

ALASKA LEGISLATURE SPECIAL COMMITTEE/SUBJECT FILE
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such selection, sliding egg take scales for donor stock transplants should allocate no more than 90% of any segment of a run for broodstock.

RESEARCH

The necessity for much of this policy arises from our ignorance of the genetics of wild salmon populations and the effects of their domestication in hatcheries. The policy is based more on extrapolation from other disciplines such as agriculture than from first-hand knowledge of our resource. As a result, the policy is a somewhat conservative interpretation of these data in order to assure the long-term viability of salmon populations. The Committee has identified several areas in which specific knowledge would clarify this policy and contribute to the effectiveness of salmon enhancement. The Committee encourages cooperative research efforts among the university, state, federal and private sectors directed toward the general areas listed below.

1. Development of performance profiles of hatchery stocks and potential for genetic improvement. Information about stocks kept in culture will be useful in several ways. If taken in a standard manner, the data will be useful in determining the extent of variability in the species and will aid in the choice of stock to be used for outplanting or transplanting. The information will also be helpful in maximizing the production of a particular facility.
2. Potential for genetic improvement of cultured stocks. A sequel to the cataloging of the variability within and among stocks will be to experimentally assess the potential for genetic improvement by selective breeding. To do this, it is necessary to determine the heritabilities for traits of interest, that is the part of the phenotypic variability present in a population which results from genetic (heritable) causes as opposed to environmental causes. Traits such as size of adults, age of return and various timing parameters are particularly interesting to industry.

Application of artificial selection is responsible for the enormous advances that have been made in agriculture; the potential also exists in aquaculture.

3. Assessment of the effect of introgression of genes from hatchery fish into wild populations. To examine this effect, one must first have an estimate of the rate of straying and the factors that influence straying. Such factors might include transplant distance, run strength, source of the hatchery stock and year-to-year environmental differences. By using a genetically marked stock, one can monitor the flow of "hatchery genes" into other populations. Because the effect of such introgression may develop over time, it is necessary that such an experiment be conducted over several generations. For this kind of study, it may be necessary to develop a means for marking fish cultured at production levels.

The second part of this problem is to establish the impact of introgression. A range of potential interactions is possible ranging from introgression between two unrelated stocks to the introgression of fish subject to the selective pressures of a hatchery back into the wild stock from which they were derived. Research to examine these effects could best be done in an experimental hatchery where hybrid stocks could be produced and all releases marked. Port sampling and stream walking would be necessary to evaluate survival, straying and other phenotypic effects.

4. The effects of inbreeding and maintenance of inbred lines. Accompanying the artificial propagation of a species is the potential for inbreeding, loss of genetic variability and increased homozygosity. Information pertinent to the extent of inbreeding depression that results from various levels of inbreeding is necessary in determining adequate effective population sizes. This is especially important for species

for which a large effective population size is difficult to maintain. In addition, this information would permit a judgement on the efficacy of enhancing very small remnant populations. This work could be done both by performing crosses designed to accomplish some level of inbreeding, and by the maintenance of small randomly breeding populations. In both cases, it is important to keep careful controls.

APPENDIX A

Appendix A

The relationship of breeding structure, effective population size, and rate of inbreeding.

Breeding structure can profoundly affect effective breeding size (N_e) of a population. We can, at least in theory, determine the effective breeding size for many breeding structures and obtain the rate of inbreeding (ΔF) as

$$\Delta F = 1/2N_e$$

directly relating variation in breeding structure to loss of genetic variation.^{1/}

The following demonstrates the consequence of some breeding structures to effective population size.

Number of males and females: Unequal numbers of males and females in the breeding population reduce effective population size. Sex ratio is related to effective population number (N_e) as

$$N_e = 4N_m N_f / (N_m + N_f)$$

where N_m and N_f refer to the total number of males and females respectively. The effective population size is strongly influenced by the number of the least frequent sex.

Unequal numbers in successive generations: If the numbers of breeding individuals is not constant in successive generations the mean effective number is the harmonic mean of the number in

^{1/} See D.S. Falconer. 1981. Introduction to Quantitative Genetics. Longman Inc., New York.

each generation. Over generations the effective number is approximately,

$$1/N_e = 1/t(1/N_1 + 1/N_2 + 1/N_3 + \dots + 1/N_t).$$

The generation that has the smallest number will have the largest effect.

Nonrandom distribution of offspring among families: When there is large variation in family size the next generation is made up of the progeny of a smaller than expected number of parents. This can be related to loss of genetic variation through effective population number as

$$N_e = 4N/(V_k + 2)$$

where V_k refers to the variance in family size. When variation of family size V_k is equal to 2, then $N_e = N$. When the number of males and females are unequal, the variance of family size may be unequal in the two sexes and

$$N_e = 8N/(V_{km} + V_{kf} + 4)$$

where V_{km} and V_{kf} are the variance of family size for males and females respectively.

Overlapping generations: In species other than pink salmon generations are not discrete, they are overlapping. When generations overlap the effective population size is

$$N_e = 4N_c L/(V_{km} + 2)$$

where L is the generation time and N_c is the number of individuals born in a year, that is the cohort size. The cohort size N_c is related to the total number (N_t) by $N_c = N_t/E$ and E is the mean age at death. As before V_{km} is the variation of family size.

The effect of unequal sex ratio and unequal numbers in successive generations on population size can be easily estimated. On the other hand it will be difficult or perhaps impossible to estimate the variance of family size. Nevertheless, we should keep in mind the relationships of family size and overlapping generations. Overlapping generations will in general increase the effective population number in that individuals mating in different years contribute to greater diversity. Variance of family size can radically reduce effective population size. Procedures that contribute to variance of family size or separation of year classes should be avoided.

STATE OF ALASKA

DEPARTMENT OF FISH AND GAME

OFFICE OF THE COMMISSIONER

WILLIAM A. EGAN, GOVERNOR

SUPPORT BUILDING
JUNEAU 99801

DEPARTMENT POLICY

STATEMENT OF POLICY ON PERMITTING NONPROFIT SALMON HATCHERIES IN ALASKA

Approved by:

James W. Brooks
James W. Brooks, Commissioner

Date:

October 3, 1974

STATEMENT OF POLICY ON PERMITTING NONPROFIT SALMON HATCHERIES IN ALASKA

References to Statutory Authority

ALASKA STATUTES:

1. AS 18.10.400-470--Authorizing the operation of private nonprofit salmon hatcheries.
2. AS 10.20--Nonprofit Corporations.

THE NEED FOR POLICY--The way in which privately owned salmon hatcheries develop in Alaska is of significant importance to the managers of the state's common property fishery resources. Spawners or eggs must be obtained from the public's natural resources to stock the private hatcheries; the salmon fry produced in the hatchery will be released from the hatchery operators control into the natural waters of the state to grow, migrate, and mix with wild stocks in a natural manner; and at some designated point near the hatchery site the returning adult salmon surviving the oceanic elements and the traditional fishery will again become the private property of the hatchery owner.

The questions of where the private hatcheries are to be located, which species are to be produced, and how and by whom the returning adults are to be harvested are the central issues of concern to the Alaska Department of Fish and Game. For each proposed hatchery decisions must be made, for example, on (1) where the hatchery should be located so that the management of the state's naturally produced salmon will not become drastically complicated or even impossible because of mixing of wild and hatchery fish; (2) how many spawning fish may be taken from perhaps an already depressed run to stock a private hatchery; (3) whether or not the public's best interests would be served by a private hatchery or public enhancement project at the proposed site; (4) whether or not the private hatchery will preempt from the public the recreational-use fishery potentials near the hatchery site; and (5) how the harvest of the returning run of adult fish--likely mixed with wild stocks--can be best managed.

Policies have been developed to serve as guidelines for determining present and future decisions on how privately owned salmon hatcheries can operate to best serve the interests of the people of Alaska.

These policies will aid in defining which course of action the department should select from a choice of several alternative and perhaps less desirable courses of action. They are to reinforce rather than diminish the need for the managers to use their keenest ingenuity and skill in formulating the numerous complex decisions that must be made in each private hatchery situation. The Department recognizes that the policies must be responsive to a given set of conditions. As conditions change and as hatcheries evolve in Alaska and as they are evaluated, the policies will also change.

Two sets of "statements of policy" are expressed below:

1. The first set deals with the determinations that will be made by the commissioner of ADIACI in judging whether or not a permit for a private salmon hatchery should be granted to an applicant, and
2. the second set deals more with the operational aspect of private salmon hatcheries.

STATEMENTS OF POLICY FOR GRANTING PERMITS--It is the policy of the State of Alaska to foster the private ownership of salmon hatcheries by qualified non-profit corporations when the following qualifying considerations are satisfied:

1. A determination by the Commissioner of the Alaska Department of Fish and Game that the stream at the proposed hatchery site is either depleted of salmon or is a non-significant producer of salmon and that the stream is unlikely to be restored or enhanced to levels supporting an adequate harvest in a reasonable time by either natural processes or by rehabilitation measures that may be taken by the state.
 - (a) The basis for declaring a stream "depleted" will be the determination that either the stream has been adversely altered to destroy its production potential or that, for whatever reason, the escapement history of the salmon spawning runs in the stream indicated a significantly reduced and consistently low level of production.
 - (b) The basis for declaring a stream a "non-significant producer" will be the determination that the stream's natural productivity of salmon--even at its maximum--is very low because of its physical limitations, e.g. because very-limited spawning area is available. One of the major factors that will be considered in permitting a private nonprofit salmon hatchery on a stream declared a "non-significant producer" will be a judgement as to whether or not substantial increases in salmon production are likely to be achieved by a hatchery. Included in this judgement will be consideration of the quality and quantity of water available and whether or not the stream has an ample egg source for stocking the hatchery.
2. A determination by the commissioner that the nonprofit corporation is both technically and financially qualified and capable of managing a hatchery. That is, a corporation that has been judged as qualified by the Commissioner is one that demonstrates that it has technical advisors with a knowledge of contemporary salmon husbandry practices to assure that seed-stock acquired from the State will not be wasted and is one that is financially capable of paying for necessary monitoring, inspections, and advisory services needed.

3. A determination by the Commissioner that the management of naturally occurring wild stocks will not be unduly hampered by locating the hatchery at the proposed site. If complexities arise in managing mixed stocks, including both hatchery fish and wild fish, it will be State policy to manage the collective resource in a manner that favors protection of the wild stocks.
4. The Commissioner's assurance that the applicant's plans indicate that operation of the hatchery will be consistent with the State's policies on fish genetics and fish disease control.

The Alaska Department of Fish and Game will restrict its hatchery permit procedures to cover only its own responsibilities as the state's fishery management agency. Thus, an ADFG permit to construct and operate a private non-profit salmon hatchery will not represent approvals, permits, or licenses that a corporation may be required to obtain from other state and federal and local agencies concerned with matters of real estate, water use, taxation, structures in navigable waters, and environmental protection.

As a provisional policy, the state will use the date-of-receipt of the application with the \$100 filing fee as a means for recognizing a proprietary claim to a hatchery site on public lands.

It will be a policy of the department to process only one permit at a time for any private non-profit corporation and to require that the first hatchery show satisfactory progress prior to issuing a permit to construct and operate a second hatchery at another site.

STATEMENTS OF POLICY FOR OPERATION OF PRIVATE SALMON HATCHERIES--

These policy statements apply to the manner in which private hatcheries should operate so that the public interests will be protected. Many of these statements amplify or supplement statements expressed in the Alaska Statutes.

1. Transplantation of Eggs--The department shall closely administer the taking and transplantation of eggs to be used in Alaska salmon hatcheries. Transplantation of eggs is one of the major overriding concerns of the department because this activity can disseminate disease in epidemic proportions and adversely affect important genetic characteristics of both propagated and wild races of fish. The role of fish disease in natural and wild populations is for the most part little understood and remains as one of the major areas of economic risk in management of hatcheries and fish rearing facilities.

Genetic manipulation of fish stocks through inadvertent management practices and transplants of stocks can disturb the heritable characteristics and thereby materially diminish the homing instinct of major portions of fish runs and affect the timing of egg development and hatching, smolt outmigration, and returns of adults. Transplantation of eggs from one stream to another is potentially one of the major biological risks in Alaska's salmon hatchery practices.

The department will not authorize the importation and introduction of salmon eggs from sources outside the State of Alaska for either public or private hatcheries. During the initial development of private hatcheries in Alaska, the department will be especially cautious about approving transplantation of surplus eggs from one private hatchery to another.

The Department of Fish and Game will not assume responsibility for egg mortalities that may occur during the collection, transportation, and after the eggs are received at the hatchery.

2. Ownership of Hatchery Reared Salmon--Salmon reared by private non-profit hatcheries are declared to be a common property Alaskan natural resource from the time they are released into the natural waters of the state until the time that they segregate from naturally occurring stocks at the specific location designated in this permit by the department. After resumption of control of returning fish by the hatchery, the highest priority use of the mature fish will be to provide hatchery brood stock requirements, and if applicable, to provide the natural spawning requirements of the hatchery water source. These requirements must be met before surplus fish or eggs can be sold or otherwise disposed of by the hatchery. Hatchery fish held under positive control within a closed system are declared to be property of the owners of the hatchery.
3. Availability of Fingerling or Smolt from State Hatcheries--The state will allow the purchase of fingerling or smolt stock by private salmon hatchery corporations when such stocks are surplus to the state's needs. Current needs for king and coho salmon stock by Alaska's public hatchery and rehabilitation program are so great that sales of fingerlings and smolts in quantities sufficient for commercial operations will not be available in the foreseeable future. The cost of the fish to the purchaser will be determined on a basis of either the pro rata cost of the state's total hatchery operation or on a highest bid arrangement when competitive bidding is expected.
4. Management of Common Property Fishery--By granting a permit for a private hatchery, the department recognizes its obligation to regulate the fishery to achieve escapements to the private nonprofit salmon hatcheries. It will be the policy of ADF&G to manage the commercial and sports fisheries to return adult fish to the hatchery site in the same manner as it regulates fisheries to obtain a return of spawners to natural streams. While the department will not institute any irregular restrictions on the traditional

fishery, it will strive for an escapement of spawners sufficient for stocking the hatchery and for obtaining an optimum number of natural spawners to the hatchery water source stream.

5. Use of Natural Lakes by Private Hatcheries--The department will exercise particular discretionary and cautious judgement before granting the use of natural lakes to private corporations. Among other things, the department must consider to what extent the permit may deny access of the lake to sport fishermen or to other public uses. As a provisional policy, the department will not permit natural lakes of greater size than 10 surface acres to be used solely for rearing of fish by private fish farming or by private nonprofit salmon hatcheries.

Department of Fish and Game
Division of F.R.E.D.

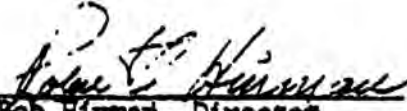
STATEMENT OF POLICY ON CONTROL OF FISH DISEASE

Disease is an important limiting factor in the success of all operations dealing with animal populations. In populations of aquatic animals, diseases may be caused by pathogenic microorganisms, the effects of toxic materials, or general environmental deterioration. It is known that subtle physical changes in aquatic environments may result in stress and lead to the impairment of fish health. However, the role of disease in the dynamics of wild fish populations is for the most part little understood. The health of these populations must not be jeopardized by enhancement and rehabilitation efforts.

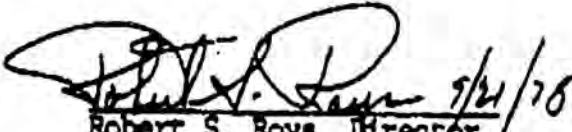
Statements of Policy

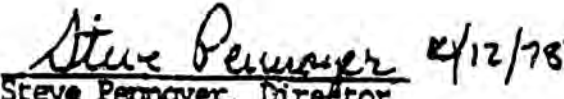
1. Protection of Wild Stocks - Wild stocks of fish and shellfish are one of the most valuable of all Alaskan resources. The health of these populations is an important consideration in disease control efforts and the determination of the status of disease in these populations is a research objective. F.R.E.D. Division's Fish Pathology Section shall monitor and guard against any hatchery practices, effluents, or stocks which pose a threat to the health of wild fish populations.
2. Rearing, Movement and Release of Infected Fish - The rearing, movement or release of infected fish shall be avoided. Apparent disease problems must be treated and controlled prior to release of fish. Regular reports dealing with fish health, site inspections, and examination of lots before release are necessary to accomplish detection and control of fish diseases. In cases where treatment is either impossible or impractical, the Fish Pathology Section will, on an individual basis, recommend either destruction of the lot or release with limitations on uses and release sites. Movement of disease carriers into watersheds without a previous history of this disease will be prohibited. All proposed egg and fish transports will require prior approval using the transfer request form.
3. Stock Selection - Import of fish or eggs from distant watersheds, whether intrastate or interstate, will be strongly discouraged. The use of native or resident stocks in all enhancement projects will be strongly encouraged to avoid importation of new pathogens. If the use of actual or suspected disease carrier stocks is necessary to maintain the genetic integrity of a watershed, the Fish Pathology Section will, if possible, recommend techniques designed to prevent or minimize these potential problems.
4. Hatchery Practices - The Fish Pathology Section will promote the use of hatchery practices designed to prevent disease. Egg disinfection will be required for all transfers between watersheds, regardless of whether or not a hatchery facility is involved. Fish pathology personnel and facility personnel will work closely concerning actions which have significant fish health ramifications.

5. Use of Chemotherapy - The use of vaccines and preventative methods of fish culture are preferable to treatment of epizootics after they occur. For most purposes, chemotherapy will be considered a last resort to be used when cultural and management techniques have failed to prevent disease. Indiscriminant use of any chemotherapy is prohibited. The decision to treat with any non-cleared drugs, on an experimental basis, shall only be with the advice and approval of the Fish Pathology Section.
6. Consistency of Public and Private Aquaculture Disease Policy - Regulations, policies, and hatchery practices related to disease prevention and control shall be consistent for all Public and Private Facilities.

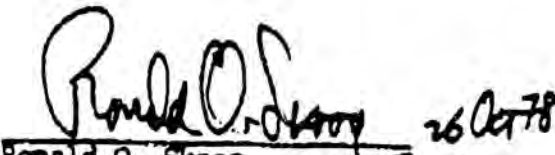

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ATTACHMENT C
Oregon's Wild Fish Management Policy

Oregon's Wild Fish Management Policy
What is it and what does it do ?

