HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

DRAFT

Hatchery Program	Chinook River- Fall Chinook Salmon Recovery Program
Species or Hatchery Stock	Chinook Salmon *(Oncorhynchus tshawytscha)*
Agency/Operator	Sea Resources, Inc.
Watershed and Region	Columbia Estuary Subbasin/Columbia River Estuary Province
Date Submitted	nya
Date Last Updated	August 16, 2004

Section 1: General Program Description

1.1 Name of hatchery or program.

Sea Resources Fall Chinook Program

1.2 Species and population (or stock) under propagation, and ESA status.

Chinook Salmon *(Oncorhynchus tshawytscha)*

ESA Status: Threatened

1.3 Responsible organization and individuals.

Name (and title):	Robert Warren
	Executive Director
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Other agencies, Tribes, co-operators, or organizations involved, including contractors, and extent of involvement in the program.

Co-operators	Role
Washington Department of Fish & Wildlife	Technical Assistance
U.S. Fish & Wildlife Service	Support in Habitat Improvement Projects

1.4 Funding source, staffing level, and annual hatchery program operational costs.

Funding Sources
Federal and State Grants
Community Donations

Operational Information	Number
Full time equivalent staff	0.1
Annual operating cost (dollars)	$4,800

Above annual operating cost is estimated annual expense of the program activity.

1.5 Location(s) of hatchery and associated facilities.

Broodstock source	Chinook River Fall Chinook Salmon
Broodstock collection location (stream, RKm, subbasin)	Sea Resources Hatchery/Chinook River/RKm 7.7/Columbia Estuary Subbasin
Adult holding location (stream, RKm, subbasin)	Sea Resources Hatchery/Chinook River/RKm 7.7/Columbia Estuary Subbasin
Spawning location (stream, RKm, subbasin)	Sea Resources Hatchery/Chinook River/RKm 7.7/Columbia Estuary Subbasin
Incubation location (facility name, stream, RKm, subbasin)	Sea Resources Hatchery/Chinook River/RKm 7.7/Columbia Estuary Subbasin
Rearing location (facility name, stream, RKm, subbasin)	Sea Resources Hatchery/Chinook River/RKm 7.7/Columbia Estuary Subbasin

1.6 Type of program.

Integrated Recovery program that utilizes supplementation and re-introduction strategies.

1.7 Purpose (Goal) of program.

- Release up to 107,500 fingerlings into the system.
- Contribute to conservation, recovery and research of natural salmonids including historical Chinook in the Chinook River.
- Overall purpose of Sea Resources Watershed Learning Center is to build around the restoration of the Chinook watershed because it offers unprecedented educational opportunities for students and presents a way to involve the local community.

1.8 Justification for the program.

In 1996, Sea Resources, a nonprofit educational organization, developed a comprehensive watershed recovery plan for the Chinook River basin (Dewsberry 1997). The plan has six parts: 1) to protect critical upland habitat from landslides and thereby protect the lower river from debris torrents in an effort to re-establish a more natural regime of sediment and organic matter movement through the watershed; 2) to reduce sediment inputs by repairing and stabilizing existing roads in the watershed and when possible to decommission unnecessary roads; 3) to protect and restore the valley floor by re-establishing a mature conifer dominated forest; 4) to restore the lower estuary by (a) removing or redesigning the tide gate located at the mouth of the Chinook River, (b) by limiting development in the lower portions of the watershed, (c) by re-establishing woody debris accumulations in the Chinook estuary and in Baker Bay, and (d) by encouraging beaver dam development in the lower river; 5) to use an existing hatchery to help supplement salmonid populations in the basin, and 6) to evaluate the effects of habitat improvements in upland, valley floor, stream channel, an estuarine areas on habitat characteristics and salmonid abundance (Dewsberry 1997).

The habitat restoration and evaluation work mentioned above and managed by Sea Resources will continue into the foreseeable future. Hence, the basin has the potential to provide a stable and high quality spawning, incubation, and early rearing refuge to Lower River Columbia River salmonids. Sea Resources operations have the support of the Co-managers and the USFWS.

The level of fish production generated by this project is necessary to maintain an adequate

number of returning adult chinook salmon in the Chinook River until such time as the habitat issues within the watershed can be addressed. The current state of salmon producing habitat in the Chinook River is considered below the minimum necessary to support a self-sustaining run of fish. This project will function as a gene bank until such time as the watershed has improved sufficiently to support self-sustaining populations

1.9 List of program "Performance Standards".

The following plans and methods are proposed to collect data for each Performance Indicator: Migrants are captured with two screw traps, one full sized trap at the tide gate at the Highway 101 bridge, and one ½ screw trap at the Sea Resources facility. The purpose of these traps is to determine the overall salmonid production of the watershed and to better understand the life histories of the fish within the watershed. The traps are operated at least four times per week from January through June. Fish captured in the trap are identified, measured, weighed, and scale samples are removed, and released. On a weekly basis trap efficiencies tests are performed. To mark the fish to test trap efficiency we cut a small piece off of the caudal fin. The fish is released approximately ¼ mile upstream. No other marks or tags are applied to the fish.

Salmonid production is also monitored on a yearly basis through snorkel counts every June.

1.10 List of program "Performance Indicators", designated by "benefits" and "risks".

PROGRAM PERFORMANCE STANDARDS
1) Meet management and recovery objectives.
2) Minimize interaction with listed and candidate fish populations through proper broodstocking, rearing and release strategies.
3) Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.
4) Maximize survivals at all lifestages using disease control and disease prevention techniques.
5) Conduct environmental monitoring to ensure that hatchery operations comply with state and federal water quality standards.
6) Communicate effectively with other resource managers.
7) Comply with applicable state and federal permits, guidelines, and agreements.

PROGRAM PERFORMANCE INDICATORS FOR BENEFITS/RISKS

1) Collect adult chinook salmon for hatchery broodstock. Release no more than 107,500 chinook smolts at approximately 80-100 fish per pound.
2) Monitor adult collection trap at least five times per week, with never more than 48 hours between checks. Rear fish to 80-100 fish per pound for the upcoming spring release date. Release fish to coincide with natural smolt outmigration.
3) Utilize two-by-two factorial spawning methods. Collect broodstock to represent the timing and distribution of the run.
4) Comply with co-manager disease control policy.
5) Monitor NPDES.
6) Complete all necessary fish production paperwork (planting slips, monthly reports, etc.)

1.11.1 Proposed annual broodstock collection level (maximum number of adult fish).

Up to 45 fish based on a 1:1 male to female ratio. Total level is dependant on natural escapement released upstream on the given year. Egg take goal could be up to 140,000 if needed with an expected 25% mortality, and an expected release of 107,500 fingerlings.

1.11.2 Proposed annual fish release levels (maximum number) by life stage and location.

Age Class	Max. No.	Size (ffp)	Release Date	Location			
				Stream	Release Point (RKm)	Major Water-shed	Eco-province
Fingerling	107, 500	80-100	April - May	Chinook River (@ Sea Resources Hatchery	7.7	Columbia Estuary	Columbia River Estuary

1.12 Current program performance, including estimated smolt-to-adult survival rates, adult production levels, and escapement levels. Indicate the source of these data.

Stray or smolt-to-adult survival rates has not been estimated for this program. Recent escapements have ranged from a low of 42 adults in 2001 to 163 in 2002 (Warren 2004).

1.13 Date program started (years in operation), or is expected to start.

Program originally started in 1893 and continued until 1935. The modern day program was restarted in 1968. The first year of operation for this hatchery was 1968.

1.14 Expected duration of program.

Until habitat in watershed is restored enough to support a viable reproducing population of coho without the aid of artificial propagation. The project will function as a gene-banking project until the habitat in the watershed is restored enough to support a viable reproducing population of Coho without the aid of artificial propagation. No specific end-date has been established.

1.15 Watersheds targeted by program.

Columbia Estuary Subbasin/Columbia River Estuary Province

1.16 Indicate alternative actions considered for attaining program goals, and reasons why those actions are not being proposed.

1.16.1 Brief Overview of Key Issues:

In 1996, Sea Resources initiated a new restoration effort in the Chinook River. The new strategy emphasized the reestablishment of lost or impaired watershed processes that shape and maintain the diversity of habitats required for all freshwater and estuary life stages of native salmon. This ecosystem approach to recovery de-emphasized the strong role the hatchery played in the past and, as a result, overall production has been reduced by nearly 90 percent. However, Sea Resources continues to explore the concept of using artificial production as a legitimate tool in salmon recovery. The artificial production component of Sea Resources' restoration effort is meant to be a temporary activity that will cease once viable self-sustaining populations are established in the Chinook River. Restoration actions to improve spawning and rearing habitat are ongoing. Once the restoration goal is met the hatchery will be used for education and research purposes.

