PLAN FOR SUPPLEMENTAL PRODUCTION OF SALMON AND STEELHEAD FOR COOK INLET RECREATIONAL FISHERIES

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Division of Sport Fish
Alaska Department of Fish and Game
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INTRODUCTION AND SCOPE

Legislation passed in 1977 (AS 16.10.375) mandated the creation of comprehensive salmon enhancement plans for each area of the State designated by the Commissioner of Fish and Game for such activities. Cook Inlet has been so designated, and a regional aquaculture association has been formed and recognized.

In addition to the legislative mandate, the Department of Fish and Game fishery staff firmly believes a comprehensive plan for each area is necessary to guide the multitude of proposed public and private enhancement facilities, projects, etc., in a manner which will result in maximum public benefit.

In 1979, a statewide salmon plan was written. This plan established major goals for salmon harvesting areas of the State. However, the plan did not include many specific projects for the various areas (i.e., specifically how goals and objectives would be met). The purpose of this plan is to define specific sites, salmon stocks and other factors necessary to address the goals of that segment of the Alaska Salmon Plan which deals with recreational fishing for salmon and steelhead in Cook Inlet.

More fish will have to be produced in Cook Inlet, not only to increase the anglers' catch but even to maintain the catch at the present rate. The objective of this plan is to produce an additional 106,000 artificially produced chinook, coho and sockeye salmon and steelhead for recreational anglers harvest by 1988.

While the commercial fishery is stable in size due to limited entry, the sport fishery is still increasing. In 1979, sport anglers fished an estimated 435,000 angler-days in Cook Inlet and Kenai Peninsula waters for chinook, coho and sockeye salmon.

By 1988, the end of the short-term objective period of this plan, the number of angler-days is expected to increase to 522,000 based on an annual increase of 2.3% (growth data from Alaska population overview). While the 2.3% figure is a low-case estimate, it is considered appropriate for the next several years because: (1) sport fish license sales and population growth have slowed in recent years; and (2) sport fishing effort for salmon will probably not increase at the high-case annual growth rate because of limited access and the fact some major fisheries are approaching an angler carrying capacity.

To maintain the present catch rate of 0.35 salmon per angler-day, the annual catch of these species must rise from 154,000 to approximately 184,000 by 1988. Sport anglers fished an estimated total of 435,000 angler- days in Cook Inlet and Kenai Peninsula waters in 1979, and caught an estimated 154,000 chinook, coho and sockeye salmon. By 1988, if the increase in recreational angling effort continues at a 2.3% annual rate, an additional 87,000 angler-days must be accommodated.

Therefore, if population growth projections are borne out and if existing natural stocks continue to produce 154,000 chinook, coho and sockeye salmon to anglers each year, and the objectives of the plan to increase the sport harvest by 106,000 chinook, coho and sockeye salmon and steelhead are met, more than one-quarter (30,000) of the artificially produced salmon will be needed just to keep catch rates at the current level. Recent public expression indicates the current catch rate is unsatisfactory. Therefore, the remaining 76,000 supplemental salmon will serve to increase angler catch rates of chinook, coho and sockeye salmon to approximately 0.50 per day. The 10 projects in this plan will support 270,000 angler-days of recreational fishing, at acceptable catch rates, if the respective projects are realized.

Allocation between sport and commercial users is currently a critical issue in Cook Inlet. Increasing recreational demand will contribute to the intensity of present allocation conflicts within Cook Inlet, as will greater use of the same salmon stocks by increasing numbers of subsistence fishermen.

If total harvests of Cook Inlet salmon stocks remain the same, individual sport catches will decrease as the number of anglers increase. Therefore, more opportunities provided recreational anglers to use artificially produced salmon and new fishing areas created by improved access will reduce disruption and impacts on the commercial and subsistence fisheries.

Since sportsmen desire chinook and coho salmon above all others, the present plan is aimed primarily at production of these species. One

project also recommends increased sockeye production and one project recommends steelhead production. The plan also recommends that coho salmon shall be of higher priority than chinook or steelhead for artificial production in the immediate future. Both Alaskan and numerous west coast hatchery programs have repeatedly demonstrated that coho salmon provide higher and more consistent returns of adult salmon than do chinook. Moreover, since cohos remain at sea only about 15 months after smolt release, benefits can be achieved in a shorter time interval than with chinook salmon, most of which return after three or four years.

Chinook salmon are recommended principally for experimental releases at this time. Hatchery returns of spring chinook have been quite low in most west coast and Canadian releases. Limited releases to date in Alaska have also produced low results, and sufficient numbers of eggs are difficult and expensive to obtain. However, public demand for chinook salmon is great and we feel a limited experimental program should be conducted in an attempt to solve rearing and release problems and produce smolts which return at a rate that will justify rearing costs.

Finally, public demand for artificial production of steelhead is growing. We feel a supplemental production program for steelhead should logically be included in this salmon enhancement plan because steelhead:

(1) are as desirable as salmon to sport anglers;

(2) could be made available in the same waters and within the same time frames as salmon;

(3) have life histories and management considerations similar to chinook and coho salmon; and

(4) require nearly identical rearing facilities as do chinook and coho salmon.

In Cook Inlet, steelhead are known to occur only in several small streams located on the southwestern Kenai Peninsula. Little is known of their numbers or life history. The time and locations of spawning have not been completely defined. This plan recommends expanding a program of collecting life history data, defining existing stock size and current harvest, testing methods of holding ripening adults with an ultimate goal of artificially rearing this species and expanding the number of stream systems in Cook Inlet containing steelhead.

The geographical scope of this salmon/steelhead plan includes all Cook Inlet waters and those coastal waters adjacent to the communities of Homer, Seldovia and Seward. No time schedules have been established, as the fishery staff believes it is far more important to clearly set out priorities between various potential projects than propose a time schedule which is contingent not only upon monies allocated to these new enhancement projects but also to modification and expansion of existing projects and/or facilities.

Finally, the plan recommends projects which are area and/or site specific based on the anglers' ability to harvest the returning fish. Future chinook, coho and steelhead enhancement programs will primarily involve the use of planted smolts.

The plan advocates the use of local stocks and, where possible, those native to the release site.

DESCRIPTION OF THE COOK INLET RECREATIONAL FISHERY

Sport fishing effort in Cook Inlet is far more intense than in any other area of the State, since half of the State's population lives in this region. Beginning in 1977, an annual angler survey, conducted by a series of mail questionnaires, has provided an accurate estimate of statewide and regional angler use. In 1979, this survey indicated a total of 213,309 anglers fished in Alaska, of which 59% fished in Cook Inlet and Kenai Peninsula waters.

Based on license sales, statewide angling effort during the last three years has increased approximately 3.0% per year. Sampling indicated that unlicensed juveniles accounted for 25% of the total number of anglers. Anglers, adult and juvenile combined, have increased on a statewide basis from about 75,000 persons in 1961 to over 213,300 in 1979.

While it is not possible to determine exactly the number of individual sport anglers who fished in Cook Inlet waters, it is known that in 1979 there were 101,639 licensed and juvenile anglers who lived in the Cook Inlet area. In addition to the local resident fishermen, there were visiting non-resident anglers utilizing the Cook Inlet fisheries; therefore, the total number of participants becomes much greater. It is estimated, based on the postal questionnaire data, that more than 125,000 licensed and juvenile anglers currently participate in the Cook Inlet sport fisheries.

The total catch of salmon within Cook Inlet has been assessed since 1977 by the aforementioned postal survey. Angler use and harvest information received from the series of postal surveys are cross-checked against a number of statistically designed "on-the-ground" creel census programs of major Cook Inlet salmon fisheries. The correlation between information received from the creel census programs and that of the postal questionnaire has been very high, rarely differing by more than 10%. As a result, the staff has developed a high degree of confidence in the postal survey results. In some areas of the State where "in season" management data are unnecessary, the "manned" creel censuses have been terminated in favor of the postal survey.

Presented in Table 1 is the estimated sport harvest of salmon from Cook Inlet and Resurrection Bay for the years 1977-1979:

Table 1. Estimated Sport Harvest of Salmon from Cook Inlet-Resurrection Bay Area, 1977-1979.*

Year	Chinook	Coho	Red	Pink	Chum	Total
1977	16,210	51,907	82,363	45,484	2,287	198,251
1978	17,856	65,230	105,532	105,446	18,419	312,483
1979	25,853	64,039	63,731	25,696	5,826	185,145

* Data from Department of Fish and Game postal survey. Includes Resurrection Bay marine fishery.

With the exception of some marine effort and very few immature feeder chinook taken near Seldovia and Seward, the salmon sport fishery in southcentral Alaska is conducted entirely on adult salmon as they either approach their spawning streams or are within those streams. Therefore, most fisheries in this region are fairly brief in duration, with anglers moving from one fishery to another as the various runs arrive.

