fry may be planted upstream pending VHS sampling of the adults in 1989.

Since fall chinook continue to be the priority program at this facility, evaluation of production releases should continue. We also have a commitment to coded wire tag this stock as a US/Canada indicator stock. Directed terminal fisheries should not occur on chinook and incidental catch of chinook during coho fisheries should be monitored closely to prevent significant impact on the return.

COHO

Releases: All brood-year 87 subyearlings and brood-year 88 eggs and fry were destroyed as required. These groups included tagged fish. Consequently, no releases occurred.

Terminal Area Returns, 1988: A total of 2,060 coho returned to the Sooes River during 1988. Steelhead river net fisheries harvested 78 coho incidentally (Table 10) and 374 were passed upstream to use available habitat (prior to finding VHS). The remainder of the return was used as broodstock or excessed to the tribe. Broodstock was successfully taken from fish entering the facility according to guidelines established during a Makah NFH Steering Committee meeting on August 18, 1987 (minutes dated August 26, 1987).

Coded Wire Tag Recoveries: All returning hatchery fish were sampled for coded wire tags. One hundred fifty-nine tags were recovered, representing five different codes. Only one tag (code 5-17-40) was recovered in a marine fishery (Puget Sound). However, this is to be expected since the fish are two years old and generally don't contribute to marine fisheries at that age.

Downstream Trap: The trap was operated from April 10 to August 1 and 14,479 coho smolts were counted, removed, subsampled for VHS, and buried. No adults were caught.

Discussion/Recommendations: Coho return timing continues to be a concern with respect to its overlap with returning fall chinook. Since we cannot allow a fishery to occur on fall chinook until the run has been re-established, any coho returning simultaneously with fall chinook also cannot be harvested. We have attempted to reduce the overlap severity by using later-timed Quinault coho when supplementation was necessary and by using only Makah coho that return after October 15 for broodstock. Figure 2 shows that approximately 50% of the coho had returned by the end of October and virtually all coho had returned by the mid-December. This timing appears to be satisfactory when compared with fall chinook return timing (Figure 2). While there is some overlap, most fall chinook have returned (approximately 85%), while less than 25% of the coho have returned by October 19. We will continue to use the separation scheme now in place (memorandum to Makah Steering Committee 8/26/87).

Since development of the Makah coho program included outside stocks (Quinault and Quilcene), the Makah Steering Committee agreed to replace the destroyed 88 brood eggs and fry with 88-brood Quinault stock. This stock has been used successfully at Makah before. A similar transfer will occur during the 1990 return since the 87-brood subyearlings were destroyed as well.

No adults will be passed upstream in the near future as a requirement of the VHS classification.

Fry releases that have previously occurred from Makah NFH to reservation tributaries have been temporarily discontinued due to the VHS classification. However, disease-free fry may be released into the upper Sooes and Waatch systems.

The trap provided an opportunity to estimate freshwater production rates for planted coho fry. If we assume that the 14,479 smolts caught by the downstream trap were produced from the 384 females passed upstream in 1987, we realize a natural production of 37.7 smolts per female. However, significant bird predation was observed before the smolts could be collected from the trap. Consequently, the number of smolts produced by the upper Sooes may be 50% higher than what was actually observed (Mark LaRiviere, Makah Tribe, pers. comm.). The production may therefore be as high as 55 per female. These production rates compare favorably to other systems (Tim Flint, WDF, pers. comm.).

Sub-yearling coho to be released in 1990 as yearlings will be coded wire tagged to identify distribution patterns and contribution rates.

CHUM

Releases: All brood-year 88 eggs were destroyed as required, so no releases occurred.

Terminal Area Returns, 1988: A total of 573 chum returned to the facility in 1988 (Table 11). Four hundred and fifty-one of these fish were four-year-olds, 110 were three-year-olds, and 12 were five-year-olds. In addition to the hatchery escapement, 459 chum were harvested incidentally during the coho and steelhead fisheries (Table 10).

Downstream Trap: No adult chum or fry were caught.

Discussion/Recommendations: The 1988 chum return was relatively good compared to other years. However, the return resulted from two of the largest releases on record (1985 and 1986) and, therefore, may not indicate an increase in survival rate. The status of the Makah NFH chum program has been discussed by the Makah Steering Committee. Outside stocks (other than Walcott) have been considered for supplemental use. However, nearby stocks are depressed and use of Nitinat stock (Canada) is precluded by international harvest management concerns regarding impact on the genetic stock identification program. With no other stock available, two courses of action have been taken, including release at a larger size and a release from a tribal net pen in Neah Bay. It is hoped that by releasing chum from a net pen at a larger size, survival will

be increased thereby providing broodstock. In the interim, supplemental Walcott/Quilcene stock will be used if available and fry releases will continue on-station.