Sea Resources has also initiated an effort to intensely monitor the effectiveness of restoration actions, including use of the hatchery. It is hoped that information derived from monitoring work can be used to manage the hatchery in a way that is complementary to habitat restoration work by minimizing the ecological risks often inherent in artificial production programs.

1.16.2 Potential Alternatives to the Current Program:

Alternative 1: None offered.

1.16.3 Potential Reforms and Investments:

Reform/Investment 1**:** In order for Sea Resources to better manage and apply the hatchery for recovery purposes it will need three essential improvements: 1) improvement of the incubation water supply by either developing a groundwater well system or a sand filtration system to remove excessive suspended sediments; 2) design and installation of a thermal marking system that will allow for the unique marking of incubating embryos and therefore complete necessary related monitoring tasks (e.g. fry-to-adult survival rates and relative contribution of hatchery and wild salmon to natural spawning); and 3) an upgraded incubation system to replace existing aging and outdated equipment. A modest investment in equipment would contribute greatly to Sea Resources' ability to sustain the artificial production component of its restoration program $$$.

The hatchery program is a part of a strategy to meet conservation and/or harvest goals for the target stock. The tables below indicate what the short- and long-term goals are for the stock in terms of stock status (biological significance and viability), habitat and harvest. The letters in the table indicate High, Medium, or Low levels for the respective attributes. Changes in these levels from current status indicate expected outcomes for the hatchery program and other strategies (including habitat protection and restoration).

	Biological Significance	Viability	Habitat
Current Status	M	M	M
Short-term Goal	M	M	M
Long-term Goal	M	H	H

Section 2: Program Effects on ESA-Listed Salmonid Populations

2.1 List all ESA permits or authorizations in hand for the hatchery program.

Scientific collection permit – monitoring Permit 901 or 902 for incidental take of endangered species. Sea Resources is concurrently writing HGMPs to cover the coho and chum programs.

2.2.1 Descriptions, status and projected take actions and levels for ESA-listed natural populations in the target area.

The following ESA listed natural salmonid populations occur in the subbasin where the program fish are released:

ESA listed stock	Viability	Habitat
Chum (Sea Resources)- Integrated	U	U
Fall Chinook (Sea Resources)- Integrated	M	M
Coho- Hatchery and Natural (Proposed)	Na	Na
H, M and L refer to high, medium and low ratings, low implying critical and high healthy.		

2.2.1) Description of ESA-listed salmonid population(s) affected by the program.

Identify the ESA-listed population(s) that will be directly affected by the program.
None.

Identify the ESA-listed population(s) that may be incidentally affected by the program.

Lower Columbia River fall Chinook salmon were listed as "threatened" under the Endangered Species Act.
Columbia River chum salmon - Mainstem Chum were listed as threatened under the ESA on March 25, 1999.
Lower Columbia River Coho were proposed as threatened on June 14, 2004.

2.2.2 Status of ESA-listed salmonid population(s) affected by the program.

Lower Columbia River fall chinook salmon *(Oncorhynchus tshawytsch*a) within the Evolutionary Significant Unit (ESU) are federally listed as "threatened" under the Endangered Species Act effective May 24, 1999.
Status: The Sea Resources Chinook population is believed to be similar to the fall Chinook in the Grays River. No genetic data is available to determine whether the Chinook River stock has diverged from the Grays River tule Chinook. Fall chinook are native to the Grays River. The natural spawners are now a mixed stock of composite production. Stock mixing very likely began when hatchery supplementation was initiated in 1947 (WDF et al. 1993). The majority of spawning takes place in a 3.6-mile area from the covered bridge on the mainstem (RM 10.7) to the Grays River Salmon Hatchery on the West Fork Grays (RM 1.2). Spawning occurs from late September to mid-November (WDF et al. 1993). In the early 1950s, there was an estimated escapement of 1,000 fall chinook to the Grays River (WDF 1951). Seining in 1979 captured few naturally-produced, fall Chinook juveniles. This evidence suggests that few natural fall chinook juveniles were being produced (WDF et al. 1993). Natural spawning escapements from 1967 to 1991 averaged 745 fish, with a low return of 147 in 1967 and a peak of 2,685 in 1978. Natural spawning escapements of 278 fish inGrays River Chinook salmon stock status is rated Depressed

in 2002 because of a long-term negative trend and a short-term severe decline in escapements in 1997, 1998 and 2000. Generally, lower Columbia tule fall chinook stocks, including Grays fall chinook, experienced poor survival in the 1990s.

Currently, this is a mixed stock with wild production. A native population of fall chinook existed in the Grays River prior to the construction of Grays River Hatchery in 1960. Until recently, a significant portion of the fall chinook spawners in the Grays River were hatchery strays. The fall chinook program at the Grays River Hatchery ended in 1998. The present population is a probably mix of native and hatchery-origin fish with life history characteristics common to those of other lower Columbia River tule fall Chinook stock.

Columbia River chum salmon *(Oncorhynchus keta*) - Mainstem Chum were listed as threatened under the ESA on March 25, 1999.
Stock status is rated Depressed in 2002 because of chronically low escapements. This is a native stock with composite production. A hatchery supplementation program designed to increase numbers of naturally spawning Grays River fall chum began at the WDFW Grays River Hatchery in 1998.
The natural population targeted for recovery and supplementation is the Grays River chum salmon stock. As mentioned previously, chum salmon production in the Lower Columbia River has drastically declined over the past fifty years (WDF 1951; WDF et al. 1993). Many lower Columbia tributaries once produced chum, however, at present, significant natural production appears to be limited to three areas: Grays River, Hardy Creek, and Hamilton Creek. The latter two streams are located just below the Bonneville Dam (Rkm 229 and 230 respectively) on the Washington-side of the river. Spawning ground counts made in these drainages since the late 1950's indicate that both streams possess stable populations of chum salmon (WDF et al. 1993). The Grays River population, on the other hand, is considered depressed due to a long-term negative trend in spawning ground escapements (WDF et al. 1993). Because of the generally low abundance of this species throughout the Columbia the NMFS listed Lower Columbia River chum salmon as a threatened species under the auspices of the ESA in early 1999.

The recovery and supplementation plan described in Part 1 calls for the re-introduction of Lower Columbia River chum (Grays River stock) into the Chinook basin. The Chinook River used to contain a native chum salmon population that was apparently extirpated several decades ago (WDF 1951). In the late 1980's, chum salmon from Bear Creek, a Willapa Bay population were transplanted into the Chinook River via a hatchery program run by Sea Resources. Initially adult returns back to the Chinook from this transplant were close to a thousand fish per year, however, recent returns have been low. For example, in 1997 and 1998 twenty or less adults returned (Garth Gale pers. comm.) to the Sea Resources Hatchery. In 1998, it was decided that these non-native chum should be removed to accommodate our effort to re-introduce native Lower Columbia River chum salmon back into the basin. Consequently, in 1999 all adult chum salmon returning to the Sea Resources Hatchery have been destroyed.

Recent stream enhancement work by the Washington Fisheries Department in Gorley Springs (RM 12) had been relatively successful until an upstream dike failed and the river changed course and now flows through the Gorley Springs channel. Other areas such as Crazy Johnson Creek can be quite productive if water flows are adequate. The lack of stable spawning habitat is considered the primary physical limitation on chum production today. Development of other spring-fed spawning areas such as Gorley Springs could improve subbasin chum production. Seasonal low flows sometimes restrict access of chum to preferred off-channel spawning areas, confining them to less stable mainstem reaches. Some mainstem reaches where chum spawn are subject to frequent channel shifts and bedload deposition or scour, all of which reduce intragravel survival. Adults migrate into the river from mid-October through November with peak spawner abundance

occurring in late November. Scale analysis indicates 3- and 4-year-old fish are the dominant age classes. During low flow years, chum spawn primarily in the larger mainstem Grays River; during higher flows they can be found in larger numbers in the smaller tributaries.