The marine effort in Cook Inlet is somewhat limited. Relatively few anglers within the Cook Inlet area have boats of sufficient size to handle rough marine waters. Launching and berthing facilities at all popular marinas are at capacity. Current angler use levels and trends at Kachemak Bay are undefined. A major marine fishery for salmon is the chinook salmon troll fishery conducted along the Kenai Peninsula beaches south of Deep Creek. Effort in this fishery has grown rapidly from 5,000 angler-days in 1974 to 35,000 in 1979, but has shown significant fluctuations in angler effort due to inclement periods of weather and availability of fish stocks. In contrast to most marine fisheries, the Deep Creek troll fishery takes place within 100-200 yards of the beach and in relatively small boats. Therefore, weather dictates to a large extent the angler effort expended in this fishery.

River fisheries on the other hand have increased far more rapidly. For example, the Kenai River chinook salmon fishery has increased from 45,000 angler-days in 1974 to 98,600 angler-days in 1979. Figure 1 presents a comparison of major Cook Inlet chinook salmon fisheries during the years 1974-79.

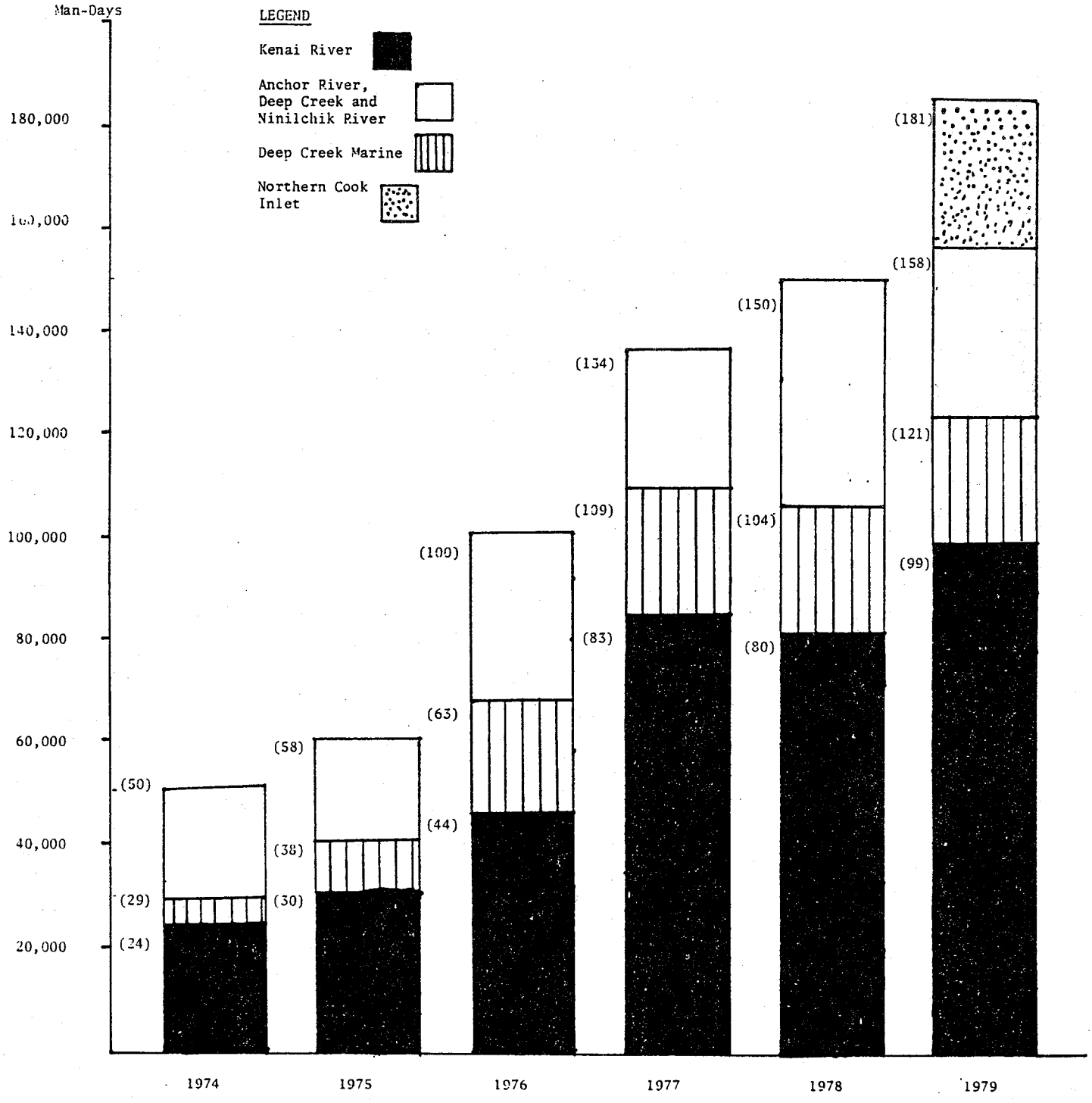

Figure 1. Cook Inlet - Total Angling Effort for King Salmon

The high percentage of lower Cook Inlet sport fishing effort which occurs on the Kenai Peninsula appears to be maintaining itself and is undoubtedly due to two major reasons:

1. The availability of large chinook, sockeye and coho salmon stocks in a generally healthy condition which provide at least an acceptable catch rate.

2. Good access to those waters having chinook, sockeye and coho stocks.

In upper Cook Inlet, access to waters west of the Susitna River is restricted to riverboat or light aircraft. Angling effort, as a result, has not grown as rapidly as in other areas. In addition, upper Cook Inlet chinook salmon fishing was only reopened to sport fishing in 1979 following a 5-year closure. While the sport catch rate for coho has improved in the last two to three years, it has been unsatisfactory for many years prior to the recent improvement. Table 2 shows the distribution of Cook Inlet salmon angling.

Table 2. Distribution of Cook Inlet Salmon Angling Effort, 1977-1979.*

Year	Angler-Days Effort Cook Inlet	Angler-Days of Effort Upper Inlet	Angler-Days of Effort Kenai Pen.	Percent of Total Upper Inlet	Percent of Total Kenai Pen.
1977	606,763	225,606	381,157	37.2	62.8
1978	699,611	231,468	468,143	33.1	66.9
1979	766,556	274,305	491,751	35.9	64.1
			Three Year Average	35.4	64.6

* Resurrection Bay excluded.

The impending capitol move to the Willow area will increase the amount and affect the distribution of recreational fishing demand in Cook Inlet. The new capitol is forecasted to have a population of approximately 30,000 people, which will likely result in a significant increase in the number of Cook Inlet anglers. Most Anchorage anglers now drive 150 to 200 miles each way to fish for salmon on the Kenai Peninsula. However, the new capitol site is approximately 70 road miles farther north of Anchorage, and this additional distance may make anglers living in this new community more reluctant to drive to Kenai Peninsula waters for weekend fishing. Therefore, the Department anticipates increased demands for recreational salmon fishing in northern Cook Inlet waters. Since marine waters of northern Cook Inlet are silty and thus unsuited to sport fishing, recreational fishing must be conducted in fresh water.

In an attempt to meet the recreational demand of an increasing population, the Division of Sport Fish has undertaken a sizeable lake rehabilitation and stocking program with associated research programs to

increase the recreational harvest of lake-reared resident game fish, primarily trout and landlocked silver salmon. This program has been very successful, chiefly in producing spring and fall fisheries. This accomplishment results from the fact that catch rates within the stocked lakes drop during the warm midsummer period and most anglers prefer salmon when they are available rather than resident game fish species. Many, if not most, anglers in southcentral Alaska tend to fish the lakes until the salmon runs arrive. They then turn to salmon fishing until these runs are over, at which time they return to the lakes for fall fishing. The lake stocking program does provide an alternative to salmon fishing for many anglers. However, it is not an acceptable alternative for the vast majority of the Cook Inlet angling public.

SPORT FISHERY ENHANCEMENT CONSIDERATIONS

Sport salmon fisheries in Cook Inlet can be developed or enhanced in three different types of waters:

1. Marine bays.

2. Large rivers such as the Kenai.

3. Small streams such as Anchor River, Willow Creek, etc.

Each type of development has certain advantages and disadvantages. It is critically important that the public, planners and managers fully understand the problems and opportunities associated with each type of fishery.

Fisheries in Marine Bays

This type of fishery requires large boats capable of withstanding rough water. Extensive berthing and support facilities are needed for fueling, repair, etc. This type of fishery usually has little angler congestion, and very seldom will a salmon stock be overharvested by a saltwater sport fishery. Weather is a critical factor and continuing bad weather at the time a salmon run is passing through can sharply reduce the harvest. The ability to assess the sport catches in this

environment is often dependent upon points of access; i.e., launch and dock facilities, and the Department's ability to contact anglers at the completion of the day at these respective departure areas.

