

OPERATIONAL PLAN
FOR
ANADROMOUS, SALMON RANCHING ACTIVITIES

OREGON DEPARTMENT OF FISH AND WILDLIFE

17 April 1991

CONTENTS

	<u>Page</u>
INTRODUCTION.....	1
Background.....	1
Purpose.....	1
PERMIT LEVELS AND ASSOCIATED RESTRICTIONS.....	2
Coho Salmon.....	2
Chinook Salmon.....	2
Chum Salmon.....	3
HATCHERY PRACTICES.....	3
Stocks Approved for Release.....	3
Coho Salmon.....	3
Spring-Run Chinook Salmon.....	3
Fall-Run Chinook Salmon.....	4
Chum Salmon.....	4
Transport, Marking, Acclimation and Release Requirements.....	5
Fish Transport Permit.....	5
Marking Rates.....	5
Representative Marking.....	5
Minimum Acclimation Period.....	6
Time and Size at Release.....	7
Fish Release Permit.....	8
Location of Release.....	8
Failure to Obtain Transport or Release Permit.....	8
Broodstock Management.....	8
Exclusive Use of Coos Coho Salmon.....	8
Selection of Coho Salmon Broodstock.....	9
Exclusive Use of Coos Fall Chinook Salmon.....	9
Age Structure of Chinook Salmon Broodstock.....	9
Sex Ratio in Chinook Salmon Broodstock.....	9
Date of Spawning for Coos River Stock Fall-run Chinook Salmon.....	10
Required Record Keeping.....	10
MONITORING PROGRAMS.....	10
Financial Accountability for Monitoring Programs.....	10
Reports of Findings and Study Design Proposals.....	10

Straying.....	11
Critical Threshold Levels for Stray Coho Salmon.....	12
Protection of Specific Wild Populations from Stray Coho Salmon.....	12
Description of Program to Monitor Coho Salmon	13
Critical Threshold Levels for Stray Fall-run (Coos) Chinook Salmon.....	13
Protection of Specific Wild Populations from Stray Fall-run Chinook Salmon.....	14
Description of Program to Monitor Fall-run Chinook Salmon....	14
Marking Fish to Aid Monitoring of Strays.....	15
 Status of Salmonid Stocks in the Coos Basin.....	15
Status of Coos Spring-run Chinook Salmon.....	16
Status of Coos Fall-run Chinook Salmon.....	16
Status of Coos Coho Salmon.....	16
Status of Coos Steelhead.....	16
Status of Coos Cutthroat Trout.....	16
 Capture of Fish Not Originating from the Private Hatchery.....	16
 Ocean Harvest.....	17
 OTHER SAMPLING REQUIREMENTS.....	17
Tag Recovery Requirements.....	17
Scale Sampling Requirements, Marked Fish.....	17
Scale Sampling Requirements, Unmarked Fish.....	18
 OTHER REPORTING REQUIREMENTS.....	18
Annual General Release Plan.....	18
Detailed Salmon Production Plan.....	18
Report of Disease Examination.....	18
Monthly Reports of Fish on Hand.....	19
Monthly Fish Health Examinations.....	19
Report of Fish Loss.....	19
Monthly Report of Fish Released.....	19
Data on Recovery of Adults.....	19
 OTHER REQUIRED LICENSES AND PERMITS.....	20
Wholesale Fish Dealer License.....	20
Fish Propagation License.....	20

Fish Transport Permit.....	20
Release Permit.....	21
COMPENSATION.....	21
DISPUTE RESOLUTION.....	21
APPENDIX A. Statistical Basis for Marking Requirements.....	26
APPENDIX B. Current CWT Recovery Data Format for Oregon Private Salmon Hatcheries.....	30
APPENDIX C. Format of Monthly Report of Fish Release.....	31
INSTRUCTIONS FOR COMPLETING MONTHLY REPORT OF FISH RELEASE.....	32

INTRODUCTION

Background

Statutes authorizing private salmon ranching were approved by the 1971 Oregon Legislature. Oregon Revised Statutes (ORS 508.700-508.745) authorize issue of permits for chum salmon (*Oncorhynchus keta*) hatcheries and provide guidance for the review of applications, conduct of operations, and general requirements for termination of permits under certain circumstances. In 1973 the Legislature added coho (*O. kisutch*) and chinook (*O. tshawytscha*) salmon to the private hatchery statutes. The Fish Commission of Oregon was charged with administering laws related to the operation of private hatcheries, and since merger of the Fish and Wildlife commissions in 1975, the Oregon Department of Fish and Wildlife (Department) has been responsible for administration of laws relating to private salmon hatcheries. Administrative rules established by the Oregon Fish and Wildlife Commission (Commission) describe policies and restrictions for the siting, operation, evaluation, and monitoring of private hatcheries. The Commission has the primary authority and responsibility to approve or modify the hatchery operational plans developed by the Department. The scope, technical requirements, or both, of these operational plans may be changed by the Commission in the future to reflect the acquisition of new information or new interpretations of old data.

This operational plan is one of a series of written documents prepared by the Department at the direction of the Commission and House Bill 2735 (which amended ORS 508.715, 720, and 740). This operational plan has been written to encompass private salmon ranching activities conducted through the Anadromous Inc. release and recapture facilities located near Jordan Point and North spit in Coos Bay. The provisions contained in this operational plan are applicable to, and shall be binding to any successive owner or owners that may acquire the Anadromous salmon ranching permit in the future. Thus, any references in this plan to Anadromous shall be understood to be applicable to any subsequent permittee to whom the permit may be transferred.

Anadromous, Inc. has been engaged in salmon ranching activities in Oregon since 1974. Initially located near St. Helens on the Columbia River, the company shifted operations to Jordan Point in Coos Bay and later acquired the North Spit facility from OreAqua, Inc. in 1984. Anadromous did not release chum, coho or chinook smolts in 1990 at either the North Spit or Jordan Point facility. At this time both facilities are for sale.

Purpose

This operational plan is limited to the salmon ranching (release and recapture) facilities located near the mouth of Coos Bay. The operational plan (1) describes procedural obligations that shall be met by Anadromous during the conduct of all aspects of fish production, (2) describes the requirement to evaluate the performance of the hatchery with respect to survival and fishery contribution, (3) describes the obligation to develop and maintain a long-term monitoring program that will determine whether operation of the hatchery places specified natural populations of fish at risk, and (4) provides formal public disclosure of terms and conditions that shall be fulfilled during the operation of this private hatchery permit.

Other activities, such as fish "farming" at the same site or at other locations within the state are regulated by separate fish propagation licenses (OAR 635-07-650 through 670). This operational plan does not describe or regulate related issues such as water rights, water quality, or land use restrictions because these issues are outside the scope of authority of the Department and the Commission.

This operational plan represents a conservative interpretation of fisheries scientific literature and of extensive practical experience with the operation of both private and public hatcheries of all sizes. The requirements in this operational plan are based on the current level of understanding of the potential effects of hatchery programs on wild populations of salmon and trout and are consistent with recently adopted Natural Production and Wild Fish Management Rules [OAR 635-07-501-529]. This operational plan may be modified by the Commission after a formal review and public comment process as new information becomes available.