WINTER STEELHEAD

Releases: All brood-year 88 subyearlings and brood-year 89 eggs were destroyed as required. The subyearlings had been marked. Consequently, no releases occurred.

Terminal Area Returns, 1988: A total of 610 steelhead returned to the hatchery between November 14, 1988 and February 14, 1989. Bio-sampling was performed to determine age structure and wild composition of the run (Table 12). All steelhead trapped during this period were of hatchery origin based on mark identification and scale analysis and 57.9% were age three fish.

A substantial commercial net fishery harvested 2,491 steelhead during the 1988-89 winter season (Table 12). Bio-sampling and mark sampling performed on the catch indicated that 98.6% were of hatchery origin and 1.4% were wild. The major age class was three for hatchery fish and five for wild fish (Table 13).

In addition to the successful net fishery, approximately 10 steelhead were harvested by sport anglers. This estimate was generated from WDW punch card data and Makah Tribal Fisheries staff estimates (Mark LaRiviere, Makah Tribe, pers. comm.).

Since the weir/ladder operation was extended due to VHS, additional adults entered the hatchery between April 3 and May 10 (The ladder was in operation from February 14 through April 3 as well, but no fish returned.) Ladder operation was then terminated because adults had ceased entering and it was necessary to begin hatchery disinfection procedures. Sixty-two fish entered during this period; 86.8% were wild and 13.2% were from the hatchery. Age structure is presented in Table 14.

Mark Recoveries: All returning fish were sampled at the hatchery for adipose marks. Approximately 80% were marked. Release information about these mark groups may be found in Kenworthy (1986) and Zajac (1988).

Downstream Trap: Both adult and juvenile steelhead were caught in the downstream trap. A total of 153 adults were trapped and bio-sampled. Through scale analysis we determined that 63% were wild and 37% were of hatchery origin.

Hatchery personnel counted 178 steelhead smolts at the trap. However, we suspect that other fish identified as trout (1,719) were probably steelhead smolts as well and we know that acute bird predation occurred (Mark LaRiviere, Makah Tribe, pers. comm.). Consequently, the actual steelhead smolt production from the system could have been several thousand.

Discussion/Recommendations: Our goal with the steelhead program is to maintain temporal separation between hatchery and wild stocks. This will

allow river net fisheries to target on hatchery fish and allow the wild run to maintain itself without competition and genetic dilution from hatchery stock. To achieve this, we have in the past assumed that hatchery fish return before February 1 and secured our broodstock before then. Fish returning after that date were assumed to be wild and allowed to pass upstream. During 1987-88, we reviewed past age data and weir operation dates and continued bio-sampling through February 1988. Based on this information, it appears that hatchery steelhead return until late February (Zajac, 1988). Operation of the weir through May 12, because of the VHS problem, allowed another opportunity to examine a potential wild/hatchery stock separation date. Virtually no wild fish entered the system until late February. We recommend that we continue to provide stock separation using a March first separation date to allow maximum protection to the wild stock from hatchery fish.

Theoretically, since the ladder/trap/weir operation continued until May 12 (ladder) and August 1 (trap), the only adult steelhead caught in the trap should have been approximately 200 hatchery stock intentionally passed prior to February 14, 1989. However, bio-sampling showed that adults caught in the trap were mostly wild (63%). Therefore, we must assume that significant numbers of wild adults were able to pass upstream during trap installation (April 3-11) or during freshets.

No adults will be passed upstream in the near future as a requirement of the VHS classification. Fry releases that have previously occurred from Makah to reservation tributaries have been temporarily discontinued. However, disease-free fry may be released into the upper Sooes and Waatch.

Since the VHS classification restricts the passing of wild as well as hatchery adults, we are considering some combination of egg incubation and fry release to maintain run integrity.

Since development of the Makah steelhead program included outside stocks (Quinault), the Makah Steering Committee agreed to replace destroyed 89-brood eggs with 89-brood Quinault stock. This stock has been used successfully at Makah before. A similar transfer will be required during the 1990 return since 88-brood subyearlings were destroyed as well.