November 5, 1990

The revised Wild Fish Management Policy (WFMP) was passed by the Oregon Fish and Wildlife Commission in January, 1990 with the singular purpose to protect the genetic resources of Oregon's native fish species.

To understand what the WFMP is really all about, there must first be some agreement as to what a "wild fish" is. In addition, the term "genetic resources" and why they are important needs to be clarified.

What is a wild fish ?

The words "wild fish" mean different things to different people. The definition used for Oregon's WFMP may not agree with some of these viewpoints. While a clear understanding of our wild fish definition is crucial to comprehending this policy, other definitions when taken out of the WFMP context, may have equal value and utility.

For the purposes of the WFMP, a wild fish must meet two criteria. It must be a species of salmon, trout, whitefish, or sturgeon native to Oregon. Also included are those non-game native fish that have been placed on the state sensitive species list. Secondly, it must be naturally spawned and descended from a population that was present in the same geographical area prior to the year 1800. For example, naturally reproducing populations of brown trout or largemouth bass (both non-native species) are not wild fish. Neither would be naturally produced Umatilla River spring chinook - the historic Umatilla population went extinct at least 50 years ago. Reintroduction efforts currently underway can not restore this lost genetic heritage, the chain of post-1800 generations has been broken.

An important aspect of our definition is that we assume unique genetic resources exist for each population of wild fish. This is a conservative approach. It is based upon the rationale that if one assumes there are differences between populations, the genetic resources of a particular species are not compromised if this assumption is proven wrong by future scientific evidence.

A riskier approach would be to assume our present level of genetic understanding is adequate to judge that important differences do not exist between certain populations or that hatchery fish have "swamped out" unique features of certain

wild populations. Either way new management activities (hatchery programs or fishery harvest) based upon such assessments would likely follow. However, if the original genetic assessment under this approach had been wrong, it is likely the option of recovering and maintaining these population differences would be lost. One of the main objectives of the WFMP was to avoid the possibility of making this type of error. Therefore, given the lack of knowledge surrounding the genetic characteristics of our native fish we determined the conservative approach embodied in the WFMP was the most responsible path to follow.

What are "genetic resources" ?

The construction and operating instruction for every plant or animal is written in the language of DNA and organized in information packages called genes. Like books in a large library, each gene corresponds with instructions for a specific aspect of a fish's structure, function, or behavior. However, any two fish of the same species rarely have the identical instructions for every gene.

Within a given population the existence of variation (i.e., differences in size, shape, behavior, survival...etc.) due to slight differences in specific genes is not uncommon. In addition, when populations of the same species are compared it is not unusual to find larger scale population patterns as to where certain variants of specific genes are found. In other words, genetic variation occurs at two levels: 1) between individuals of a single population, and 2) between populations of an entire species. This two-level genetic variation we define as the "genetic resource" of a species.

Why is protection of genetic resources important ?

The protection of genetic resources is an important issue to fishery management. First, for fish populations to maximize production potential they must retain genetic characteristics which are conducive to high survival in the specific ecological communities and habitats they occupy. Since these habitats vary throughout the range of a species, it is reasonable to assume that genetic characteristics also vary in a corresponding manner. To disrupt this type of variation may result in populations that are less adapted to survive in their native habitats and as a consequence experience a decline in their production (fewer fish).

Second, habitat and ecological communities are not static. Whether natural or human-caused, changes occur. To give a population (and ultimately a species) the best chance for surviving these changes it must retain the capacity to make the appropriate genetic response. In most cases this response consists of a corresponding genetic change. A

population that contains a large supply of genetic variation among individuals is, in general, best prepared for making such adaptive changes.

In summary, the preservation of sustainable fish production is contingent upon maintaining populations that are adapted to their local habitats, yet flexible enough to respond to future changes in these habitats. The protection of genetic resources facilitates the mechanism by which this adaptive yet flexible capacity is maintained.

Summary of the Wild Fish Management Policy (WFMP)

Why do we have it ?

The purpose of the WFMP is to protect the genetic resources of wild fish (OAR 635-07-525). However, the other intent of this short section is to limit the management scope of the WFMP. By intentional omission, the WFMP does not classify waters of the state as to where hatchery fish can or can not be planted. Nor does the WFMP require that populations of wild fish be managed to maximize the productive capacity of natural habitat. Fishery management issues that fall outside of protecting the genetic resources of wild fish are not addressed by the WFMP. For example, a wild steelhead population that has been depressed from a run size of 5,000 to a stable level 500 fish due to dam mortalities, over-fishing and adverse interactions with hatchery fish might still be consistent with the specific standards of the WFMP and therefore be acceptable from the genetic standpoint. However, such a depressed population would unlikely meet natural production objectives and corrective actions would be taken. The WFMP provides the genetic foundation upon which desired natural production objectives set in basin plans can be built.

What does it direct us to do ?

The general policy statement of the WFMP is contained in OAR 635-07-526. First, it states that for wild fish, protection of genetic resources is job number one. As such it takes management priority over all other economic, commercial, recreational, and aesthetic benefits. However, it also states that sustaining these benefits is the reason for protecting genetic resources. Second, it directs that all populations of wild fish be managed to meet specific conditions spelled out in subsequent portions of the policy unless withdrawn from consideration by direct action of the Commission. Third, it directs the Department to not take a sudden, "meat cleaver" approach in implementing this policy.

It recognizes that the process of bringing all wild populations into compliance with the WFMP standard may take time, however, incremental progress towards this long-term goal is expected.

What is the WFMP standard ?

The operating principles section of this policy (635-07-527) describes in detail the standard that is desired to be met for all wild populations. While a long section, the standard can be generally stated as follows. For a wild population to be consistent with WFMP it must have no fewer than 300 spawners (with some exceptions). In addition, if hatchery fish exist and spawn naturally within the geographical area where a wild population is found a limit is placed on their relative numbers. For most situations, this limit is set so that during the time period wild fish are spawning, hatchery fish may comprise no more than 10% of the total spawning population. However, in those circumstances where the hatchery fish are from a broodstock that is genetically similar to the wild population the limit is raised to 50%.

A more detailed description of the WFMP standard begins with the first paragraph of 635-07-527. This paragraph stresses that there is uncertainty with respect to the standard developed for the WFMP. The criteria used to define the WFMP standard were based upon our best judgement as to what would be necessary to protect the genetic resources of wild fish. A conscious effort was made to take these criteria measurable in order to avoid the ambiguity and difficulty of such phrases as "...to the extent possible" or "...having a minimum impact". However, the danger of providing a measurable standard is that future evidence may suggest that it is scientifically incorrect. Therefore, as new and better information becomes available the WFMP will be revised as appropriate.

Operating principle number 1, relating to the interbreeding of hatchery fish with wild fish, is the most complex of the six operating principles that define the WFMP standard. Under this principle, several options are given concerning the use of hatchery fish. Hatchery fish can either be removed entirely (option a), manipulated such that they will not reproduce (option b) or controlled in some other way such that their assumed genetic impact on the wild population will not be significant (options c and d).

Option (c) consists of using genetically similar hatchery fish in controlled numbers such that they will not outnumber wild fish on the spawning grounds (i.e., hatchery fish comprise less than 50% of the total spawning population). The 50% limitation is specified because it is unknown if a

hatchery can spawn and rear fish from wild broodstock without some genetic change occurring either immediately or in successive generations. Therefore, this limitation is intended to offer some protection should future analyses show that our guidelines for development of hatchery stocks that are genetically similar to specific wild populations do not work.

The concept behind the type of hatchery fish described under option (d) is that they spawn at different locations or times than do wild fish. The objective of this strategy is to reproductively isolate hatchery fish from wild fish. Given this reproductive isolation, it is acceptable if these fish are genetically different from the wild population. For example, if coho salmon released into a particular river all return to the hatchery site as adult spawners, then they will not be able to interbreed with wild fish. Isolation may also occur if the hatchery fish spawn at a much earlier time than do their wild counterparts. The critical issue under option (d) is to prevent hatchery x wild matings in the natural environment.

Finally, a further limitation with respect to hatchery fish is presented in paragraph (e). Particularly for anadromous species, hatchery fish often stray to river systems adjacent to those where they are planted. A high level of straying can seriously impact the genetics of wild populations. In addition, it is not realistic to assume that option (d) hatchery fish will be 100% isolated from wild spawners. Most likely, both option (d) hatchery fish and hatchery strays from adjacent rivers will differ genetically from the wild fish. Therefore, they are lumped together and given a maximum limit in paragraph (e) of 10%. This limit applies only to the time period when the wild fish are spawning. For example a wild population having 900 spawners existing in a watershed which also has 900 naturally spawning hatchery fish may be consistent with WFMP under certain conditions. One of these conditions would be if the hatchery fish spawned so early that only 100 were left during the time wild fish were spawning. This would result in relative numbers that would meet the 10% limit (900 wild fish and 100 hatchery fish) and therefore be acceptable.

During the course of developing the WFMP the 10% limit was a topic of considerable debate. However, based upon the comments received from several geneticists and the output from several different genetic modelling exercises, we feel that the 10% limit provides adequate genetic protection in most situations. The policy does allow for this limit to be reduced when hatchery fish differ substantially from the wild fish.

Operating principles 2, 3, and 4 relate to largely the same genetic concern. A population that has been reduced to a small number of breeding individuals tends to lose genetic variation through a random process geneticists call "genetic drift". Mortality, from any source that suddenly drives a population down to these levels is therefore genetically risky. For each of these three operating principles (each relating to different source of mortality) a boundary of 300 breeding individuals was set as the minimum stable population size that is acceptable under the WFMP standard. In addition, if the population is declining, this decline is only acceptable under the WFMP standard if a breeding population of 300 or fewer fish is not expected within the next 5 years.

The fifth operating principle is a description of special situation that requires an exception from the 300 fish criteria described for principles 2, 3, and 4. A small, trout population isolated by a barrier waterfall best exemplifies this special situation. In such a case there is simply not enough habitat to support a spawning population of more than say 150 adults. However, such a population differs from a population that has been suddenly reduced from 2,000 to 150 fish due to human activities. Because genetic differences between naturally small populations are often great, collectively they represent an important genetic resource. Principle 5 was written to make sure such populations are recognized and that the WFMP accepts them in their natural, below 300 condition.

The last operating principle, number 6, addresses management concerns specific to fisheries operating on aggregates of many different populations. It would be disruptive, for example, to place severe harvest restrictions on a coho salmon fishery in order to bring one or two small populations into compliance with the WFMP when they are aggregated with fish from 50 other populations that are healthy and can withstand harvest. This principle then, is a recognition of the fact that for populations which enter aggregate fisheries extra care must be exercised in bringing them into compliance with WFMP so as to minimize adverse social and economic impacts.

Are there exceptions ?

The WFMP has a provision whereby individual populations may be exempted from ever meeting the WFMP standard (OAR 635-07-528). Although it is hoped this option will be used infrequently under certain conditions the Oregon Fish and Wildlife Commission may take such action.

To exempt a population the Commission must find that social and economic considerations offset the biological

consequences of losing the genetic resources of the population involved. Before making such a decision however, the Department is required to prepare an analysis of the long-term biological implications should the population in question be granted an exemption. The critical issue will be whether such action might cause a serious depletion of the species within Oregon. This analysis will also be made available to the public for comment, 45 days prior to the meeting date the Commission considers the exemption.

How will the WFMP be implemented ?

The last section of the WFMP (OAR 635-07-529) describes the steps that will be taken to implement this policy. In developing this section one of the primary goals was to make it possible for the public to objectively measure if the Department was making progress towards achieving the overall policy goal of meeting the WFMP standard for all populations. In addition, it was intended that this section provide directions for a deliberate and accountable process in making key decisions, which implementation of this policy will require.

The first paragraph of this section directs the Department to develop a list of populations for all species of wild fish by January 1991. This is an extremely significant step, because the WFMP is designed to work on a population by population basis. These populations will become the units by which the policy is implemented and by which progress will be judged.

In many situations it will be difficult to identify individual populations, because we do not have enough information to discern clear population boundaries. In those cases when we are in doubt if a group of fish is isolated enough to be a population, we will err on the side of being too conservative and call them a population. Once developed, this list of populations will be examined one at a time against the WFMP standard.

In general, paragraphs 2, 3, and 4 of this section describe actions that the Department is directed to take during the interim period prior to achieving full compliance with the WFMP. They recognize that while existing basin and species management plans are being rewritten to be in compliance with the WFMP, the WFMP will take preference. For preparation of new basin plans, direction is given that they include for each species at least one strategy that is consistent with the WFMP standard. Finally, the Department is directed to not stock hatchery fish into wild fish populations not currently being stocked. The only exception being if such action is approved in a basin plan or if the wild population has been exempted from the WFMP.

Paragraph 5 of this last section describes the preparation of a status report which the Department is required to do every two years beginning with December, 1991. This report will have five components.

First, for each population a historical and current status summary will be prepared based upon best available information. Past records of hatchery fish introductions, changes in habitat, and harvest patterns will be the focus of the historical portion. The current status portion will require an estimate of the number of wild spawners for each population. In addition, if hatchery fish occur within the geographical boundaries of the wild population, estimates of the proportion of hatchery fish naturally spawning during the time the wild fish spawn and whether they are genetically similar to the wild fish will be necessary.

The second part of the report will describe the results of comparing each wild population, using the information described above, against the WFMP standard. Out of this comparison will come two lists. A "pass" list of populations which that consistent with the WFMP standard, and a "fail" list of populations which are either not consistent with the standard or for that there is insufficient information to make a reasonable determination of compliance. This process is to be repeated for each biennial report (every two years)..

It is envisioned that the number of populations on the fail list will be used as a report card on the progress with which the WFMP is being implemented. The rate at which the size of this list decreases over the next 10 years will provide an accountable and objective basis for measuring our progress in achieving the intent and goal of the WFMP.

An identification and description of problems for each population on the fail list will be presented in the third portion of the report. Again, lack of data may make this assessment difficult, even for populations that are known not to meet the standard. For example, it may be hard to tell if over-harvest or loss of habitat is responsible for depressing a population below the 300 spawner level (recall that a minimum of 300 spawners is needed to pass the WFMP standard). Questions about the potential productive capacity of the existing habitat and spawner-recruit relationships would need to be at least crudely understood to identify the problem that caused the decline.

The next section in the report will describe possible solutions that the Department has developed for each population on the fail list. The intent of these solutions is, that if implemented, they would result in the population eventually being moved from the fail list to the pass list.

An approximate cost for each of these solutions will be included as part this presentation.

At least initially, the "solution" for many populations may be to obtain the data necessary to fill in crucial data gaps required to permit testing the population against the WFMP standard. For other populations, enough information will be available to propose immediate on-the-ground solutions to bring them in compliance with the WFMP standard. For populations that have failed because of having less than 300 spawners, possible solutions might include: 1) habitat restoration, 2) screening of water diversions, 3) improving passage at dams, 4) changing release locations and numbers of hatchery fish to reduce competition and predation, 5) closing of certain areas to fisheries to protect spawners, 6) reducing direct or incidental fishing mortality on juvenile or adult fish.

For other populations which have failed the WFMP standard because hatchery fish are exceeding the natural spawning limit, another range of possible solutions exist. These include: 1) decrease the number hatchery fish that reach the spawning grounds by reducing the number of fish planted or implementing strategies to target increased harvest on hatchery fish, 2) release hatchery fish that are sterile, 3) increase the number of wild spawners through strategies that increase natural production (i.e., habitat restoration) or regulations to reduce fishing mortality, 3) switch to a hatchery broodstock that is genetically similar to the wild population, 4) develop strategies to draw returning adult hatchery fish away from natural spawning areas (e.g., acclimation ponds, changes in time and place of releases, etc.).

Finally, at the end of this report, a list of those strategies that may have significant effect on future management direction, user groups, or funding requests. This list will include a summary of the decision needed in each case and a corresponding assessment of what each of the possible decision outcomes (i.e., accept, reject, or defer) might mean to the resource, the public, and the Department. Where appropriate the Oregon Fish and Wildlife Commission would be asked to take the action necessary to make specific decisions.

The last portion of the WFMP concerns a short paragraph directing the Department to develop a gene conservation policy and associated program to monitor the genetic status of representative populations.

Mark W. Chilcote, ODFW Natural Production Program
November 5, 1990

Wild Fish Management Policy

Purpose of Wild Fish Management Rules

635-07-525 These rules are established to guide the management and conservation of genetic resources of wild fish in Oregon. Although direction with respect to natural production is provided by OAR 635-07-521 through OAR 635-07-524, additional guidance is required to assure that genetic resources of wild fish are protected. f. & ef. 1-24-90

General Policies of Wild Fish Management

635-07-526 (1) Protection of genetic resources shall be the priority in the management of wild fish to assure optimum economic, commercial, recreational, and aesthetic benefits for present and future residents of Oregon.

(2) It is the policy of the Department to implement the Wild Fish Management Rules for all populations of wild fish except those populations specifically exempted by the Commission in accordance with OAR 635-07-528.

(3) It is recognized that management of some populations may not currently be fully consistent with these rules. However, it is the Department's long-term goal to bring these populations into compliance, with the exception of populations specifically exempted by the Commission in accordance with OAR 635-07-528. f. & ef. 1-24-90

Operating Principles for Wild Fish Management

635-07-527 The Department recognizes that the operating principles developed to implement this policy are associated with varying levels of uncertainty. These principles shall be continuously revised as better information becomes available. In addition to the operating principles of the Natural Production Rules (OAR 635-07-521 through 635-07-524), the following operating principles apply to the management of populations of wild fish.

(1) Interbreeding of hatchery and wild fish: The interbreeding of hatchery fish with wild fish poses risks to conserving and utilizing the genetic resources of wild populations. These risks shall be limited by implementing either strategy (a), (b), (c), or (d) listed below, consistent with the further limitation described in (a) below.

(a) Eliminate the release of hatchery fish.

(b) Release hatchery fish that are sterile and that do not attempt to spawn.

(c) Release hatchery fish that are maintained to be genetically similar to the wild population and limit the number of all naturally spawning hatchery fish to no more than 50% of the total number of naturally spawning hatchery and

hatchery fish that are genetically similar to the wild population are:

(A) Use only hatchery fish that originated from the wild population;
(B) Incorporate naturally produced fish in the broodstock in every generation; and

(C) Avoid random and nonrandom genetic change due to failure to maintain a representative sampling of the genes within a population.

(d) Release fish that are demonstrated to be reproductively isolated (spatially or temporally) from the wild population. The Department recognizes that absolute reproductive isolation may not be possible to achieve and therefore these fish shall be included in the limitation of 10% dissimilar fish stated in (e) below.