PERMIT LEVELS AND ASSOCIATED RESTRICTIONS

Coho Salmon

Anadromous has a permit, as modified on November 19, 1985, to release up to 11.3 million coho salmon *O. kisutch* per year, subject to all applicable requirements of Oregon statutes and rules. The Department interprets several key applicable statutes and rules, including allowable stray rates and the Wild Fish Management Policy as implemented through the Coos River Basin Fish Management Plan, to provide an overall annual ceiling on coho releases into the Coos River Basin. Allowable release numbers shall be periodically calculated by the Department based on observed stray rates and coho population status in the Coos, Millicoma, Coquille, Eel Lake and Tenmile Lake basins. Based on current population status in the Coos and Millicoma basins, releases in 1992 or the next year smolt releases are reinitiated shall be limited to 3.3 million. Individual releases shall be authorized through a release permit. Moreover, any group, brood or series of releases may be further limited, depending on the outcome of monitoring and evaluation and the annual prioritization of smolt release outlined in OAR 635-07-817.

Chinook Salmon

Anadromous has a permit, as modified on November 19, 1985, to release up to 9.4 million chinook salmon *Oncorhynchus tshawytscha* per year, subject to all applicable requirements of Oregon statutes and rules. The Department interprets several key applicable statutes and rules, including allowable stray rates and the Wild Fish Management Policy as implemented through the Coos River Basin Fish Management Plan, to provide an overall annual ceiling on chinook releases into the Coos River Basin. Allowable release numbers shall be periodically calculated by the Department based on observed stray rates and chinook population status in the Coos, Coquille, Sixes and Elk river basins. Fall chinook releases in 1992 or the next year smolt releases are reinitiated shall be limited to 1.4 million smolts based on current population status of Coos River fall chinook. Individual releases shall be authorized through a

release permit. Moreover, any group, brood or series of releases may be further limited, depending on the outcome of monitoring and evaluation and the annual prioritization of smolt releases outlined in OAR 635-07-817.

Chum Salmon

Anadromous has a permit, as transferred from OreAqua, Inc. on July 17, 1985, to release up to 20.4 million chum salmon *O. keta* per year, subject to all applicable requirements of Oregon statutes and rules. The Department interprets several key applicable statutes and rules, including allowable stray rates and the Wild Fish Management Policy as implemented through the Coos River Basin Fish Management Plan to allow no chum releases. Accordingly, the Commission has determined that the operation is not in the best public interest, and has commenced proceedings to cause an orderly termination of the permit, in accordance with ORS 508.720 and ORS 183.310 to 183.550. No releases are authorized for 1992 or in subsequent years.

HATCHERY PRACTICES

Stocks Approved for Release

Coho Salmon

Anadromous is authorized to release Coos River stock coho salmon. As required by the Coos River Basin Fish Management Plan (OAR 635-500-410 (1) (6)), no other stock of coho salmon is authorized for release.

Anadromous shall submit a proposal to obtain Coos River stock coho salmon from the Department in the time frame specified in OAR 635-40-022. The Department will try to provide eggs from Coos stock coho salmon to Anadromous in accordance with OAR-635-07-830 but will not guarantee future availability of eggs.

Anadromous shall notify the Department regarding its intentions to release coho salmon in accordance with OAR 635-40-022. Failure to submit the required information shall result in termination of permission to release coho salmon in the relevant year.

Spring-Run Chinook Salmon

Anadromous is not authorized to release any stock of spring-run chinook salmon for ranching purposes.

Current Department management programs emphasize conservation of relatively small spring-run chinook salmon stocks in the nearby Coquille River basin. The Department views the use of any spring-run chinook salmon stock by Anadromous as detrimental to these conservation efforts.

As an example, if Anadromous released 5 million smolts that survived to return at 2%, and if 1% of the returning fish strayed to the Coquille River basin, that would amount to 1,000 strays. Because the population of wild spring-run chinook salmon in the nearby Coquille probably is fewer than 200

ceptable proportion of strays in the basin is 3% (OAR 635-500-022), the Department believes that the use of the same with the wild fish management policy.

3, suppose that Anadromous proposed only to release a stock (50,000) of spring-run chinook salmon smolts. In this case, the 3% to return and 1% out-system straying predicts that the Coos River basin. Theoretically, such a stock marginally meet the standards set by the wild fish management policy. However, it would be difficult to determine the percent in the Coquille River basin in percentages that are above the threshold permitted by the private hatchery rules.

Coos River Basin Fish Management Plan (OAR 635-500-022) of fall-run chinook salmon that the Department has approved under the Operating Principles for Wild Fish Management is therefore potentially suitable for ranching by Anadromous. The Department collected eggs from Coos River fall-run chinook salmon in 1977, 1978, and 1979 to allow the permittee to establish a hatchery. Anadromous was not pleased with the results obtained from the fall-run chinook salmon, however. Poor flesh quality, poor market value, and low contribution to Oregon's economy motivated Anadromous to document the unsuitability of fall-run chinook salmon for these purposes. Although releases of Coos fall-run chinook salmon were approved by the Department, Anadromous has not released any since 1986.

Anadromous is required to work with the Department to develop a program to produce a stock from wild fish. Anadromous shall submit a permit for fall-run chinook eggs from the Department in the Coos River Basin (OAR 635-40-022).

Anadromous shall notify the Department regarding its intentions to release fall-run chinook salmon in accordance with OAR 635-40-022. Failure to comply with this provision shall result in termination of permission to release fall-run chinook salmon in the relevant year.

Anadromous is not authorized to release any stock of chum salmon for hatchery purposes. Representatives of Anadromous have stated that no plan to release chum salmon because of the expected low survival rate of this species. Anadromous and the previous permittee have not released chum salmon smolts since 1979. The Department has added chum salmon to a "sensitive species" list. Hatchery plans are being developed that will attempt to produce chum salmon in the Coos and nearby coastal river basins. Anadromous is required to submit a hatchery plan for the Coos River Basin Fish Management Plan, hatchery operations within the basin (OAR 635-500-415 (1)(2)).

Transport, Marking, Acclimation, and Release Requirements

Fish Transport Permit

Anadromous shall obtain a written fish transport permit from the Department prior to transporting juvenile or adult salmon to or from the release and recapture site (as provided in OAR 635-07-600). Separate transport permits are required for each group or period in which fish are transported to or from the release and recapture site.

Marking Rates

Anadromous shall mark coho and chinook salmon released for ranching so that the Department may estimate catch and survival rate and monitor strays from the hatchery. For marking requirements related to monitoring strays from the hatchery see Marking Fish to Aid Monitoring of Strays. The Anadromous marking program shall meet or exceed the following minimum conditions:

1. At least 50,000 smolts per species released, per 2-week period of release, shall be marked Ad+CWT. This requirement is based on an expected contribution rate of 1% to Oregon fisheries, a 20% sampling rate for the fisheries, and a 95% confidence interval on the catch estimate of $\pm 20\%$.
2. Private hatchery salmon shall be marked at a rate not less than the rate of tagging at Department hatcheries (in 1990 this rate was approximately 8% for coho salmon and 9% for chinook salmon) [ORS 508.715 (1)].
3. Tagged fish shall be representative of the production lots.

Representative Marking

Marked fish are used to make inferences about unmarked fish. Marked fish shall be representative of unmarked fish in terms of survival, contribution to fisheries, size, etc.

Anadromous shall adhere to the following procedures in marking fish. Fish selected for tagging shall be removed from the general population 2 to 5 months prior to seawater entry. The number of fish selected shall be 60,000 or more, so that at least 50,000 fish will be available for release to the ocean. The fish shall be tagged as three or more replicates so that consistency in tagging can be evaluated. After being tagged, the fish shall be held separately from unmarked fish until they are transported to the release site at Coos Bay. The tagged fish representing production groups shall be shipped separately so that transport mortality can be evaluated.

On arrival at Coos Bay, the tagged fish shall be mixed in the same rearing enclosure as the production fish. Mortalities shall be counted separately for tagged and untagged fish.