Adipose clipping of yearling steelhead (to be released in 1990) will continue to determine return rates and further evaluate the hatchery/wild separation date.

QUINAULT NATIONAL FISH HATCHERY

The funding base for Quinault NFH was changed from U.S. Fish and Wildlife Service to Bureau of Indian Affairs in fiscal year 1985. A Memorandum of Agreement was developed whereby the lead programming and hatchery evaluation responsibility, previously performed by the Service, would be accomplished by the Quinault Tribe. Consequently, Service participation in this area has been greatly reduced. However, this arrangement was reversed in 1988 and we expect our involvement in programming and evaluation to increase dramatically. Although we have not yet begun active hatchery evaluation, we have started some basic data collection as described below.

FALL CHINOOK

Releases and Transfers: Hatchery personnel released 670,341 subyearlings on July 25 at 51.5 fish/pound (Table 15) and transferred 220,555 fingerlings to the Salmon River facility (Table 16). The transfer is a cooperative program with the Quinault Tribe using Salmon River stock.

Terminal Area Returns, 1988: Hatchery personnel used 254 males and 337 females for broodstock. These numbers include both returns to the hatchery and adults captured in the Quinault River. Insufficient voluntary adult returns to the hatchery continue to be a problem.

COHO

Releases: On April 14, 747,800 yearlings were released at 16.1 fish/pound. Also, 115,950 fingerlings were planted into reservation tributaries on May 11 at 218.4 fish/pound (Table 15).

Terminal Area Returns, 1988: Escapement to the hatchery was 1,600 males, 2,795 females, and 1,869 jacks.

CHUM

Releases: On April 25, 1,203,040 fry were released at 803.1 fish/pound (Table 15).

Terminal Area Returns, 1988: Seven hundred thirty-two males and 579 females returned to the hatchery.

WINTER STEELHEAD

Releases and Transfers: On May 15, 178,624 yearlings were released at 10.1 fish/pound (Table 15). Also, 50,000 fingerlings were transferred to Whiskah Pond, 49,997 fingerlings to Chalaat Creek, and 154,400 fingerlings to Salmon River Pond (Table 16). Eyed eggs were also transferred to Washington Department of Wildlife, Puyallup Tribe, and Suquamish Tribe, totalling 557,194 (Table 16).

Terminal Area Returns, 1988: Four hundred seventeen males and 354 females returned to the hatchery.

ACKNOWLEDGEMENTS

Much of the data required for hatchery evaluation, programming, and coordination is collected solely by hatchery staff. That which is not, is collected cooperatively by Olympia Fisheries Assistance Office staff. Also, many suggested program changes and evaluation ideas originate from hatchery personnel. Makah, Quinault, and Quilcene hatchery staff have contributed significantly to the current success and future direction of the hatcheries through their innovative ideas and continuing cooperation with fisheries assistance staff. I thank the staff at Makah, Quinault, and Quilcene

hatcheries for their continued support and look forward to working with them each year. We also appreciate the cooperation received from the Olympia Fish Health Center. J.M. Hiss and several other fisheries assistance staff members collected the snorkel survey data reported here and T. Kane prepared the graphs.