Lower Columbia River Coho (*Oncorhynchus kisutch*) is currently a candidate for listing but has been proposed as threatened on June 14, 2004.
Status: NMFS concludes that the LCR coho ESU includes all naturally spawned populations of coho salmon in the Columbia River and its tributaries from the mouth of the Columbia up to and including the Big White Salmon and Hood Rivers. Twenty-one artificial propagation programs are considered to be part of the ESU as NMFS has determined that these artificially propagated stocks are genetically no more than moderately divergent from the natural populations (NOAA, 2004b).

2.2.3 Describe hatchery activities, including associated monitoring and evaluation and research programs, that may lead to the take of listed fish in the target area, and provide estimated annual levels of take.

Describe hatchery activities: The following activities listed below are identified as general hatchery actions that are identified in the ESA Section 7 Consultation "Biological Opinion on Artificial propagation in the Columbia River Basin" (March 29, 1999).

Broodstock Program:

Broodstock Collection: See HGMP section 7.0. Up to 40 pairs could be taken although the actual amount is much less. Staff has been using partial live spawn techniques to minimize take of broodstock. See take tables at the end of the document.

Genetic introgression: The program is intended to re-establish but not be permanent in nature. The collection of coho salmon brood stock will continue until significant habitat improvements have stabilized the dynamic river-flow patterns currently extant in the basin. There is no data to determine if current returns have diverged from the Grays River population (genetically or in life history characteristics), but the program collects adults from thru out the run timing and is representative of the naturally spawning adults. Indirect take from genetic introgression is unknown.

Rearing Program:

Operation of Hatchery Facilities: Facility operation impacts include water withdrawal, hatchery effluent, and intake compliance with impact on listed fish unknown but monitoring and maintenance are conducted along with staff observations. Indirect take from hatchery facilities is unknown.

Disease: Outbreaks in the hatchery may cause significant adult, egg, or juvenile mortality. Over the years, rearing densities, disease prevention and fish health monitoring have greatly improved the health of the programs at Sea Resource Facilities. Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries (IHOT 1994) chapter 5 have been instrumental in reducing disease outbreaks. Indirect take from disease are unknown.

Release Program:

Hatchery Production/Density-Dependent Effects: The design of the program is intended to minimize the influence of any hatchery and density effects on the existing populations. The coho program is intended to accomplish additional spatial distribution at a minimal productivity level in lieu of habitat improvements while providing the research needed for future decisions. Indirect take is unknown.

Competition: Salmon and steelhead feed actively during their downstream migration (Becker 1973; Muir and Emmelt 1988; Sager and Glova 1988) and if they do not migrate they can compete with wild fish. WDFW is unaware of any studies that have empirically estimated the competition risks to listed species posed by the program described in this HGMP. Studies conducted in other areas indicate that this program is likely to pose a minimal risk of competition:

1) As discussed above, coho salmon and steelhead released from hatchery programs as smolts typically migrate rapidly downstream. The SIWG (1984) concluded that "migrant fish will likely be present for too short a period to compete with resident salmonids." On station release in large systems may travel even more rapidly – migration rates of approximately 20 river miles per day were observed by steelhead smolts in the Cowlitz River (Harza 1998).
2) NMFS (2002) noted that ".where interspecific populations have evolved sympatrically, chinook salmon and steelhead have evolved slight differences in habitat use patterns that minimize their interactions with coho salmon (Nilsson 1967; Lister and Genoe 1970; Taylor 1991). Along with the habitat differences exhibited by coho and steelhead, they also show differences in foraging behavior. Peterson (1966) and Johnston (1967) reported that juvenile coho are surface oriented and feed primarily on drifting and flying insects, while steelhead are bottom oriented and feed largely on benthic invertebrates."
3) Flagg et al. (2000) concluded, "By definition, hatchery and wild salmonids will not compete unless they require the same limiting resource. Thus, the modern enhancement strategy of releasing salmon and steelhead trout as smolts markedly reduces the potential for hatchery and wild fish to compete for resources in the freshwater rearing environment. Miller (1953), Hochachka (1961), and Reimers (1963), among others, have noted that this potential for competition is further reduced by the fact that many hatchery salmonids have developed different habitat and dietary behavior than wild salmonids." Flagg et al (2000) also stated "It is unclear whether or not hatchery and wild chinook salmon utilize similar or different resources in the estuarine environment."
4) Fresh (1997) noted that "Few studies have clearly established the role of competition and predation in anadromous population declines, especially in marine habitats. A major reason for the uncertainty in the available data is the complexity and dynamic nature of competition and predation; a small change in one variable (e.g., prey size) significantly changes outcomes of competition and predation. In addition, large data gaps exist in our understanding of these interactions. For instance, evaluating the impact of introduced fishes is impossible because we do not know which nonnative fishes occur in many salmon-producing watersheds. Most available information is circumstantial. While such information can identify where inter- or intra specific relationships may occur, it does not test mechanisms explaining why observed relations exist. Thus, competition and predation are usually one of several plausible hypotheses explaining observed results."
5) Studies from Fuss (2000) on the Elochoman River and Riley (2004) on two Willapa Bay tributaries (Nemah and Forks Creek), indicate that hatchery reared coho and Chinook can effectively leave the systems within days or weeks.

Predation (Freshwater): Coho yearlings from this program may prey upon listed species of salmonids, but the magnitude of predation will depend upon the characteristic of the listed population of salmonids, the habitat in which the population occurs and the characteristics of the hatchery program (e.g.. release time, location, number released and size upon release). The site specific nature of predation and the limited number of empirical studies that have been conducted, make it difficult to predict the predation effects of this specific hatchery release. WDFW is unaware of any studies that have been empirically estimated the predation risks to listed juvenile Chinook or chum posed by the Elochoman Hatchery programs. In the absence of

site-specific empirical information, the identification of risk factors can be a useful tool for reviewing hatchery programs while monitoring and research programs are developed and implemented.

Predation Risk Factors:

Environmental Characteristics: These characteristics can influence the level of predation (see SIWG 1984 for a review) with risk greatest in small systems during periods of low flow and high clarity. The Chinook River is a small rain fed tributary to the Columbia River. Volitional releases of fish can be timed for tidal back up into the Chinook River and also be during night time to ensure dispersion below the facility.

Dates of Releases: The release date can influence the likelihood that listed species are encountered. There are limited studies on migration timing of naturally produced Chinook but listed Chinook from the Lower Columbia ESU are believed to emigrate over a wide window from March thru August. Chum are present in the mainstem Columbia from the Grays River and Sea Resources chum restoration programs.

Relative Body Size: Studies and opinions on size of predator/prey relationships vary greatly and although there is evidence that salmonids can prey upon fish up to 50% of their body length, most prey consumed is probably much smaller. Keeley and Grant (2001) suggest that the mean prey size for 100-200 mm fl salmonids is between 13-15% of predator body size. Salmonid predators were thought to be able to prey on fish up to approximately 1/3 of their length (USFWS 1994), although coho salmon have been observed to consume juvenile chinook salmon of up to 46% of their total length in aquarium environments (Pearsons et al. 1998). Artic char are well known as piscivorous predators, but recent studies suggest the maximum prey size is approximately 47% of their length (Finstad et al. 2002). The "33% of body length" criterion for evaluating the potential risk of predation in the natural environment has been used by NOAA Fisheries and the USFWS in a number of biological assessments and opinions (c.f., USFWS 1994; NMFS 2002). Although predation on larger Chinook juveniles may occur under some conditions, WDFW believes that a careful review of the Pearson and Fritts (1999) study supports the continued use of the "33% of body length criterion" is valid until further species data for these systems can be collected.

Release Location and Release Type: The likelihood of predation may also be affected by the location and the type of release. Other factors being equal, the risk of predation may increase with the length of time that involves co-mingling. In the freshwater environment, this is likely to be affected by distribution of the listed species in the watershed, the location of the release and the speed at which fish released from the program migrate.

We have provided in this section a summary of empirical information a theoretical analysis of competition and predation interactions that may be relevant to the Elochoman Hatchery coho program.

Potential Sea Resources fall Chinook predation and competition effects on listed salmonids: Proposed release is up to 107,500 although the average release for the past three years has been 21,678 fish at 136/lb (approximately 68 mm fl). Chinook are reared for release as an active migrant based on time, size and past history. Due to stage at release as an active migrant, it is unlikely based on size as yearlings that the would compete for the same food items as first year listed chinook or chum. Based on timing of release, most listed chum are likely to have emigrated before coho release date (figure 1). At 23 fpp, predation would be fish 39 mm fl and under. Based on length frequencies

from Abernathy Creek and Sea Resources/Grays River chum recovery programs, predation impact is unlikely.