(e) Except for genetically similar hatchery fish described in (c), hatchery fish that spawn at the same time and place as the wild population, shall comprise no more than 10% of the total number of naturally spawning fish. A more restrictive level may be designated for those situations where the hatchery fish are known to differ substantially from the wild population in their genetic makeup.

(2) Habitat: Degradation of habitat that reduces the potential for fish production or adversely affects fish migration routes poses a risk to conserving and utilizing the genetic resources of wild populations. The Department shall oppose habitat degradation that causes a population to experience a decline in abundance that if continued for an additional 5 years would likely reduce the number of spawners to 300 fish. In addition, the Department shall advocate the restoration of degraded habitat that has depressed a population to a stable level of 300 or fewer spawners.

(3) Competition, predation, and disease: Introductions of fish of the same or different species as those already present may seriously reduce the survival of wild fish through competition for food and space or through predation. Introductions of disease may also deplete a wild population. An extreme level of mortality from these sources poses a risk to conserving and utilizing the genetic resources of wild populations. The Department shall oppose any actions that allow mortality from competition, predation or disease to cause a population to experience a decline in abundance that if continued for an additional 5 years would likely reduce the number of spawners to 300 fish. In addition, where a population has been depressed to a stable level of 300 or fewer spawners, the Department shall support and advocate actions to correct the cause of such population decrease.

(4) Harvest: providing the opportunity for optimum harvest benefits is consistent with wild fish management. However, an extreme level of harvest, or harvest that disproportionately reduces some segment of a population, poses a risk to conserving and utilizing the genetic resources of a wild population. The Department shall oppose harvest strategies that, by themselves, cause a population to experience a decline in abundance that if continued for an additional 5 years would reduce the number of spawners to 300 fish. In addition, the Department shall advocate the termination of harvest strategies that have depressed a population to a stable level of 300 or fewer spawners.

(5) Small populations: It is recognized that even in the absence of changes brought on by human activities, populations of 300 or fewer spawners may exist naturally. Such populations have survived even though random genetic processes, operating over long periods of time, have probably caused a reduction in genetic variation. Often in the process of losing this variation, rare genetic characteristics become established. From an evolutionary

perspective, protection of these small populations is highly desirable because of the unique features they contain. Therefore, these populations shall not be excluded from consideration for wild fish management.

(6) Aggregate stock fishery management: Some fisheries, such as ocean salmon fisheries, target on aggregations of fish belonging to many different populations. In implementing the Wild Fish Management Rules (OAR 535-07-529), the Department shall pursue the most cost effective, least disruptive (in terms of adverse social and economic impacts on those fisheries), and feasible strategy consistent with the policies and operating principles set forth in the rules. To bring individual populations into compliance with wild fish management, priority shall be given to correcting problems as they relate to use of hatchery fish, habitat, competition, predation, and disease before harvest restrictions on any aggregate stock fishery shall be considered. f. & ef. 1-24-90

Wild Fish Management Exemption Procedure

635-07-528 (1) The Commission may decide, at the request of any person, the Department, or on its own initiative, to determine whether a population shall be exempted from wild fish management.

(2) Such exemptions shall be scheduled for consideration through a rule making either at the next meeting at which the Commission adopts or reviews a basin plan for the area where the population is found, or at the next meeting at which the wild fish management progress report, described in OAR 635-07-529(6), shall be presented.

(3) Before scheduling a rule making on a proposed exemption, the Commission shall direct the Department to prepare a written analysis describing the biological significance and long-term implications of losing the genetic resources of the population proposed for exemption. The Department's report shall also assess whether the proposed exemption would cause a serious depletion of the species within Oregon. In addition, the Commission shall request that the proponent of the exemption prepare a written analysis of the social and economic justification for such action.

(4) The analyses described in (3) shall be made available for public review and comment at least 45 days in advance of the rule making on the proposed exemption.

(5) To exempt a population, the Commission shall find that social and economic considerations offset biological consequences, and that such exemption, when considered alone and in light of any other exemptions that have been granted, shall not cause a serious depletion of the species within Oregon. f. & ef. 1-24-90

Implementation of Wild Fish Management Rules

635-07-529 (1) Within one year of the effective date of these rules, the Department shall develop, for approval by the Commission, a provisional statewide list of populations of wild fish. This list shall be made available to the public for review prior to Commission consideration and approval.

(2) It is the intent of the Commission that, to the extent any basin and/or species plan currently adopted plan shall now be governed by these rules. As existing plans are reviewed and new plans are adopted, the Commission intends that they be explicitly brought into conformity with these rules.

(3) Basin plans presented to the Commission after the adoption of the Wild Fish Management Rules shall present at least one alternative strategy for

with a population which is consistent with wild fish management. For those basins with existing hatchery programs, two alternatives consistent with wild fish management shall be presented; one without hatchery supplementation and one with hatchery supplementation.

(4) The Department shall not stock hatchery fish into wild fish populations not currently being stocked, without authorization in a basin plan approved by the Commission or an exemption of the wild population in accordance with OAR 635-07-528.

(5) Progress toward achieving consistency with these Wild Fish Management Rules shall be reported to the Commission during the first six months of each biennium, prior to preparation of the next biennial budget. Beginning in 1991, each biennial report shall include, by species, the following information:

(a) Documentation of the management history of each wild population based on best available information. This shall include the current status of the population and a history of habitat change, harvest, and hatchery introductions;

(b) A list of populations of wild fish not currently managed consistent with the Wild Fish Management Rules;

(c) Identification and description of the problems preventing the Department from achieving consistency with the Wild Fish Management Rules for each of these populations;

(d) A description of the short- and long-term strategies and associated funding necessary to solve these problems; and

(e) A list of Commission actions, as appropriate, necessary to implement strategies identified in (d).

(6) The Department shall develop a gene conservation policy and a program to monitor the genetic status of representative populations. f. & ef. 1-24-90

Definitions

635-07-501 As used in this Division and Division 40:

(18) "Hatchery fish" means a fish spawned and/or reared under artificial conditions regardless of the history of the parent stock.

(23) "Management Plan" means:

(a) A plan which provides the basic framework (goals, policies and objectives) for managing a resource, geographic area, watershed (waterbody) or species adopted by the Fish and Wildlife Commission in public hearing; and

(b) Which may include specific information or alternatives relative to how the goals and policies may be achieved, e.g., techniques and guidance for implementation of the basic plan normally found in operation plans.

(27) "Natural Production" means the maintenance of naturally spawned fishes and their capacity to reproduce and rear in habitats which allow those fishes to fulfill all their necessary life history functions.

(36) "Population" means a group of fish spawning in a particular area at a particular time which do not interbreed to any substantial degree with any other group spawning in a different area or in the same area at a different time.

(43) "Sensitive" means those fishes that have been designated for special consideration pursuant to QAR 635-100-040.

(48) "Stray" means a hatchery fish that spawns naturally in a location different from the location intended when the fish was stocked.

(52) "Wild fish" means any naturally spawned fish belonging to an indigenous population of the following species:

- (A) *Oncorhynchus clarki*, commonly known as cutthroat trout.
- (B) *Oncorhynchus keta*, commonly known as chum salmon.
- (C) *Oncorhynchus kisutch*, commonly known as coho salmon.
- (D) *Oncorhynchus mykiss*, commonly known as steelhead (anadromous form) or Rainbow trout (non-anadromous form).
- (E) *Oncorhynchus nerka*, commonly known as sockeye salmon (anadromous form) or kokanee (non-anadromous form).
- (F) *Oncorhynchus tshawytscha*, commonly known as chinook salmon.
- (G) *Salvelinus confluentus*, commonly known as bull trout.
- (H) *Prosopium williamsoni*, commonly known as mountain whitefish.
- (I) *Acipenser transmontanus*, commonly known as white sturgeon.
- (J) *Acipenser medirostris*, commonly known as green sturgeon.
- (K) All fishes that have been designated as sensitive, pursuant to QAR 635-100-040.



Biological Interactions of Natural and Enhanced Stocks of Salmon in Alaska

Interim Report from the Cordova Workshop, November 10-15, 1991

Editors

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Fisheries and Ocean Sciences**
UNIVERSITY OF ALASKA FAIRBANKS



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CHAPTER VIII. FUNDING OF THE ALASKA SALMON ENHANCEMENT PROGRAM

INTRODUCTION

Sources of funds for the Alaska salmon enhancement program and projects include bond issuances, state general fund appropriations, salmon enhancement tax assessments paid by fishermen, state enhancement loans, and cost recovery sales of fish. This chapter provides information on funding of Alaska salmon enhancement program.

STATE HATCHERIES AND ENHANCEMENT PROJECTS

The Alaska Department of Fish and Game, Fisheries Rehabilitation and Enhancement Division (FRED) was established by the State Legislature in 1971 to encourage the use of hatcheries and other enhancement techniques to return the state's then depressed salmon fisheries to abundance.

At its peak, the division operated 20 hatcheries. Currently, the FRED Division operates 12 (though 16 are owned by the State) hatcheries to produce salmonid fishes for commercial, sport, and subsistence fisheries. As a result of declining state revenues, state policy shifted regarding the construction and operation of state hatcheries. In general, the state will only continue to operate salmon hatcheries that primarily benefit sport and subsistence fisheries and/or are primarily research facilities. In keeping with this policy, four permits have been issued to regional aquaculture associations for the operation of state-owned hatcheries at Trail Lakes, Cannery Creek, Kitoi Bay, and Hidden Falls. Additional permits will be issued to regional aquaculture associations for operation of the Main Bay, Tutka, and Beaver Falls hatcheries in 1992. Many of the state hatcheries were constructed for research purposes and not with cost recovery and loan repayment in mind. Therefore, in order to transfer these facilities to PNPs, the state has invested funds to make the hatcheries cost effective. While these transfers may be cost effective from an amortized capital and annual operating cost analysis, questions have been raised regarding the resulting fisheries management problems. Information on state hatcheries is provided in Table 1.

In addition to hatcheries, FRED has constructed numerous fish passes (several maintained cooperatively with the U.S. Forest Service) which provide access to spawning and rearing habitat that would otherwise be unavailable to salmon stocks. Other enhancement operations include lake fertilization, habitat improvement, and fish stock introduction to provide increased freshwater survival and new salmon production opportunities.

FRED also administers the PNP Hatchery Program and coordinates the development of regional aquaculture associations, approves annual operations management plans for all salmon hatcheries, and reviews PNP hatchery applications and the permitting process (which includes hatchery and fish and egg transporting permits). FRED operates five biological laboratories--Fish Pathology, Genetics, Limnology, and Tag Recovery facilities--which provide information and support for FRED and PNP hatchery programs. FRED also provides engineering service support to the department (including field facilities) and coordination with consultants, contractors, and landowners.¹

¹Brad Pierce, Aquaculture in Alaska, House Research Agency Report 87-B, February 1987, p.30.

Alaska Department of Fish and Game-FRED Division
Public Hatchery Strategic Plan

15-Mar-91

Hatchery	Location	Species	Percent Commercial	Percent Sport	Percent ** Subsistence	FY92 Operating Costs	Funding Source	Operational Plan FY	Agency	Comments
1 Beaver Falls	Ketchikan	Sockeye	100%	0%	***			92	SSRAA	
2 Big Lake	Big Lake	Sockeye Coho	85% 30%	0% 65%	15% 5%	\$50.0 \$344.3	Unfunded GF	92	FRED	Sockeye unfunded interim funding or contract required.
3 Cannery Creek	Whittier	Pink	100%					89	PWSAC	
4 Clear	Clear	Arctic char Arctic grayling Lake trout		100% 100% 100%		\$22.4 \$308.5 \$90.8	GF DJWB F&G	92	FRED	Major sport fish production facility Vital to US/Can chum and chinook programs
5 Crooked Creek	Soldotna	Sockeye Coho Steelhead	95%	0% 85% 100%	5% 5%	\$46.0 \$346.2 \$12.0	CIAA GF PgR	92	FRED CIAA	Sockeye contracted to CIAA Contributes substantially to chinook sport fish program through egg takes for other facilities
6 Crystal Lake	Petersburg	Chinook CL rel. Chinook remote rel. Coho Steelhead	56% 99% 83%	44% 1% 17% 100%	***	\$518.7	GF	92	FRED	Large US/Can capital investment US/Can involvement including Herding River, Deep Cove, and Farragut River Provides 5-7 million chinook eggs in addition to its own needs, primary stream rehab work from unique isolation modules.
7 Deer Mountain	Ketchikan	Chinook Coho Steelhead	60% 83%	40% 17% 100%	*** ***	\$144.2 \$144.2	GF ANAD	92	FRED	Fisheries technology development results supplied to other state and private programs. Prime tourist facility, over 200,000 visitors annually. Major role in public education.
8 Elmendorf	Anchorage	Chinook Coho	9% 10%	90% 87%	1% 3%	\$112.6 \$375.2 \$67.9	F&G DJWB GF	92	FRED	Major sport fish production facility High visibility tourist attraction
9 Ft Richardson	Anchorage	Chinook Coho Rainbow	13% 10%	88% 90% 100%		\$144.2 \$583.5 \$181.6	GF DJWB F&G	92	FRED	Major sport fish production facility

Hatchery	Location	Species	Percent Commerci	Percent Sport	Percent ** Subsistence	FY92 Operating Costs	Funding Source	Operational Plan FY	Agency	Comments
10	Gulkana	Glennallen Sockeye Chinook	90% 50%	2% 30%	8% 20%			92	FRED/PWSA	The most cost effective sockeye facility in the world 35 million sockeye salmon eggs/ale annually
11	Hidden Falls	Sitka Pink Chum	100% 100%					89	NSRAA	
12	Kitoi Bay	Kodiak Pink Chum Coho Sockeye	100% 100% 50% 100%	50%				92	FRED/KRAA	
13	Klawock	Klawock Sockeye Coho Steelhead Chum	93% 50%	7% 100%	100% *** 50%	\$446.9 GF \$18.0 WB \$100.0 BIA (request)		92	FRID	BIA funds to address local projects, chum and sockeye. GF used in projects to rehabilitate POW in post-logging y
14	Main Bay	Whittier Sockeye	98%	1%				92	PWSAC	
15	Pillar Creek	Kodiak Sockeye	100%		***	\$200.1 PgR 38.6 GF		92	FRED/KRAA	Unfunded Interim funding or contract required
16	Russell Creek	Cold Bay Chum Pink Coho	100% 98% 50%	1% 50%		\$420.1 GF \$53.0 PgR		99	Reg. Assoc.	FY92 PgR from Aleutian's East Borough Fisheries developmental facility to be contracted in FY99
17	Sikusilaq	Kotzebue Chum	80%		20%	\$391.4 GF		99	Reg. Assoc.	Developmental facility, fisheries technology development Great potential for subsistence harvest. To be contracted in FY99
18	Snettisham	Juneau Sockeye CIF Sockeye (smolt) Chinook (Deep Cove) Chinook (juvenile)	100% 100% 94% 66%	6% 34%	*** ***	\$775.8 GF \$167.6 US/Can Deep Cove \$108.0 US/CAN \$180.0 W/B		92	FRID	Tremendous involvement in US/Can projects, \$1.35 million 5 years operational funding in Deep Cove. Applied technology development for sockeye smolt. Major sport fish production in Juneau recreation project.
19	Trail Lakes	Moose Pass Coho Sockeye	100%	100%	***			89	CIAA	
20	Tulka	Homer Pink Chum Sockeye	98% 100% 100%	2%	*** ***	\$429.3 CIP		96	CIAA/ LCI Seiners	Unfunded Interim funding or contract required.

** - Includes personal use

*** - Thought to contribute to subsistence but as yet unspecified

STATE ENHANCEMENT PROJECT FUNDING

Funding for the operation of the state salmon enhancement program and state project construction, operation, and maintenance has been primarily through state bonds and general fund appropriations to ADF&G, FRED Division. From FY 72 - 92 operating budget, funding for the FRED Division totalled approximately \$210.3 million, the majority of which was for salmon enhancement. Bond issues totalling \$56.17 million were authorized by the 1976 and 1978 Legislatures, and overwhelmingly endorsed by voters, to fund the construction and operation of hatchery production and other enhancement projects in each region of the state. Of the \$56.17 million in bond issues for FRED enhancement projects, \$50.3 million was spent on the construction of hatcheries, while the remainder was used for other enhancement projects. In addition to bond issues, the capital appropriations for FRED division construction of state facilities totaled approximately \$24.8 million through FY 92.

As part of the Pacific Salmon Treaty, the federal government agreed to provide \$20 million in mitigation monies to produce new salmon through enhancement as a means to mitigate losses to Alaska fishermen resulting from treaty catch quotas. These funds were to be transferred over a five year period. The final \$2 million will be paid this year.

PRIVATE NONPROFIT HATCHERIES

The PNP Hatchery Program was created by the legislature to provide private sector participation in rebuilding Alaska's depleted salmon fisheries. The impetus for the program came from the desire of commercial fishermen to enhance the severely depressed salmon stocks of the early 1970s. The program represented an unprecedented partnership among fishermen, processors, legislators, and the Governor's Office.² The statutes for PNP salmon hatcheries (AS 16.10.375-620 passed in 1974) authorized the ADF&G, FRED to issue hatchery permits to qualified PNP corporations. The intent of the program was to allow private ownership of salmon hatcheries that would contribute to the state's salmon fisheries. Costs of constructing and operating these hatcheries was to be derived from the sale of a portion of the returning fish. Comprehensive salmon planning is part of the PNP program and is implemented through the regional planning teams in conjuncture with the regional aquaculture associations.

Since the inception of the PNP program, 30 salmon-hatchery permits have been issued and three given up. The ADF&G is currently in the process of revoking another PNP permit. Thirty-nine applications have been either denied or withdrawn from the permitting process. Twenty-two of the permitted PNP hatcheries are in operation, and all but one (Bell Island) had returns of adult salmon in 1991. Currently, there are 3 applications for PNP hatchery permits under consideration. Another application is expected in early 1992.

²Brian J. Allee, "The Private, Non-Profit Hatchery Perspective," Alaska Fish and Game, May/June 1986, p. 17 and Brad Pierce, op.