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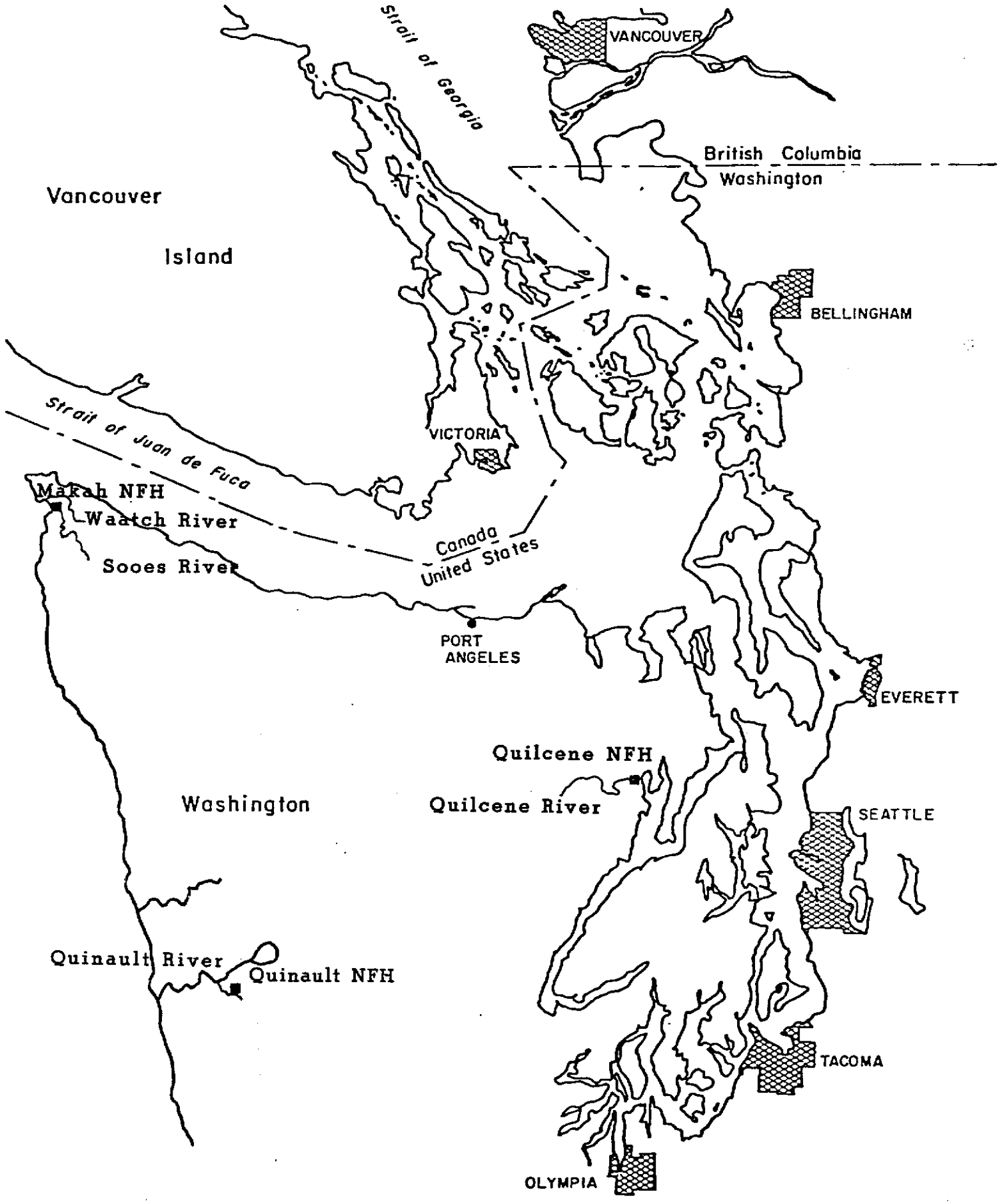


Figure 1. Location of Quilcene, Makah, and Quinault National Fish Hatcheries.