- Abernathy Creek (WRIA 25) indicated lengths of 36mm – 40mm from March to April 25 with average size at 58 mm fl by mid May. Also Mill Creek fall Chinook are 53 mm fl by May 12 (Hanratty pers comm. 2004).
- Besides releases occurring after chum emigration, mean lengths from the Grays River Hatchery and Sea Resources (Chinook River) Chum Recovery programs indicate chum releases as: 56.2 – 58.8 mm fl (in mid-March), 55.2 mm fl (late March), and 54.6 mm fl in mid-April (Lower Columbia Chum HGMP 2004). For the Duncan Creek and Ives Island Chum Recovery programs, fish are released at 1.0-1.5 grams or 50-55 mm fl on a staggered basis from mi-March through May (Bonneville Population of Columbia River Chum Salmon HGMP 2004). Chum from Duncan Creek appear to complete emigration by late April (Figure 2).

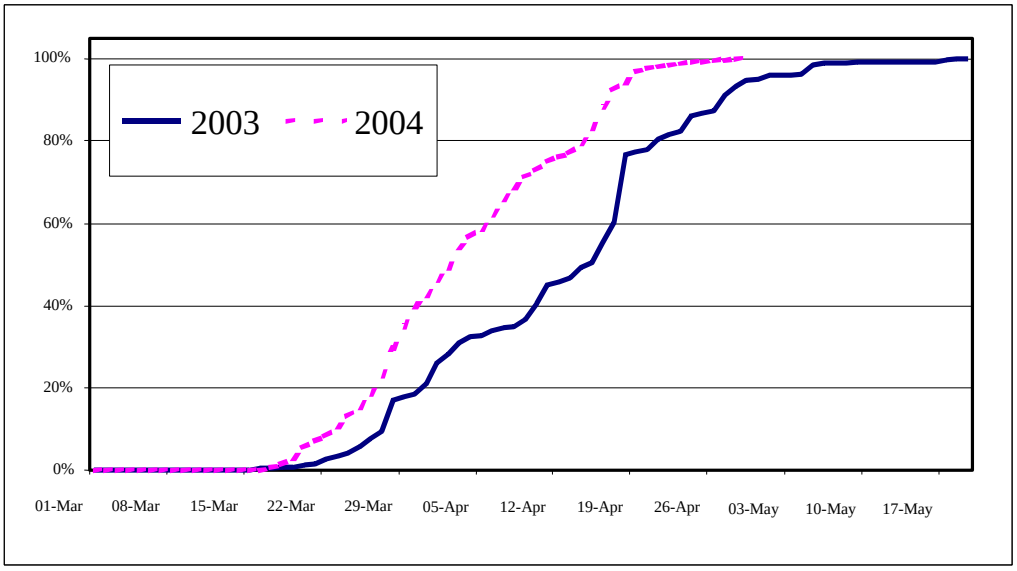

Figure1. Emigration of listed chum from Duncan Creek Programs. The Grays River/Sea Resources Chum Restoration program is closely aligned with the Duncan Creek Program.

Listed coho (proposed):
Current lengths and data for proposed listed coho in the Chinook River is unknown. Depending on water temperatures, hatchery coho fry during the month of April can range from 600 – 750 fpp (42 – 40 mm fl, Elochoman Hatchery staff 2004). Indirect take from predation and competition is unknown.

Residualism: To maximize smolting characteristics and minimize residualism, WDFW adheres to a combination of acclimation, volitional release strategies, size, and time guidelines. In 1996 and 1997, snorkeling studies were conducted on the Elochoman River to examine possible residualism and migration trends of coho (Type N and S) and fall Chinook releases. For 1996, a total of 1.7 million coho smolts were released in staggered periods from early April to mid-May. Snorkeling at 7 sites below the release point indicated no hatchery smolts remaining two weeks after the last release. Release strategies were a combination of volitional and forced. In 1997, a much reduced program of 300,000 coho smolts were volitionally released in mid-April and snorkeling surveys indicated that no hatchery coho were observed by early July. In 1998, after volitional and flush releases ending May 11, no hatchery coho were observed in the middle and

lower reaches downstream of the release point one week later (Fuss, June 2000). Indirect take from residualism is unknown.

Migration Corridor/Ocean: It is unknown to what extent listed fish are available both behaviorally or spatially on the migration corridor. Once in the main stem, Witty et al. (1995) has concluded that predation by hatchery production on wild salmonids does not significantly impact naturally produced fish survival in the Columbia River migration corridor. Evidence in estuarine and nearshore environments indicate that diets are often dominated by invertebrates with Durkin (1982) reporting that diet of coho smolts (128-138 mm fl) in the Columbia River estuary was composed almost entirely of invertebrates without evidence of salmonids as prey (HSRG - Hatchery Reform 2004). There appear to be no studies demonstrating that large numbers of Columbia system smolts emigrating to the ocean affect the survival rates of juveniles in the ocean in part because of the dynamics of fish rearing conditions in the ocean. Indirect take in the migration corridor or ocean is unknown.

Monitoring:

Associated monitoring and evaluation and research programs: The following monitoring baseline activities are conducted in the Lower Columbia Management Area (LCMA) for adult steelhead and salmon: redd surveys are conducted for winter steelhead in the SF Toutle, Coweeman, EF Lewis and Washougal rivers. Redd surveys are also conducted in the Cowlitz River for fall and spring chinook. Mark-recapture surveys provide data for summer steelhead populations in the Wind and Kalama rivers. Mark-recapture carcass surveys are conducted to estimate populations of chinook salmon in Grays, Elochoman, Coweeman, SF Toutle, Green, Kalama, NF Lewis, EF Lewis, rivers and Skamokawa, Mill, Abernathy, and Germany creeks and for all chum salmon populations. Snorkel surveys are conducted for summer steelhead in the EF Lewis, Washougal rivers. Trap Counts are conducted on the Cowlitz, NF Toutle, Kalama, and Wind rivers and on Cedar Creek a tributary of the NF Lewis River. Area-Under-the-Curve (AUC) surveys are conducted to collect population data for chum salmon in Grays River and Hardy and Hamilton Creeks. All sampling of carcasses and trapped fish include recovery of coded wide tagged (CWT) fish for hatchery or wild stock evaluation. Downstream migrant trapping occurs on the Cowlitz, Kalama, NF Lewis, and Wind rivers, Cedar Creek, and will expand to other basins as part of a salmonid life cycle monitoring program to estimate freshwater production and wild smolt to adult survival rates. Any take associated with monitoring activities is unknown but all follow scientific protocols designed to minimize impact.

Provide projected annual take levels for listed fish by life stage (juvenile and adult) quantified (to the extent feasible) by the type of take resulting from the hatchery program (e.g. capture, handling, tagging, injury, or lethal take).

In other HGMPs provided to NOAA (Puget Sound, Upper Columbia), indirect takes from hatchery releases such as predation and competition is highly uncertain and dependant on a multitude of factors (i.e. data for population parameters - abundance, productivity and intra species competition) and although HGMPs discuss our current understanding of these effects, it is not feasible to determine indirect take (genetic introgression, density effects, disease, competition, predation) due to these activities. (See Take Tables at the end of this document for identified levels).

Indicate contingency plans for addressing situations where take levels within a given year have exceeded, or are projected to exceed, take levels described in this plan for the program.

Any additionally mortality from this operation on a yearly basis would be communicated to Fish program staff for additional guidance. For other listed species, if significant numbers of wild salmonids are observed impacted by this operation, then staff would inform the WDFW District

Biologist.

Provide information regarding past takes associated with the hatchery program, (if known) including numbers taken, and observed injury or mortality levels for listed fish.
No data available.

Section 3: Relationship of Program to Other Management Objectives

3.1 Describe alignment of the hatchery program with any ESU-wide hatchery plan (e.g. *Hood Canal Summer Chum Conservation Initiative*) or other regionally accepted policies (e.g. the *NPPC Annual Production Review* Report and Recommendations - NPPC document 99-15). Explain any proposed deviations from the plan or policies.