Any proposal to modify these standards for representative marking shall be submitted by Anadromous to the Department prior to January 1 of any potentially affected year. Failure to submit such proposal to modify these standards by January 1, or to revise a proposal as required by the Department, shall result in denial of the request.

At release, the tagged fish shall be sampled for length and weight and the general condition shall be noted compared with that of the untagged fish. The adipose-clipped fish shall also be sampled for coded-wire tag retention, and the number of tagged fish released shall be adjusted for tag loss.

OAR 635-40-014 (6) requires data sufficient to verify compliance with these procedural requirements shall be collected and summarized by Anadromous and submitted to the Department in a monthly report that is due to the Department by the 15th day of the month immediately following the release (see *Monthly Report of Fish Released*). For tagged and untagged fish, the following data shall be provided in a summary table:

1. Species.
2. Coded-wire tag number or fin-mark (if any).
3. Date and number tagged or fin-clipped (as appropriate).
4. Date and number transported to acclimation facility.
5. Percent mortality since tagging (as appropriate).
6. Date and number released.
7. Percent mortality since transport to the acclimation facility.
8. Length, weight, and condition factor of released fish.

Failure to submit the required data summaries shall result in revocation of permission to release fish during the relevant year. Requests to deviate from the previously described procedures shall be submitted by Anadromous to the Department by 1 January of any potentially affected year. The Department shall conduct a prompt review and may approve or deny any such requests.

Minimum Acclimation Period

The purpose of establishing a minimum acclimation time is to improve homing and survival of returning adults. A minimum of 20 days acclimation in saltwater holding ponds is required for coho and for chinook salmon prior to release. No fish may be released following less than 20 days acclimation without implementing an evaluation based on a sound experimental design approved by the Department. Anadromous shall submit to the Department prior to 1 January of any potentially affected year, any proposal to modify these standards for minimum acclimation period. Failure to submit such a proposal to modify minimum acclimation period requirements by 1 January or to revise a proposal as required by the Department shall result in denial of the request. Proposals to modify these standards in future production years shall be considered by the Department on the basis of (1) available information sufficient to demonstrate that the new standards would not tend to increase straying and (2) the design and assured funding of a monitoring program to verify that shorter acclimation periods do not produce unacceptable straying levels.

The acclimation period requirement is based on the Departments assessment that, historically, acclimation periods of 7-14 days tend to correlate with lower survival rate and higher straying rates than acclimation periods of 20 days or more. The Department believes that even longer acclimation periods may be needed in the future to improve survival, homing, or both, of Anadromous salmon.

Time and Size at Release

OAR 635-07-810 directs that salmon smolts shall be released at a time and size such that they will migrate directly to the ocean. The Department recognizes that it is difficult or impossible to assure that all hatchery fish will migrate "directly" to the ocean. However, the Department believes that placing restrictions on the size of juveniles that may be released and on the dates during which juveniles may be released will increase the proportion of hatchery fish that migrate directly to the ocean. The Department also believes that a relatively rapid migration by hatchery fish from estuary to ocean reduces the potential for ecological effects on the estuarine fish communities in Coos Bay. Anadromous may release fish within the size and date restrictions noted below.

Species	Release period	Minimum average size
Coho salmon	1 March-20 August	30 g (15/lb)
Chinook salmon	15 June-31 July	35 g (13/lb)
	1-31 August	40 g (11/lb)
	1-30 September	50 g (9/lb)
	1 October-30 November	60 g (7.5/lb)

The time and size of release requirements for chinook salmon are based on a review of data collected by public and private hatcheries. These data generally indicate improved survival, contribution, or both, for chinook salmon that meet the minimum criteria.

The size of release requirements for coho salmon are based on the Department's assessment that coho salmon less than about 30 g will survive poorly and are likely to remain in the estuary or river for a longer duration. The time of release requirement for coho salmon is based on the observation that many juvenile hatchery coho salmon released after late August 1982 migrated upstream into the Yaquina River basin. The Department has repeatedly stated that limited releases of coho salmon after about 20 August would be permitted only as part of a well-planned, comprehensive experimental program (for example see letter dated 10 April 1989 from T.E. Cummings, Oregon Department of Fish and Wildlife to R.F. Severson, General Manager, Oregon Aqua-Foods, Inc.).

Any proposal to approve variances to these parameters for a specific year shall be submitted prior to 1 January of the year for which the variance is requested, and shall be accompanied with information sufficient to demonstrate that the proposed variance will not increase the "residence period" of the hatchery fish in the bay. The Department shall not approve any request to release coho salmon smolts after 15 September. Any requests to release coho salmon smolts from 20 August through 15 September that the Department might approve shall be contingent on a requirement that Anadromous fund field studies to monitor upstream movement of smolts in the Coos River Basin. Requests for approval of variance that are submitted late or with insufficient information shall be denied.

Fish Release Permit

Anadromous shall obtain written permission from the Department prior to releasing salmon smolts (OAR 635-40-014 (4)). The request to release fish shall be accompanied by a report of disease examination (OAR 635-40-014 (5)) and the length-frequency distribution, displayed in tables and graphs, for a representative sample of 200 fish from each release group. Separate permits are required for each group or period in which fish are released. It is expected that such periods shall generally be on a two week basis. Length data will be used to monitor compliance with the size at release requirements and will provide a reference database for future analysis.

Location of Release

Anadromous is authorized to release salmon only at the release and recapture facilities located at Jordan Point and the North Spit at Coos Bay. Transporting fish offshore prior to liberation is not authorized.

Failure to Obtain Transport or Release Permits

In the event that Anadromous fails to obtain any required fish transport or release permit as cross referenced in OAR 635-40-014 and this operational plan, the Department shall immediately rescind authorization to transport or release fish. Anadromous shall then be required to submit to the Department, a written explanation of circumstances regarding its failure to obtain the relevant permit or permits. The Department shall then determine the period of time during which Anadromous shall not be authorized to transport or release fish ("penalty period"). The "penalty" period shall not normally exceed one annual fish production cycle.

Broodstock Management

Exclusive Use of Coos Coho Salmon

Anadromous discontinued releases of mixed stock coho smolts in 1989. Anadromous shall begin to establish a broodstock derived entirely from Coos River stock coho salmon starting with the next egg take. The Department will attempt to supply Coos River stock coho salmon eggs annually, in accordance

with OAR 635-07-830, for four years. Anadromous shall be required to compensate the Department for eggs that are furnished. Anadromous has the responsibility to take strong measures to develop a self-sustaining broodstock (see Coho Salmon). Requests to obtain additional eggs after the four year period shall be viewed unfavorably by the Department and shall, in all but the most extraordinary circumstances, be denied.

Selection of Coho Salmon Broodstock

No restrictions are placed on the age structure, date of return, or date of spawning for the coho salmon broodstock spawned by Anadromous for ranching purposes. The Department will review the issue of broodstock selection in the future during a formal revision of the Coho Salmon Management Plan. Depending on the outcome of this review, future restrictions may be placed on the broodstock selection criteria used by Anadromous.

Exclusive use of Coos Fall Chinook Salmon

Anadromous shall begin to establish a broodstock derived entirely from Coos River stock fall-run chinook salmon starting with their next egg take. The Department will attempt to supply Coos River stock fall chinook salmon eggs annually, in accordance with OAR 635-07-830, for four years. Anadromous shall be required to compensate the Department for eggs that are furnished. Anadromous has the responsibility to take strong measures to develop a self-sustaining broodstock. Requests to obtain additional eggs after the four year period shall be viewed unfavorably by the Department and shall, in all but the most extraordinary circumstance, be denied.