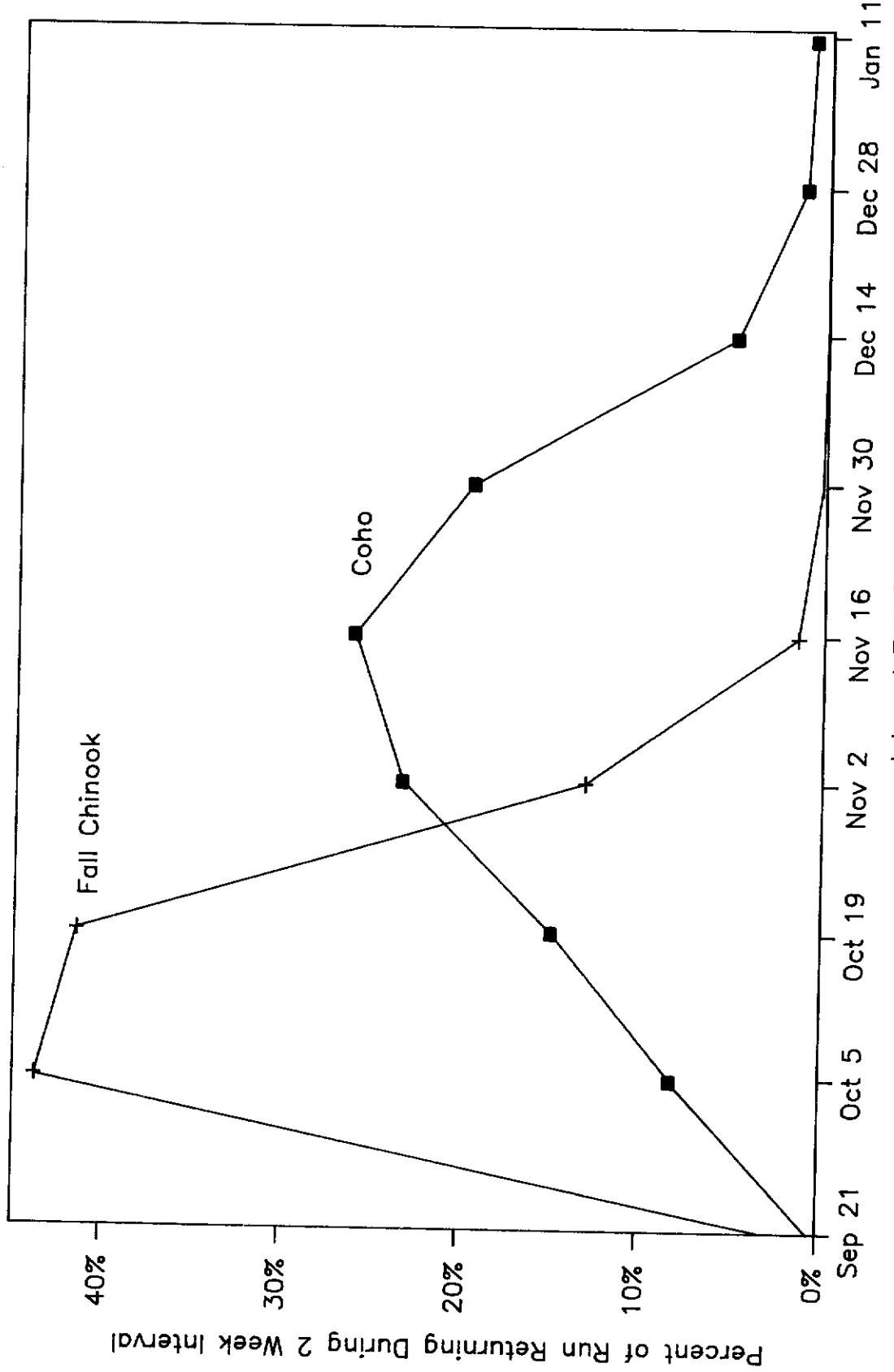


Figure 2. Timing of the 1988 broodyear salmon returns to the Makah National Fish Hatchery

Table 1. Quilcene National Fish Hatchery salmon releases made into Washington waters during 1989.

Species	Stock	Brood year	Release location	Date	Number	Size (No/lb)	Weight(lbs)
Spring Chinook	Quilcene NFH	87	Big Quilcene R.	5/10/89	120,924	17.2	7,030
Coho	Quilcene NFH	87	Big Quilcene R.	5/10,11/89	753,390	22.5	33,484
		88	Big Quilcene R.	5/18/89	331,273	341.9	969
Chum	Quilcene NFH	88	Big Quilcene R.	5/5/89	1,140,241	710.9	1,604
	Walcott Slough	88	Big Quilcene R.	5/5/89	761,463	630.9	1,207

Table 2. Spring chinook age at return to Quilcene National Fish Hatchery during 1988 (98.3% sampled).

	Male		Female		
Age	Expanded number	Mean fork length(mm)	Expanded number	Mean fork length(mm)	Total number in age class
3	13	548	0	-	13
4	20	701	18	787	38
5	5	839	63	837	68
Totals	38		81		119

Table 3. Actual counts of brood-year 1989 spring chinook (all ages)in the Big Quilcene River and hatchery. Counts in the river are based on snorkel observations.

Date	4/17	5/3	6/1	6/16	6/30	7/17[1]	8/11	8/17
Hatchery	-	-	7	12	44	58	72	81
River	1	16	43	54	47	41	46	43
Totals	1	16	50	66	91	99	118	124

[1] Weir was not operating until this date.

Table 4. Preliminary 1988 estimated (observed) recoveries of spring chinook released from Quilcene National Fish Hatchery.