The Sea Resources chinook conservation program will be operated under the technical assistance of Washington State Department of Fish and Wildlife, US Fish and Wildlife Service and the Treaty Tribes. Planners recommended that a combination of natural and hatchery production would be the optimal way to produce the most rapid sustainable improvement in salmonid runs. It assumed the quickest way to rebuild the run would be to combine releases of an appropriate stock into improved habitat (WDF 1990). This approach is being applied in this program. For ESU-wide hatchery plans, the production of chinook salmon from Sea Resources Facilities is consistent with:

- 1999 Biological Opinion on Artificial Propagation in the Columbia River Basin
- 1999 Review of Artificial Production of Anadromous and Resident Fish in the Columbia River Basin
- Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries (IHOT 1994)
- The *U.S. v. Oregon* Columbia River Fish Management Plan
- NWPPC Fish and Wildlife Program

For statewide hatchery plan and policies, hatchery programs in the Columbia system adhere to a number of guidelines, policies and permit requirements in order to operate. Sea Resources Program is closely aligned with these policies and technical assistance is provided throughout the program. These constraints are designed to limit adverse effects on cultured fish, wild fish and the environment that might result from hatchery practices. Following is a list of guidelines, policies and permit requirements that govern WDFW Columbia hatchery operations with which the production of coho salmon from Sea Resources Hatchery is consistent with the following WDFW Policies*:*

Genetic Manual and Guidelines for Pacific Salmon Hatcheries in Washington. These guidelines define practices that promote maintenance of genetic variability in propagated salmon.. Also, *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (Genetic Policy Chapter 5, IHOT 1995).

Spawning Guidelines for Washington Department of Fisheries Hatcheries. Assembled to complement the above genetics manual, these guidelines define spawning criteria to be use to maintain genetic variability within the hatchery populations.. Also, *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (Genetic Policy Chapter 7, IHOT 1995).

Stock Transfer Guidelines. This document provides guidance in determining allowable stocks for release for each hatchery. It is designed to foster development of locally-adapted broodstock and to minimize changes in stock characteristics brought on by transfer of non-local salmonids (WDF 1991).

Fish Health Policy in the Columbia Basin. Details hatchery practices and operations designed to stop the introduction and/or spread of any diseases within the Columbia Basin. Also, *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (Fish Policy Chapter 5, IHOT 1995).

National Pollutant Discharge Elimination System Permit Requirements This permit sets forth allowable discharge criteria for hatchery effluent and defines acceptable practices for hatchery operations to ensure that the quality of receiving waters and ecosystems associated with those waters are not impaired.

3.2 List all existing cooperative agreements, memoranda of understanding, memoranda of agreement, or other management plans or court orders under which program operates.

The recovery and supplementation program described in this HGMP is consistent with the following agreements and plans:

- The Sea Resources Chinook River Restoration and Recovery Plans
- The Columbia River Fish Management Plan
- U.S. vs. Oregon court decision
- Production Advisory Committee (PAC)
- Technical Advisory Committee (TAC)
- Integrated Hatchery Operations Team (IHOT)
- Pacific Northwest Fish Health Protection Committee (PNFHPC)
- In-River Agreements: State, Federal, and Tribal representatives
- Northwest Power Planning Council Sub Basin Plans
- Washington Department of Fish and Wildlife Wild Salmonid Policy

3.3 Relationship to harvest objectives.

3.3.1) Describe fisheries benefiting from the program, and indicate harvest levels and rates for program-origin fish for the last twelve years (1988-99), if available.

The program has no harvest goal since it primary purpose at this time is stock recovery/supplementation and habitat restoration. Historically, exploitation rates of hatchery and wild fall chinook and coho were likely similar. Fall chinook and coho are an important target species in ocean and Columbia River commercial and recreational fisheries, as well as tributary recreational fisheries. Regulations for wild fish release have been in place for coho fisheries in recent years, and all coho released from the hatchery are adipose fin-clipped to allow for selective harvest. Specific hatchery-selective commercial and recreational fisheries in the lower Columbia target hatchery coho. Therefore, in recent years the exploitation rates of coho by commercial and recreational fisheries are higher for Sea Resources Hatchery coho than wild fish. Hatchery and wild fall chinook harvest rates remain similar and are constrained by ESA harvest limitations. No site specific data for this program are available.

3.4 Relationship to habitat protection and recovery strategies.

In 1996, Sea Resources conducted a watershed analysis as part of the first stage of a restoration plan. This research was conducted by T.C. Dewberry. In the analysis the dynamics of sediment and organic matter within the watershed was identified as the major limiting factor limiting salmonid production within the watershed. Sea Resources has been involved with many habitat improvement and protection efforts including road repair/bank stabilization in the upper watershed, bridge and culvert repairs and replacements, creating woody accumulation projects in the lower river, and native vegetation planting throughout the riparian areas of the watershed. Sea Resources is also a partner in a project with WDFW, Ducks Unlimited. USFWS, NRCS, WSU, and the Columbia Land Trust to restore 870 + acres of the lower Chinook River back to estuarine conditions. The potential benefits to these projects on natural production are expected to be significant. Reduction of sediment input in the upper watershed through stabilization of slopes, treeplanting, and culvert repair/replacement will dramatically reduce inputs of sediment thus

improving spawning success and trophic dynamic. The restoration of the lower Chinook River back to an estuary will greatly improve fish habitat. The removal of the tidegate under Highway 101 will allow saline tidal exchange which will serve to extirpate non native species such as reed canary grass and centrarchids that are detrimental to salmonid production.

3.5 Ecological interactions.

Below are discussions on both negative and positive impacts relative to the Sea Resources coho program and are taken from the Puget Sound listed and non-listed HGMP template (WDFW and NOAA 2003).

(1) Salmonid and non-salmonid fishes or species that could negatively impact the program: Chinook smolts can be preyed upon release thru the entire migration corridor from the river subbasin to the mainstem Columbia River and estuary. Northern pikeminnows (beginning at RM 4.0) and introduced spiny rays along the Columbia mainstem sloughs can predate on coho smolts as well as avian predators, including gulls, mergansers, cormorants, belted kingfishers, great blue herons and night herons. Mammals that can take a heavy toll on migrating smolts (river otters), and returning adults include: harbor seals, sea lions and Orcas.

(2) Salmonid and non-salmonid fishes or species that could be negatively impacted by the program: Co-occurring natural salmon and steelhead populations in local tributary areas and the Columbia River mainstem corridor areas could be negatively impacted by program fish. Of primary concern are the ESA listed endangered and threatened salmonids: Snake River fall-run Chinook salmon ESU (threatened); Snake River spring/summer-run Chinook salmon ESU (threatened); Lower Columbia River Chinook salmon ESU (threatened); Upper Columbia River spring-run Chinook salmon ESU (endangered); Columbia River chum salmon ESU (threatened); Snake River sockeye salmon ESU (endangered); Upper Columbia River steelhead ESU (endangered); Snake River Basin steelhead ESU (threatened); Lower Columbia River steelhead ESU (threatened); Middle Columbia River steelhead ESU (threatened); and the Columbia River distinct population segment of bull trout (threatened). Listed fish can be impacted thru a complex web of short and long term processes and over multiple time periods which makes evaluation of this a net effect difficult. WDFW is unaware of studies directly evaluating adverse ecological effects to listed salmon. See also Section 2.2.3 Predation and Competition.

3) Salmonid and non-salmonid fishes or other species that could positively impact the program. Other programs including chinook and chum are released in the Chinook River system and natural production of resident and anadromous species could occur in this system along with non-salmonid fishes (sculpins, lampreys and sucker etc.).

4) Salmonid and non-salmonid fishes or species that could be positively impacted by the program. Hatchery fish provide an additional food source to natural predators that might otherwise consume listed fish and may overwhelm established predators providing a beneficial, protective effect to co-occurring wild fish. Northern pikeminnows and introduced spiny rays in the Columbia mainstem sloughs can predate on chinook smolts as well as avian predators, including gulls, mergansers, cormorants, belted kingfishers, great blue herons and night herons. Mammals that benefit from migrating smolts (river otters), and returning adults include: harbor seals, sea lions and Orcas. Successful or non-successfully spawner adults originating from this program may provide a source of nutrients in oligotrohic coastal river systems and stimulate stream productivity. Many watersheds in the Pacific Northwest appear to be nutrient-limited (Gregory et al. 1987; Kline et al. 1997) and salmonid carcasses can be an important source of marine derived nutrients (Levy 1997). Carcasses from returning adult salmonids have been found to elevate stream productivity through several pathways, including: 1) the releases of nutrients from decaying carcasses has been observed to stimulate primary productivity (Wipfli et

al. 1998); 2) the decaying carcasses have been found to enrich the food base of aquatic invertebrates (Mathisen et al. 1988); and 3) juvenile salmonids have been observed to feed directly on the carcasses (Bilby et al. 1996).