Age Structure of Chinook Salmon Broodstock

No restrictions are placed on the age structure of the chinook salmon broodstock at the present time. Recommendations regarding systematic selection of the age of chinook salmon that are spawned at public hatcheries are being considered by the Department for inclusion in a comprehensive chinook salmon management plan. Depending on the outcome of this review, future restrictions regarding the age structure of chinook salmon broodstock used by Anadromous may be established.

Sex Ratio in Chinook Salmon Broodstock

No restrictions are placed on the sex ratio of the chinook salmon broodstock at the present time. Recommendations regarding sex ratio of chinook salmon that are spawned at public hatcheries are being considered by the Department for inclusion in a comprehensive chinook salmon management plan. Depending on the outcome of this review, future restrictions regarding the sex ratio of chinook salmon broodstock used by Anadromous may be established.

Date of Spawning for Coos Stock Fall-run Chinook Salmon

No restrictions are placed on the dates during which Anadromous may spawn Coos stock fall-run chinook salmon, or on the temporal distribution of spawning for this stock. Recommendations regarding selection of date of return and date of spawning of public hatchery chinook salmon are being considered by the Department for inclusion in a comprehensive chinook salmon management plan. Depending on the outcome of this review, future restrictions may be established regarding selection of date of return, date of spawning, or both, for Coos stock chinook salmon.

Required Record Keeping

Data sufficient to verify compliance with these broodstock management requirements shall be submitted to the Department by Anadromous by 1 January each year. At the present time, a table summarizing the number of males and females spawned, by date, and a written description of the design of the mating program shall be sufficient. Failure to provide these data shall result in revocation of permission for Anadromous to release fish for a period of 1 year.

MONITORING PROGRAMS

The operation of a large-scale hatchery, public or private, probably poses some level of genetic or ecological risk to production of wild salmonid stocks in the local region. Genetic interactions occur if wild and hatchery stocks interbreed. Ecological interactions occur as a consequence of competition, predation, introduction of disease, etc. This operational plan describes specific genetic and ecological risks associated with the operation of the Anadromous hatchery that shall be evaluated. Although many other genetic and ecological risks may be associated with operation of the hatchery, they shall not be addressed by this operational plan.

Financial Accountability for Monitoring Programs

Anadromous is responsible for any costs over and above normal Department programs [ORS 508.715(8)] that are necessary to accomplish the following monitoring programs. They may contract with the Department or with a mutually acceptable private party to accomplish required work. For the purpose of monitoring catch of private hatchery fish in ocean fisheries, Anadromous shall provide the Department funding for the services of coded-wire tag recovery and processing. The level of funding of these services shall be determined by the Department annually, and Anadromous shall be billed for these services.

Reports of Findings and Study Design Proposals

Anadromous shall annually submit a written report of the results of work to monitor strays and a proposal describing future work to monitor strays. Anadromous shall submit a draft report of findings and a proposal for future monitoring programs by 1 March each year. The Department shall review and

comment on the draft report, and shall describe necessary revisions to the study design proposal by 1 April. Anadromous shall submit a final report of findings and a revised study design proposal by 1 May.

In the event that Anadromous does not fund, conduct, or report monitoring programs as required by the Department and this Operational Plan, authorization to release any salmon of any species shall immediately be revoked. The Department shall notify Anadromous regarding (1) the specific nature of the monitoring that was not funded, conducted, or reported (2) the effective date of revocation of authorization to release fish, and (3) the work that shall be accomplished, the funds that shall be provided, or both, before authorization to release fish may be reinstated.

Straying

Based on an extensive series of verbal and written discussions with fish geneticists throughout the Pacific Northwest, the Department believes that conservation of the genetic characteristics of a wild stock requires that the level of stray hatchery fish that spawn with the wild fish shall be kept very low if genetic differences between hatchery and wild fish exist. OAR 635-07-527 (Operating Principles of Wild Fish Management) established general standards for managing genetic and ecological interactions between wild and hatchery fish. If the hatchery and wild fish are genetically dissimilar, OAR 635-07-527 states that hatchery fish shall not exceed 10% of the spawners in a wild population. OAR 635-07-527 (1e) notes that more conservative percentage standards may be appropriate, however, if the hatchery stock is considerably different than the wild stock. Prior to completion of written operational plans for private salmon hatcheries in Oregon, the Commission established interim rules for marking requirements and acceptable proportions of stray hatchery fish in wild populations (OAR 635-40-101).

Regarding straying by Anadromous salmon, the Department is establishing the following general standards for permissible proportions of strays in wild populations:

1. Because Coos River stock coho salmon are presently thought to be similar to coho salmon stocks in the region, the 10% standard noted in OAR 635-07-527 shall apply in populations managed for wild coho salmon.
2. Because Coos stock fall-run chinook salmon are similar to fall-run chinook salmon stocks in the region, the 10% standard noted in OAR 635-07-527 shall apply in populations managed for wild fall-run chinook salmon.
3. Because Coos stock fall-run chinook salmon exhibit a date-of-return that is dissimilar to spring-run chinook salmon stocks in nearby river basins, the Department shall establish more conservative standards for the occurrence of stray fall-run chinook salmon in wild spring-run populations. For Coos stock fall-run chinook salmon, a standard of 3% (of populations of wild spring-run chinook salmon) shall apply.

In accordance with the Natural Production and Wild Fish Management Rules adopted by the Commission in 1989 (OAR 635-07-501 -529), management programs are being developed to conserve native stocks of salmonids. One important

aspect of developing management programs designed to conserve native stocks is the necessity to determine whether stray hatchery fish are present in specific reaches of river basins. Monitoring for the occurrence of stray adult salmon from Anadromous shall be accomplished by conducting surveys in a limited number of river basins, using these as indicator stocks (for example see Description of Program to Monitor Coho Salmon).

The Department is currently developing, for approval by the Commission, a provisional statewide list of populations of wild fish (OAR 635-07-529). The level of resolution of the list of wild fish populations has not been determined yet, but will be an important factor in application of stray rate standards. For example, stray private hatchery salmon may be more common in the East Fork of the Coquille than they are in the Coquille basin as a whole. If the East Fork of the Coquille is listed as a wild stock distinct from the remainder of the Coquille basin, the occurrence of strays in a sample of fish the East Fork Coquille, rather than the occurrence of strays in a sample of fish from the entire basin, would be used to judge whether the critical stray prevalence (OAR 635-40-101) had been exceeded. Until the Commission approves a statewide list of wild fish populations, this operational plan shall provide interim guidance regarding the stocks of salmon that shall be protected under the Operating Principles of Wild Fish Management (OAR 635-07-527).

Critical Threshold Levels for Stray Coho Salmon

The Department has determined that the Anadromous hatchery shall be managed so that the proportion of stray coho salmon does not exceed a critical threshold level of 10% of the populations of spawning coho salmon in all but a few specific river basins nearby. If the proportion of stray Anadromous coho salmon in a single wild stock is at or above the 10% level in 2 out of any 5 consecutive years, the Department shall require Anadromous to modify operational procedures, reduce the number of fish released, or both, in order to reduce the percentage of strays to an acceptable level. The Department shall employ the best information available to predict the number of smolts that may be released without exceeding the critical threshold level. The stipulation that strays exceed the critical threshold level in 2 out of 5 years before the Department requires a reduction in smolt releases is a safeguard strictly for the private hatchery. This stipulation will ensure that a single year of operational or environmental circumstances would not curtail operation of the hatchery. These standards shall take effect for coho salmon during the first year that hatchery coho salmon are expected to return to the Anadromous facility.

Protection of Specific Wild Populations from Stray Coho Salmon

The Department shall require Anadromous to limit the occurrence of stray coho salmon in specific river basins. River basins near the Anadromous hatchery either (1) support very small (probably fewer than 100 fish) populations of wild coho salmon, or (2) support one or more populations of wild coho salmon.