TABLE 2.
SALMON ENHANCEMENT REVENUE SOURCES, FY 76 - FY 91
(nominal dollars)

REGION/CORPORATION	CAPITAL LOANS	OPERATING LOANS (a)	ENHANCEMENT TAX	COST RECOVERY (b)	TOTAL REVENUE	OUTSTANDING PRINCIPAL
Bristol Bay RAA	\$0	\$100,000	\$0	\$0	\$100,000	\$0
Chignik RAA	0	65,000	0	0	65,000	0
Cook Inlet RAA	1,438,881	783,369	12,069,415	76,295	14,367,960	328,614
Kodiak RAA	0	100,000	3,182,884	11,671,982	14,954,866	0
Lower Yukon/Kuskokwim RAA	0	100,000	0	0	100,000	0
Northern Southeast RAA	2,724,265	1,738,496	9,015,989	3,842,420	17,321,170	2,684,209
Prince William Sound AC	18,676,153	1,185,500	6,053,981	37,045,965	62,961,599	19,869,315
Southern Southeast RAA	8,093,000	2,948,942	15,882,353	6,884,886	33,809,181	12,393,824
Alaska Aquaculture, Inc.	1,091,985	2,537,554	0	376,463	4,006,002	3,876,043
Armstrong-Keta, Inc.	2,002,645	2,015,500	0	753,724	4,771,869	3,961,608
Burro Creek Farms, Inc.	119,500	171,575	0	6,079	297,154	256,651
Douglas Is. Pink & Chum, Inc.	8,124,000	5,193,000	0	990,723	14,307,723	13,445,375
Kake Nonprofit Fisheries Corp.	1,500,724	1,845,060	0	253,878	3,599,662	3,324,227
Sheldon Jackson College AP	362,254	61,370	0	638,797	1,062,421	346,728
Tlingit & Haida Fisheries Dev. Corp.	1,464,000	89,860	0	0	1,553,860	1,200,000
Valdez Fisheries Development Assoc.	3,193,830	3,250,563	0	8,328,064	14,772,457	5,965,383
TOTAL	\$48,791,237	\$22,185,789	\$46,204,622	\$70,869,276	\$188,050,924	\$67,651,977
% Category is of Total Revenues	26%	12%	25%	38%	100%	95% (c)

Notes: (a) Operating loan amounts include initial organizational and planning grants to regional aquaculture associations (\$100,000 except for \$65,000 to the Chignik RAA).
(b) Information on cost recovery from ADF&G, FRED annual reports.
(c) This is the percentage of total loan principal outstanding as of 10/16/91.
Enhancement taxes can only be paid to regional aquaculture associations.

Sources: Alaska Department of Commerce & Economic Development, Division of Investments, November 1991.

Regional Aquaculture Associations

In 1976, the legislature authorized the formation of regional aquaculture associations. Regional associations are comprised of representatives of commercial, sport, and subsistence fishermen; processors; local communities members; and other user groups in the region. Each regional association must have a board of directors consisting of at least one representative from each user group within the association. Currently, there are eight regional aquaculture associations:

Northern Southeast Regional Aquaculture Association (NSRAA)
Southern Southeast Regional Aquaculture Association (SSRAA)
Prince William Sound Aquaculture Association (PWSAC)
Cook Inlet Aquaculture Association (CIAA)
Lower Yukon/Kuskokwim Regional Aquaculture Association (LYKRAA)
Bristol Bay Regional Aquaculture Association (BBRAA)
Kodiak Regional Aquaculture Association (KRAA)
Chignik Regional Aquaculture Association (CRAA)

Regional Planning Teams

Three representatives from each regional aquaculture association are appointed by their respective boards of directors to serve on a regional planning team (RPT) along with three ADF&G representatives--two from FRED and one from the Division of Commercial Fisheries. These teams are responsible for developing regional comprehensive salmon plans for both FRED and PNP hatchery production. From FY 77 to FY 86, the legislature provided funds for planning teams via grants and contracts administered through the ADF&G commissioner's office. With the exception of an initial start-up planning grant available to all regional aquaculture associations from DCED, no funds for planning have been provided to regional associations since FY 86.

Private Non-Profit Hatchery Funding

Funding for PNP hatcheries is primarily through state loans, the salmon enhancement tax, and cost recovery sales of fish. To a lesser extent, the state has provided grants to some facilities and fishing organizations; these have totalled approximately \$12.3 million.

Since 1977, a significant portion of the funding necessary for the implementation of salmon rehabilitation and enhancement activities by PNP corporations has been provided through the *Fisheries Enhancement Revolving Loan Fund* administered by the Alaska Department of Commerce and Economic Development (DCED), Division of Investments (AS 16.10.500-620). The loan program has gone through several modifications by the legislature, the most recent occurring in 1987. The maximum loan amount available for an individual project is \$10 million at approximately 9.5 percent interest, with a payback period of up to 30 years.

According to state statute (AS 16.10.525), payments and accrual of interest on these loans *must* be deferred for 6 to 10 years. Loans for non-regional aquaculture association projects have these same terms with the exception that the loan maximum is limited to \$1 million. Loans are available for the purpose of planning, construction, and operation of salmon rehabilitation and enhancement projects, primarily salmon hatcheries. These loans are secured through collateral that may include returning hatchery fish and enhancement assessment of commercial fishermen.

The *Salmon Enhancement Tax* (AS 43.76.010-.015) is charged to limited entry permit holders who are members of qualified regional aquaculture associations. State law allows the associations to set enhancement tax rates at either 1 to 3 percent of the ex-vessel value of the salmon catch, subject to the vote of the membership. The Cook Inlet and Northern and Southern Southeast Regional Association assessment rates (2, 3, and 3 percent, respectively) have been in place since 1981. The Prince William Sound assessment (2 percent) began in 1985 and the Kodiak assessment became effective in 1988. Buyers of salmon are required to collect the tax and remit the revenue to the Alaska Department of Revenue. This is a pass-through program, since the legislature appropriates Salmon Enhancement Tax revenues to the regional associations from whose members the tax was collected.

Cumulative state loans secured by corporations for capital construction and operations, cumulative enhancement funds returned to the regional aquaculture associations, and revenue generated by corporate sales of returning hatchery fish are presented in Table 2.

Through November, 1991, \$71.0 million has been borrowed by PNP corporations. Approximately \$67.7 million (95 percent) of the \$71.0 million principal balance is currently outstanding. Including state appropriations (\$12.3 million), approximately \$83.3 million has been provided in state loans and grants to PNPs. Another \$46.2 million has been generated through enhancement tax assessments. To date, PNP operators have sold approximately \$70.9 million worth of cost recovery fish to help pay for hatchery operations. The amount and percentage of funding by category is shown below.

\$71.0 million	35 percent	State Loans
\$12.3 million	7 percent	General Fund Grants
\$46.2 million	23 percent	Enhancement Tax Assessments
\$70.9 million	35 percent	Cost Recovery Sales of Fish
\$200.4 million		Total

As can be seen, the private sector has provided over 58 percent of the direct funding for PNP operation and construction through self-imposed taxes and cost recovery sales of fish.

OPTIONS FOR POSSIBLE CONSIDERATION:

- Requiring a more extensive public benefit-cost analysis before providing enhancement loans. This means that a project or facility expansion would not only have to be financially feasible--capable of paying back loans--but also provide net benefits to the public.
- Eliminating the statutory loan repayment deferment requirement on operating loans.
- Development of a mechanism for placing moratoriums on state enhancement loans for increased fish production. Consideration of a moratorium on loans until results of the Legislative Enhancement Program Review economic studies are complete.
- Implementing a requirement for more complete analysis of transfers of the operation of state hatchery facilities that includes factors such as fisheries management, increased need for cost recovery, and the impact on traditional common property fisheries.
- Analysis of the enhancement tax program to determine 1) whether costs are distributed in proportion to benefits, and 2) the impact of a mechanism to allow specific gear groups to opt out of the program or pay in proportion to the enhancement benefits they receive.

- Analysis of increasing the salmon enhancement tax so fishermen who benefit from the program will pay for more of the costs.
- In light of declining state revenues and lower fish prices, development of an auditing mechanism to ensure that annual PNP operating costs, paid by loans, enhancement tax receipts and cost recovery, are "reasonable."
- Development of a requirement that funds provided in treaty agreements for enhancement be used for fish production to the maximum extent possible. In addition, a requirement for a comprehensive feasibility analysis of using enhancement as part of treaty agreements could be considered.

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CHAPTER IX. ECONOMICS

INTRODUCTION

Note: This section summarizes the economic studies that are currently in progress under contract. The results of these studies are not yet available and, therefore, are not included in this draft. The full chapter on economic studies provides more detailed information on the contracts. The final report will include the results of the economic studies.

The main focus of the review of the economic impact of salmon hatchery production on Alaska salmon prices is to determine:

- whether current levels of Alaska salmon harvest are over- or under-supplied from a world-market perspective, and
- whether increased hatchery production of salmon will lower prices, fishing and processing revenues, and the total net value of Alaska's salmon fisheries.

To answer these questions requires a benefit-cost analysis. This type of analysis measures the level and cost of enhanced salmon production, the cost of managing, harvesting, and processing enhanced salmon stocks, and the impact or "price responsiveness" of world salmon markets to various levels of Alaska enhanced salmon production. The costs are then subtracted from the benefits to estimate the net benefits of the salmon enhancement program and the incremental net benefits of different levels of enhanced salmon production to commercial fisheries. To analyze only the impact of different levels of salmon production on world salmon markets and prices paid to fishermen is insufficient for thorough policy analysis because it does not measure the net benefits (benefits minus costs) of the commercial salmon fisheries to fishermen or all Alaskans.

An example of some of the policy questions a benefit-cost analysis would help to address are as follows:

- Is increased Alaska salmon hatchery production the cause of this year's lower salmon prices? What is the significance of other factors, such as increased farmed-salmon production, exchange rates, economic recessions, and prices of food substitutes?
- What is the most profitable salmon species mix and level of production for the statewide enhancement program? Should the emphasis shift from pink salmon to king and coho salmon, for example, or even to other non-salmon species?
- If Alaska curtailed hatchery salmon production, would Alaska salmon (both wild and hatchery) prices increase or would the resulting market share be filled by farmed salmon from other countries? Ultimately, what would be the net effect or benefits to Alaskans from these changes?
- How are the estimated benefits and/or costs of the existing hatchery production distributed to fishermen and processors in each region of the state? If changes in production occurred, how would these benefits and/or costs be distributed?
- What would be the economic benefits of changes in policy or additional legislative oversight regarding the production capacity and releases of hatchery salmon?

NEED FOR ADDITIONAL RESEARCH

Rather than initiating a new benefit-cost analysis, the Senate Special Fisheries Committee requested the Hatchery Research Group to first identify the specific issues that need additional economic research. In response, the economics group developed a study plan with the initial tasks of reviewing economic and marketing studies completed to date and assessing the need for additional research.

After reviewing current research, the group determined that insufficient economic information currently exists to accurately address salmon enhancement public policy questions. The research that has been completed is either out-of-date, or additional research needs to be done to improve the reliability of existing economic models. As a result of the significant investment by private parties and the state of Alaska in both enhancement projects and commercial fishing, a rigorous analysis using accepted bioeconomic techniques is warranted to fill these information gaps.

Based on our review, the economics group proposed a set of contracts for additional research. The group worked closely with staff from the Alaska Department of Fish and Game (ADF&G), FRED Division to develop the research plan because FRED Division staff have considerable experience in these areas of research and have contracted for previous studies. In addition, we solicited comments from the Divisions of Commercial Fisheries and Sport Fish to ensure that their concerns are addressed. As the committee requested, the studies build on previous research to close information gaps. Funding for the research contracts was approved at the November 1, 1991, Legislative Council meeting.

RESEARCH COMPONENTS

The five principal research components are:

- 1) a hatchery production and cost model,
- 2) a fish biological population model linked to fishing effort and harvests,
- 3) a demand model for Alaska salmon in world markets,
- 4) a fishing cost model, and
- 5) a computer software system to combine the four models.

The five components are described below including estimated costs and a brief summary of the information gaps the research is intended to address. Based on prior research conducted for the FRED Division and expertise, the economics group contacted potential University of Alaska researchers to determine interest in the projects.

As a result of the short time period available to complete the research, it will be funded through RSAs. Therefore, interested parties did not formally bid on the projects, but instead provided information on proposed research methodology, pertinent research experience and qualifications, and the ability to complete the contract in the time available.

Hatchery Production and Cost Model

Principal Investigators: Economics Group, Legislative Research Agency, and the ADF&G, FRED Division staff

Anticipated Cost: \$0

This research component consists of a survey of hatchery and enhancement project operators to determine the cost of producing salmon. In economics jargon, survey information will be used to develop an enhancement project "production function" to estimate the incremental cost of changes in the number of salmon produced by these projects. The survey will be developed by the economics group and FRED division staff and administered by the Legislative Research Agency and FRED division. This portion of the research will also solicit information from the ADF&G, Division of Commercial Fisheries regarding the costs of fisheries management of enhancement project stocks. This portion of the research needs to be conducted because no data exist on the incremental costs of enhancement project fish production. When the Governor's fisheries mini-cabinet reviewed the Alaska salmon enhancement program in 1984, a similar survey was conducted. Those results, however, are out-dated and additional salmon enhancement projects have been developed since that time.

Biological Population Model

Principal Investigators: Dr. Jeremy Collie, Juneau Center for Fisheries and Ocean Sciences, University of Alaska Fairbanks

Anticipated Cost: \$10,000

The purpose of the biological population model is to estimate the number of adult fish produced by enhancement projects and available for harvesting. Salmon produced by hatcheries and other projects are exposed to similar biological and environmental conditions and fisheries as wild stocks--as compared to farmed salmon. As a result, this research would estimate the interdependence of wild and enhanced stocks. These estimates will be taken into consideration varying management assumptions regarding stock separation and cost recovery. This research component is necessary because ADF&G has not comprehensively analyzed the interaction of wild and enhanced stocks and the impact of different levels of enhanced stock production on commercial fisheries harvests.

Salmon Demand Model

Principal Investigator: Dr. Mark Herrmann, Department of Economics, and Dr. Joshua Greenberg, School of Land Resources Management, University of Alaska Fairbanks

Anticipated Cost: \$18,000

This contract will extend and improve research on the salmon enhancement program completed to date by Dr. Boyce for the FRED division. To more fully understand world salmon markets, improvements to existing demand models are needed. Relatively little research has been conducted to date on the demand for Alaska salmon, and models that do exist are insufficient to reliably answer the Legislature's policy questions. The additional work has not been contracted by the FRED because of insufficient funding.

In 1990, Dr. John Boyce's research compared single-equation and system of equations demand models for Alaska salmon. The study compared two, single-equation models developed by Ben Muse of the Alaska Commercial Fisheries Entry Commission (CFEC) in 1984 and Nick Ronan, University of Alaska Anchorage, Institute for Social and Economic Research (ISER) in 1989, and an alternative model proposed by Hongru Zhang, University of Alaska Fairbanks graduate student, using a Two-Stage-Least-Squares (2SLS) approach. Boyce found that the 2SLS approach appears to have superior predictive capability within the sample.

Boyce (1990) estimates ex-vessel and wholesale prices for five species of Pacific salmon, which is required for evaluating enhancement project tradeoffs between different salmon species and markets that are relevant to the state of Alaska. However, Boyce's study did not (1) develop a satisfactory profit function at the wholesale level for all salmon species, (2) conduct a full testing of wild, enhanced, and farmed salmon substitutes, including the extent to which farmed-salmon production is a substitute for Alaska salmon harvests, (3) link ex-vessel markets or wholesale markets to retail consumer markets, and (4) produce demand models for pink and sockeye salmon with low estimation errors.

In addition to this recently completed research by Dr. Boyce, recent econometric analyses completed by Lin and Herrmann (1988) and Mittelhammer, Herrmann, and Lin (1989) provide considerable information on the import and export markets for salmon, and the relationship of farmed-salmon markets to capture-fishery markets.

The models of Mittelhammer, Herrmann, and Lin develop demand functions using import and export data closer to the final markets. They include more substitutes, and incorporate a supply and demand model for farmed salmon. However, the models are not sufficiently stratified by species at the ex-vessel level for evaluating tradeoffs in Alaska's statewide enhancement program.

Neither of the two modeling efforts (Boyce or Mittelhammer, Herrmann, and Lin) were designed to compute regional distribution of gross earnings within the major Alaska salmon fisheries, or the amount of price response imposed on a given region by another region's salmon production. The ability to discern regional impacts is a high priority in evaluating the benefits and costs of the salmon enhancement program.

In summary, two major salmon demand model improvements are needed. The first is in the ability to project future salmon prices and the impact of changes in enhanced salmon production and harvest levels on Alaska salmon prices. The second improvement is incorporating into salmon demand models the impact of changes in world salmon-farming production levels on Alaska salmon markets and prices.

Fishing Cost Model

Principal Investigator: Dr. John Boyce, Department of Economics, University of Alaska Fairbanks

Anticipated Cost: \$20,000

This portion of this study will estimate the cost to fishermen of harvesting salmon to determine the incremental cost of harvesting different levels of enhancement project produced fish. This information can address questions such as--if hatchery production results in a 10 percent increase in harvest levels and a 2 percent decrease in the price of pink

salmon, are the additional revenues minus the additional cost of harvesting the fish sufficient to increase fishermen's net revenues.

The objective of this study is to formulate and test empirical models that will project short- and long-run fishing costs for specific Alaska salmon fisheries. To conduct a benefit-cost analysis, fishing costs must be determined in the short and long run. In the short run, an enhancement project or a management action may encourage salmon fishermen to direct more fishing effort--which is a function of gear, boat size, horse power, and crew size, for example--into a specific statistical area and away from another statistical area (or alternative fishing opportunity). With the existing management constraints on salmon fishing in place, such as limited entry and fisheries openings and closures, the short-run increases in marginal costs may be smaller or larger than the potential short-run revenues from a given project. However, in the long run, fishermen can be expected to increase fishing effort in statistical areas where the marginal revenues are greater than marginal costs of fishing. Fishing effort would be increased even if new vessels are not allowed to enter the fishery. As a result of insufficient research, economists currently can only provide informed guesses of the magnitude of these short- and long-run fishing costs in Alaska's salmon fisheries. Because little extensive or reliable research has been completed on this topic which accounts for the relatively higher cost of this study component.

Combining of Models for Policy Analysis

Principal Investigator: Drs. John Boyce and Mark Herrmann, Department of Economics, and Dr. Diane Bischak, School of Management, University of Alaska Fairbanks

Anticipated Cost: \$10,000

When completed, the four models will be combined into a single, complete software system for the analysis of specific policy questions. This contract will test specific future enhancement program options--such as maintaining, decreasing, or increasing current enhanced salmon production levels, changing the current species mix, and maintaining or changing the location of enhancement projects--on the net economic benefits to fishermen and Alaskans. To the extent possible the analysis will differentiate the distribution of enhancement program net benefits among regions of the state. The results of this analysis will be a written report for the committee that will facilitate the development of public policy decisions.