The single most critical problem in developing or enhancing marine fisheries is in achieving a high enough density of fish to provide a minimum acceptable catch rate. Where salmon enter a large bay, very large numbers of salmon are necessary to produce an acceptable catch rate. It is not enough that some fish return to the fishing area--enough fish must return to a given location at the same time so that a minimum satisfactory catch rate is achieved. If such a rate is not achieved, anglers move to another fishery and the fish produced for the original fishery are wasted.

What is a minimum acceptable catch rate? The lowest catch rate that anglers will tolerate varies with species, weather, difficulty of access and a host of other factors. We do know that anglers will settle for a lower harvest rate on chinook salmon and steelhead trout than other species, and probably a lower rate on coho than on the remaining three salmon species. Minimum acceptable catch rates per angler-day of Cook Inlet salmon fishing, by species, are estimated to be as follows: Chinook salmon, 0.2; coho salmon, 0.5; sockeye salmon, 0.6; pink salmon, 1.0; chum salmon, 0.7; steelhead trout, 0.1.

Large Rivers

Fisheries taking place in large rivers need launching, parking and camping facilities. Streambank access may or may not be important.

Some angler congestion and/or interference is common, particularly between boat and shore anglers.

Weather typically does not interfere with angling except when rain produces turbid or high flow conditions.

Assessment of catch depends upon the number of angler access points, and usually this type of fishery is the most difficult to accurately assess catches.

It is possible, at current sport fish utilization levels in Cook Inlet, to overharvest specific salmon stocks in a large river system. Currently, a series of rivers in southcentral Alaska are managed on a day-to-day basis to avoid this eventuality.

The number of fish required for a successful river fishery is a very important consideration. Far fewer fish are needed than for a marine fishery as the confining nature of a river serves as a mechanism to increase density and thus provide a greater catch rate. An excellent example is the Kenai River where a rapidly expanding coho and sockeye fishery is taking place. This is a very successful freshwater fishery, but the same fish migrating to the river along the Kenai Peninsula beaches do not support a successful marine fishery (as do Kenai chinook salmon) because the catch rate, as a result of fish density, is apparently too low until they are within the confines of the river.

Small Streams

In smaller streams, continuous linear streambank access is mandatory since little or no use of boats is possible. Angler congestion is usually high, but is tolerated by anglers if the catch rate is satisfactory.

Weather is not a factor except when rain produces turbid or high flow conditions.

Stocks of fish can easily be overharvested if the fishery is not stringently managed. However, it is possible with monitoring to conduct intensive, short duration fisheries in small streams which can produce thousands of angler-days of fishing and yet not damage the resource. Two examples in this region are the Anchor River chinook salmon fishery and the Russian River sockeye salmon fishery. The three lower Kenai Peninsula streams (Anchor, Deep and Ninilchik) have provided an average of 37,000 angler-days of fishing for chinook salmon the last few years (1978-80) on only 2 miles of each river during a 12-day season. The average harvest during this period has been about 2,100 chinook salmon and the stocks remain in excellent condition. In the Russian River, 60,500 angler-days of fishing produced a harvest of approximately 52,700 sockeye salmon (1978-1980 data) and the stock continues to be in excellent condition.

A major consideration is that far fewer fish are needed to produce a successful fishery in a small stream. The small stream confines the fish into "holes" easily recognized by the angler. This type of fishery

is also better suited to less skillful anglers and children due to the increased harvest potential.

It is critical, however, that the stream selected for enhancement not be too small. If so, the high level of angler activity on the streambank will impede the upstream migration of salmon. This effect has been documented on several small streams in Cook Inlet. Also, it is mandatory that any stream selected for enhancement have public access along the banks. A single land parcel in private ownership can block access to all fishing waters beyond that property.

Enhancement of small streams within an urban area is not reasonable from a management viewpoint. Angler use becomes too intense and it is impossible not to create trespass and property damage problems on adjacent properties, inevitably resulting in a closure.

REALITIES OF ENHANCING RECREATIONAL FISHERIES

All proposals to enhance Cook Inlet chinook, coho and sockeye stocks generally share the following difficulties that demand solution:

1. Commercial Interception: Unless recreationally enhanced Cook Inlet stocks can be returned either before or after commercial fishing seasons, those stocks will be subject to commercial utilization prior to entering recreational fisheries. Unless major accomplishments in stock separation occur, it is likely the commercial harvest of artificially produced coho will greatly exceed that of the recreational fisheries. Interception of an enhanced stock by commercial fisheries may not necessarily be undesirable, but it can generate problems when recreational anglers are seeking the same fish and, particularly, where enhancement is conducted for recreational benefit. For example, cost-benefits of a smolt plant may be favorable when most fish are sport caught but undesirable if a great many are harvested commercially. Assessment of the total adult return is another consideration that would become exceedingly difficult if recreationally enhanced fish are harvested in Cook Inlet marine waters.

   Measuring the total contribution of an enhanced coho population would be particularly troublesome because these fish are captured throughout much of the commercial fishery. Many returning enhanced adults are harvested in the mixed

stock commercial fishery; i.e., it will be difficult if not impossible to reduce harvest mortality during the rebuilding process.

The Board of Fisheries comprehensive management plan recognizes and addresses this very serious issue.

2. Access: One of the major problems in managing sport salmon fisheries in Cook Inlet is the matter of access. Only on the Kenai Peninsula is the highway system related to streams in such a manner that anglers have good access.

In northern Cook Inlet, the population centers are located on the east side of the Inlet (and the east side of the Susitna River), while the major clearwater streams are west of the Susitna River. It is currently difficult even to launch a boat on the Susitna River for boat access to west side tributaries.

East side Susitna tributaries are, in most cases, intersected by highways rather than being parallel to the highway. When the highways were constructed, most adjacent streambanks moved into private ownership leaving only small access points at the highway intersection. Stream banks farther from the highway system often remain blocked to angler access by these private holdings.

Therefore, enhancing the Cook Inlet salmon sport fishery, particularly in northern Cook Inlet, involves more than smolt releases. It must include consideration of and, in some instances, development of access sites where significant numbers of anglers can get to waters and where artificially produced fish can be harvested in large numbers.

At the present time, two of the three top priority projects listed in this plan will be developed at sites where large numbers of anglers could harvest artificially produced salmon only with access improvement. These streams are Willow Creek and the Little Susitna River. This need prompted the inclusion of access development projects for these streams in the Alaskan fish plan. They are also recommended in this plan for enhancement with hatchery coho and/or chinook salmon only with improved access.

In addition, there are presently very few public facilities (campgrounds, boat launches, etc.) adjacent to upper Cook Inlet salmon streams. The major clearwater systems that enter the Susitna River from the west are only accessible by difficult river travel or air. A scarcity of public access is therefore a serious deterrent, at this time, to enhancement of numerous systems that may otherwise be satisfactory for enhancement.

3. Research Support: To provide a feasible supplement to natural production requires the relationships between the environment and fish be known, and that the rearing needs of the propagated fish be satisfied. This encompasses everything associated with survival, growth and behavior, as well as a host of other factors that affect fish. Much of the knowledge necessary to guide enhancement in upper Cook Inlet is lacking. Our understanding of chinook vividly illustrates this problem; e.g., when do most upper Cook Inlet chinook migrate seaward; what is the size and condition index of these smolts; what role do glacial streams play in the rearing of these fish; and what is the response of chinook to associated fishes?

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Because of these common problems, a modest enhancement effort for upper Cook Inlet is recommended at this time. The short range goal of enhancement in this area must be research oriented and directed to development of reliable brood sources for use in the future production programs. In the case of coho, enhancement activities should strive to develop stocks that migrate through Cook Inlet after the period of major commercial fishing activity.

The recreational and social demand for chinook and coho in upper Cook Inlet is such that a sizeable investment is warranted to overcome the difficulties confronting enhancement. Research and development projects to acquire needed life history and stock separation data as well as the development of public access, are included in the Alaska Salmon Fisheries Plan.

In keeping with modest enhancement objectives, Table 3 lists by priority 10 sites recommended for enhancement. Each site has one or more species recommended for use and a numerical objective to provide a minimum specified level of catch. Further, the plan specifies for each site the estimated total run of artificially produced fish necessary to produce the minimum desired catch.