The Department shall require Anadromous to take action to reduce stray coho salmon below 10% of the populations of spawning coho salmon in the following basins: Eel Lake, Tenmile Lake, Millicoma, Coos, and Coquille. Approval by the Commission of a statewide list of wild fish populations will provide future guidance regarding the number of populations within these basins that will be protected under OAR 635-07-527.

Description of Program to Monitor Coho Salmon

Indicator stocks shall be monitored to detect the presence of stray coho salmon from Anadromous. Monitoring shall consist of detecting marked fish (identified by a coded-wire tag) during a sampling program that may extend from approximately October through February. The Department conducts surveys of spawning coho salmon as a routine part of biological surveys in many coastal river basins. At present the Department conducts index spawning ground surveys annually in the Coos, Coquille, and Tenmile lake basins. Information regarding the proportion of stray Anadromous coho salmon in each of these areas shall be estimated and reported annually.

The Department shall annually notify Anadromous as to the basins that shall be surveyed for possible occurrence of stray coho salmon. At first the Department shall require Anadromous to fund surveys in at least two of the major spawning areas that are typically used by coho salmon in the Coos and Coquille River basins. Depending on the results of sampling, the Department may require Anadromous to fund additional surveys.

Critical Threshold Levels for Stray Fall-run (Coos) Chinook Salmon

The Department has determined that the Anadromous hatchery shall be managed so that the proportion of stray fall-run chinook salmon does not exceed a critical threshold level of 3% of the populations of spawning spring-run chinook salmon, and 10% of populations of spawning fall-run chinook salmon in specified river basins nearby. If the proportion of stray Anadromous fall-run chinook salmon in any of the wild stocks in a specified basin is at or above the critical threshold level in any 2 out of 5 consecutive years, the Department shall require Anadromous to modify operational procedures, reduce the number of fish released, or both, in order to reduce the percentage of strays to an acceptable level. The Department shall employ the best information available to predict the number of smolts that may be released without exceeding the critical threshold level. The stipulation that strays exceed the critical threshold level in 2 out of 5 years before the Department requires a reduction in smolt releases is a safeguard strictly for the private hatchery. This stipulation will ensure that a single year of operational or environmental circumstances would not curtail operation of the hatchery. These standards shall take effect three years after Anadromous resumes releases of fall-run chinook salmon. Three consecutive years releasing marked fall-run chinook salmon would result in the presence of marked returns of ages 2 through 5.

Protection of Specific Wild Populations from Stray Fall-run Chinook Salmon

The Department shall require Anadromous to limit the occurrence of fall-run chinook salmon in specific river basins. River basins near the Anadromous hatchery either (1) do not support any viable wild populations of chinook salmon, (2) support one or more viable populations of wild fall-run chinook salmon, or (3) support one or more viable populations of spring- and fall-run chinook salmon.

The Department shall not restrict operation of the Anadromous fall-run chinook salmon program to limit the occurrence of stray fall-run chinook salmon in river basins that do not support wild populations of chinook salmon. Examples of basins that do not support wild chinook populations include Eel and Tenmile lake systems.

Conversely, the Department shall require Anadromous to take action to reduce stray fall-run chinook salmon below 3% of the population of spawning spring-run chinook salmon in the Coquille River basin, and below 10% of the population of spawning fall-run chinook salmon in the Coos, Coquille, Sixes, and Elk River basins. Approval by the Commission of a statewide list of wild fish populations will provide future guidance regarding the number of populations within these river basins that will be protected under OAR 635-07-527.

Description of Program to Monitor Fall-run Chinook Salmon

Indicator stocks shall be monitored to detect the presence of stray fall-run chinook salmon from Anadromous. Monitoring shall consist of detecting marked fish (identified by a fin mark, a coded-wire tag, or both) during a sampling program that may extend from approximately October through December. The Department conducts surveys of spawning fall-run chinook salmon in the Coos, Coquille, Elk and Sixes river basins. Information regarding the proportion of stray Anadromous fall-run chinook salmon, identified by a fin mark, a coded-wire tag, or both, in each of these areas shall be summarized annually.

Anadromous shall fund additional surveys, identified by the Department, to monitor the occurrence of stray fall-run chinook salmon in the Coos River beginning three years after Anadromous resumes releases of fall-run chinook salmon, regardless of the number of smolts released.

Three years subsequent to any release level above 150,000 Coos stock chinook salmon, Anadromous shall be required to fund studies designed to monitor the occurrence of stray fall-run chinook outside the Coos basin because the Department believes that the risk of out-system straying will be significant. The Department shall annually notify Anadromous as to the basins that shall be surveyed for the possible occurrence of stray fall-run chinook salmon. At first, the Department shall require Anadromous to fund surveys in at least two of the major spawning areas that are typically used by fall-run chinook salmon in the lower reaches of the Coquille River basin. Depending on the results of sampling, the Department may require Anadromous to fund additional surveys.

At a release level of or below 150,000 Coos stock chinook salmon, Anadromous shall not be required to fund studies designed to monitor the occurrence of stray fall-run chinook outside the Coos basin, because the Department believes that the risk of significant out-system straying will be low at this release level. Depending on the information available to the Department from standard spawning surveys and from Anadromous funded monitoring programs, the Department may, in the future, require Anadromous to fund studies of outsystem straying by fall-run chinook salmon even though fewer than 150,000 smolts may be scheduled for release.

If, in 2 years out of 5, Anadromous fall-run chinook salmon occur at a level above 3% of any spawning population of spring-run chinook salmon in the Coquille basin, or at a level above 10% of any population of fall-run chinook salmon in the Coos, Coquille, Sixes, or Elk basins, the Department shall require action by Anadromous to reduce strays to the critical threshold level.

Marking Fish to Aid Monitoring of Strays

Monitoring the proportion of stray Anadromous salmon in several stocks may be accomplished only if the hatchery fish are marked so as to be positively identified when they are observed among a sample of fish. To accomplish these monitoring programs, Anadromous shall excise the left ventral fin (LV) from a proportion of fall-run chinook salmon smolts released by the hatchery. Spring-run and fall-run chinook salmon are treated as distinct "species" with respect to marking because they are reproductively isolated groups. Anadromous may choose to conduct feasibility studies that will demonstrate the proportion, the number, or both, of hatchery fish of each species that would need to be marked to obtain statistically reliable estimates of proportions of stray hatchery fish among indicator stocks. In the absence of such feasibility studies, 100% of the salmon released from the hatchery shall be marked in a manner approved by the Department. Some discussion of the Department's assumptions regarding marking and sampling are presented in APPENDIX A.

Status of Salmonid Stocks in the Coos Basin

The Department conducts a variety of activities designed to monitor the status of salmonid stocks throughout the state, including the Coos River basin. However, this task is complicated by public hatchery programs that are existing or proposed for some of the stocks. These include Department programs for coho salmon fry, presmolts, and smolts; steelhead *Oncorhynchus mykiss* fry and smolts; and chinook salmon fry, presmolts, and smolts. The Department shall continue to monitor certain indicators of the status of anadromous salmonids in the Coos River basin, and will attempt to infer the status of wild fish in the basin.

Status of Coos Spring-run Chinook Salmon

The Department believes that the Coos River basin does not presently support a wild population of spring-run chinook salmon. Historically, fewer than a few hundred spring-run chinook salmon probably spawned in the Coos River basin.

Status of Coos Fall-run Chinook Salmon

Abundance of adult fall-run chinook salmon shall be indexed by Department spawning surveys and supplemental surveys funded by Anadromous.