Preliminary reports on the research being conducted under these contracts are to be submitted to the Legislature in April, 1992, and the final reports in June, 1992. The remainder of the Legislature's hatchery review project can move forward in the meantime. Information gathering and the formation of some conclusions, options and courses of action, regarding the other portion of the project can be accomplished independent of these economic studies.

CONCLUSION

In addition to providing information on Alaska's salmon enhancement programs, the models developed by the study could be used for evaluating other salmon management policy questions.

The total estimated cost of the research is \$58,000 which is approximately \$17,000 less than the UAA, Institute of Economic and Social Research proposal provided in May 1991. The reasons for

the estimated lower costs are that the hatchery cost model work would be done with current legislative and ADF&G staff.

The research does not include studies to develop new markets or products for Alaska salmon for a number of reasons. The time available is insufficient, the cost of reliable marketing studies is usually quite high, and the Alaska Department of Commerce and Economic Development (DCED), Division of Economic Development and the Alaska Seafood Marketing Institute (ASMI) are both initiating salmon marketing studies in response to this summer's lower salmon prices. Therefore, the legislative economics and marketing group plans to provide information to the legislature on the success of past state efforts to market Alaska salmon and coordinate with the DCED efforts to avoid research duplication and encourage the best possible information.

The research also does not include studies to estimate the net benefits of the salmon enhancement program to sport or subsistence users. Including these additional uses would significantly expand the scope and cost of the studies.

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CHAPTER X. MARKETING

As a result of the precipitous decline in Alaska salmon prices in 1991, Governor Hickel formed the Salmon Strategy Task Force. The purpose of the group was to identify the problems facing Alaska's salmon fishing industry and recommend state actions to address these problems. A primary focus of the task force was salmon marketing. The task force recently finalized its recommendations. To avoid duplication with the task force's efforts, it was decided that the Legislative review of the Alaska salmon enhancement program would analyze the economic costs and benefits of the enhancement program and review past state salmon marketing efforts. In addition, as part of the legislative review, the Salmon Strategy Task Force's final recommendations are summarized (a copy of the Task Force's report is attached).

INTRODUCTION

The Alaska Seafood Marketing Institute (ASMI) was established in 1981 as a quasi-state corporation in the Alaska Department of Commerce and Economic Development (DCED). The institute's statutory responsibilities include:

- To conduct educational, research, advertising, and sales promotional programs to increase awareness of all species of seafood and their by-products that are harvested in Alaska.
- To develop quality specifications to enhance the high quality image of Alaska seafood worldwide, and to adopt recommendations for the handling of seafood from the moment it is caught until it is shipped to the marketplace.
- To prepare market research and product development plans for all species of seafood and their by-products harvested in Alaska.

State statutes prohibit ASMI from favoring any region, product, or processor. For that reason, ASMI uses "generic" marketing campaigns aimed at enhancing the sales of particular "species" of fish or broad product categories (such as canned or frozen) rather than specific products. Also, because it is likely to favor individual processors, ASMI does not promote new products.

ORGANIZATION

Board of Directors

To accomplish its statutory mission, the ASMI organization consists of a board of directors, numerous committees, and a relatively small number of staff. Policy and program direction is set by the 18-member board of directors. The board membership consists of 12 fish processors, 5 commercial fishermen, and 1 public citizen. Of the 12 processors, 8 are to be appointed from "large processors" (annual Alaska payroll of \$1 million or more) and 4 are to be appointed from "small processors" (annual Alaska payroll between \$50,000 and \$1 million). Although not required by statute, the board has three non-voting ex-officio members: the DCED commissioner, and a legislator appointed from each chamber.

Committees

The ASMI committee system is extensive with the largest portion being a system of marketing committees. The primary marketing committee plans the generic Alaska seafood marketing program for the domestic market. Committee members include the chairs from the five individual species committees (halibut, shellfish, canned seafood, whitefish, and salmon), plus the chairs of the export and quality committees, and two board members. The philosophy of the primary marketing committee is to promote Alaska seafood through the development of long-term marketing goals and strategies.

Under the marketing committee are the five individual species committees. These committees generically address marketing concerns related to their particular species group. The philosophy of the individual marketing committees is to promote the species with short-term marketing goals and strategies that are consistent with the long-term goals and strategies of the marketing committee.

The quality and export committees develop industry guidelines for the care and handling of seafood and oversee the federal Targeted Export Assistance (TEA) program, respectively. The TEA program was developed to increase U.S. exports.

Most of the members of the marketing committees are marketing specialists employed by the fish processors represented on the ASMI board. Other committee members are representatives from fishery organizations that are knowledgeable about the fishing industry.

Staff

The ASMI executive director is selected by the board of directors and permitted to hire additional staff upon approval of the board. The central staff members include: communications manager, comptroller, quality coordinator, special projects coordinator, and office manager. In the past year, ASMI was authorized to hire four additional marketing specialists who had previously worked with ASMI as contractors.

ASMI FUNDING SOURCES

A portion of ASMI's funding is derived from a self-imposed seafood marketing assessment. All fish processors who purchase annually \$50,000 or more (ex-vessel value) of seafood pay an assessment of 0.03 percent of their total purchases. These assessments are collected in the state's general fund and are appropriated annually to ASMI. The balance of ASMI's funding is derived from state general fund and federal appropriations. Table 1 shows funding sources and levels since FY 82.

According to an ASMI briefing paper, ASMI has spent nearly \$35 million in the domestic market since 1981 in their "generic" seafood marketing program. Since FY 88, an additional \$24 million was spent in foreign markets, using federal funds and small state general fund matching appropriations. *Federal funding, which has increased as a result of the TEA program, is restricted to international marketing efforts.* In contrast, state general fund appropriations have declined in recent years. In addition, because processor contributions are based on ex-vessel values, the industry assessment will decline approximately \$600,000 in FY 92. Given the outlook for Alaska salmon

ASMI FUNDING HISTORY

(in millions of \$)

<u>FY</u>	<u>GF</u>	<u>Ind.</u>	<u>Fed.</u>	<u>Total</u>	<u>Domestic</u>	<u>International</u>
1982	2.07	--	--	2.07	2.07 (-overhead)	
1983	5.66	1.15	--	6.81	6.81 (-overhead)	
1984	2.57	1.29	.10	3.96	3.1	
1985	2.57	1.04	.34	3.95	3.3	
1986	2.6	1.0	--	3.6	3.15	
1987	1.93	1.49	.25	3.68	2.7	
1988	1.63	2.65	2.2*	6.48	3.22	2.4
1989	2.1^	3.3	5.2*	10.6	3.9	5.8
1990	2.2^	3.2	4.5*	9.9	3.8	5.1
1991	2.45^	2.7	8.78*	13.93	3.6	9.5
1992	2.1^	2.6+-	?*	??	3.0+-	??

TOTAL 27.88 20.42 21.37 64.98 38.65 22.8
 ^ This general fund total includes general fund matching dollars for the federal funds. The general fund match is used in foreign markets and is not available for domestic marketing. In FY89 and FY 90 the match was \$495,000 each year, in FY91 it was \$750,000 and in FY92 it is \$750,000.

* The federal fiscal year is different from the state fiscal year so the figures for the federal funds are not available on the same cycle as the state dollars.

Prepared by the Alaska Seafood Marketing Institute, no date.

prices, industry contributions can be expected to remain below historic levels. *State general fund appropriations and industry contributions are used primarily to fund domestic marketing efforts. As a result, ASMI will have fewer resources for domestic marketing at a time when the domestic market has been identified by analysts as having the greatest potential for increasing sales of Alaska salmon.*

EFFECTIVENESS OF ASMI'S MARKETING PROGRAM

When ASMI was established, the Alaska salmon industry provided most of the U.S. production and about half of the world production from wild and ocean-ranched salmon stocks. As a major supplier, the generic marketing of Alaska salmon was relatively effective. A recent Legislative Audit report evaluated whether there has been an increase in awareness of Alaska seafood since ASMI's inception. The audit report analyzed ASMI effectiveness based on the following criteria:

- *Perception that Alaska is the best region for seafood.
- *Awareness of Alaska as a seafood-producing region.
- *Positive beliefs/attitudes toward Alaska seafood.
- *Awareness of Alaska seafood advertising.
- *Association of seafood species with Alaska.
- *Awareness of seafood species.

The Legislative Audit review of market research provided by ASMI, concluded that increases had occurred in consumers' perception of Alaska seafood. In addition, consumers are more aware of Alaska as a seafood-producing region.

Despite these overall improvements in consumer perceptions and increased consumption of seafood, Alaska has lost a significant share of both the domestic and international salmon markets as a result of the tremendous growth in world farmed-salmon production. The dramatic rise in production and growing acceptance of farmed salmon as a source of fresh salmon represents the single greatest threat to the Alaska salmon market. The consistent year-round availability and quality of fresh, farmed salmon has made wild (and ocean ranched) Alaska salmon, with its short fresh season and quality and supply inconsistencies, a secondary choice for a large number of buyers. United States and foreign markets generally prefer fresh over frozen salmon.

According to ASMI board chair, Bob Waldrop, the large farmed-salmon producer nation of Norway spends about five cents per pound marketing salmon, while only one cent per pound is spent marketing Alaska salmon. *The new producers of salmon are out-competing Alaska producers in product preference, quality, availability, and marketing.*

Another problem is the fact that canned salmon production represents 59 percent of all retail salmon volume. U.S. per capita consumption of canned salmon declined 60 percent from 1980 to 1989, at the same time that harvests of pink salmon--the majority of which is canned--increased approximately 50 percent. Canned salmon suffers from an "old-fashioned" image with most younger consumers. The bones and skin also result in the perception that it is

inconvenient and unappealing. In foreign markets, canned salmon markets have declined primarily due to price effects.

Analysts who are critical of ASMI's marketing programs maintain that the "generic" approach promotes all salmon, regardless of origin, because Alaska products are not clearly identified in the market. They argue that without brand identification and a quality assurance program to guarantee that Alaska salmon is superior, generic marketing may actually be helping Alaska's competitors.

LABELING OF ALASKA SALMON

A recent Consumer Reports article attacking the quality of seafood sold in the United States has caused considerable concern within the Alaska fishing industry. The industry already faces difficult marketing challenges in a changing competitive environment. Despite its flawed methodology and lack of specificity, the report's potential impact on Alaska must be taken seriously.

The Consumer Reports article also illustrates the problem of insufficient labeling of seafood products when sold in retail markets. The salmon samples tested in the report could not be identified by species, origin, or whether it was wild or pen reared. The Alaska Seafood Marketing Institute has recently developed a new U.S. promotion of Alaska salmon in order to meet increasing market challenges. This promotion is to emphasize the freshness and purity of Alaska's wild salmon. However, without specific labeling of salmon products as to species, state of origin, and identification as to whether wild or pen reared, the effectiveness of such marketing will be reduced.

To address the labeling problem, the Alaska State Legislature sent a letter to the Alaska Congressional delegation requesting that they introduce federal legislation requiring the labeling of seafood products. Proper labeling will ensure that consumers can identify and select Alaska salmon, and provide better information and clearer choices in the market place. It would also reward those states that maintain strict quality control programs, such as Alaska, and ensure that the benefits of promotional efforts accrue to Alaska.

It should be noted that Alaska does have a statute that requires that any farmed salmon sold in the state must be labeled that it is farmed and is from outside Alaska.

THE SALMON STRATEGY TASK FORCE RECOMMENDATIONS

The Salmon Strategy Task Force finalized its recommendations on January 24, 1992. The Task Force's provided immediate, mid-range, and long-range recommendations which are summarized below.

Recommendations for Immediate Action. 1) ASMI should develop a budget and strategy for selling the existing inventory surplus of Alaska salmon; 2) processors and fishermen should initiate price negotiations early; 3) The University of Alaska, DCED, and ADF&G should provide the best possible information to fishermen regarding world salmon markets; 4) DCED should review Prince William Sound processing capacity; 5) DCED and the Alaska Commercial Fishing and Agriculture Bank (CFAB) should provide loan extensions as needed.

Mid-Range Recommendations. The mid-range recommendations include actions for product and market development, salmon quality, and marketing and a review of ASMI's role.

Long-Term Recommendations. The long-term recommendations include the development of a strategic plan to help strengthen the fishing industry and its support sector. This includes an integrated marketing and production strategy, a review of loan and limited entry permit policies, a review of ASMI, a review of fish tax policy, and the reduction of regulatory burdens to lower costs. ASMI's Salmon Recovery proposal is included in the Task Force's long-range recommendations as well as its recommendations for immediate action. This proposal is discussed in the following section.

The ASMI Salmon Recovery Proposal

One of the recommendations of the Salmon Strategy Task Force is ASMI's Salmon Recovery Proposal. According to an ASMI briefing paper, the *goal* of the Salmon Recovery Proposal is to increase annual per capita U.S. salmon consumption from 1 to 1.5 pounds. This increase would absorb an additional 119 million pounds of salmon each year or about 15 percent of Alaska's annual production. Of the expansion, 60 percent would be frozen and 40 percent would be canned salmon.

The *strategy* of the program would be a combination of consumer and trade education and advertising, direct trade contacts, and other promotional methods used by ASMI over the last decade. Instead of patchwork, crisis-response marketing, this would be an integrative approach tying all marketing elements together. The basis for the marketing effort comes from a number of core issues identified by ASMI. These include:

- *trade and consumer preference for fresh salmon,
- *decreased consumer consumption of canned salmon,
- *low consumer knowledge and awareness of Alaska salmon products,
- *negative consumer perception of quality of frozen and canned salmon,
- *limited regional and seasonal purchases of Alaska salmon,
- *limited food-service use of Alaska salmon, especially canned,
- *fluctuating supply and prices of Alaska salmon, and
- *increased competition.

It is unclear from ASMI's information how consumer and trade preference for fresh over frozen and canned salmon is expected to be changed. It appears that efforts will be made to increase overall salmon consumption while convincing purchasers that Alaska frozen and canned salmon are also high quality products. To avoid merely expanding the farmed-salmon market, central to ASMI's recovery program is an Alaska salmon product identification promotion using a logo or seal of origin. This is similar to the "Alaska Made" program.

ASMI does have a record of success. As a result of direct marketing, Alaska canned salmon exports to the United Kingdom increased from 370,000 cases to 946,500 cases between 1989 and 1991. However, unless this product identification campaign is very successful and/or ASMI's generic marketing approach is modified, there is significant risk that the Salmon Recovery Program could benefit international farmed-salmon producers as much as it would the Alaska industry.

The *cost* of the proposal is \$10 million annually for five years, totalling \$50 million. A lower annual amount would be needed after the first five years to sustain the marketing effort. ASMI has identified some potential sources of funds as follows:

- 1) state general fund appropriations,
- 2) a raw fish tax credit,
- 3) an endowment from the *Exxon Valdez* settlement as part of the restoration agreement,
- 4) a redirection of salmon enhancement taxes paid by fishermen to regional aquaculture associations, and
- 5) a combination of the above sources.

In reality, a raw fish tax credit amounts to an indirect state appropriation because a small amount (0.03 percent) of the foregone general fund fish tax revenues would then be paid in the form of industry processor contributions. Unless the legislature deems that a well specified and directed raw fish tax credit is desirable public policy in and of itself, a direct state general fund appropriation to ASMI is a superior method for funding the proposal.

Regarding a redirection of the enhancement tax, ASMI states that Alaska does not have a salmon production problem but a salmon marketing problem. While this may be true, the pass-through salmon enhancement taxes pay for the operation and/or repayment of state loans for salmon enhancement projects. As a result, this funding source is also an indirect state appropriation---the funding the aquaculture associations would forego would reduce payments on state loans and/or require additional operating loans. In general, if the legislature supports the salmon recovery proposal, a direct appropriation would be the best fiscal approach for funding the program.

Senator Jones has introduced legislation to appropriate \$10 million to ASMI for domestic salmon marketing efforts during Fiscal Years 92 and 93.

ALTERNATIVE PROPOSALS TO INCREASE MARKETING EFFORTS

Proposed Changes to Alaska Statutes:

A number of pieces of legislation have been introduced to address the salmon marketing problem. The general intent of the legislation is to provide funding for the immediate increased promotion of Alaska salmon and to increase the voice of fishermen in those marketing efforts either through changes to ASMI or creation of a new salmon marketing association. Funding for increased marketing efforts would be provided through temporary marketing assessments.

- Representative Gene Kubina has proposed legislation to create six regional salmon marketing committees and the Alaska State Salmon Marketing Association. Two fishermen from each committee would sit on the association. Funding for marketing efforts would be provided through a 1 percent marketing tax on value of salmon landed.
- Representative Dave Choquette introduced legislation that would expand ASMI's statutes to allow for targeted development of Alaska salmon markets and product development.
- Representative Bill Hudson introduced legislation that would impose a temporary one percent (1%) marketing tax on the value of salmon landed and increase the ASMI Board of Directors by two positions that must be filled by commercial fishermen.
- Senator Dick Eliason introduced a bill that would establish a temporary one percent (1%) salmon marketing tax and a committee within ASMI to provide fishermen with control over how the funds would be expended.
- Representative Cliff Davidson and Senator Fred Zharoff have introduced legislation that would endow the Alaska Fisheries Development Foundation to fund fisheries development research projects.

Development of a Salmon Marketing Council

Under the federal Seafood Promotion Act of 1986, after rigorous fisherman and processor review and approval, a salmon marketing council could be developed to increase the U.S. marketing efforts of salmon. If properly organized and chartered, a "National Salmon Council" would have the power to assess industry participants for funds to be used for salmon promotion and marketing, product research, and consumer education. The council would also be able to develop and offer salmon quality standards for U.S. Department of Commerce approval.

Marketing Efforts by Groups Such as PWSAC

Recognizing the need to develop markets for their very successful salmon hatchery production, PWSAC has established a product development strategy.

As part of this development strategy, in the short-run PWSAC would like to: (1) pre-sell all 1992 cost-recovery fish, (2) ensure the utilization of all cost-recovery fish, and (3) negotiate one-to-three year contracts for the sale of fish. PWSAC does not intend to tie price contracts to anticipated ex-vessel prices and would like any contractual agreements to require primary processing in Alaska. *In the long term, PWSAC would like to facilitate pink salmon product development to provide price and supply stability and continuity, and to facilitate state research on new product forms.* PWSAC would use cost-recovery fish to achieve these objectives.