The ratio between catch and total run shown in this table (i.e., an estimate of the relative effectiveness of anglers to harvest returning

salmon) was computed somewhat arbitrarily by fishery managers of the Division of Sport Fish based on what we have observed in numerous existing fisheries. It must be clearly understood that angler effectiveness is influenced by many factors such as access, fish density, water clarity, ease of boating, angler density, weather, etc. These factors will result in day-to-day changes in the effectiveness of anglers. Therefore, the ratios of harvest to total run size shown in the plan are our best estimates as to average expected rate at each site based on the particular set of factors which prevail at that site. A series of factors were considered in establishing priorities of the various projects. Angler effectiveness in harvesting returning fish was one major consideration in establishing priority. Other important factors were access, existing facilities, distance from population centers, amount and quality of fishing which could be produced and size of natural runs at the site and in adjacent waters.

It should be emphasized that additional numbers of salmon can be utilized at most sites recommended in this report if enhancement facilities are able to produce and return more fish than are called for in this plan. The figures shown in this plan are, in most cases, the minimum number of adults which we believe must return to result in a successful fishery.

A successful fishery for the purposes of this plan is defined as one which results in a minimum acceptable catch rate and will provide a minimum of 10,000 angler-days of fishing opportunity.

PRIORITY NUMBER I-(A) - LITTLE SUSITNA RIVER COHO ENHANCEMENT

Project Goal--To provide a harvest of 10,000 late run coho which will support an estimated 20,000 angler-days of additional recreational fishing opportunity.

1. Management. Little Susitna River coho, as is the case with all coho of northern Cook Inlet origin, are currently harvested by both sport and commercial users. Commercial exploitation of this system's natural stock is substantially greater than the sport harvest. This catch disparity in turn fosters substantial ever-growing user group conflict. Present stock separation knowledge does not permit management to allow greater numbers of coho through the mixed stock commercial fishery in the central drift net district without greatly reduced catches of very valuable associated salmon; i.e., the Little Susitna River coho migrate through the entire length of the inlet at similar times when large numbers of sockeye, pinks and chums are moving through the same area. Reducing commercial opportunities to ensure additional coho for recreational fishing is also contrary to existing Board of Fisheries policy which states that insofar as it is consistent with the subsistence priority, stocks which normally move in Cook Inlet after June 30 shall be managed primarily as a commercial resource until August 15. While Susitna coho are recognized as a target species for sport fishermen and Cook

Inlet management is designed to stabilize the incidental commercial harvest of these fish, some level of commercial utilization is unavoidable. Development of an artificially aided run having natural migrational timing would undoubtedly enhance harvest opportunities for all users; however, placement of large numbers of coho, which have been designated by the Board of Fisheries as a species to be principally harvested by sport users, into areas where most are harvested commercially is certain to generate additional conflict. On the other hand, enhancement of coho stocks that migrate after the period of major commercial activity would be expected to lessen existing and future allocation disputes. Establishment of a late run, therefore, should become the primary goal of this supplemental production effort.

2. Fishing Areas and Access. The Little Susitna River provides an exceptional opportunity to harvest coho in an aesthetically pleasing manner, and the waterway's physical features would accommodate substantial recreational use without excessive congestion. More than 75 miles of river are available for boat fishing, and most land surrounding this section of the river is public. A portion of the river borders the Nancy Lake Recreation Area and a canoe portage system presently links the recreation area to the stream. The river is located within a convenient 1-1/2 hour drive of Anchorage and is also adjacent to the proposed Willow Capitol Site.

Logistical access to much of the river is very limited, therefore, improved access would compliment major enhancement efforts. Currently the stream can only be reached by the Parks Highway (the uppermost area open to salmon fishing) and via the Burma Road (middle section of harvest area). The last three to four miles of the Burma Road is restricted to 4 X 4 vehicles only and seriously restricts general public access.

3. Existing Fishery and Use. Present recreational use is relatively light due primarily to poor access. During rainy periods in the spring, the Burma Road is nearly impassable and fishing effort in the lower river, therefore, is often a function of road condition. The system's coho fishery extends from July 15 to approximately September 1.

4. Other Fish Species Present. Good pink salmon fishing is available, particularly on "even" years. Fair to good chinook salmon fishing is also available; however, poor spring road conditions often restrict angler use. Sockeye and chum salmon enter the sport harvest in significant numbers, and rainbow and Dolly Varden residing in the system also provide added angling opportunity. Recreational use during recent years has ranged between 12,000 and 21,000 angler-days fishing for all fish species.

5. Public Facilities. Tourist accommodations are available in the nearby communities of Houston, Big Lake and Wasilla. A small public campsite is also operated by the City of Houston adjacent to the river near the Parks Highway. Additional State campgrounds are located in the Nancy Lake Recreational Area. Several commercial fishing guides currently operate on the river. No public boat launch site exists on the system.

6. Brood Source. The system's coho are among the largest in upper Cook Inlet and there is an ample stock from which to secure eggs. Whether "late arriving" subpopulations exist has not yet been determined. Capture of brood for eggs may be difficult because the stream would be costly if not impossible to weir and spawning appears to be spread over a wide area. Road access is, however, available to many of the upriver spawning sites.

7. Evaluation Potential. Since existing adult returns are subject to intense, widespread commercial use, evaluation would be both costly and difficult if enhanced coho follow normal migration timing. A late arriving enhanced stock would, however, eliminate the need for assessment of the commercial catch. Estimation of the sport harvest could be readily accomplished because of the scarcity of access points; i.e., there are only two primary access points which could

be easily surveyed. Assessment of escapement would be relatively difficult due to the size of the system, extensive distribution of spawners, silty water and magnitude of fall stream flows. No permanent ADF&G facilities are currently available on the system to assist with evaluation.

8. Imprint and Release Sites. Potential lentic and lotic release sites can be reached by good roads in the upper portion of the system. Imprinting smolts in one or more of the river's numerous small lateral tributaries may also be practical.

9. Miscellaneous. This system has the potential for providing diverse fishing opportunities that cannot be found elsewhere on the Cook Inlet Basin road system. Presently the river provides shore based fishing and angling from drift or jet powered boats in an environment that has undergone few human related changes. A float trip from the Parks Highway to the Burma Road pull-out can be accomplished in as few as two days. A canoe trip starting in the Nancy Lake Recreational Area can also be completed in two to three days. Standard outboard power boats (without jet drives) can be operated safely from the Burma Road downstream to tidewater.

10. Research and Development Needs:

a. Improve Burma Road access to lower portions of the Little Susitna River.

b. Determine magnitude, distribution and timing of all segments of the escapement.

b. Identify various adult capture and juvenile release sites. Lakes of the Nancy Lake Recreation Area, including Nancy Lake, should be included in these studies.

d. Determine optimum smolt release size, age, timing and locations. Assess contribution to the recreational fisheries of the Little Susitna River.

e. Evaluate the effect of coho plants on other rearing species; i.e., chinook, sockeye, etc. Chinook salmon enhancement may be practical in this system if it can be demonstrated that such a program does not conflict with the primary goal of coho production (see chinook project 1-B).

PRIORITY NUMBER I-(B) - LITTLE SUSITNA RIVER CHINOOK ENHANCEMENT

Project Goal--To provide a harvest of 6,000 chinook salmon which will result in an estimated 30,000 angler-days of additional recreational opportunity.

1. Management. Little Susitna chinook salmon are presently harvested by sport, subsistence and commercial users and considerable conflict currently characterizes the division of catch for this stock. Little Susitna chinook, as is the case with all chinook of northern origin, arrive early in Cook Inlet marine waters (prior to July 1) and are incidentally harvested in the commercial fisheries of the northern district and, to a lesser degree, along the beaches of the central district. This early arrival places them within the time period designated by the Board of Fisheries as a period to be managed primarily for recreational benefits, as long as the subsistence priority is accommodated. Sport fishing for this chinook stock extends from late May until July 6, and the catch is restricted to a maximum harvest of 1,000 fish. Supplemental chinook salmon production in the Little Susitna River would, because of current Board of Fisheries directives, have maximum benefits to recreational and/or subsistence users.

2. Fishing Areas and Access. Refer to Project I-(A).

3. Existing Fishery and Use. Present recreational use is relatively light due primarily to poor physical access. Fishing effort in the lower river is often a function of the condition of the Burma Road rather than stock abundance. The system's chinook fishery extends from late May to early July and is confined to that portion of the river downstream from the Parks Highway. Early fishing use is normally heaviest along the lower reach of the river near the Burma Road access, whereas in late June and early July anglers shift their attention to water near the Parks Highway. A total of 500 to 900 chinook have been harvested annually from the system in recent years.

4. Other Fish Species Present. Refer to Project I-(A).

5. Public Facilities. Refer to Project I-(A).

6. Brood Source. The system supports ample stock from which to secure eggs. Capture of brood for eggs may, however, be difficult because the stream would be costly, if not impossible, to weir and spawning occurs over a wide area. Road access is available to many upriver spawning sites.