Status of Coos Coho Salmon

Abundance of adult coho salmon shall be indexed by Department spawning surveys and supplemental surveys funded by Anadromous.

Status of Coos Steelhead

The Department shall use estimates of recreational catch derived from angler catch records to monitor trends in abundance of the steelhead population. Analysis of scales collected by the volunteer scale program will be used to separate hatchery fish from wild fish. These data may be supplemented by creel survey programs.

Status of Coos Cutthroat Trout

Currently, the Department does not monitor the status of cutthroat trout populations in the Coos River basin.

Capture of Fish Not Originating From the Private Hatchery

Anadromous shall develop and fund an ongoing program approved by the Department to monitor the capture of adult wild or public hatchery fish in their facilities. This monitoring program should at least include sampling of scales from unmarked and marked fish that return to the capture facility. A preliminary proposal for the design of such a study shall be submitted to the Department by 1 January for implementation by 1 August of the next year that the hatchery plans to operate. Failure to submit a proposal for this monitoring program by the specified date, or to make required modifications to the proposal within 14 days of notification by the Department that changes are needed, shall result in revocation of permission to release or recapture fish in the relevant calendar year.

Anadromous shall maintain recapture facilities in good working order continuously from 1 August through 30 November each year, depending on the species and race of salmon returning that year. The recapture facilities may not be operated during periods outside these specified dates except for testing purposes, and Anadromous shall obtain written permission from the

Department prior to such testing. Anadromous shall submit a written report of the findings of studies conducted to detect capture of non-Anadromous fish on 1 January annually.

Ocean Harvest

The Department conducts an ongoing program to monitor the contribution of hatchery fish to ocean fisheries. Anadromous is required to mark coho and chinook salmon so that the Department can estimate catch of these fish in the ocean fishery (See Rearing, Marking, and Release Requirements). The Department shall bill Anadromous annually for their share of the ocean sampling, tag recovery, and data processing program. The Department shall annually publish summaries of the contribution of public and private hatchery fish to Oregon ocean fisheries.

OTHER SAMPLING REQUIREMENTS

Tag Recovery Requirements

Tags shall be recovered and decoded from all adipose-marked fish that return to the Anadromous recapture facility. Anadromous may accomplish the necessary work or may contract with the Department or another mutually acceptable party to do the work. Summarized recovery data shall be submitted to the Department by 1 January of each year. Failure to submit required data summaries by the specified date shall result in revocation of permission to release fish during that year.

Scale Sampling Requirements, Marked Fish

Scale samples shall be collected from a representative cross section of Ad+CWT-marked salmon that returned to Anadromous. At a minimum, the Department requires the Anadromous collect scales from a random sample of 30 adults selected for harvest and from 30 adults selected for brood that return to the recapture facility each week. Anadromous shall submit these scale samples organized by date of return or date of spawning, as may be appropriate, by 1 January annually. The following information shall be provided with each scale sample.

1. Date of collection.
2. Sex.
3. Fork length (cm).
4. Weight (kg).
5. Coded-wire tag code number.

Scale Sampling Requirements, Unmarked Fish

Scale sampling requirements for unmarked fish that return to Anadromous shall be established during a review of a proposal to monitor the capture of non-Anadromous fish that shall be submitted to the Department by 1 January of the year following resumption of releases. (See Capture of Fish Not Originating from the Private Hatchery).

OTHER REPORTING REQUIREMENTS

In accordance with OAR 635-40-014, OAR 635-40-022, and this Operational Plan, Anadromous shall submit the following listed documents and refer to the following instructions regarding summarization of data for submission to the Department.

Annual General Release Plan

An annual general plan for fish proposed to be released during the calendar year showing species, stock, and number of each shall be submitted to the Department prior to collection of broodstock, or by 20 July of the preceding year, whichever is earlier. The Department shall review and approve or reject the plan in accordance with the criteria set forth in OAR 635-07-810 et seq. In the event that the Department rejects the plan, the Department and the permittee shall consult on changes to be made to the plan in order to satisfy the Department that the criteria have been met, based on consideration of the financial and technical capability of the permittee and on estimated biological effects of such releases.

Detailed Salmon Production Plan

A detailed salmon production program, including proposed fin marking and release size and time, shall be submitted to the Department in January of each year, to be applicable to that year. The Department shall review and approve or reject the program in accordance with the criteria set forth in OAR 635-07-810 et seq. and further specified under the Rearing, Marking, and Release Requirements section of this Operational Plan. In the event that the Department rejects the program, the Department and the permittee shall consult on changes to be made to the program in order to satisfy the Department that the criteria have been met.

Report of Disease Examinations

Reports of disease examinations, indicating disease status, are required prior to transport or release of fish, in accordance with ORS 508-715 (2) and OAR 635-40-014 (5). Disease examinations conducted within 6 weeks prior to release meet the requirements of this section.

Monthly Reports of Fish on Hand

Monthly reports of fish on hand at each facility, whether operated by the permittee or by a contractor on the permittee's behalf, shall be submitted to the Department by the 15th day of the following month. This report shall list the species, stock, number per species and stock on hand, disease losses for each stock during the month, causative agent for such losses, and remedial treatments used to reduce losses.

Monthly Fish Health Examinations

As provided in OAR 635-07-580, monthly fish health examinations, funded by the permittee, shall be conducted by a pathologist acceptable to the Department. A copy of the disease examination shall be provided to the Department by the permittee within seven working days of the completion of the appropriate tests.

Report of Fish Loss

A report of any fish loss that exceeds 0.1% per week in any one pond be immediately made to Fish Propagation Section of the Department by telephone and by written report as provided in OAR 635-07-580.

Monthly Report of Fish Released

Reports of all fish released are required. Such reports shall include the following: species released, number released, number marked per species, tag loss by tag group, size and length frequency distribution of each release group, and dates of release. Anadromous shall verify the accuracy of data contained in monthly reports as shown in the annual Department summary report of all releases. A copy of the format for the monthly report of fish released is provided in Appendix C.

Anadromous shall provide a summary of expansion factors for all Ad+CWT groups released. All unmarked fish shall be assigned to the appropriate coded-wire tag group. Fish in the representative mark group shall be about the same size as fish in the production group with which it was released (See Representative Marking). This report shall be submitted to the Department by the 15th day of the month immediately following release.

Data on Recovery of Adults

1. Summarize data for jacks and adults separately. Jacks and adults shall be categorized by age at return rather than by an arbitrary size threshold.

2. Decode every coded-wire tag marked fish that returns to the facility and provide the following information by tag code:
 - a. Total number of fish collected.
 - b. Appropriate expansion factor to account for unmarked fish.
 - c. Total number of each sex.
 - d. Mean weight and length for each sex and for sexes combined.
 - e. Number released and percent return for each tag code.
3. Summarize returns of jacks, males, and females by statistical week (Monday through Sunday).
4. Summarize all data on an appropriate floppy disk for entry into Department computer files as per format instructions provided by the Department (APPENDIX B).
5. Provide a hard copy of data summaries to the Department by 1 January annually.

OTHER REQUIRED LICENSES AND PERMITS

This section cross-references licenses and permits that Anadromous shall obtain (OAR 635-40-014).

Wholesale Fish Dealer License

Anadromous shall obtain and maintain a wholesale fish dealer license. Monthly reports and payments of poundage are required (as provided in OAR 635-06-200 through 220) on all fish harvested.

Fish Propagation License

Anadromous shall obtain and maintain a fish propagation license in order to propagate and rear fish for sale or to sell live fish that are not released. Regulations governing fish propagation licenses are found at OAR 635-07-650 through 670.

Fish Transport Permit

Anadromous shall obtain fish transport permits as required in OAR 635-07-600 (see Transport of Fish).