The primary marketing obstacle identified by PWSAC is processing capacity---getting the fish out of the water as whole frozen fish. While there is sufficient canning processing capacity in the Sound, the decline in canned salmon markets results in

little demand for the abundant pink production by canning processors. PWSAC has identified potential buyers of frozen pink salmon, but there is insufficient freezer processor capacity to ensure product delivery. PWSAC had hoped to utilize floating processors via the coordination of the groundfish trawl season regulated by the North Pacific Fisheries Council. While this will not occur during the 1992 season, it is an option PWSAC will continue to pursue for future seasons.

OPTIONS FOR POSSIBLE CONSIDERATION:

- Review of the state's role in the marketing of Alaska seafood, and salmon in particular, including a review of the ASMI program.
- Given that ASMI's generic approach to marketing was statutorily established prior to the significant increase in world farmed-salmon production, expansion of ASMI's statutes to reflect changes in world salmon markets. In particular, ASMI's marketing efforts could be expanded to include new product and market development, including targeting and distribution of salmon products at the wholesale and retail levels.
- Providing funding for ASMI's Salmon Recovery Proposal.
- Supporting the Salmon Strategy Task Force's recommendation that ADF&G review the impact of fisheries management practices on fish quality, especially related to the quality of cost-recovery fish harvested in terminal areas.
- Conducting a comprehensive analysis of ASMI privatization including whether 1) privatization would provide greater flexibility and possibly more effective marketing and 2) privatization would result in the loss of control over marketing activities to the detriment of Alaska and Alaska fishermen.
- Encouragement of the development of a national salmon marketing council.

Salmon Strategy Task Force Recommendations



**Walter J. Hickel, Governor
Commissioner Glenn A. Olds, Chair**

**State of Alaska
Department of Commerce and
Economic Development
Division of Economic Development**

JANUARY 24, 1992

INTRODUCTION

Governor Hickel appointed the Salmon Strategy Task Force on August 15, to investigate the reasons for the 1991 salmon crisis and to review options for industry stabilization and recovery.

Alaskans should be proud of the courage of the people and companies that started this industry years ago. The people and lifestyle of the salmon industry are a fundamental part of Alaska's history, culture and way of life.

Alaska has been the world's leading supplier of salmon. The state's salmon industry now faces strong competition from many other sources and its dominant role is threatened. Traditional markets are no longer dependent on Alaska for their needs.

The entire world is producing salmon at a record rate. For many years, Alaska's salmon industry enjoyed a market strategy based on allocating scarce resources among competing customers. In less than a decade the entire system has changed. Now the competition in both traditional and developing markets is intense, and it's likely to stay that way.

In order to compete, and indeed survive in this new environment, it is essential that all participants in the industry recognize and accept the reality of these competitive changes. The industry is facing a crisis of considerable magnitude, requiring decisive short term action and long term action to prevent the crisis from recurring.

The 1991 salmon season has forced us to recognize that the Alaska salmon industry is at a crossroads. As with many other industries in America, we must recognize that traditional business practices are no longer adequate in the face of global competition. Reevaluation and action are required.

The Salmon Strategy Task Force has made several immediate and long-term recommendations which should alleviate the immediate crisis, help stabilize the industry, and plot a course to regain our leadership role in the marketplace.

The effects of the decrease in salmon prices are profound, putting at risk state loan programs, community stability, and tax revenues to all levels of government. The seafood industry is the state's largest private sector employer, with the largest resident private sector payroll. The failure of the state and the industry to take decisive action will result in continued weakness in this economic sector and put increased demands and safety net programs.

These will not necessarily be easy changes to make. It will take a substantial commitment of time, hard work, and money. We ask that the Administration, the entire salmon industry and the Legislature work together to support the implementation of these recommendations.

Charge to the Task Force

Governor Hickel's charge was to develop a strategy to generate maximum economic return to Alaska fishermen, processors, and the state as a whole, consistent with wise use and conservation of the resource. The Task Force is to make specific recommendations to the seafood industry, the Administration and the Legislature.

The group was to focus on methods to maintain existing markets, develop alternative markets and product forms, promote secondary processing, develop necessary infrastructure, coordinate production and marketing strategies, improve salmon quality control, optimize fish tax policies and improve fish harvesting and processing efficiency. The Task Force also delineated existing salmon markets and collected and distributed information to assist fishermen and processing companies in reaching agreement.

Conditions requiring study

The major factors distressing the industry are greatly increased competition, high inventory levels, low prices, and projections of continuing high production levels. The runup in prices 1986-1988 followed by declining prices since have left many fishermen with debt loads they cannot support. The declining markets have hurt processors, exporters, and end users holding product in a declining market as well. These factors led to serious price disputes and charges of price fixing in some quarters as the 1991 season developed.

The market outlook for the 1992 season may improve somewhat for sockeye, but extremely high inventory levels remain for pinks. These species represent the vast majority of Alaska production value and volume. The early, very tentative prognosis from Fish and Game is for another big production year.

Inventory of issues

An initial questionnaire went out to 350 recipients of the Alaska Fish and Game weekly catch reports in mid July. This was followed by a second mailing of 125 in late July that added all Alaskan salmon fishing organizations, processors and legislators. The mailing solicited opinion on the issues the Task Force should address. Some 70 responses (a 15% response rate) were received. Staff collated the responses and summarized them. These responses were then categorized under nine headings for presentation to the Task Force.

Selection of Task Force

The Governor announced the membership of the Task Force on August 15. It includes broad representation from the salmon industry, appropriate state agencies, and the general public. The group provides a good cross section of the industry and policy makers in state government, while main-

taining reasonable geographic balance and a practical size. The members are:

Honorable Richard Eliason of Sitka,
President of the Alaska Senate,
and a Southeast Alaska fisher;
Honorable Fred Zharoff of Kodiak,
Chairman of the Alaska Senate Rules
Committee and a Bristol Bay fisher;
Honorable Eugene Kubina* of Valdez,
Chairman of the House State Affairs
Committee;
Commissioner Glenn Olds,
Alaska Department of Commerce and
Economic Development;
Commissioner Carl Rosier*,
Alaska Department of Fish and Game;
Mr. Ed Crane*,
President of the Alaska Commercial
Fishing and Agriculture Bank;
Dr. Jerome Komisar,
President, University of Alaska;
Mr. Richard Lauber,
Vice President, Pacific Seafood
Processors Association;
Ms. Hazel Nelson*,
President, Becharof Corporation,
and Bristol Bay fisher;
Mr. Greg Seider*,
Executive Director, United Fishermen of
Alaska;
Ms. Sandra Tavanis*,
Co-owner, Sea Hawk Seafoods, Valdez;
Mr. Bob Van Brocklin,
Prince William Sound Aquaculture
Corporation; and
Mr. Robert Waldrop,
President of the Board, Alaska Seafood
Marketing Institute, and Vice President,
Silver Lining Seafoods, Ketchikan.

* Editorial Committee

Calendar of work

The Task Force met four times, August 29, October 7, November 1, and November 22. Agendas and summaries of the meeting minutes are contained in appendices to the full report.

At the first meeting, the Task Force selected which of the issues raised in the extensive mail-out solicitation to pursue. Five of the original nine survived; product and market development, reducing costs of production, getting reliable information, improving quality, and marketing salmon and ASMI's role. It also became clear there were several myths at work clouding the issues. Staff reworked the five issues passed by the Task Force in the first meeting into problem statements before the second meeting.

The second meeting started with presentations on various myths, including "everyone's making money but me," "it's all just a Japanese conspiracy," and "we should stick to business as usual, the customer just thinks they want something different." The Japanese market, salmon prices, margins and costs at various points in the industry, and ASMI's mission were discussed. The Task Force made changes to the problem statements and staff followed up the second meeting with extensive interviews of Task Force members and other experts to lay out the facts and options available to address the problems. A sixth problem was isolated and addressed in this process, the need for strategic planning. The persons interviewed, the questions asked and the options identified are in the full report appendix.

The third meeting started with presentations of the interview results and options gathered. The interview results form the main body of the full report. The Task Force then ranked the options available at that time. Some options were dropped. Staff reworked the options into general, specific, and detailed lists, and prepared a draft outline for the report.

The fourth meeting consisted of preparing some new recommendations for immediate action, and reworking the options that passed muster at the third meeting into the recommendations that follow. Some items were dropped. An editorial committee was appointed to oversee production of the report (see footnote above), and a schedule established for completion of the report.

Recommendations

The Task Force recommendations take into account budget cycles and priorities. In many cases requiring state agency action, existing budgets are not adequate to perform the recommendations. Additional funding will be required, not reprogramming of existing budgets. The Task Force expects the relevant agencies to prepare the necessary budget information, and respectfully requests full and favorable consideration by the Administration and Legislature.

RECOMMENDATIONS FOR DEALING WITH THE IMMEDIATE CRISIS

1. The Alaska Seafood Marketing Institute (ASMI) should develop a budget for immediate funding to deal with the existing inventory surplus before the 1992 season and projected 1992 production. This must be implemented as soon as possible¹.
2. Processors and fishermen should initiate market discussions early. The Task Force recognizes that the market situation will be uncertain at that time, and that the risk involved will lead to low price suggestions from processors, but recommends early discussions to provide maximum information sharing and opportunity to reach agreement. The Department of Labor (DOL) should be prepared to bring in knowledgeable mediators if necessary.
3. The University of Alaska (U of A), Commerce and Economic Development (DCED), and Fish and Game (ADF&G), should initiate and/or support efforts to expose the broadest possible range of Alaska fishermen to credible and detailed information about recent and ongoing changes, including problems and opportunities, in the world markets for salmon.³
4. The DCED Division of Economic Development should review the processing capacity situation in Prince William Sound, taking into account the outcome of the 1991 season, and make preliminary findings available to the Governor (and the industry) as early as is practicable. The Task Force recognizes that the capacity problems that developed in Prince William Sound were the result of the fishery being late and very concentrated, and the fish being relatively dark and small.⁴
5. The DCED Division of Investments and Alaska Commercial Fishing and Agriculture Bank (CFAB) recognize the crisis caused by low prices and the effect this has on loan payments. The Task Force encourages them to actively seek out fishermen having problems and work with them on loan extensions and other measures to minimize foreclosures.⁵

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1. The immediate ASMI program should be geared to long-term domestic market growth. The Governor could include this amount in his budget request, including a request for exemption from procurement codes for this emergency funding. The Legislature could pass this supplemental funding out as soon as possible in the session. ASMI could reprogram funds to initiate the campaign as soon as possible, prior to release of the funds, consistent with prudent financial management.
 3. Provide reasonably detailed but clearly written information on prices and markets for salmon for widespread distribution in the spring of 1992 and thereafter. The information could be updated in season. A goal should be to establish a clearer understanding of the effects of market conditions and dynamics on prices.
 4. DCED could prepare a supplemental budget to cover the costs of doing the necessary surveys for the PWS capacity determination.
 5. Reinstatement of state funding for the ABDC (Alaska Business Development Centers) program of outreach and business assistance in rural areas has been identified as an important component in dealing with financial hardship. This organization provides one-on-one assistance with loan workouts and dealing with the IRS that is not available elsewhere.

MID-RANGE RECOMMENDATIONS

General

1. The DCED, ADF&G, and Department of Labor (DOL) should consider promoting a closer and more trusting relationship among the interests involved in the issues concerning Alaska's salmon industry. This effort should be closely coordinated with other ongoing educational and consensus building efforts.¹

Product and Market Development

2. The Alaska Science and Technology Foundation (in fisheries area), and the U of A's Fisheries Industrial Technology Center, and Marine Advisory Program should be encouraged to expand their efforts in salmon product and market development and to coordinate their efforts in providing technical assistance and research and development in salmon products through the Alaska Fisheries Development Foundation (AFDF).²
3. The DCED's ability to provide international marketing information and sales assistance should be expanded. The Department's Division of Economic Development and Office of International Trade should work closely with ASMI and the Alaska Center for International Business (ACIB) to reduce risk and costs to the private sector.³
4. The DCED, ASMI and the Marine Advisory Program's ability to assist domestic marketing should be expanded. The Department's Division of Economic Development work closely with ASMI to reduce risk and costs to the private sector.⁴

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1. In the consensus building efforts, the agencies could organize forums and/or participate in existing trade shows and conferences. The issues examined by the Salmon Strategy Task Force could be presented and discussed with the objective of developing a consensus about the direction the state should take in the future regarding the harvesting, management, promotion and marketing of Alaska's salmon.
 2. AFDF has in place a proven industry board and ability to perform, but will require administrative funding to continue operations. Salmon industry representation on their board should be expanded.
 3. Specific projects could include:
 - Work to reduce tariff barriers for Alaska seafood products overseas.
 - Encouragement to foreign reprocessors to purchase or joint venture value-added production in Alaska.
 - Continuing investigation of new markets for salmon overseas where disposable income is high enough, and seafood is commonly eaten.
 4. These entities could reduce risk and costs to the private sector of expanding domestic markets through:
 - Working with food service entities in Alaska and other states to promote sales and distribution of Alaska salmon products.
 - Providing start-up technical assistance to new ventures.

Quality

5. The Department of Fish and Game should reexamine management practices with the goal of obtaining the highest quality pack possible without harming the stocks.⁵
6. The Department of Fish and Game should conduct a comprehensive study in Southeast Alaska and Prince William Sound, with the cooperation of fishermen and processors, to determine the degree of risk managers should take in managing for economic efficiency and fish quality. The goal would be to identify the optimum locations for harvest.⁶
7. Industry and the Department of Fish and Game should cooperate on a program to educate fisheries managers, fishermen and industry operators on the physiological changes that occur in salmon (and hence its marketability) to encourage management that provides for the optimum use of the resource.⁷
8. Hatcheries should conduct research to determine the cause for variations in sexual maturity and other quality factors for stocks returning to hatcheries. Based on the research, hatcheries should modify their stocks and practices to optimize quality.

Marketing and ASMI's Role

9. ASMI, the FITC and the Marine Advisory Program (U of A) should expand educational programs on fish handling, cleaning, chilling, and processing for virtually all parts of the industry. Such efforts should focus on providing hands-on training from the fishing boat to the market, and on meeting the needs of the consumer for quality seafood. The effects of quality handling on the ability to market the end product should be emphasized.

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5. The reexamination of management practices could include changes in the length of openings and the timing of fisheries to optimize salmon quality. The Task Force recognizes that Fish and Game may need statutory and regulatory changes to incorporate such considerations in management decisions.
 6. A controlled set of experiments to determine the optimum points of harvest for top quality could include:
 - a. testing the condition of fish to determine rates of deterioration in terminal harvest and outer areas, throughout the duration of the run; and
 - b. identifying the optimum location which will provide the highest quality of salmon with an acceptable risk to the wild stocks.
 7. A study to examine the effects of sexual maturity on finished product quality could include the following:
 - a. samples in each of the categories in ASMI's Color Guide and hatchery broodstock would be collected;
 - b. portions of each category would be processed at least as headed and gutted, filleted and canned products; and
 - c. the end products would then be used in a workshop setting to educate managers on the various aspects of salmon quality.

The Task Force recognizes that a similar program budgeted at \$25,000 was considered and set aside by the ASMI board, and that it may be possible to achieve the same ends using commercially-processed products. ADF&G should prepare a budget item if necessary.

10. The Department of Commerce and Economic Development should initiate and/or encourage efforts to expose all salmon fishermen to organized, accurate and credible data concerning the salmon industry and markets in sufficient form and detail to permit fishermen's consideration of a national salmon marketing council chartered by the U. S. Secretary of Commerce under the Federal Fish and Seafood Promotion Act of 1986.¹⁰

LONG-TERM RECOMMENDATIONS

GENERAL GOAL

The state needs to develop a strategic plan for long term development of the salmon (seafood) resource, using recommendations of this task force as a starting point. This should focus on strengthening the support structure and sustainability of the industry. The goal would be a more rational and efficient system which is less vulnerable to market, production, and financial fluctuations. This would ensure an integrated and uniform state approach to the fishing industry.

OBJECTIVES:

- review and evaluate the institutions and relationships developed in the industry with an eye toward improving competitiveness and economic return to Alaska residents.
- bring together agencies and functions to affect a rational, consistent and sustainable program linking production, harvesting, processing, marketing and financing.
- determine the proper roles for the public and private components of the industry, integrating regulatory and developmental activities.

ACTION ITEMS

General

1. The Department of Commerce and Economic Development, in cooperation with other state agencies and the salmon industry, should organize a group with broad experience and understanding, in aggregate, of food and commodities industries, to:

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10. The Federal Fish and Seafood Promotion Act of 1986 provides that species-specific councils (roughly parallel to the National Beef Council, etc.) may be formed only after a rigorous referendum process which must include all salmon harvesters and all primary processors or harvest purchasers and may include other industry participants. If properly organized and chartered, a "National Salmon Council" would have the power to assess the industry participants for funds to be used for salmon promotion and marketing, product research, consumer education, etc. It would also have the power to develop and offer, for Department of Commerce and Economic Development approval, salmon quality standards.

- a. review the functional and procedural workings of the Alaska seafood industry;
- b. identify areas of inefficiency, counter-productivity and resource waste.
- c. review and evaluate research and development capabilities.
- d. recommend what state resources, including statutes, regulations, prestige, etc., can and should be applied to address those areas.

Fish Production

2. DCED, ADF&G, and ASMI should develop an integrated production and marketing strategy, which would:
 - a. recognize marketability of the fish as an important management goal.
 - b. recognize that price will be set by overall supply and demand, including the production of farmed salmon.
 - c. coordinate production with wider economic goals, including processing, product development, and markets, based on dependable information and planning.
 - d. better coordinate wild and hatchery production, regionally and by species and market.

Harvesting/Processing

3. The Commercial Fisheries Entry Commission, DCED, and DF&G, should develop fishery management and regulatory measures aimed at reducing operating costs, more efficiently utilizing present investments, and promoting a rational sustainable industry. Investigate ways to retain permits in Alaska and rural areas in particular, provide greater stability and enhanced revenues to resident fishermen, and increased shoreside investment consistent with sound financial standards, through:
 - a. reexamination of loan policies and permit use limitations.
 - b. reexamination of Alaska's limited entry system.
4. To widen options for Alaskan fishermen, DCED, in cooperation with other state agencies and the industry should consider promoting Alaskan controlled joint venture processing developments linking present investors and industry participants with new technologies and capital, and Pacific Rim and lower 48 markets. Give special attention to rural communities dependent on the salmon resource, smaller plants, local consumption and market needs, infrastructure needs, and current economic development plans.