		Washington			British Columbia		
Tag code	Brood year	Troll	Puget Sound net	Puget Sound sport	Troll	Net	Georgia Srait sport
5-8-32	85	(0)	3(1)	(0)	(0)	(0)	(0)
5-14-53	83	(0)	(0)	(0)	4(1)	(0)	(0)
5-14-62	85	(0)	(0)	5(1)	(0)	3(1)	(0)
5-17-48	85	(0)	(0)	(0)	(0)	1(1)	(0)
5-17-50	85	(0)	9(2)	4(1)	(0)	1(1)	(0)
5-18-32[1]	85	(0)	2(1)	(0)	(0)	(0)	(0)
5-18-33	85	(0)	3(1)	(0)	(0)	2(1)	(0)

Table 5. Fingerling releases of brood-year 1988 Quilcene National Fish Hatchery coho made by Washington Department of Fisheries. (All releases were made on April 11, 1989 at 367 and 471/lb.).

Location	Number
East Fork Tarboo Creek	50,400
East Fork Chimacum Creek	38,200
West Fork Chimacum Creek	5,100
Chimacum Creek	70,500
Leland Creek	25,000
Little Quilcene River	62,600
Unnamed Creek	15,100
Total	266,900

[1] Estimated 10 recoveries in California.

Table 6. Chum age at return to Quilcene National Fish Hatchery during 1988 (28.6% sampled).

	Male		Female		
Age	Expanded number	Mean fork length(mm)	Expanded number	Mean fork length(mm)	Total number in age class
3	546	646	381	619	927
4	280	721	206	674	486
5	49	792	14	804	63
Totals	875		601		1,476

Table 7. Chum age at return to Walcott Slough during 1988 (27.9% sampled).

	Male		Female		
Age	Expanded number	Mean fork length(mm)	Expanded number	Mean fork length(mm)	Total number in age class
3	267	643	247	617	514
4	412	719	357	689	769
5	118	802	31	730	149
Totals	797		635		1,432

Table 8. Estimated return rates of chum to Quilcene National Fish Hatchery and Walcott Slough in 1988.

Brood year	Release location	Release number	Age at return	Number returned	% return to rack
1983	Quilcene NFH	1,218,671	5	63	.005
	Walcott Slough	1,315,375	5	149	.011
1984	Quilcene NFH	2,464,414	4	486	.020
	Walcott Slough	832,715	4	769	.090
1985	Quilcene NFH	2,584,971	3	927	.036
	Walcott Slough	0	3	514	-

Table 9. Fall chinook age at return to Makah National Fish Hatchery during 1988 (91.1% sampled).

	Male		Female		
Age	Expanded number	Mean fork length(mm)	Expanded number	Mean fork length(mm)	Total number in age class
2	70	444	0	-	70
3	26	650	2	719	28
4	177	867	228	873	405
5	6	899	57	948	63
Totals	279		287		566

Table 10. Monthly Indian set net harvest in the Sooes River during the 1988-1989 season (data provided by Makah Tribal Fisheries Management).

Species	December	January	February	Totals
Fall chinook	0	0	0	0
Coho	73	5	0	78
Chum	454	5	0	459
Steelhead	1,697	778	16	2,491

Table 11. Chum age at return to Makah National Fish Hatchery during 1988 (78.1% sampled).

	Male		Female		
Age	Expanded number	Mean fork length(mm)	Expanded number	Mean fork length(mm)	Total number in age class
3	61	660	49	635	110
4	212	734	239	759	451
5	9	809	3	761	12
Totals	282		291		573

Table 12 Winter steelhead age at return to Makah National Fish Hatchery during 1988 (November 14, 1988 - February 14, 1989, 44.5% sampled).

	Male		Female		
Age	Expanded number	Mean fork length(mm)	Expanded number	Mean fork length(mm)	Total number in age class
2	7	452	0	-	7
3	196	659	157	642	353
4	66	810	184	766	250
Totals	269		341		610

Table 13. Winter steelhead age at harvest during the 1988-89 set net fishery in Sooes River (not expanded).

Age	Number of hatchery fish	Number of wild fish
3	179	0
4	164	2
5	0	3
Totals	343	5

Table 14. Winter steelhead age at return to Makah National Fish Hatchery during 1988 (April 3, 1989 - May 10, 1989, 61.3% sampled).

Age	Expanded number
2	2
3	7
4	24
5	29
Total	62

Table 15. Quinault National Fish Hatchery salmon and steelhead releases made into Washington waters during 1989.