Release Permit

Anadromous shall obtain separate release permits for each group or period in which fish are released (see Release of Fish).

COMPENSATION

In accordance with ORS 508.720, the Commission may determine that, as a result of operation of Anadromous, compensation is appropriate for damage to public resources. The form of such compensation shall be determined by the Commission and may involve support for Department programs in the area of damage.

DISPUTE RESOLUTION

The Fish and Wildlife Commission shall promptly resolve disputes between the Department and Anadromous over any of the issues addressed by this plan. Any decision by the Commission can not be appealed in a court of law.

Summary of proposals, sampling, and reports required
by the Anadromous operational plan
(Page 1 of 4)

Type	Reference page	Due date, frequency	Remarks
PROPOSALS			
Request to transport fish	5	Prior to transport of a group of fish	Must submit report of disease examination
Request to change requirements for representative marking	6	1 January of potentially affected year	Written proposal accompanied by supporting material
Proposal to change time or size at release or acclimation period requirements	7, 8	1 January potentially affected year	Written proposal with supporting information
Request to release fish	8	Prior to releasing any group of fish	Submit report of disease examination and length frequency distribution data with request to release
Request for eggs	3	Preliminary request due 1 January annually, final request due 1 June annually	Written request, priorities for obtaining eggs based on OAR 635-07-830
Study design proposal for monitoring strays	12	1 March (preliminary), 1 May (final)	Written study proposal

Summary of proposals, sampling, and reports required
by the Anadromous operational plan
(Page 2 of 4)

Type	Reference page	Due date, frequency	Remarks
Marking feasibility study proposal	18	As desired by Anadromous	Study will determine if less than 100% of smolts may be marked in future.
Study design proposal to detect capture of non-Anadromous fish at hatchery	19	1 January 1991 and annually thereafter	Written study proposal
Request to cease operation of fish ladder between 1 August and 30 November, or to operate fish ladder during 1 December-31 July	20	As desired by Anadromous	Written request
SAMPLING			
Sampling to determine coded-wire tag retention percentage	6	Submit data with monthly report of release of juvenile on 15th day of month following release	Sample to determine % CWT retention prior to release
Length frequency of juvenile salmon prior to release	8	Submit to Department with release request	Submit data in tables and graphs.
Field studies to detect Anadromous smolts in Coos River basin	8	As required by Department	Required if coho smolt releases are made during 20 August-15 September

APPENDIX A

STATISTICAL BASIS FOR MARKING REQUIREMENTS

1. MARKING AND SAMPLING REQUIREMENTS

1.1 EXPECTED TAG RECOVERIES

The Department requires sufficient marking and sampling so that there will be a reasonably high probability of detecting at least some strays whenever the prevalence of strays is at the critical level determined for that stock. The Department requires that the expected number of tag recoveries from sampled adults be at least 3 when the prevalence of strays is at the critical level.

In the absence of a feasibility study, the marking requirements were calculated assuming that a representative sample of the adults in the spawning population of concern would be examined. When a representative sample of adults can be collected, the expected number of tag recoveries relates to the true prevalence and the marking and sampling levels in the following way:

$$E(t) = r * p * s$$

(1)

where

$E(t)$ = the expected number of private hatchery tags that would be collected from adult salmon sampled in the area of concern (this is required to equal 3 when the prevalence of strays reaches the stated critical level),

r = the true prevalence of private hatchery strays in the area of concern (the proportion of the spawning population consisting of private hatchery strays),

p = the proportion of the private hatchery releases that are marked, and

s = the number of adult salmon examined for marks in the basin of interest.

1.2 AN EXAMPLE

When, for example, the population of concern is Coquille spring-run chinook salmon, the critical prevalence of strays is 3% and the Department expects that a representative sample of 100 adults could be examined. Substituting these values into equation (1) gives:

$$3 = E(t) = 0.03 * p * 100 .$$

In order to satisfy this equation p must equal 1, i.e. 100% of private hatchery spring chinook releases shall be marked.

Summary of proposals, sampling, and reports required
by the Anadromous operational plan
(Page 4 of 4)

Type	Reference page	Due date, frequency	Remarks
Annual report of sampling to detect capture of non-Anadromous fish	19, 20	1 January, annually	Written report
Annual general release plan	21	Prior to collection of broodstock, or 20 July of preceding year	Written production plan
Detailed salmon production plan	21	1 January annually	Written plan in greater detail than annual general release plan
Reports of disease examination	22	Submit prior to transport or release of fish	Submit with request to transport or release fish
Monthly reports of fish on hand	22	15th day of following month	Written data summary
Monthly reports of fish health	22	7 days after completion of tests	Department approved pathologist
Report of fish loss	22	As required, any loss >0.1% per pond per week	Report by telephone followed by written report
Monthly report of fish released	22	15th day of month following release	Written data summary
Data on recovery of adults	23	1 January, annually	Written data summary

Summary of proposals, sampling, and reports required
by the Anadromous operational plan
(Page 3 of 4)

Type	Reference page	Due date, frequency	Remarks
Scale sampling and reading to detect non-Anadromous fish at hatchery	19, 20	As required by study approved by Department	Study proposal approved by Department will describe needed work
Coded-wire tag recovery and analysis, ocean fishery	20	Ongoing, results reported by Department periodically and annually	Department conducts sampling and analysis, Anadromous will be billed for services
Coded-wire tag recovery at hatchery	20	1 January annually	Written summary
Scale sampling, marked fish	20, 21	1 January annually	Organize scale samples by date of collection
Disease examinations	22	Within 6 weeks of release	Submit written report with request to transport or release fish.
REPORTS			
Summary of broodstock spawned	11	1 January annually	Table showing number of males and females spawned by date and written description of mating program.
Annual report of stray monitoring studies	12	1 March (preliminary), 1 May (final), annually	Written report

1.3 FEASIBILITY STUDIES

The required marking rates apply only until a feasibility study is done. Feasibility studies may result in a reduction in the proportion of releases that need to be marked. Such a reduction shall only occur, if it can be demonstrated that a lower marking rate would still result in the required expected number of tag recoveries (3 at the critical prevalence of strays). In the previous example, using Coos River fall chinook as the population of concern, if a feasibility study shows that a representative sample of 500 adults rather than 100 adults can be examined, then the proportion marked would only need to be 20%.

1.4 ESTIMATING THE TRUE PREVALENCE OF STRAYS

When a representative sample can be obtained, then the prevalence of strays would be estimated by:

$$\text{Estimated } r = t/(s*p)$$

(2)

where t , s and p are defined above. For example, if $s*p = 100$ and $t = 3$ tags are recovered, then the prevalence would be estimated as $3/100 = 0.03$. If $s*p = 30$ and $t = 4$ then the estimated prevalence would be $4/30 = 0.13$.

2. STATISTICAL MODELS

2.1 PREDICTIONS ABOUT ACTUAL TAG RECOVERIES AND ESTIMATES OF PREVALENCE

Because of sampling variation, the actual number of tag recoveries in any 1 year may be above or below the expected number of tag recoveries. The expected number of recoveries can be thought of as the long-term average in repeated sampling. To predict the behavior of the actual number of tag recoveries requires a statistical model of the sampling variation. A simple Poisson error model (see below) was used here.

The marking and sampling must meet the following requirement: When the prevalence of strays is at the critical level defined for that stock, then the expected number of tag recoveries from sampled adults must be at least 3. If that requirement is met then the Poisson model predicts the following:

- 1) When the true prevalence is at the critical level, then the probability of at least one tag recovery is 0.95 and the probability of 2 or more tag recoveries is 0.80.
- 2) If the true prevalence is 1.33 times the critical level (for example, the true prevalence is 0.04 when the critical level is 0.03), then:
 - 2.1) the probability of at least one tag recovery is 0.98,
 - 2.2) the probability of two or more tag recoveries is 0.91, and
 - 2.3) the probability of getting an estimated prevalence above the critical level in any one year is 0.57.