Marketing

5. DCED should contract a major marketing research firm with proven credentials in food marketing to develop and analyze the "facts" related to salmon market trends, opportunities and weaknesses in major and potential markets. The group should also evaluate the state and industry's marketing efforts, including consideration of changes in the ASMI statute or operations, to permit, if possible, a more effective approach to marketing Alaska seafood.³
6. The Governor and Legislature should consider funding ASMI's \$10 million per year proposal for an intensive 5 year domestic marketing campaign. The goal is to raise domestic consumption of salmon from 1 to 1.5 pounds per person annually.
7. DCED, in cooperation with ASMI and DEC, should conduct a study to find the most cost effective ways to improve consumer confidence in Alaska seafood products. The Task Force recognizes that the entire seafood industry must improve the inherent quality of the salmon it processes, the freshness and workmanship of the product, and the consistency of grading to remain competitive, particularly when competing with farmed salmon.⁷

Finance/Other

8. DCED, in cooperation with other agencies and the industry, should readdress the issue of infrastructure including but not limited to improving quality, providing cold storage capacity, and promoting value added production.
9. OMB, in cooperation with state agencies and the industry, should reexamine the policy and implementation of fisheries taxes, including the corporate income and marine fuels taxes. The State must first decide what it wishes to accomplish by taxation. While this is nominally raising revenues, any tax distorts the market in some way, and a review of the current tax structure and various proposed alternatives is in order. Of particular interest is whether targeted tax credits for research and development expenditures is feasible.

Reducing Costs and Regulatory Burdens

1. The Departments of Fish and Game and Revenue should consider combining the appropriate processor annual report forms to simplify reporting requirements for the industry. This should be done at an agency level with the agencies sharing information from each form or integrating them, and may require statutory changes.
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5. The efforts should take into account what's already been done (Salmon 2000) and focus on those areas outside ASMI's assigned and traditional role, including new product and market development. The results must be produced in a form which will permit evaluation and initiation of strategies to further enhance and stabilize markets.
 7. A great deal of the input the Task Force received identified the lack of consistency in Alaska salmon products as a major marketing problem. Some Alaska product has been described as "low quality" compared to the competition. As Alaska's products become better identified in the marketplace, the Task Force recognizes that "Alaska brand" seafood must be of "good" quality, and meet the customers' expectations if customer satisfaction is to be achieved and advertising dollars well spent. Exactly how to determine those inherent quality standards, and how to ensure that the customer consistently gets the product they have purchased and expect could not be reconciled. The industry is divided on how large a role the state should play in determining quality, ranging from mandatory grading standards to no standards beyond wholesomeness.

2. The Department of Commerce and Economic Development, in cooperation with other affected agencies and the industry, should investigate ways to assist small operators in meeting the myriad regulatory requirements of various agencies. This might range from exempting processors under a specified size from filing certain forms to providing a central clearinghouse for permitting and filing information, technical advisory services and special loans for equipment such as computers and computer software.
3. The relevant state agencies should, in consultation with the Limited Entry Commission, collect child support payments from permit holders at the time of yearly permit renewal. Permit holders will be motivated to pay this fee and it will not unfairly burden processors.
4. The Departments of Revenue and Labor respectively, should relieve the burden of prepayment of the Fishery Business Tax and provision of Labor bond for companies with proven payment records and sufficient assets.

SCOMM

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CHAPTER XI. OTHER ISSUES

A. USE OF HATCHERIES AS ENVIRONMENTAL MITIGATION

Hatcheries are sometimes built with the goal of mitigating environmental damage caused by such things as construction of dams and other projects, and water pollution. The goal of environmental mitigation has been a driving force in salmon hatchery development in the Pacific Northwest, particularly in association with dams on the Columbia River.

In contrast, Alaska's hatchery system has been developed for fisheries enhancement, mitigation of the effects of over-fishing, and the offsetting of reductions in fishing quotas for Alaskan fishermen negotiated as part of the U.S./Canada Salmon Treaty. However, Alaska law does contain several provisions regarding use of fisheries enhancement projects as a means of mitigating environmental damage. The primary one is the "Fishways Act."

Alaska Statutes 16.05.840 through 860, referred to as the "*Fishways Act*," gives the Commissioner of Fish and Game the authority to require the builder of a dam or other obstruction across a stream containing fish to provide and maintain a fishway or other device for fish passage. Where a fishway is not practical because of cost, the builder of the obstruction can choose among several other mitigation options with the approval of the commissioner. The options include:

1. Paying a lump sum to the state Fish and Game Fund;
2. Conveying land and funding the building, maintenance and operation of a fish hatchery, rearing ponds, buildings and other facilities; or
3. Agreeing to provide money (both initially and in annual payments) to expand, maintain, and operate additional facilities at existing hatcheries within a reasonable distance of the dam or obstruction.

The Fishways Act was passed in 1959. Since that time, other environmental protection laws and regulations have been enacted setting water quality standards and regulating the types, locations, designs, and allowability of development projects. The *Anadromous Fish Act* (AS 16.05.870) is especially important as it spells out requirements for pre-approval of any projects which could potentially impact fish or fish habitat. This Act and other environmental protection requirements work in conjunction with the mitigation requirements in the Fishways Act.

According to the Department of Fish and Game, the requirement to provide a fishway, either as a permanent structure or as a temporary one during construction, logging, or other work, is used frequently. The State often requires construction of spawning channels in streams that are being disturbed by such things as highway projects. *Although the other provisions of the Fishways Act which require construction of hatcheries or monetary compensation are rarely imposed, state officials believe their existence in statute encourages modifications in project plans that will avoid the actual stream obstruction and serious risk to fish that would activate these very expensive mitigation measures.*

Obviously, preventing damage to fish and fish habitat in the first place is the simplest and most practical means of ensuring the health and ongoing availability of fish. State and Federal officials are charged with making every effort to ensure that the siting, planning and construction of any development project is done in a way that avoids or minimizes potential damage. *Realistically, however, development will occur which will damage fish and fish habitat. In*

those cases where environmental protection methods, even fishways, cannot prevent that damage, mitigation of some sort is usually required by law. In other states and countries, hatchery production has indeed provided enough fish to keep some commercial and sport fisheries alive, at least for a time, that would otherwise have been curtailed due to a lack of fish. This is particularly true in areas where major dam projects or pollution have completely changed or destroyed salmon habitat and spawning patterns. To fishermen in an affected area, hatcheries seem better, at least initially, than no mitigation at all.

While salmon and steelhead hatcheries do produce fish to offset declines in natural runs, there is increasing concern among some scientists in the Pacific Northwest that under some circumstances hatcheries may actually cause the further depletion of already suffering natural stocks, even to the point of extinction. These concerns are further addressed in Chapter VII of this report, regarding biological and genetic issues.

It is important to note how the federal Endangered Species Act (ESA) relates to the matter of using hatcheries as a means of mitigating environmental damage. In the state of Washington, where hatcheries have been used extensively with mitigation as a goal, scientists and fishermen are concerned that regardless of how productive hatcheries might be, they cannot prevent the federal government from invoking the provisions of the ESA if particular stocks are declared endangered. Indeed, the National Marine Fisheries Service (NMFS), which has jurisdiction over endangered species, proposed in 1991 that one stock of Snake River sockeye be listed as endangered under the ESA, and that two stocks of Snake River chinooks be listed as threatened. Decisions on two more salmon stocks (in the Snake and Columbia Rivers) are expected soon.

The Washington Legislature is considering legislation to address issues which have arisen from the application of the ESA to Washington's salmon. These issues include salmon habitat, wild stock protection, tagging of hatchery stocks, and how to define "species" or "stocks" of fish. (See Attached information).

Declaration of a salmon stock as "endangered" can have enormous impacts on fisheries and local and state economies. Since salmon are migratory, any restrictions placed on fisheries to protect a particular stock could affect fishing hundreds or even thousands of miles from the spawning area of that stock.

The Endangered Species Act in effect sets the parameters within which hatcheries can be used to mitigate environmental damage. The Act does not recognize the creation of strong runs of one stock of salmon, through hatcheries or other enhancement efforts, as adequate compensation for the destruction of another stock. If a natural stock is at risk of becoming "endangered," the ESA will not allow for hatcheries to serve as a substitute for damaged habitat. The end result is that efforts to mitigate damage through hatcheries can backfire, closing down fisheries rather than enhancing them, if the hatcheries contribute to the further depletion of a stock. *Thus, to avoid the impacts of the strict protective measures which can be imposed under the ESA, primary concern must be focused on preservation of wild stocks.*

It should be noted however, that in some instances, such as where dams have irreparably destroyed the ancestral habitat of a particular salmon stock, a carefully designed hatchery or other enhancement project may represent the only hope for survival of that stock. For the purposes of ESA, federal law defines "conservation" as including "propagation" if it is necessary to help an endangered or threatened species recover. *Thus, while the ESA serves as a warning against hatchery development that could deplete natural stocks, it also recognizes the potential usefulness of hatcheries in the ultimate survival of an endangered stock.*

Judgement about how effective hatcheries can be for "mitigating environmental damage" must be made on a case by case basis and with a recognition that mitigation is just that, a means of minimizing or offsetting some of the change or damage. Hatcheries can produce new harvestable salmon, but they do not generally repair or duplicate a damaged resource. Hatchery production of fish is an expensive ongoing commitment. The use of hatcheries to mitigate damage must be employed with the understanding that salmon which have been provided "free" and perpetually by nature, are being replaced by salmon that will initially and continuously cost money to produce. This cost, along with the possibility that hatcheries may harm remaining natural stocks, must be realistically considered and weighed in each case, against what is to be gained through the project that will cause the damage and set the mitigation effort into motion.

OPTIONS FOR POSSIBLE CONSIDERATION:

- Re-evaluation of the state Fishways Act and Anadromous Fish Act in light of the provisions of the federal Endangered Species Act.
- Evaluation of whether specific consideration of potential consequences of the ESA should be required before the commissioner can pre-approve a project (under the Anadromous Fish Act) or approve of mitigation measures (under the Fishways Act).
- Tracking the current and upcoming debate and actions occurring in other areas, particularly the state of Washington, regarding environmental mitigation of damage to fish habitat. Determine the relevance of findings to Alaska.

B. ROLE OF HATCHERIES IN INTERNATIONAL TREATIES

U.S./Canada Pacific Salmon Treaty

After many years of negotiation, the United States and Canada signed a treaty in 1985 regarding the interception of Pacific Salmon. *The primary goals of the treaty were to protect and rebuild depleted salmon stocks, assure the long-term viability of salmon stocks within the jurisdiction of the treaty, and bring equity by providing that each country receive benefits from the fisheries which are roughly commensurate with their respective production of salmon in the treaty area.* Fisheries management guidelines for the region covered by the treaty (Oregon, Idaho, Washington, Southeast Alaska and British Columbia, Canada) are provided in a series of annexes to the treaty which are renegotiated on a regular basis. The annexes establish baseline-harvest numbers for many areas but the authority over allocation of fish between user groups within specific areas is maintained by the respective states, provinces, and tribes.

In 1983, a tentative treaty agreement was reached, but Alaska fishing groups found the provisions to be unacceptable and the treaty was not signed. Concerns centered on the concessions to be made by Alaska in the treaty. The reduction in the level of chinook salmon that Alaska trollers would be allowed to harvest was especially controversial. Key to the eventual acceptance of the treaty by Alaska was an offer by the U. S. federal government to give Alaska approximately \$20 million for salmon enhancement to help offset impacts of the treaty. *This mitigation money was not part of the negotiated multi-party treaty. It was a separate agreement between Alaska and the U.S. federal government, offered fundamentally as an incentive to Alaska to agree to the treaty.*

Under the terms of the treaty, Alaska hatchery fish caught after 1985 were not to be counted as part of the negotiated quota of allowable catch, and could be taken in addition to that quota. *While everyone involved seemed to understand that the federal mitigation money was intended to replace what the Southeast Alaska fisheries groups had lost in the treaty settlement, the specific purpose of the money was not clearly spelled out at the time of the agreement. This lack of clarity and documentation has caused considerable confusion and controversy over the years.* Initially many fishermen and the Alaska Department of Fish and Game believed that the money was to go towards an annual production goal of 100,000 chinook for the trollers, 1,000,000 chum for the seiners, and 20,000 to 40,000 sockeye for the gillnetters. Although the state appears to have honored the general purpose of salmon enhancement with the mitigation funds, it has not spent the funds in accordance with the most widely-held understanding of the intent for those funds.

The governments of Washington and Oregon have not allocated any funds specifically for enhancement projects related to this treaty. British Columbia instigated a treaty-related enhancement project on the Fraser River, but has since run out of funds to continue it.

A computer model was developed to calculate the allowable catch of each of the parties to the treaty, and to update that quota annually. Information about hatchery-bred fish indicates the health and numbers of the natural stocks for the computer model.

Alaska fishermen agreed to the Pacific Salmon Treaty, despite the sacrifices it required in their allowable catch levels, because of guarantees that increased hatchery efforts and production would result in increases in these allowable catches. For reasons which may have included misunderstandings of original intentions, a lack of clear binding language in the treaty, or ineffectual negotiating at annual sessions to update agreements and re-negotiate treaty annexes, many fishermen are dissatisfied with what the treaty has accomplished. Hatchery efforts funded with mitigation funds have indeed produced salmon, but fishermen, particularly trollers, do not believe they have received the benefits they were promised from that production.

While fishermen may not have seen the specific benefits they had hoped for in the form of increased allowable catches, the state hatchery program has received more funding than it would have had without mitigation funds, and the Alaska Department of Fish and Game has been able to use mitigation money to supplement their budget for projects and personnel which are related directly or indirectly to the goals of the treaty.

Yukon River Treaty

Salmon restoration and enhancement have been discussed as part of the United States/Canada Yukon River salmon negotiations since 1985. The goal of the United States in these talks has been to ensure the long-term health of salmon stocks and assure consistency in harvest for both countries of the Yukon River system.

The U.S. proposal, agreed to by the Alaska Department of Fish and Game, the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, and the Yukon River Drainage Fisheries Association, includes:

- Restoration projects to increase production of transboundary stocks that do not respond to harvest management.
- Fisheries enhancement projects where appropriate, consistent with state genetics and disease policies.

- Planning strategies to allocate and manage restored stocks before the program starts.
- Operational plans for enhancement projects, with protection of wild stock genetic diversity as the paramount concern.

The FRED Division has developed a Yukon Fisheries Enhancement Initiative with its key components being overall design and planning work, expansion of the Clear Hatchery near Nenana, Alaska, and rehabilitation of natural salmon production. The cost of this initiative is estimated to be more than \$13 million.

Fishermen along the Yukon are primarily interested in bringing natural stocks back to historic levels. Rehabilitation projects and protection of wild stocks are their top priorities.

Some biologists believe that supplemental hatchery production on the Yukon River will only further complicate mixed stock fisheries management, and risk the reduction or elimination of small wild stocks. They are also concerned about the risks of genetic dilution of natural stocks, reduced stock fitness, and disease. The Alaska Chapter of the American Fisheries Society is currently considering a resolution to support setting aside the Yukon River drainage as a Wild Stock Management Zone (hatchery-free).

OPTIONS FOR POSSIBLE CONSIDERATION:

- Evaluation of the effectiveness of enhancement as an international treaty component.
- Requirement of a comprehensive feasibility and benefit-cost analysis of enhancement in treaty proposals prior to treaty agreements. Because state agency budgets tend to "benefit" from enhancement agreements, consider contracting these reviews to disinterested third parties.
- Development of an auditing mechanism to determine if enhancement benefits are realized by fishermen impacted by treaty agreements.

C. ENVIRONMENTAL REGULATIONS RELATED TO HATCHERIES

There are a number of environmental considerations involved in the siting, construction, and operation of hatcheries. In addition to the biological and genetics matters associated with the fish and eggs themselves, other environmental protection issues include the siting of hatcheries, their water usage requirements, the effluent they produce, and the disposal of fish carcasses (of broodstock or fish which are excess or diseased).

While Alaska law does not contain many environmental statutes and regulations which are specific to hatcheries, it does have a number of general provisions regarding protection of the environment which come into play during the planning, development, and operation of hatcheries. These include the Anadromous Fish Act which controls and requires approval for any construction projects or other action which might affect "rivers, lakes or streams or parts of them that are important for the spawning, rearing or migration of anadromous fish"; the Fishways Act which requires the construction of a fishway or hatchery construction if a dam or other obstruction will impact the passage of fish (see section on environmental mitigation); plus many laws and regulations about water quality and pollution,

protection of genetic purity of fish stocks (see chapter on biology and genetics), fish health inspections (AS 16.05.868), and siting of hatcheries.

A significant environmental protection issue associated with hatcheries is the discharge of waste into public waters. The procedures and permits required of hatchery operators in this regard have been confusing and in a state of flux for several years, but now seem to be headed for some resolution and streamlining. Part of the confusion stems from the fact that both the Federal Environmental Protection Agency (EPA) and the Alaska Department of Environmental Conservation (DEC) have some jurisdiction in this matter.

It appears that both EPA and DEC have been fairly lenient about requiring the various waste disposal permits that have technically been required. Even so, there have been very few complaints or problems regarding hatchery impacts on water. Hatcheries do discharge effluent which may contain organic fish waste, as well as some disinfectants or other chemicals used to prevent or control disease, but generally they discharge only very small amounts of pollutants. ***However, recent developments necessitating the disposal of large numbers of fish carcasses have raised the subject of waste disposal monitoring.*** These developments include 1) a joint decision by the Federal Food and Drug Administration and the Alaska DEC in 1990 that the carcasses of hatchery broodstock (mature fish used for the taking of eggs and milt) should no longer be sold for canning for human consumption, and 2) the recent huge returns of fish, particularly in Prince William Sound, which have resulted in the inability of hatcheries to sell large numbers of their "cost-recovery fish." Both of these developments demonstrated the need to establish procedures for hatcheries to dispose of large numbers of fish carcasses.

The federal Clean Water Act prohibits the point source discharge of pollutants by any person into the waters of the United States, except in compliance with the terms and conditions of a National Pollutant Discharge Elimination System (NPDES) permit issued by EPA. ***Under federal regulations, discharges of concentrated aquatic animal production facilities require NPDES permits.*** The regulations identify the annual level of production and feeding of a facility to require an NPDES permit, but also leaves to the EPA the discretion to require the permit of any facility it deems to be a significant contributor of pollutants.