Species	Stock	Brood year	Release location	Date	Number	Size (No/lb)	Weight (lbs)
Fall Chinook	Quinault NFH	88	Cook Creek	7/25/89	670,341	51.5	13,016
Coho	Quinault NFH	87	Cook Creek	4/14/89	747,800	16.1	46,447
	Quinault NFH	88	Red Creek	5/11/89	77,300	218.4	354
	Quinault NFH	88	Moclips River	5/11/89	38,650	218.4	177
Chum	Quinault NFH	88	Cook Creek	4/25/89	1,203,040	803.1	1,498
Winter Steelhead	Quinault NFH	88	Cook Creek	5/15/89	178,624	10.1	17,686

Table 16. Fish and eyed egg transfers from Quinault National Fish Hatchery, 1989.

Species	Stock	Location	Date	Number	Stage
Fall Chinook	Salmon River	Salmon River Pond	6/20/89	220,555	fish
Winter Steelhead	Quinault NFH	Chalaat Creek	3/15,16/89	49,977	fish
	Quinault NFH	Salmon River Pond	3/31/89	154,400	fish
	Quinault NFH	Whiskah Pond	5/14/89	50,000	fish
	Quinault NFH	Puyallup Tribe	2/24/89	100,694	eggs
	Quinault NFH	Suquamish Tribe	2/24/89	52,500	eggs
	Quinault NFH	Wash. Dept. Wildlife	2/11/89	404,000	eggs

Appendix A. Types of data collected at Quilcene, Makah, and Quinault National Fish Hatcheries for hatchery evaluation during the reporting period[1].

Hatchery	Fall chinook	Spring chinook	Coho	Chum	Winter steelhead
Quilcene	adult entry fish removal scale sample fish transfer	adult entry fish removal scale sample mark sampling mark recovery ind. spawning fish transfer environment marking specific rel. general rel.	fish removal group spawn. fish transfer environment marking specific rel. general rel.	fish removal scale sample group spawn. environment specific release general release	n/a
Makah	adult entry fish removal scale sample mark sampling mark recovery group spawning fish transfer environment marking specific rel. general rel.	n/a	fish removal group spawn. fish transfer environment marking specific rel. general rel.	fish removal scale sample group spawn. fish transfer environment specific rel. general rel.	fish removal scale sample mark sampling mark recovery group spawning fish transfer environment marking specific rel. general rel.

[1] See FRED Manual for variables included in the data types presented.

Appendix A. (con't) Types of data collected at Quilcene, Makah, and Quinault National Fish Hatcheries for hatchery evaluation during the reporting period

Hatchery	Fall chinook	Spring chinook	Coho	Chum	Winter steelhead
Quinault	fish removal fish transfer specific release general release	n/a	fish removal group spawn. fish transfer specific rel. general rel.	fish removal specific rel. general rel.	fish removal group spawning fish transfer specific release general release

Appendix B. Information related to tag groups released from Quilcene National Fish Hatchery.

Tagging information	Quilcene spring chinook	Quilcene coho
Purpose	indicator stock, antibiotic comparison	hatchery evaluation
Project length	on-going	three years
Year of project	n/a	first
Brood year	1987	1987
Tag code	5-19-59-R3 5-19-61-R3 5-19-62-R3	5-21-07-R3 5-21-08-R3 5-21-11-R3
Tag date	May 1988	October 1988
Stock	Quilcene NFH	Quilcene NFH
Size at tagging	110/lb; 150/lb; 130/lb	62.0/lb
Release location	Big Quilcene River	Big Quilcene River
Release date	May 10, 1989	May 10,11, 1989
Size at release	17.2/lb	22.5/lb
Number marked released	49,313; 36,629; 18,362	25,683; 25,842; 23,435
Tag retention rate (%)	96.2; 95.1; 95.5	95.2; 94.3; 86.3
Number unmarked released	11,141; 0; 0	18,741; 19,133; 21,100
Percent marked at release	78.3; 100.0; 100.0	57.8; 57.5; 52.6

Appendix C. Informational leaflet distributed to the public regarding White River spring chinook program.

Dear Friends,

There are not many White River spring chinook left. Fisheries biologists expect to see as few as 45 return to our Minter Creek Hatchery this year, and even fewer return to the White River watershed.

In 1979, fisheries agencies and Indian tribes launched a program to rebuild the White River spring chinook using the Minter Creek, Hupp Springs and Manchester salmon rearing facilities. The chinook return to Minter Creek where they are artificially spawned and then transported to Hupp Springs. Ultimately, they are released in salt water.

The numbers of adult spawners that returned to Minter Creek in 1986 and 1987 were encouraging -- over 130 fish. Combined with the mature spring chinook brought in for spawning from our Manchester facility, salmon production was well above previous levels. This year the spring chinook are not expected to have a high survival rate, however. Also, two brood year classes of this stock at our Manchester facility were devastated by otter predation and disease problems.