- 3) If the true prevalence is 1.33 times the critical level for 5 years, then the probability of the estimated prevalence being above the critical level for 2 years out of the 5 is 0.88. (It is assumed that independent estimates are made each year.)
- 4) If the true prevalence is 1.67 times the critical level (for example, the true prevalence is 0.05 when the critical level is 0.03), then:
 - 4.1) the probability of at least one tag recovery is 0.99,
 - 4.2) the probability of two or more tag recoveries is 0.96, and
 - 4.3) the probability of getting an estimated prevalence above the critical level in any one year is 0.73.
- 5) If the true prevalence is 1.67 times the critical level for 5 years, then the probability of the estimated prevalence being above the critical level for 2 years out of the 5 is 0.98.

Increasing the product of the proportion marked times the number of adults sampled ($p*s$) will increase the probabilities in 1 through 5.

The probabilities given above could be overestimates if the marking and sampling programs result in bias or variation beyond that expected from the Poisson model. Non-representative marking or sampling could result in bias. Certain sampling designs for the collection of adults could result in greater variation beyond that predicted by the Poisson model. Careful review of sampling designs is therefore important.

2.2 PREDICTING BEHAVIOR OF ESTIMATES WHEN PREVALENCE IS LOW

The Poisson model can also be used to predict the behavior of estimates when the sampling and marking requirements are met and the true prevalence of strays is below the critical level. In this case it would be incorrect to conclude that the prevalence is above the critical level. Therefore, it is desirable to have a relatively low probability of estimating that the prevalence is above the critical level. The Poisson model predicts the following:

- 6) If the true prevalence is 0.67 times the critical level (for example, the true prevalence is 0.02, when the critical prevalence is 0.03), then the probability of getting an estimated prevalence above the critical level in any 1 year is 0.14.
- 7) If the true prevalence is 0.67 times the critical level for 5 years, then the probability of the estimated prevalence being above the critical level for 2 years out of the 5 is 0.15.

Increasing the product of the proportion marked times the number of adults sampled ($p*s$) will decrease the probabilities in 6 and 7.

2.3 THE JUSTIFICATION FOR POISSON MODELS

The Poisson model appears appropriate as an approximation when the following assumptions are met:

- 1) Marking practices are such that the marked fish behave in a statistically similar way to unmarked fish (i.e., there is no significant differential mortality, differential catch rate or differential tendency to stray),
- 2) the sample of adults examined in the basin of interest behaves (statistically) approximately like a simple random sample from the entire spawning population,
- 3) the number of adults examined in the basin of interest is a fairly small proportion of the total number of adults in the basin's spawning population that year,
- 4) very few marks are missed and nearly all marked fish are correctly identified as to their origin,
- 5) the expected number of recovered tags is small (here it is 5 or less).

Mathematical Note -- The estimation of commercial catch from Coded-Wire Tagged salmon is modeled with a compound binomial-hypergeometric distribution by Clark and Bernard (1987). The same model could be used for modeling the estimation of the prevalence of strays. However, the Poisson model provides an excellent approximation to the compound binomial-hypergeometric distribution when the five assumptions above are met.

Clark, J.E. and D.R. Bernard. 1987. A compound multivariate binomial-hypergeometric distribution describing coded microwire tag recovery from commercial salmon in Southeastern Alaska. Alaska Dept. of Fish and Game Informational Leaflet No. 261. Alaska Dept. of Fish and Game, P.O. Box 3-2000, Juneau, AK 99802. 109 pp.

APPENDIX B

Current CWT recovery data format for Oregon private salmon hatcheries

Your Snout ID # - Currently numeric

Date - 6N MMDDYY (i.e., 111788)

Disposition - Harvest = 1

Mortality = 2

Spawn = 3

Other = 4

Site of OAF Coos = 231

ANAD Coos = 233

Initial Recovery: OAF Coos Bay = 232

Domsea Siuslaw = 234

OPSR Burnt Hill Ck = 237

Species Chin = 1

Coho = 2

Tag Code No Tag = 1

Lost Tag = 2

Unreadable = 3

Questionable Clip = 4

Length (cm) 1 implied decimal

Weight (kg) 1 implied decimal

Sex Male = 1

Female = 2

Jack = 3

Unknown = 0

Split Card # and Position # into two fields.

Put a delimiter between all fields, create ASCII records with a carriage return between records, and label each field.

Additional questions on report format should be referred to ODFW Fisheries Information Systems or the Salmon Program Manager in the Portland office.



APPENDIX C
OREGON PRIVATE SALMON HATCHERY RELEASE REPORT

COMPANY: _____ RELEASE SITE: _____ RELEASES FOR MONTH OF: _____ 19__

TAG CODE			SPECIES	B R Y R O A D R	STOCK	DATE OF RELEASE		NUMBER OF FISH RELEASED			TAG LOSS		SIZE ON RELEASE FISH PER LB.	R E M A R K S (1)	R E X P E C T E D	E X T E R N A L M A R K S
A G E N C Y	D A T A 1	D A T A 2				START MO/DA/YR	END MO/DA/YR	WITH ADIPOSE CLIP & WIRE TAG	WITH OTHER MARKS	WITH NO MARKS	%	DAYS FROM TAG- GING				

31

MAIL COMPLETED REPORT TO:
PRIVATE SALMON HATCHERY COORDINATOR
OREGON DEPARTMENT OF FISH & WILDLIFE
PO Box 3503
PORTLAND, Or 97208

REPORT DUE BY 20TH OF MONTH FOLLOWING RELEASE.

SIGNED: _____ DATE: _____

1) P = PRODUCTION, R = RESEARCH, E = EVALUATION FOR ODFW

APPENDIX C (cont.)

INSTRUCTIONS FOR COMPLETING
OREGON PRIVATE SALMON HATCHERY RELEASE REPORT
(Form BM 3081 3-81)

DATA ELEMENT	EXPLANATION
Tag Code	Record elements of tag code under subheading. Use decimal equivalents of binary codes. For half mm. Tags, put and "H" in the left-most column. For x-ray-readable tags, put an "XX" in the Agency column. If no coded wire tags are associated with this release group, put "NT" in the Agency column and leave other columns blank.
Species	Record species as : coho = COHO, spring chinook = CH-1, fall chinook = CH-3, chum = CHUM, pink = PINK
Brood Year	Record two digit year.
Stock	Record river of origin, state abbreviation, see list of ODFW stock names for correct name and format.
Date of Release	Record date of first release of fish in this group and date of last release. If all released on one date, record date in End column.
Number with Adipose Clip & Wire Tag	Record number released with this mark and tag code.
Number with Other Marks	Record number released with a some type of mark other than an adipose clip with a coded-wire tag.
Number Unmarked	Record number released with no marks.
Tag Loss Percent	Record tag loss to nearest tenth of a percent.
Tag Loss Days	Record length of time in days that transpired from tagging until the testing for tag loss.
Size on Release	Record size of fish at release in fish per pound to one decimal.
Reason Marked	Record the reason this group was marked. P = fish marked for company's estimation of production. R = fish marked as part of a research project. E = fish marked at request of ODFW for evaluation of hatchery. Use on or two letters as required.
Return Expected	Record two digit year in which this group is expected to first contribute to Oregon's fisheries.
External Marks	Record fin mark abbreviation and indicate any other marks used.