Section 4. Water Source

4.1 Provide a quantitative and narrative description of the water source (spring, well, surface), water quality profile and natural limitations to production attributable to the water source.

The Sea Resources aquaculture operation is operated entirely on water that is obtained from the Chinook River at a dam and intake 0.6 miles above the facility. The water is piped via gravity flow to the facility 0.6 miles downstream. The incubation room and raceways are supplied with gravity-fed Chinook River water which is delivered to the hatchery by a .9 km long by 38 cm in diameter pipeline. A drop of 3 m occurs from the intake of the pipeline to the hatchery to provide the hatchery with almost 3 meters of head. Depending upon stream flows, and amount of in-water debris, the line can deliver up to 1,900 liters of water/min to the hatchery.

4.2 Indicate risk aversion measures that will be applied to minimize the likelihood for the take of listed natural fish as a result of hatchery water withdrawal, screening, or effluent discharge.

The facility operates within the limitations established in its National Pollution Discharge Elimination System (NPDES) permit. All hatchery effluent from pond cleaning is discharged into a spare Burrows pond where the solids are allowed to settle out and are later used for fertilizer for our native plant propagation. There is 1/8 in. screening on the hatchery water intake to prevent salmonid fry from entering the intake.

Section 5. Facilities

5.1 Broodstock collection facilities (or methods).

An instream pond 12'x12'with a weir is used to trap and hold adults.

Ponds (number)	Pond Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Available Flow (gpm)
1	Concrete Barrier/Picket Weir with V-Trap for Capturing Adults	672	14.0	12.0	4.0	Seasonal Instream Flow
1	Instream Holding Area above Concrete Barrier/Picket Weir for Holding Adults	672	14.0	12.0	4.0	Seasonal Instream Flow

5.2 Fish transportation equipment (description of pen, tank, truck, or container used).

Fish are not transported, but are directly released from the Sea Resources rearing/acclimation units into the Chinook river. Transport equipment is not required for the program since all program activities are conducted on-site.

5.3 Broodstock holding and spawning facilities.

Same as broodstock collection facilities. See section 5.1 above.

5.4 Incubation facilities.

Incubation occurs in 10 trays of "Heath" style salmon incubators. The incubation room is supplied by Chinook River water that is pumped directly out of one of the seven Burrows ponds.

Incubator Type	Units (number)	Flow (gpm)	Volume (cu.ft.)	Loading-Eyeing (eggs/unit)	Loading-Hatching (eggs/unit)
Heath Stacked Tray Incubation Units	2	3	nya	5000	5000

5.5 Rearing facilities.

Ponds (No.)	Pond Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Flow (gpm)	Max. Flow Index	Max. Density Index
8	Fiberglass Raceways	256	16.0	4.0	4.0	30	nya	nya

Seven Burrows ponds (2.4 meters (m) wide and 24.4 m long) and four fiberglass raceways (.9 m wide x .9 m deep x 4.8 m long) are delivered gravity fed Chinook River water via a .9 kilometers (km) long by 38 centimeters (cm) diameter pipeline from an intake at a head pressure of 9 m.

5.6 Acclimation/release facilities.

Same as above, see section 5.4.

5.7 Describe operational difficulties or disasters that led to significant fish mortality.

Significant mortality has occurred in the process of cleaning the sediment buildup in the Heath incubators. If the rubber stoppers are not secured properly they may pop out thus starving the trays below of oxygen. Significant mortality also occurs during rearing due to bird predation as Sea Resources has chosen not to screen predators away from fingerling, even though kingfishers and herons take up to 20 or 25 percent of the fish over the course of the rearing cycle. Also cutthroat trout are able to access the ponds from the river via leaks that have occurred between the river and the Burrows Ponds. These leaks cannot be fixed because the river has aggraded over the years and the Burrows Ponds can no longer be completely drained.

5.8 Indicate available back-up systems, and risk aversion measures that will be applied, that minimize the likelihood for the take of listed natural fish that may result from equipment failure, water loss, flooding, disease transmission, or other events that could lead to injury or mortality.

The facility is staffed 24/7 through the duration of the egg incubation period. The facility is also equipped with two alarms; one for a loss of electrical power and the second is a float alarm that indicates loss of water flow.

Section 6. Broodstock Origin and Identity

6.1 Source.

From 1988 until present, all chinook production originated by collecting returning Chinook River fish, with the exception of 1989 and 1994. In those years, eggs were transferred from the WDFW Washougal Hatchery.

Until 1996 all chinook returning to the Chinook River weir were either spawned for artificial production or surplused; no fish were passed upstream to spawn.

6.2.1 History.

Broodstock Source	Origin	Year(s) Used	
		Begin	End
Chinook River Tule Fall Chinook	H/N	1988	Present
Washougal River Tule Fall Chinook (Washougal Hatchery)	H	1989	1994

6.2.2 Annual size.

80 adults.

6.2.3 Past and proposed level of natural fish in the broodstock.

All returning fall chinook are considered hatchery in origin because, since the late 1960s, the hatchery has blocked off the entire river with a weir trap from September through early December. Returning fish in excess of the needed egg take goals were surplused. It was not until 1996 that fall chinook salmon were released upstream to spawn naturally.

6.2.4 Genetic or ecological differences.

No known genetic or ecological differences.

6.2.5 Reasons for choosing.

Current broodstock collection methods call for using fall chinook returning to the Chinook River, i.e. the locally-adapted stock. The program has introduced and developed a locally adapted natural spawning population of Tule Fall Chinook. It is not known whether or not the Chinook River system originally contained a natural spawning fall chinook.

6.3 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish that may occur as a result of broodstock selection practices.

The risk of adverse genetic or ecological effects is minimized by using locally-adapted broodstock and by randomly selecting fish throughout the return time. Monitor adult collection trap at least five times per week, with never more than 48 hours between checks.

Section 7. Broodstock Collection

7.1 Life-history stage to be collected (adults, eggs, or juveniles).

Adults only.

7.2 Collection or sampling design

Adult fall chinook are captured at the Sea Resources facility from the end of September through the first week of November with a weir trap. The weir trap captures the majority of the returning fall chinook at low flows. During high flows there is a channel in which the fall chinook can bypass the weir. There is also evidence of fall chinook spawning in the Chinook River below the weir trap. Collect Broodstock are collected throughout the run to represent the timing and distribution of the run.

7.3 Identity.

There is only one identified population of fall chinook in the Chinook River. Hatchery produced fish have not been marked in any way to distinguish them from natural origin fish.

7.4 Proposed number to be collected:

7.4.1 Program goal (assuming 1:1 sex ratio for adults): Collect up to 40 pair of adult tule fall chinook salmon for hatchery broodstock. Release no more than 135,000 subyearling smolts at approximately 100-200 fish per pound. In 2003, staff live spawned smaller amounts of eggs form more adults. These fish were released upstream for additional spawning and nutrient enhancement.

7.4.2 Broodstock collection levels for the last twelve years (e.g. 1990-2001), or for most recent years available.

Year	Females	Males	Jacks	Eggs
1988	383	134	3	1,816,600
1989	114	82	8	538,500
1990	256	95	3	1,009,500
1991	225	163	17	1,155,500
1992	162	132	22	806,500
1993	169	162	15	797,000
1994	166	171	11	559,000
1995	252	282	0	980,000
1996	464	403	0	2,177,900
1997	254	102	0	1,053,130
1998	33	30	0	122,700
1999	Na	Na	Na	136,286
2000	15	28*	Na	63,962
2001	4	11*	Na	22,523
2002	8	10	Na	37637
2003	62*	50*		25200

* - Indicates fish live spawned and released upstream.

7.5 Disposition of hatchery-origin fish collected in surplus of broodstock needs.

Not applicable, as hatchery-origin fish cannot be distinguished from natural origin fish. All fish not needed for broodstock are passed upstream.

7.6 Fish transportation and holding methods.

Fall chinook are not transported to or from the facility. Broodstock Holding/Maturation: Un-ripe adult broodstock are held and maturated in the Sea Resources Hatchery instream holding structure (~12 ft long X ~14 ft wide X ~4.0 ft depth). Available water flow is seasonal.

7.7 Describe fish health maintenance and sanitation procedures applied.

Fish are solely derived from Chinook River broodstock and associated eggs/juveniles. No fish transfer into the Chinook watershed have been employed since 1996. Integrated Hatchery Operations Team (IHOT), Pacific Northwest Fish Health Protection committee (PNFHPC), state or tribal guidelines are followed for broodstock fish health inspection and broodstock holding and disposal of carcasses.