The rebuilding program also requires some fishing restrictions. The Carr Inlet area of Puget Sound was recently closed to fishing to protect the small number of spring chinook so desperately needed for the program.

The sacrifices being made today will pay off. While we increase the spring chinook population, we will also be working to solve some long standing White River salmon habitat problems. Once this important run of spring chinook is rebuilt, we will hopefully have healthy numbers of fish for south Puget Sound sport salmon fishing.

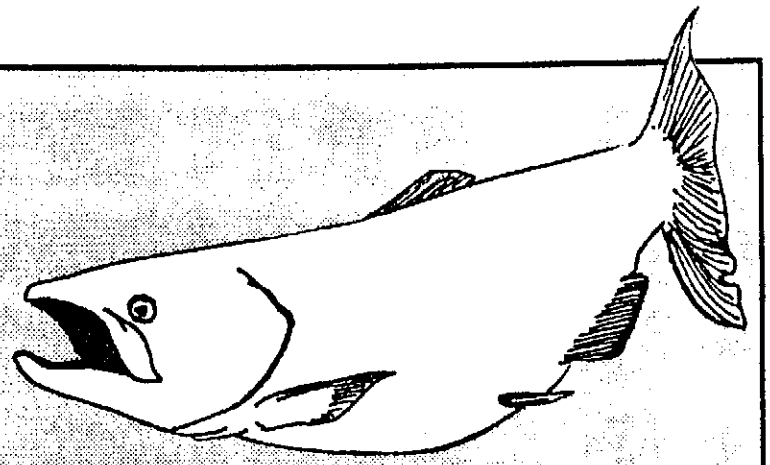
I sincerely appreciate any support you can give us for this effort.

Yours truly,

Joseph R. Blum,
Director
Washington Department of Fisheries

HELP US SAVE THE WHITE RIVER SPRING CHINOOK

Minter Creek Chinook Watch



The Washington Department of Fisheries and treaty Indian tribes have begun a new program to protect an endangered run of highly valued White River spring chinook salmon. At this time, the run is so weak, biologists expect to see only 45 adult fish return to the Minter Creek Hatchery this year.

Beginning in late May and running through August, Fisheries employees will conduct a 24-hour watch of the estuary to protect the fish. The employees will be in clearly marked vehicles.

Dogs have been known to harass the migrating chinook attempting to enter the Minter Creek Salmon Hatchery area during periods of low tides. Dog owners are asked to take steps to prevent this. Also, children tend to chase the chinook, causing stress and higher disease and death rates for the fish. Please explain the importance of the survival of these fish to children who might unknowingly hurt them.

Report any problems to: Minter Creek Salmon Hatchery (857-5077), Fisheries Patrol (1-753-6585) in Olympia, or the Washington State Patrol office in Tacoma (1-593-2424). Your help is greatly appreciated.

What happened to the White River spring chinook?

Hydroelectric power and flood control projects erected on the White River in the 1940's, as well as other forms of habitat degradation, decimated the once vibrant run of White River spring chinook. What's more, this is the only spring chinook run left in south Puget Sound.

Highly valued for the excellent quality of their salmon meat, spring chinook are so-named because they return to spawn in their streams of origin in late spring (May - August). Fall chinook return to their spawning grounds in the fall (September - November).

Unlike other species of salmon, spring chinook begin their life cycle high in mountain streams like those found in the uppermost reaches of the Cascade Mountain Range. Following a brief period of growth in-stream, they migrate to the ocean where they develop to adulthood before returning to their birthplace to spawn.

Like all species of Pacific salmon, toward the end of their life cycle, as they approach their final spawning grounds, spring chinook quit feeding and begin a process of decomposition. After they spawn, they die, and their carcasses provide important nutrients for the next generation of salmon. While covering the last reaches of their migratory path, if they strike a sportsman's lure, it is because they are irritated, not hungry.

Because the spring chinook's final migratory journey is a long one, these fish feed more while in salt water (like lower Puget Sound) and continue to feed when they enter the lower river areas. Sport fishers know the spring chinook to be "biters," and, like all salmon, they are "fighters." Conversely, fall chinook spawn in the lower river areas.

Also, since spring chinook spawn far upstream, as a species they are more susceptible to death and disease caused by habitat degradation.