7. Evaluation Potential. Moderate costs would be associated with assessment of the marine commercial and subsistence catches of Little Susitna chinook salmon. Significant changes in current subsistence regulations could, however, increase the

difficulty of evaluation. Estimation of the sport harvest could be readily accomplished because of the scarcity of access points; i.e., there are only two primary access points that could be easily monitored. Assessment of escapement would be relatively difficult because of the system's size, extensive distribution of spawners and silty water. No permanent ADF&G facilities are currently available on the system to assist evaluation.

8. Imprint and Release Sites. Refer to Project I-(A).

9. Miscellaneous. Refer to Project I-(A).

10. Research and Development Needs:

a. Upgrade Burma Road to allow all weather use to ensure greater utilization of the lower portions of the Little Susitna River.

b. Determine magnitude, distribution and timing of all segments of the escapement.

c. Identify various adult capture and juvenile release sites and determine optimum smolt size and time of migration.

d. Evaluate the effect of chinook plants on other rearing species such as coho (refer to Project I-(A)).

PRIORITY NUMBER II - EARLY RUSSIAN RIVER SOCKEYE SALMON ENHANCEMENT

Project Goal--Provide an additional harvest of 20,000 sockeye salmon to satisfy 33,000 angler-days of effort.

1. Management. At the present time, the early Russian River sockeye salmon run is not harvested significantly by the commercial gill net fishery due to the late June opening date. Although annual efforts are made by commercial fishermen to open earlier in June, the current Board of Fisheries policy on Cook Inlet salmon allocation states that salmon stocks which normally move in Cook Inlet to spawning areas prior to June 30 shall be managed primarily as a recreational resource, to the extent that such management is consistent with the subsistence priority. The harvest is monitored by a Division of Sport Fish creel census program and the escapement by a weir, above the area open to fishing, at the Lower Russian Lake outlet.

2. Fishing Areas and Access. Good access exists via the Seward Highway 110 miles from the Anchorage population center. The Russian River fishery occurs on both public lands of the Chugach National Forest and Kenai National Wildlife refuge. There are two federal campgrounds adjacent to the open fishing area.

3. Existing Fishery and Use. A good shore fishery exists from a point two miles upstream on the Russian River to the Kenai River confluence area. During 1980, an estimated 27,200 early run sockeye salmon were taken by 31,430 angler-days of effort. The fishery extends from early June through mid-July.

4. Other Fish Species Present. This stream has coho salmon stocks in fair to good condition, as well as rainbow trout and Dolly Varden.

5. Public Facilities. There are good commercial tourist accommodations available in the Cooper Landing area. There are also five additional federal campgrounds within a 10-mile radius of the stream.

6. Brood Source. An excellent brood source is available from Upper Russian Creek which is primarily used by the early sockeye salmon run. This is a small stream which could be temporarily weired for egg take purposes.

7. Evaluation Potential. The potential for evaluation is excellent because currently there is no commercial set gill net fishery on returning early sockeye salmon adults until late June. The recreational catch is presently being monitoring by a creel program conducted over the area open to fishing.

Escapement monitoring is complete because of the Lower Russian Lake weir. There is housing available at the Russian Lake weir for monitoring the escapement as well as a cabin on Upper Russian Lake for conducting egg takes.

8. Imprint and Release Sites. The sockeye salmon fry release sites should be confined to Upper Russian Creek or Upper Russian Lake.

9. Miscellaneous. This project is of major importance because of the high existing angler use and the ability of this intensive fishery to completely harvest any excess fish above the escapement goal. A stable sockeye salmon incubation facility (spawning channel, incubation boxes, excess stream flow bypass, etc.) is required to provide stable early run production. During 1976 and 1977, years in which excellent early sockeye salmon escapements were achieved, flooding conditions drastically reduced the egg deposition. With completion of the Russian River Fall's fishpass, more "2-ocean" sockeye salmon are now able to enter the system, which may ultimately increase the magnitude of the early run.

10. Research and Development Needs:

    a. Determine the optimum sockeye salmon fry release size and timing into Upper Russian Lake.

b. Initiate studies on types of sockeye salmon egg incubation systems or flood bypass systems to provide stable fry production from Upper Russian Creek.

c. Determine the feasibility of selective breeding to promote a greater return of "2-ocean" sockeye salmon to the system which can utilize the fishpass at Russian River Falls.

PRIORITY NUMBER III - WILLOW CREEK COHO AND CHINOOK SALMON ENHANCEMENT

Project Goal--To provide a harvest of 6,000 chinook salmon and 6,000 coho salmon which will result in an estimated 42,000 angler-days of additional fishing opportunity.

Note: This proposal is contingent upon development of an access road along the lower portion of Willow Creek to its junction with the Susitna River.

1. Management. Willow Creek chinook salmon, as is the case with all chinook of northern Cook Inlet origin, are presently harvested by sport, commercial and subsistence users. Considerable conflict currently characterizes the division of catch for this species. Unlike northern coho, chinook salmon arrive early in Cook Inlet marine waters (prior to July 1) and follow more specific migrational paths; i.e., they are harvested primarily in the northern district and, to a much lesser degree, along the beaches of the central district. This early arrival places them within the time period that has been designated by the Board of Fisheries as a period to be managed primarily for recreational benefits, as long as the subsistence priority is accommodated. Supplemental chinook salmon production in Willow Creek and other northern Inlet waters would, therefore, presumably have maximum benefit to

recreational and subsistence users; i.e., commercial fishing could be restricted if such harvests significantly reduce these other opportunities.

2. Fishing Area and Access. The system is located within a 2-hour drive of Anchorage and is within the proposed Capitol Site. The creek is accessible by highway and has public lands in the major salmon fishing area, however, access to this area is restricted to hazardous river travel. Improved access, therefore, must be a prerequisite to any major enhancement effort on this system (such an access proposal is included in the Alaska Salmon Fisheries Plan). Chinook salmon tend to linger at the mouth of the creek until approaching maturity, hence the prime fishing area is physically confined; i.e., the fish school at the mouth or the lower pools of the river and then ascend the creek rapidly to protected upstream spawning areas. An access road (about 3 1/2 miles in length) bordering the stream to its confluence with the Susitna River would be necessary to adequately harvest supplemental production. This road would also provide relatively easy boat access to other potential harvest areas located at the mouths of the Deshka River and Alexander Creek. In addition, this access road would also enhance potential for supplemental coho production originating in the Caswell Creek drainage (Proposal V).

3. Existing Fishery and Use. The stream has historically supported a modest chinook salmon fishery that has been limited because of access difficulties. The fishery occurs during June and early July and is presently confined to four consecutive weekends. A maximum allowed harvest of 300 chinook governs the seasonal catch from the system.

4. Other Fish Species Present. A substantial pink salmon fishery occurs particularly on "even" years. Unlike chinook salmon, these fish are primarily harvested near the Parks Highway at a time when flesh condition is beginning to deteriorate. Improved access to the stream mouth would also be beneficial to this fishery. Grayling and Dolly Varden are also available and enter sport fisheries in small numbers.

5. Public Facilities. There are numerous tourist accommodations adjacent to the Parks Highway near Willow Creek. A State wayside is also present on Willow Creek near the Parks Highway, and excellent State camping facilities are located in the nearby Nancy Lake Recreational Area. Private campgrounds and commercial fishing guides are also present.

6. Brood Source. An adequate chinook salmon brood stock is available and capturing adults for eggs would be reasonably easy (by weir, electroshocking or seine). Because of limited numbers, coho brood stock will have to be obtained from other

sources. Spawning areas are accessible by road at numerous locations. Spawning distribution and magnitude are well documented for both coho and chinook within the system.

7. Evaluation Potential. Assessment of the sport harvest in Willow Creek would not be difficult; however, costs for creel checks would increase if chinook are taken at downstream Susitna River tributary mouths. Moderate costs would also be associated with assessment of the marine catch of Willow Creek chinook salmon. Escapement can accurately be measured by visual means and examination of carcasses for "marks". No ADF&G facilities are currently available on the system to aid the program, however, there is considerable background information for the river; i.e., escapement magnitudes, distribution, sex and age composition, juvenile growth rates and various physical and chemical data.

8. Imprint and Release Sites. Potential lotic release sites are available by road at numerous locations in the drainage. Deception Creek, a tributary of Willow Creek, may prove to be an excellent imprint site; i.e., easy to weir and located upstream of the area open to salmon fishing.

9. Miscellaneous. This system was chosen for supplemental production studies for the following basic reasons: (1) to determine the feasibility of harvesting chinook salmon as they

pass through and/or school off the mouths of downstream Susitna River tributaries (2) to obtain available background data from these downstream fisheries and, (3) due to the ease of evaluation. Stated harvest and effort goals will not likely be achieved if Willow Creek proves to be the sole harvest area. An understanding of the harvest potential at downriver tributary mouths will undoubtedly guide future enhancement site selections throughout the Susitna River drainage.