7.8 Disposition of carcasses.

When the adult fish are spawned their carcasses are distributed throughout the river to provide critical nutrients to support productivity of the river's food web.

7.9 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the broodstock collection program.

Adults are randomly selected for broodstock from the spawning population over the entire run-entry pattern. The random selection of fish is representative of the population, and should assure the long-term fitness of the population components (natural and hatchery). Adults are randomly selected for broodstock from the spawning population over the entire run-entry pattern. The random selection of fish is representative of the population, and should assure the probability of survival for the population components (hatchery and natural).

Section 8. Mating

8.1 Selection method.

Spawners are chosen randomly from ripe fish on at least a twice-weekly basis throughout the entire run.

8.2 Males.

All jacks are either spawned or released upstream in proportion to the adult return.

8.3 Fertilization.

Egg fertilization will be conducted using a two-by-two factorial spawning method. Prior to the 2000 brood year, fertilization used one to one spawning. Special care is taken to ensure that no blood, feces, or water are introduced during the fertilization process until the eggs are placed in the heath trays.

8.4 Cryopreserved gametes.

Cryopreserved gametes are not used.

8.5 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the mating scheme.

Section 9. Incubation and Rearing.

9.1.1 Number of eggs taken and survival rates to eye-up and/or ponding.

Year	Egg Take	Green-Eyed Survival (%)	Eyed-Ponding Survival (%)	Egg Survival Perfor-mance Std.	Fry-fingerling Survival (%)	Rearing Survival Perfor-mance Std.	Fingerling-Smolt Survival (%)
1990	12250	nya	nya	nya	nya	nya	nya
1991	140750	nya	nya	nya	nya	nya	nya
1992	0	nya	nya	nya	nya	nya	nya
1993	27000	nya	nya	nya	nya	nya	nya
1994	50000	nya	nya	nya	nya	nya	nya
1995	0	nya	nya	nya	nya	nya	nya
1996	12000	nya	nya	nya	nya	nya	nya
1997	32600	nya	nya	nya	nya	nya	nya
1998	13060	nya	nya	nya	nya	nya	nya
1999	61823	nya	nya	nya	nya	nya	nya
2000	55828	nya	nya	nya	nya	nya	nya
2001	30723	nya	nya	nya	nya	nya	nya
2002	37767						
2003	25200						

9.1.2 Cause for, and disposition of surplus egg takes.

Outside of securing up to 140,000 green eggs for the program, excess eggs are not taken.

9.1.3 Loading densities applied during incubation.

Eggs are loaded at approximately 50% of capacity in the Heath Trays.

9.1.4 Incubation conditions.

Sediment, temperature and dissolved oxygen are monitored.

9.1.5 Ponding.

After button up, fish are placed in rearing raceways for rearing.

9.1.6 Fish health maintenance and monitoring.

Temperature units are monitored. Information is noted onto Sea Resources forms, and electronically entered into the Sea Resources database. Dead/undeveloped eggs are disposed into dumpster/local landfill.

9.1.7 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish during incubation.

The program is a recovery/supplementation program for the stock, and families in the program are not culled; all eggs/juveniles are required.

9.2.1 Provide survival rate data (*average program performance*) by hatchery life stage (fry to fingerling; fingerling to smolt) for the most recent twelve years (1990-2001), or for years dependable data are available.

Year	Egg Take	Green-Eyed Survival (%)	Eyed-Ponding Survival (%)	Egg Survival Perfor-mance Std.	Fry-fingerling Survival (%)	Rearing Survival Perfor-mance Std.	Fingerling-Smolt Survival (%)
1990	12250	nya	nya	nya	nya	nya	nya
1991	140750	nya	nya	nya	nya	nya	nya
1992	0	nya	nya	nya	nya	nya	nya
1993	27000	nya	nya	nya	nya	nya	nya
1994	50000	nya	nya	nya	nya	nya	nya
1995	0	nya	nya	nya	nya	nya	nya
1996	12000	nya	nya	nya	nya	nya	nya
1997	32600	nya	nya	nya	nya	nya	nya
1998	13060	nya	nya	nya	nya	nya	nya
1999	61823	nya	nya	nya	nya	nya	nya
2000	55828	nya	nya	nya	nya	nya	nya
2001	30723	nya	nya	nya	nya	nya	nya

9.2.2 Density and loading criteria (goals and actual levels).

Our loading density goal for Sea Resources hatcheries is to try to rear the fish at less than one-half a pound of fish per gallon per minute for the majority of their rearing period and thus never exceed the loading value recommended by Piper et al. (1982).

9.2.3 Fish rearing conditions.

Fish in the program are fed diets at feeding rates specified by the manufacturer and WDFW to achieve specified size/wt at various milestones in the rearing cycle. Rearing units are cleaned at least once per week. All hatchery effluent from pond cleaning is discharged into a spare Burrows pond where the solids are allowed to settle out and are later used for fertilizer for our native plant propagation.

9.2.4 Indicate biweekly or monthly fish growth information (average program performance), including length, weight, and condition factor data collected during rearing, if available.

Unavailable

9.2.5 Indicate monthly fish growth rate and energy reserve data (*average program performance*), if available.

Unavailable

9.2.6 Indicate food type used, daily application schedule, feeding rate range (e.g. % B.W./day and lbs/gpm inflow), and estimates of total food conversion efficiency during rearing (*average program performance*).

Sea Resources Feed Rates:

Rearing Period	Food Type	Application Schedule (# feedings/day)	Feeding Rate Range (%B.W./Day)	Lbs. Fed Per gpm of Inflow	Feed Conversion
Feb-Mar	Moore Clark Nutra #0	8	2.5	0.06	1.0:1.36
Mar-Apr	Moore Clark Nutra #1	6	2.5	0.08	1.0:1.8

9.2.7 Fish health monitoring, disease treatment, and sanitation procedures.

Fish health and disease condition will be continuously monitored in compliance with Co-manager Fish Health Policy standards (WDFW and WWTIT 1998).

9.2.8 Smolt development indices (e.g. gill ATPase activity), if applicable.

The migratory state of the release population is determined by behavior, condition factor, physical appearance and other criteria.

9.2.9 Indicate the use of "natural" rearing methods as applied in the program.

The program attempts to better mimic the natural rearing environment by reducing rearing density below agency or other guidelines) , rearing under natural water temperature , predator avoidance training and providing natural or artificial cover.

9.2.10 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish under propagation.

Section 10. Release

10.1 Proposed fish release levels.

107,000 fingerlings at 100 fpp.

10.2 Specific location(s) of proposed release(s).

Sea Resources Hatchery located at RKM 7.7 on the Chinook River.

10.3 Actual numbers and sizes of fish released by age class through the program.

10.4 Actual dates of release and description of release protocols.

Fish are released directly into the Chinook River. The direct release of program fish lies within the natural outmigration window of naturally produced fish. The primary factor controlling program for releases is a specified release period and size. Water flow and temperature of the Chinook River and estuarine tidal stage are also considerations. Fish are released during the night-time period.

10.5 Fish transportation procedures, if applicable.

Fish are released in the same subbasin as the final rearing facility and do not need transport.

10.6 Acclimation procedures (*methods applied and length of time*).

Fish have been reared to a fingerling stage at Sea Resources Hatchery and have been acclimated on Chinook River water

10.7 Marks applied, and proportions of the total hatchery population marked, to identify hatchery adults.

Up to 60% of the program can be CWT and AD clipped. This number has varied over the years.

10.8 Disposition plans for fish identified at the time of release as surplus to programmed or approved levels

Program is managed to prevent surplus juveniles/smolts at time of release since strict broodstock/egg collection protocols are employed to prevent surplus eggs, juveniles, and smolts.

10.9 Fish health certification procedures applied pre-release.

All fish are examined for the presence of “reportable pathogens” as defined in the PNFHPC disease control guidelines, within 3 weeks prior to release.

10.10 Emergency release procedures in response to flooding or water system failure.

In the event of flooding, rearing fish will simply end up in the Chinook River, their intended destination. In the event of water system failure, fish may be released early into the Chinook River directly from the rearing ponds.

10.11 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from fish releases.