In a January 1991 letter to all hatchery operators in Alaska, the EPA explained these requirements and noted that even if the regular operations of a hatchery did not fall under the NPDES permit guidelines, a permit would be required if the operator planned to dispose of fish carcasses in the water. It further explained that fish processors who dispose of greater than 1000 pounds of waste per day may be covered by the "Authorization to Discharge Under the National Pollutant Discharge Elimination System for Alaska Seafood Processors" general permit (the GP), and that for the purposes of carcass disposal, the EPA was willing to cover hatcheries under the same GP. The letter explained that this "greatly simplifies the administrative process and reduces the time frame in which a NPDES permit is obtained." The letter ended by asking that hatchery operators notify the EPA of their plans for fish waste disposal prior to the 1991 season.

In April 1991, the Anchorage EPA office sent another letter to all hatchery operators stating that many of the responses they had received to the January letter had raised a number of issues to be considered. Since resolving these issues is likely to take some time, the EPA established an interim policy to allow the hatcheries to operate and to provide for environmental protection in the interim period. The letter goes on to lay out three conditions under which the disposal of whole fish carcasses would be permissible. The criteria include 1) the depth of water where discharge may occur, 2) a requirement of pre-approval of the discharge site by EPA, and 3) a requirement that the skipper of the discharge vessel maintain records of each discharge occurrence, its location, and the date.

Alaska is currently operating under the interim criteria spelled out in the EPA's April 1991 letter. Many hatcheries, particularly state-run hatcheries, have submitted their applications for the NPDES permits to EPA. However, the EPA considers these state hatcheries to be minor dischargers and has agreed to turn over to the state the authority for permitting and monitoring of their waste discharge. EPA has forwarded copies to DEC of all the NPDES permit applications they have received from hatchery operators, and has asked that the state implement a hatchery waste permitting process.

Under current state law, hatchery effluent is covered under the DEC waste disposal permit statute (AS 46.03.100). DEC reports that few hatcheries apply for this permit but DEC has been comfortable with the situation, and has made permitting hatcheries a low priority, since hatcheries generally handle effluent in a manner that maintains acceptable water quality standards.

DEC has drafted a "General Waste Disposal Permit for Fish Hatchery Discharges," to be issued to hatcheries to fulfill the state waste permit requirement. Once the state has officially adopted this permit, hatchery operators will obtain waste permits only from DEC under the operating agreement between DEC and EPA. This state permit would in effect fulfill both state and federal waste permit requirements. This centralization and consolidation should simplify the permitting and reporting processes for hatchery operators, ensure more compliance, and improve uniformity in the monitoring and information available.

The state's draft permit contains a provision stating that the permit is effective until a specified date, "unless superseded before that time by a state certified EPA permit." This statement is included in order to provide for any potential situation in which EPA might require an NPDES permit, which would then supersede the state permit. The draft permit contains specific language regarding discharges, carcass disposal, drugs, chemicals and medications, operational, monitoring and reporting requirements, and so on. It lacks specific language to address disposal of diseased fish or eggs but other general provisions in the permit, or language in the hatchery operational permits from ADF&G may sufficiently provide for that circumstance.

Despite the lack of clear regulations and enforcement, and the confusion over federal and state requirements, there have been very few problems reported regarding such things as hatchery waste disposal in Alaska. Even during the situation in Prince William Sound during the 1991 season when processors would not buy many of the hatchery fish that later had to be dumped, both DEC and EPA report that their agencies worked very closely with the hatcheries to devise and carry out plans for large-scale carcass disposals, and things went quite smoothly. The Alaska Departments of Fish and Game and Environmental Conservation, and the federal Environmental Protection Agency, generally believe that for this aspect of environmental protection, current laws are adequate.

Other environmental issues related to hatcheries are covered in this report in the chapters on Biology and Genetics, Planning and Permitting, and Environmental Mitigation. The topics covered in those chapters appear to raise more serious and complex environmental concerns and questions, and need more extensive review, than the more direct environmental protection regulations discussed here.

OPTIONS FOR POSSIBLE CONSIDERATION:

- Encouraging DEC and EPA to coordinate waste disposal permitting requirements to the extent possible.

- Ensuring that adequate direction is provided in regulation regarding the disposal of any diseased hatchery fish.

D. USE OF ENHANCEMENT AS TOOL FOR ECONOMIC DEVELOPMENT

The state's financial support of hatchery production and other enhancement efforts has focussed primarily on Southeast Alaska, Prince William Sound, Cook Inlet, and Kodiak. However, fisheries enhancement is increasingly being viewed in other rural areas of the state as a tool for local economic development. Potential benefits from enhancement activities include the increased number of jobs, the potential for attracting processors or other value-added businesses to the region, as well as increased harvest for fishermen.

In some cases, the regions interested in enhancement for economic development have small, localized commercial fisheries based on local stocks of fish which in many cases are depleted, and which local residents would like to see replenished. In other areas of the state, residents are interested in the potential of creating entirely new fisheries. For many rural areas of the state, fisheries development represents the most viable - and in many cases, perhaps the only - opportunity for economic development.

Some of the projects being discussed and planned include:

- **Sikusuilaq Springs Hatchery.** Residents of Kotzebue Sound are meeting with a planning core group that includes ADF&G, the National Park Service, and the Northwest Arctic Borough to develop increased production proposals as part of a basic management plan for this small state hatchery located on the Noatak River. A regional aquaculture association will probably be established in 1992, and a comprehensive salmon plan for the region should be completed in 1993.
- **Yukon Enhancement Initiative.** Residents of the Yukon River area are organizing an aquaculture association and seeking legislative funding so that regional enhancement planning can be reactivated and expanded. A draft comprehensive salmon plan could be completed by the fall of 1992. Enhancement efforts are also being considered as part of the U.S./Canada Yukon River treaty negotiations.
- **Western Alaska.** Feasibility studies are underway for potential fisheries enhancement projects in the Nelson Island/Chevak area. Local villages and the Bering Sea Fishermen's Association are contributing to the effort, with additional funding requested from the Bureau of Indian Affairs and the National Coastal Resources Research and Development Institute. Although there are no natural runs currently, fishermen in this region are interested in developing salmon returns in streams that are ice-free year round.
- **Norton Sound Economic Development Initiative.** Under this proposal, developed in February 1991, FRED Division is providing technical support in developing a fisheries enhancement program at Elim, including stream rehabilitation and a possible hatchery.
- **Port Graham Salmon Development Project.** The goal of this pink salmon development project is to create a local village economy based on high quality value-added salmon products. The goal of the hatchery is to produce fish for the processing plant.

•**Kake Nonprofit Fisheries Corporation.** This southeast Alaska community proposes to expand its Gunnuk Creek Hatchery with the express goal of contributing to the economic development of the village. Kake has historically been a fishing village, but in recent years saw logging replace fishing as the major form of employment in the community. Logging is now on the decline, and the village wishes to expand its fishing industry.

It should be noted that these enhancement proposals are subject to the same concerns and conflicts generated by enhancement projects elsewhere in the state. The continued interest in enhancement and in hatcheries however, should be a prime reason for addressing the issues highlighted in other chapters.

OPTIONS FOR POSSIBLE CONSIDERATION:

•Evaluation of how much weight to give the need for local economic development when considering a new hatchery permit application.

E. IMPORTANCE OF HATCHERIES TO SPORT FISH

While the Senate Special Committee on Domestic and International Commercial Fisheries initiated the Legislative Review of Alaska's Fisheries Enhancement Program to evaluate the contribution of the program to commercial salmon fisheries, the role of the program in sport fisheries warrants attention. This section summarizes information provided by a FRED Division report attached to this chapter.

Many projects in the statewide enhancement program produce fish, primarily chinook, coho, pink, sockeye, and chum salmon, steelhead, rainbow trout, grayling, and Arctic char, that are highly valued by sports fishermen. Fish targeted for sport fisheries are released in over 350 locations around the state. Many of the projects operated by the FRED Division are entirely dedicated to improving recreational fishing opportunities.

Sport fishing has been growing in Alaska as evidenced by the increase in the number of licensed anglers from 1977 (200,000 total license sales) to 1990 (425,000 total license sales). This dramatic increase in sport fishing participation can be attributed to many factors, including changes in population, real per capita income of residents and non-resident visitors, and the opportunities for quality sport fishing experiences. A major component of a high quality fishing experience, especially for resident anglers, is the probability of catching a fish during the fishing experience (called the harvest per angler day). According to ADF&G, the economic value of fishing experiences are directly related to higher harvests per angler day. The statewide enhancement program has been a key factor in maintaining and augmenting these harvests despite increasing fishing effort.

The statewide salmon enhancement program has grown to the point of supporting a significant portion of total sport and commercial fishing harvests. For example, total 1990 recreational harvests of salmon, trout, grayling, Arctic char, and steelhead was approximately 1.3 million fish. The enhancement program is estimated to have contributed 28 percent of the harvest. State facilities provided 73 percent of the enhanced harvest while PNPs provided 27 percent.

According to recent studies completed by the ADF&G, sport fishing provides significant economic benefits in Alaska.

OPTIONS FOR POSSIBLE CONSIDERATION:

- If the Legislature initiates an on-going enhancement program review similar to Canada's, include sport as well as commercial fishing aspects of the program in order to achieve a more comprehensive performance report.
- Increasing the sport fish license fees to pay for a larger portion of the enhancement projects that benefit recreational fisheries.
- Encouraging Congress to increase Dingle-Johnson funds provided to Alaska to support increasing sport fishery enhancement and rehabilitation efforts.

F. CONTRIBUTION TO SUBSISTENCE FISH

In addition to commercial and sport fisheries, there is increasing demand for the state's enhancement program to provide fish for subsistence and personal use fisheries.

Sikusilaq Hatchery on the Noatak River provides a substantial number of chum salmon for subsistence gillnets in Kotzebue Sound and on the Noatak. Subsistence users in southern Southeast harvested 5,000 sockeye salmon produced from the McDonald Lake fertilization project. Production from the Klawock Hatchery, located on Prince of Wales Island, is extensively used by subsistence fishermen.

OPTIONS FOR POSSIBLE CONSIDERATION:

- If the Legislature initiates an on-going enhancement program review similar to Canada's, include subsistence and personal use as well as commercial and sport fishing aspects of the program in order to achieve a more comprehensive performance report.

G. ENHANCEMENT OF OTHER SPECIES

In addition to its work on such sport fish species as grayling, rainbow trout, and arctic char, FRED Division is also exploring king crab rehabilitation in a cooperative effort with Kodiak fishermen and the Kodiak Island Borough. Additional funding is being requested from the Alaska Science and Technology Foundation in order to examine shellfish rehabilitation projects in other countries and states.

Currently, research and production of non-salmon species is done almost entirely by the FRED Division. If private entities became interested in taking on such efforts, statutory changes would be required since the entire PNP program is based on salmon production.

OPTIONS FOR POSSIBLE CONSIDERATION:

- Amending statutes to allow the private sector to enhance non-salmon species.
- Taking action to encourage the production of non-salmon species.

BACKGROUND: DECLINING SALMONIDS IN WASHINGTON

Columbia River Salmon and the Endangered Species Act (ESA)

In April and June of 1990 petitions were filed by the Shoshone-Bannock tribe in Idaho, Oregon Trout and five other organizations, under the federal Endangered Species Act (ESA) to list five wild stocks of Columbia River salmon as threatened or endangered. These stocks were: Snake River sockeye, Snake River spring, summer, and fall chinook, and lower Columbia River coho. The National Marine Fisheries Service (NMFS) is the federal agency with jurisdiction over endangered fish species. In April and June of 1991, NMFS proposed that three of the five stocks of salmon be listed under the Endangered Species Act. These stocks are the Snake River sockeye salmon (proposed as endangered), the Snake River fall chinook (proposed as threatened) and the Snake River spring/summer chinook (proposed as threatened). On November 14, 1991, NMFS officially listed the Snake River sockeye as endangered. Decisions on the other two stocks are expected shortly.

Wild Stocks Under the Endangered Species Act

An important part of the NMFS decision was their determination of what the definition of stock would be that would constitute a "species" for purposes of the ESA. The agency determined that an "ecologically significant unit", or ESU, would constitute a species for the purposes of the ESA. Another key point in application of the ESA to fish is that the wild stocks were recognized and being genetically and biologically important and merit protection, or stocks that have not been intermixed with hatchery stocks and that still spawn naturally, are considered.

Salmon in the Columbia River System and Reasons for Decline

Approximately one-third of the Columbia River drainage that historically supported salmon populations is not currently accessible to these fish because of dam construction without fish passage facilities. Alterations in river flow and velocity, adjacent habitat changes, irrigation diversions, commercial and recreational harvest, and hatchery practices have resulted in fewer "returns" of spawning adults from the ocean than historically. In the mid-19th century, anadromous fish runs in the Columbia River basin numbered up to 16 million adult fish. Anadromous fish include salmon, steelhead, and sea-run cutthroat trout. Juveniles migrate from freshwater to the ocean, where they take between one and five years to mature. They return as adults to their streams of origin to spawn. Salmon and steelhead numbers on the Columbia have been reduced to about 15 percent of historic run sizes.

Dams: The U.S. Army Corps of Engineers, the U.S. Bureau of Reclamation, and the state's public utility districts operate water projects in the Columbia and the lower Snake Rivers. The Bonneville Power Administration, part of the U.S. Department of Energy, markets the power generated by these hydroelectric facilities. There are hindrances to both upstream and downstream fish migration that can occur because of dams. The impoundments that are associated with dams alter natural water flow, sometimes preventing downstream migration of juvenile fish. Power turbines without adequate screening can cause fish mortality when fish do attempt to migrate downstream. Five of eight Army Corps of Engineers projects have juvenile fish bypass systems. Facilities at the Lower Monumental, Ice Harbor, and the Dalles dams are not yet in place. For successful upriver migration of adult salmon, dams are equipped with fish

ladders. There are no ladders at the Chief Joseph or Grand Coulee Dams, blocking upstream spawning in the Columbia River at Bridgeport.

Habitat Alteration Out of River: Activities such as timber harvest, mining, agricultural drainage, livestock grazing and point source pollution can alter fish habitat conditions. Increased sediment, increased water temperatures, loss of riparian (adjacent to the watercourse) habitat, and reduced oxygen can negatively affect fish.

Harvest: Both recreational and commercial salmon fishing occur on the Columbia River. Salmon fishing in Washington and Oregon state waters is regulated by the Washington Department of Fisheries and by the Oregon Department of Fish and Wildlife, respectively. The two states coordinate their commercial fishing regulation development through the Columbia River Compact. Recreational fishing is regulated by the Washington Department of Wildlife (steelhead trout and resident game fish), Washington Department of Fisheries (salmon and marine fish), and the Oregon Department of Fish and Wildlife (all species of fish).

Fish Production: 80-90% of salmon returning to the Columbia River from the ocean are produced in hatcheries. There is an ongoing debate over the role of hatchery practices in preservation of wild stocks of fish. Deterioration of wild stocks of salmon and steelhead can occur through poor hatchery management practices. Hatchery practices have begun to explore the use of wild stock in breeding programs, to avoid deterioration of hatchery stocks.

Water Use: There are several large users of water in Washington, including municipal, industrial, irrigation, hydroelectric generation, and instream. Municipal water use includes water supplied by public water systems for domestic, commercial, and fire protection. Industrial use includes process and cooling water. Irrigation accounts for the majority of water use in Washington. Water is diverted from water sources. Diversions must be screened to prevent fish from entering the irrigation system, unless the area of the diversion is under the management authority of the Department of Wildlife and the diversion existed prior to 1947. Water storage for irrigation, power production or flood control affects timing of peak flows that under natural conditions coincide with juvenile anadromous fish migration downstream.

The American Fisheries Society Endangered Species Committee Report

According to a report by the Endangered Species Committee of the American Fisheries Society, entitled Pacific Salmon at the Crossroads, 214 stocks of wild salmon, steelhead, and cutthroat trout are in decline in the Pacific Northwest. 52 of these are in the Columbia River basin. In the coastal and Puget Sound areas of Washington, outside of the Columbia River basin, 41 stocks are in jeopardy. There are currently no mandated recovery efforts for these stocks, other than for the Snake River sockeye salmon.

Other Efforts to Recover the Columbia River Salmon

Columbia River Salmon Flow Measures

The Army Corps of Engineers, Bureau of Reclamation, and the Bonneville Power Administration are conducting an Environmental Impact Statement (EIS) to examine water management actions to help both juvenile and adult salmon. These actions will be taken in 1992, for a one year period, on an experimental basis. The alternatives include various combinations of reservoir drawdown and flow augmentation to assist juvenile salmon migration.

The final EIS is expected to be released in March of 1992.

The Salmon Summit

The Salmon Summit was convened at the urging of Senator Mark Hatfield by agencies and organizations in the Pacific Northwest to develop a management and recovery program for the Columbia and Snake River salmon. This effort concluded in March 1991 and the participants failed to reach a consensus on major recovery methods. However, the task of continuing these efforts was subsequently undertaken by the Northwest Power Planning Council (NWPPC).

The Northwest Power Planning Council Amendments

In 1980, Congress passed the Northwest Power Act. The Act created the NWPPC and directed it to determine how much energy the region would require over the next twenty years and to develop an electric power plan to meet those needs; and to develop a program to protect, mitigate, and enhance fish and wildlife and related habitat in the Columbia River basin. The NWPPC develop a Fish and Wildlife Program (FWP) to accomplish this. In response to the declining salmon on the Columbia and Snake Rivers, the NWPPC is amending its FWP. The amendments are in four phases. Phase I identified immediate measures to assist in salmon recovery. Phase II, completed on December 12, 1991, recommends the following actions, as well as many others not listed below:

- mainstem passage improvements on the Snake and Columbia by increasing flows for juvenile salmon migrating downstream and by improving screens so that juveniles don't experience as much mortality in dam turbines;
- reductions in commercial harvest;
- implementation of a temporary commercial salmon license leaseback program;
- adoption of water conservation measures including the placement of instantaneous flow meters on all diversions from anadromous fish streams tributary to the Snake and Columbia;
- improvement of hatchery management practices;
- development of habitat management standards for salmon protection.

NMFS will use this Phase II Amendment as the basis for their recovery plan for the endangered sockeye salmon. Phase III and IV are watershed level planning, and resident fish and wildlife protection, respectively. The NWPPC has just begun to develop these phases.