10. Research and Development Needs:

a. Improve access to the mouth of Willow Creek by road and boat launch construction.

b. Identify various adult and juvenile release sites.

c. Determine optimum smolt and/or fingerling stocking densities, sizes and release times.

d. Evaluate enhancement contributions to the Willow Creek fishery and to the downstream Deshka River and Alexander Creek fisheries (downstream Susitna River tributaries).

e. Evaluate the effects of chinook salmon enhancement on the system's coho population. Coho enhancement may be practical in this system if it can be demonstrated that such a program does not conflict with the primary goal of chinook salmon enhancement.

PRIORITY NUMBER IV - ANCHOR RIVER STEELHEAD ENHANCEMENT

Project Goal--Provide an additional harvest of 1,000 steelhead to satisfy 10,000 angler-days of effort.

1. Management. Little commercial and recreational fishery conflict exists on this stream, as the commercial gill net fishery begins one mile north of the Ninilchik River. The current Board of Fisheries policy on Cook Inlet salmon allocation states that commercial salmon gill net fishing after August 15 will be curtailed or eliminated in areas where these fisheries intercept stocks bound for Kenai Peninsula spawning areas. This policy further reduces the already limited incidental harvest of steelhead that are taken in the commercial salmon set net fishery. There are areas south of Anchor River where steelhead bound for the Anchor River are subjected to subsistence fishing. The closely regulated fishery averages less than 100 fish per year.

2. Fishing Areas and Access. There is a good access via the Seward and Sterling Highways about 190 to 210 miles from the Anchorage population center. The entire stream is open to steelhead fishing and is generally accessible to the public. There is considerable State land along the Anchor River.

3. Existing Fishery and Use. There is a fair to good steelhead fishery with high existing use from late August through the end of October. The harvest from 1977 to 1979 has ranged from 780 to 1,750 steelhead. Angler effort exceeds 15,000 angler-days annually.

4. Other Fish Species Present. This stream has chinook salmon stocks in excellent condition as well as good anadromous Dolly Varden stocks and a fair to good coho salmon population. Small rainbow trout stocks occur in the upper portions of the streams with small numbers of pink salmon present in the lower areas on "even" years.

5. Public Facilities. There are limited tourist motel facilities adjacent to this stream, but excellent accommodations are available in Homer 20 miles away via the Sterling Highway. The State Division of Parks has two campgrounds adjacent to the Anchor River.

6. Brood Source. A good steelhead brood source is available from Stariski Creek. This stream has a close geographical proximity to these streams (six miles from the Anchor River). It is a fairly small stream which could be easily weired. In the event it was selected as a brood stock, it could be completely closed to fishing without the loss of substantial recreational opportunity. Crooked Creek, located 45 miles

north of Anchor river, has a F.R.E.D. Division weir on it and could also be used as a location to establish a steelhead "over-wintering" holding facility for spring egg takes.

7. Evaluation Potential. Good evaluation potential already exists as returning adults are subjected to a limited subsistence fishery and no commercial fishery. A creel census is currently being conducted on the Anchor River coupled with a tag and recovery program and escapement surveys.

8. Imprint and Release Sites. Good imprint and release sites are available below the North and South Forks of the Anchor River which are accessible at several points by a gravel road.

9. Miscellaneous. Steelhead could be reared at the existing Anchorage Area Hatchery Complex where warmer water conditions could be utilized to shorten the freshwater phase of smolt rearing by possibly two years. The greatest problem facing this program will be in holding returning mature steelhead adults which arrive in September and October until their spawning time in April and May. If this program is successful, it could be expanded to other streams such as the Ninilchik River and Deep Creek and possibly the lower Kenai River.

10. Research and Development Needs:

a. Determine optimum smolt release size and timing.

b. Determine the effect of steelhead smolt plants on other rearing species; i.e., chinook and coho salmon.

PRIORITY NUMBER V - CASWELL CREEK COHO SALMON ENHANCEMENT

Project Goal--To provide a harvest of 6,000 late run coho which will result in an estimated 12,000 angler-days of additional recreational fishing opportunity; and to evaluate harvest and catch distribution at the mouths of downstream Susitna River tributaries.

1. Management. Sport and commercial user group concerns described previously for the Little Susitna River apply in this system. Precise manipulation of sport catch and escapement may prove difficult if substantial numbers of coho are harvested at the mouths of downstream tributaries.

2. Fishing Areas and Access. The system is located within a 2-hour drive of Anchorage and lies just north of the proposed Willow Capitol Site. Highway access is available to the mouth of the creek where most salmon fishing occurs. Public lands border this portion of the creek. The harvest area at the mouth of Caswell Creek is physically very restricted and, therefore, can only accommodate limited fishing pressure. Fishing areas would be greatly expanded, however, if the mouths of downstream Susitna River tributaries develop into significant harvest sites.

3. Existing Fishery and Use. Present fishing pressure is relatively light and, for the most part, the harvest occurs on coho stocks bound for tributaries in the upper Susitna River

drainage. The system's fishery occurs from mid-July until early September.

4. Other Fish Species. Impact on indigenous salmonids would be minimal; i.e., only a few grayling and a small rainbow population exist in the drainage. Angling effort is currently very light on these fishes. Small chinook and pink salmon fisheries also occur at the mouth on stocks that are moving further upstream in the Susitna River.

5. Public Facilities. Tourist accommodations are available at numerous Parks Highway lodges in the vicinity of Caswell Creek. No public campgrounds are present on the system and/or at the mouths of potential downstream harvest sites. If supplemental production is successful, a lack of public facilities will generate the need for garbage removal, parking, restrooms, etc.

6. Brood Source. Existing coho brood stock is limited. However, procurement of eggs could easily be achieved by weiring this small creek although the system's coho are small and have low fecundity. The small size of this population and its relatively minor contribution to existing fisheries suggest that late arriving coho from other drainages may be suitable for building this population.

7. Evaluation Potential. Problems of accurately assessing adult returns in the commercial fishery would be identical to those described for the Little Susitna River. Estimation of the sport harvest at the mouth of Caswell Creek and determination of escapement could be efficiently accomplished. Evaluation of catches from downstream Susitna River tributaries would be moderately costly; i.e., this would involve census at Alexander Creek, Deshka River, Willow Creek and Little Willow Creek. Assessment of out-migration could be obtained by weir. The headwaters of the system are accessible by road and the entire system can be foot surveyed in one day. The system offers opportunities for lentic and lotic rearing and release experimentation. There are currently no ADF&G facilities on the creek.

8. Imprint and Release Sites. Road accessible lentic and lotic release sites are available at several locations in the drainage.

9. Miscellaneous. This is a small system that only affords modest opportunities for production supported solely by fry-fingerling plants. The primary basis for selecting this site is to determine the feasibility of harvesting coho as they pass through downstream tributarial fisheries. Stated harvest and effort goals will not be achieved if coho do not contribute to downstream tributary catches. An understanding of the harvest potential from upstream Susitna River hatchery

releases will play an important role in future enhancement site selection throughout the Susitna River drainage.

10. Research and Development Needs:

a. Determine magnitude, distribution and timing of all segments of the escapement into the system.

b. Identify various adult capture and juvenile release sites.

c. Determine optimum fry and/or smolt release densities, size, age, timing, etc. These studies must include, but not be limited to, evaluation of lotic and lentic releases, fry-fingerlings vs. smolt releases and accelerated vs. full term smolt releases.

d. Assess the contribution of enhanced coho to the Caswell Creek fishery and to fisheries of the lower Susitna River.

PRIORITY NUMBER VI - RESURRECTION BAY COHO SALMON ENHANCEMENT

Project Goal--Provide an additional harvest 10,000 coho salmon to satisfy 20,000 angler-days of effort.

1. Management. There currently exists a limited conflict between recreational and commercial users in Resurrection Bay. This area was closed to commercial fishing for coho salmon by the Board of Fisheries in 1965. There is some overlap in timing of adult returns between pink salmon which are harvested by commercial purse seiners, and coho salmon stocks. Conflicts in this area have been minimized through implementation of a 1976 Board of Fisheries policy which prohibits the commercial taking of coho. The Division of Sport Fish has collected substantial background information on coho salmon catch to escapement ratios needed to formulate sound management practices.

2. Fishing Areas and Access. Good access is available via the Seward Highway 130 miles from the Anchorage population center. Resurrection Bay is 15 miles long and 3 miles wide and is generally sheltered from weather during the summer with some protected coves.