- Fish are volitionally released at a size, life stage and historical time period that promotes rapid migration.
- Release amounts are based on the amount of natural spawners that have been utilizing the natural stream.
- Location of the hatchery releases are low in the Chinook River watershed.
- Fish are solely derived from Chinook River broodstock and associated eggs/juveniles. No fish transfer into the Chinook watershed have been employed since 1996.
- Smolt releases are usually done on a weekly basis throughout the aforementioned time period to lessen the effects of hatchery coho releases on the limited food resources of the lower Chinook River.
- Smolt can be released of varying sizes to reduce competition and predation impact.
- Releases are held to June to ensure that listed chum have vacated the system.
- Fry plants have been discontinued to eliminate sub-yearling competition in the Chinook River.

Section 11. Monitoring and Evaluation of Performance Indicators

11.1.1 Describe plans and methods proposed to collect data necessary to respond to each "Performance Indicator" identified for the program.

Salmonids are captured with two screw traps. one full sized trap at the tidegate at the Highway 101 bridge, and one ½ screw trap at the Sea Resources facility. The purpose of these traps is to determine the overall salmonid production of the watershed and to better understand the life histories of the fish within the watershed. The traps are operated at least four times per week from January through June. Fish captured in the trap are identified, measured, weighed, and scale samples are removed, and released. On a weekly basis trap efficiencies are performed to determine the efficiency of the traps. To mark the fish to test trap efficiency we cut a small piece off of the caudal fin and release the fish approximately ¼ mile upstream. No other marks or tags are applied to the fish.

Salmonid production is also monitored on a yearly basis through snorkel counts every June.

11.1.2 Indicate whether funding, staffing, and other support logistics are available or committed to allow implementation of the monitoring and evaluation program.

Staff is funded and available through annual grants to Sea Resources that support Chinook River habitat assessment/rehabilitation and stock assessment (hatchery and natural).

11.2 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from monitoring and evaluation activities.

Technical guidance form WDFW and Tribal Co-Managers

Section 12. Research

12.1 Objective or purpose.

(1) Determine factors that limit/effect production of coho in the Chinook River watershed.

(2) Determine the productivity and carrying capacity of coho salmon in the Chinook River watershed.

12.2 Cooperating and funding agencies.

Sea Resources, Inc.
Washington Department of Fish and Wildlife
U.S. Fish and Wildlife Service

12.3 Principle investigator or project supervisor and staff.

Garth Gale, Sea Resources Fish Biologist

Robert Warren, Sea Resources Executive Director

12.4 Status of stock, particularly the group affected by project, if different than the stock(s) described in Section 2.

Chinook River Chum Salmon

Chinook River Coho Salmon

Chinook River Fall Chinook Salmon

Chinook River Cutthroat Trout

Chinook River Steelhead Trout

12.5 Techniques: include capture methods, drugs, samples collected, tags applied.

Salmonids are captured with two screw traps. one full sized trap at the tidegate at the Highway 101 bridge, and one ½ screw trap at the Sea Resources facility. The purpose of these traps is to determine the overall salmonid production of the watershed and to better understand the life histories of the fish within the watershed. The traps are operated at least four times per week from January through June. Fish captured in the trap are identified, measured, weighed, and scale samples are removed, and released. On a weekly basis trap efficiencies are performed to determine the efficiency of the traps. To mark the fish to test trap efficiency we cut a small piece off of the caudal fin and release the fish approximately ¼ mile upstream. No other marks or tags are applied to the fish.

Salmonid production is also monitored on a yearly basis through snorkel counts every June.

12.6 Dates or time periods in which research activity occurs.

January 1-June 30

12.7 Care and maintenance of live fish or eggs, holding duration, transport methods.

Live fish are held in the livebox between trap checks, they are held in the live box for no more than 24 hours, and live fish are not transported from either trapping location.

12.8 Expected type and effects of take and potential for injury or mortality.

Occasionally dead fish are found in the smolt traps. This mortality likely occurs because of the mechanical spinning action of the smolt traps.

12.9 Level of take of listed fish: number of range or fish handled, injured, or killed by sex, age, or size, if not already indicated in Section 2 and the attached "take table" (Table 1).

Insignificant numbers of listed fish are expected to be injured, or killed during research activities.

12.10 Alternative methods to achieve project objects.

12.11 List species similar or related to the threatened species; provide number and causes of mortality related to this research project.

Chinook River Coastal Cutthroat Trout

12.12 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse ecological effects, injury or mortality to listed fish as a result of the proposed research activities.

Section 13. Attachments and Citations

13.1 Attachments and Citations

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Section 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

14.1 Certification Language and Signature of Responsible Party

"I hereby certify that the information provided is complete, true and correct to the best of my knowledge and belief. I understand that the information provided in this HGMP is submitted for the purpose of receiving limits from take prohibitions specified under the Endangered Species Act of 1973 (16 U.S.C.1531-1543) and regulations promulgated thereafter for the proposed hatchery program, and that any false statement may subject me to the criminal penalties of 18 U.S.C. 1001, or penalties provided under the Endangered Species Act of 1973."

Name, Title, and Signature of Applicant:

Certified by_____ Date:_____

Take Table 1. Estimated listed salmonid take levels by hatchery activity.

Fall Chinook

ESU/Population	Lower Columbia River Chinook
Activity	Sea Resources Fall Chinook Program
Location of hatchery activity	Sea Resources Hatchery
Dates of activity	September – November
Hatchery Program Operator	WDFW

Type of Take	Annual Take of Listed Fish by life Stage (number of fish)			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass (a)	nya	nya	nya	nya
Collect for transport (b)	nya	nya	nya	nya
Capture, handle, and release (c)	nya	nya	Up to 40	nya
Capture, handle, tag/mark/tissue sample, and release (d)	nya	nya	nya	nya
Removal (e.g., broodstock (e)	nya	nya	nya	nya
Intentional lethal take (f)	nya	nya	Up to 40	nya
Unintentional lethal take (g)	Up to 5,250*	Up to 5,250*	Up to 40	nya
Other take (specify) (h)	nya	nya	nya	nya

* Average 25% loss for the past three years from only 21,678 smolts produced per year.

a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.

b. Take associated with weir or trapping operations where listed fish are captured and transported for release.

c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.

d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.

e. Listed fish removed from the wild and collected for use as broodstock.

f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.

g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.

h. Other takes not identified above as a category

Take Table 2. Estimated listed salmonid take levels by hatchery activity.

Chum

ESU/Population	Lower Columbia River Chum
Activity	Sea Resources Fall Chinook Program
Location of hatchery activity	Sea Resources Hatchery
Dates of activity	September – November
Hatchery Program Operator	WDFW

Type of Take	Annual Take of Listed Fish by life Stage (number of fish)			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass (a)	nya	nya	nya	nya
Collect for transport (b)	nya	nya	nya	nya
Capture, handle, and release (c)	nya	nya	0*	nya
Capture, handle, tag/mark/tissue sample, and release (d)	nya	nya	nya	nya
Removal (e.g., broodstock (e)	nya	nya	nya	nya
Intentional lethal take (f)	nya	nya	nya	nya
Unintentional lethal take (g)	nya	nya	nya	nya
Other take (specify) (h)	nya	nya	nya	nya

* During Chinook trapping, chum are handled for the Sea Resources chum program. See Grays River/Sea Resources Chum HGMP.

a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.

b. Take associated with weir or trapping operations where listed fish are captured and transported for release.

c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.

d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.

e. Listed fish removed from the wild and collected for use as broodstock.

f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.

g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.

h. Other takes not identified above as a category.

Take Table 3. Estimated listed salmonid take levels by hatchery activity.

Coho

ESU/Population	Lower Columbia River Coho
Activity	Sea Resources Fall Chinook Program
Location of hatchery activity	Sea Resources Hatchery
Dates of activity	September – November
Hatchery Program Operator	WDFW

Type of Take	Annual Take of Listed Fish by life Stage (number of fish)			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass (a)	nya	nya	nya	nya
Collect for transport (b)	nya	nya	nya	nya
Capture, handle, and release (c)	nya	nya		nya
Capture, handle, tag/mark/tissue sample, and release (d)	nya	nya	nya	nya
Removal (e.g., broodstock (e)	nya	nya	nya	nya
Intentional lethal take (f)	nya	nya	nya	nya
Unintentional lethal take (g)	nya	nya	nya	nya
Other take (specify) (h)	nya	nya	nya	nya

0* During Chinook trapping, coho are handled for the Sea Resources coho recovery program. See Grays River/Sea Resources Coho HGMP.

a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.

b. Take associated with weir or trapping operations where listed fish are captured and transported for release.

c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.

d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.

e. Listed fish removed from the wild and collected for use as broodstock.

f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.

g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.

h. Other takes not identified above as a category