3. Existing Fishery and Use. A high-use marine boat fishery exists which provides 20,000 to 30,000 angler-days and takes 10,000 to 20,000 coho salmon from the middle of July through

the middle of September. While shore fishing opportunities for coho salmon are available, the catch rates are substantially lower.

4. Other Fish Species Present. A good pink salmon fishery exists primarily on "even" years. Rockfish and ling cod are also available near the Resurrection Bay entrance. Other species present are halibut, chinook salmon, Dolly Varden, greenling, cod, etc.

5. Public Facilities. There are good tourist accommodations available as well as developed public parking and boat launching sites. There are also numerous charter boat services available. The Seward Silver Salmon Derby has been held during mid-August since 1956.

6. Brood Source. Excellent coho brood sources exist from the Seward Lagoon and Bear Lake stocks. This area is currently the major brood source for southcentral Alaska coho salmon programs.

7. Evaluation Potential. Excellent evaluation potential exists through the Resurrection Bay creel census program and the Bear Creek weir. The adult coho salmon returns are subjected to virtually no commercial fishing effort. Tributary streams, except for the mainstem Resurrection River, are relatively small and can be easily foot surveyed. The Department has

existing permanent facilities at Bear Creek for housing personnel to monitor this project. The Bear Creek weir has excellent adult capture, holding and egg take facilities as well as smolt enumeration and marking capabilities. An adult capture and holding facility was constructed at the Seward Lagoon Inlet during 1978.

8. Imprint and Release Sites. Excellent proven coho salmon smolt imprint and release sites exist at Bear Creek and Seward Lagoon. Seward Lagoon smolt plants have achieved smolt survivals as high as 15%. Numerous small tributary streams and Grouse Lake are also available as sites.

9. Miscellaneous. This proposed coho salmon enhancement effort will supplement the existing fry stocking in Bear Lake and the planting of smolts in the Seward Lagoon. The present program has been responsible for increasing the Resurrection Bay recreational coho salmon harvest by approximately one-third.

10. Research and Development Needs:

    a. Determine the optimum coho salmon fry stocking density for rehabilitated Bear Lake.

    b. Determine optimum coho salmon smolt release size and timing for the Seward Lagoon and Resurrection Bay tributary streams.

c. Construct a rearing pond system in the lower Resurrection River area to utilize coho salmon fry "downstream drift".

d. Investigate the feasibility of increasing the stocked coho salmon fry to smolt production in Bear Lake by employing artificial fertilization methods.

PRIORITY NUMBER VII - EARLY KENAI RIVER CHINOOK SALMON ENHANCEMENT

Project Goal--Provide an additional harvest of 5,000 chinook salmon to satisfy 25,000 angler-days of effort.

1. Management. At the present time the early Kenai River chinook salmon run is essentially not harvested by the commercial gill net fishery due to the late June opening date. Although annual efforts are made by commercial fishermen to open earlier in June, the current Board of Fisheries policy on Cook Inlet salmon allocation states that salmon runs prior to July 1, destined for Kenai Peninsula spawning areas, will be managed primarily for the recreational fishery as long as the subsistence priority is accommodated. The Kenai River early run is subjected to a limited harvest by sport fishermen during the Deep Creek marine fishery. Both fisheries are monitored by a Division of Sport Fish creel census program.

2. Fishing Areas and Access. There is good access via the Seward Highway 130 to 160 miles from the Anchorage population center. The Kenai River near the Skilak Lake outlet is on public lands of the Kenai National Wildlife Refuge. The lower portion of the river is mainly private land, but there are five public boat launching sites in addition to the numerous private sites.

3. Existing Fishery and Use. A good boat fishery exists from the Skilak Lake outlet to the Kenai River's termination with Cook Inlet. During 1979, an estimated 3,660 early run chinook salmon were taken by 39,670 angler-days of effort. The fishery extends from early June through early July.

4. Other Fish Species Present. This stream has coho salmon stocks in fair to good condition as well as rainbow trout, Dolly Varden and sockeye salmon. Pink salmon are very abundant during "even" years.

5. Public Facilities. There are excellent tourist accommodations available in the Kenai, Soldotna and Sterling areas. There are guide charter services available as well as boat rentals. There are numerous camping sites and boat launching ramps along the entire length of the lower Kenai River.

6. Brood Source. An excellent source is available from Benjamin Creek, a tributary to the Killey River. It is considered undesirable to introduce non-indigenous stocks to this major system.

7. Evaluation Potential. The potential is good because there currently is no commercial set gill net fishery on returning adults until late June. The recreational catch is presently being monitored by a creel census program conducted over the bulk of the area open to fishing. Escapement monitoring is difficult at the present time but will be possible after the

lower Kenai River trap is operational. There is housing available at Soldotna for monitoring the overall stock returns.

8. Imprint and Release Sites. Returning adult chinook salmon should be as concentrated as possible to ensure maximum recreational harvest. Primary release sites should be confined to the lower Kenai River, probably at the mouths of Slikok and Soldotna Creeks, because future needs may necessitate eggs being taken from these returning adults. Secondary release sites should be further upstream, probably at the mouths of Killey and Funny Rivers.

9. Miscellaneous. This project is of considerable importance because of the present high existing use of the fishery (35,000 angler-days over a 30-day period).

10. Research and Development Needs:

    a. Determine optimum chinook salmon smolt release size and timing.

    b. Assess supplemental chinook salmon production utilizing tag and recovery methods.

PRIORITY NUMBER VIII - KNIK ARM TRIBUTARIES COHO SALMON ENHANCEMENT (Including Fish, Cottonwood and Wasilla Creeks).

Project Goal--To provide a harvest of 9,000 late run coho which will result in an estimated 18,000 angler-days of additional fishing opportunity; and to develop and evaluate various coho enhancement practices.

1. Management. Sport and commercial user-group concerns described previously for the Little Susitna River coho apply to each of these systems. Manipulation of sport catch and escapement can readily be accomplished for each stream because salmon fishing areas are restricted and escapements can be assessed easily by visual or weir methods.

2. Fishing Areas and Access. All systems are located within a 1 to 1 1/2 hour drive of Anchorage and are also near the communities of Palmer and Wasilla. Highway access is available to all three streams. Public lands border most areas open to salmon fishing, however, a potential access problem could develop along an existing road to Wasilla Creek. Harvest areas are restricted to brackish water portions of each stream, and these confined areas can only accommodate moderate fishing pressure without causing substantial streambank congestion.

3. Existing Fishery and Use. Each of the Knik Arm systems have substantial existing recreational use which fluctuates considerably each year according to run strength. Salmon fishing is currently restricted to weekends only because angling demands far exceed present stock levels. These fisheries are characterized as being intense and of short duration due to restricted fishing areas and time.

4. Other Fish Species Present. Both Fish and Cottonwood systems have sizeable sockeye salmon populations that do not presently contribute significantly to a recreational fishery. These two systems also have healthy rainbow stocks that enter lentic fisheries in moderate numbers. Big Lake, within the Fish Creek drainage, supports a quality winter Dolly Varden fishery. Wasilla Creek contains a resident Dolly Varden population that supports light fishing pressure.

5. Public Facilities. There are favorable tourist accommodations available in the nearby communities of Palmer and Wasilla. An unmaintained campground (formerly Borough-operated) is present at Fish Creek; however, a lack of public facilities on or near the other streams could cause difficulties if angling intensity increases substantially; i.e., limited parking, no garbage or restroom facilities, etc.

6. Brood Source. Acquisition of eggs could readily be accomplished, however, the size of the population in Cottonwood Creek is often limited. Brood exchange between the streams

may be possible because the drainages are located within close proximity of one another and they appear to have many similar characteristics. Egg takes have been conducted in both Fish and Cottonwood Creeks in the past and brood fish can be captured efficiently with low cost weirs. The fecundity of coho in all three systems is relatively low; i.e., 2,300 to 2,600 per female. No known late arriving sub-populations have been documented for these systems.

7. Evaluation Potential. Problems of accurately assessing adult returns in the commercial fishery would be identical to those described for the Little Susitna River. Estimation of both recreational harvest and escapements could be efficiently accomplished in all drainages. Fish and Cottonwood Creeks currently have both up and downstream migrant weirs. Road accessibility is excellent along the entire length of each drainage. Environmental similarities suggest the enhancement techniques developed in one watershed may be applicable to the other systems. The existing staff and incubation facility at Meadow Creek would readily facilitate enhancement evaluations. Although Meadow Creek currently has numerous ADF&G facilities, it may be desirable to conduct definitive coho enhancement research in the Cottonwood drainage where a larger sockeye population would not complicate investigations; i.e., accurate enumeration of both adult and juvenile coho would be difficult in Fish Creek because of the more numerous sockeye.

8. Imprint and Release Sites. Both lentic and lotic imprint and release sites are available by road in all drainages. All sites are within a one-hour drive of the Fort Richardson-Elmendorf Hatchery and within a half-hour drive of the Meadow Creek incubation facility.

9. Miscellaneous. The Knik Arm system appears to be ideal for enhancement related coho research. Substantial biological, chemical and physical data are available for these systems and they are very accessible and easy to weir. Lentic and lotic rearing and release sites are plentiful in two systems, and environmental similarities allow for comparative investigations.

10. Research and Development Needs:

a. Determine magnitude, distribution and timing of all segments of the escapement into Cottonwood and Wasilla Creeks.

b. Identify various adult capture and juvenile release sites.

c. Determine optimum fry and/or smolt release densities, size, age, timing, etc. These studies must include, but not be limited to, evaluation of lotic vs. lentic

releases, fry-fingerling vs. smolt releases and accelerated vs. full term smolt releases. The contribution of enhanced stocks to the recreational fisheries of the respective systems will be evaluated.

d. Evaluate the effect of coho plants on other species. Emphasis should be directed toward inter-reactions with sockeye and rainbow trout. Coho production MUST NOT significantly interfere with or impact the enhancement of Fish Creek sockeye.

PRIORITY NUMBER IX-(A) - KACHEMAK BAY COHO ENHANCEMENT

Project Goal--Provide an additional harvest of 15,000 coho salmon to satisfy 30,000 angler-days of effort.

1. Management. There currently exists a limited conflict between recreational and commercial users in Kachemak Bay. The area adjacent to the northeast side of the Homer Spit was closed to commercial fishing by the Board of Fisheries in 1976 although it still remains open to subsistence gill net fishing. There is some overlap between pink salmon, which are harvested by commercial purse seiners and coho salmon stocks.

2. Fishing Areas and Access. There is good access via the Sterling Highway 240 miles from the Anchorage population center. Kachemak Bay is 20 miles long and 4 miles wide and has numerous protected coves on its south side as well as sheltered water on the east side of the Homer Spit.

3. Existing Fishery and Use. This is a good recreational fishery with angling effort for all finfish exceeding 50,000 angler-days in 1979. The Kachemak Bay coho salmon catch by sport anglers was approximately 1,800 in 1979. While shore fishing opportunities for coho salmon are also available, the catch rates are substantially lower than for boat anglers.

4. Other Fish Species Present. There is a good pink salmon fishery on both "even" and "odd" years, particularly in the Tutka Bay area. There is an excellent halibut fishery in Kachemak Bay west of the "Spit". Other species present are chinook salmon, Dolly Varden, crab, shrimp and hardshell clams.

5. Public Facilities. There are good tourist accommodations available in Homer as well as developed public parking, camping and boat launching sites. There are numerous charter boat services available although they are primarily oriented toward halibut fishing at the present time.

6. Brood Source. There are good coho brood sources from both the Seward Lagoon and Bear Lake coho salmon stocks. These stocks spend at least two months feeding in saltwater prior to entering their spawning streams, so they would be available to the recreational fishery for a long period of time.

7. Evaluation Potential. There is good evaluation potential through a Kachemak Bay creel census program. The adult coho salmon returns are not subjected to an intense commercial fishing effort but are taken by the subsistence gill net fishery. Because of this, some monitoring may be required. Tributary streams, where smolts may be planted, are relatively small and can easily be foot surveyed. The Department has existing permanent facilities at the Anchor River for housing personnel to monitor this project.

8. Imprinting and Release Sites. Imprint and release sites in Kachemak Bay should be confined primarily to the vicinity of the Homer Spit where maximum utilization by recreational anglers can be achieved. Sites that should receive primary initial consideration are Fritz Creek and the Mud Bay area (direct saltwater).

9. Miscellaneous. This proposed coho salmon enhancement effort is of lower priority because good marine fishing occurs in Kachemak Bay for other finfish and shellfish species. Also, the program has to be relatively successful to provide a sufficient number of coho salmon to establish a marine sport fishery.

10. Research and Development Needs:

a. Determine optimum coho salmon smolt release size and timing.

b. Determine optimum coho salmon smolt imprint and release sites in the Homer Spit area.

c. Determine the degree of interception of returning coho salmon adults by the commercial purse seine and gill net fisheries.

PRIORITY NUMBER IX-(B) - KACHEMAK BAY CHINOOK SALMON ENHANCEMENT

Project Goal--To provide an additional harvest of 2,000 chinook salmon to satisfy 10,000 angler-days of effort.

1. Management. Generally the same considerations exist as IX-(A) except that early run chinook salmon will tend to concentrate more in the south side of Kachemak Bay and be subject to the commercial set gill net fishery.

2. Fishing Areas and Access. Refer to IX-(A).

3. Existing Fishery and Use. There is a good recreational fishery with high existing use for all finfish. More than 50,000 angler-days were recorded in 1979. The chinook salmon catch by boat anglers fishing mainly the south side of Kachemak Bay, was 400 chinook in 1979--mostly "feeders".

4. Other Fish Species Present. A good pink salmon fishery exists on both "even" and "odd" years particularly in the Tutka Bay area. There is a good halibut fishery in Kachemak Bay west of the "Spit" and in the Seldovia area. Other species present are coho salmon, Dolly Varden, crab, shrimp and hardshell clams.

5. Public Facilities. Refer to IX-(A).

6. Brood Source. Crooked Creek stocks are currently in use as a brood stock.

7. Evaluation Potential. It has fair evaluation potential through a Kachemak Bay creel census program. The adult chinook salmon returns will be subject to the commercial set gill net fishery in the English Bay to Kasitsna Bay areas, so these sites will require monitoring. Depending on the locations of chinook salmon smolt releases, monitoring of adult returns should be possible at the tributary streams (Tutka Bay Lagoon Creek) or marine rearing pens.

8. Imprint and Release Sites. Suitable experimental release sites may be available in protected coves on the south side of Kachemak Bay, its tributary streams or the marine rearing pens at Halibut Cove.

9. Miscellaneous. An experimental plant of 26,000 chinook salmon smolts was made in Tutka Bay Lagoon Creek in 1976, however, only three adult chinook from this plant returned in 1978. In addition to satisfying the research needs on this project, it is important that the returning chinook salmon adults remain in saltwater a sufficient length of time (a minimum of one month) to provide a viable sport fishery. If they tend to return to the release sites as rapidly as Cook Inlet chinook

salmon normally do, without any saltwater delay, no recreational fishery can occur. Donor streams entering Kachemak Bay are too small to provide an aesthetically acceptable fishery.

10. Research and Development Needs:

a. Determine the success of various brood stocks available in the Cook Inlet area for establishing chinook salmon runs in areas where they are not currently indigenous.

b. Determine optimum smolt release size and timing.

c. Initiate studies to determine the period of saltwater availability to the recreational fishery of returning adult chinook salmon.

PRIORITY NUMBER X - LATE KENAI RIVER COHO SALMON ENHANCEMENT

Project Goal--Provide an additional harvest of 10,000 coho salmon to satisfy 20,000 angler-days of effort.

1. Management. Although there presently exists considerable user group conflict between sport and commercial fishermen over the late Kenai River coho salmon run, existing commercial fishing effort is virtually nonexistent. The current Board of Fisheries policy on Cook Inlet salmon allocation states that the commercial effort after August 15 will be reduced or eliminated. This essentially allocates this segment of the run to the recreational fishery, as long as the subsistence priority is accommodated. This fishery has been monitored by a creel census program since 1976.

2. Fishing Area and Access. Good access via the Seward Highway 110 to 160 miles from the Anchorage population center. The upper section of the Kenai River is on public lands of the Chugach National Forest and Kenai National Wildlife Refuge. The lower portion of the river is mainly private land but there are five public boat launching sites in addition to the numerous private sites.

3. Existing Fishery and Use. Good boat fishery from the Skilak Lake outlet to the Kenai River's termination with Cook Inlet. During 1979, an estimated 5,700 late run coho salmon were

taken by 12,300 angler-days of effort. The fishery is long, extending from the middle of August through October.

4. Other Fish Species Present. This stream has chinook salmon stocks in good condition as well as rainbow trout, Dolly Varden and sockeye salmon. Pink salmon are very abundant during "even" years.

5. Public Facilities. There are excellent tourist accommodations available in the Kenai, Soldotna and Sterling areas. There are guide charter services available as well as boat rentals. There are numerous camping sites and boat launching ramps along the entire length of the Kenai River.

6. Brood Source. Brood stock for an enhancement program should come from the late run itself. This segment of the run, however, is believed to be comprised primarily of mainstem Kenai River spawners and would not lend itself to easy capture for egg take purposes. Spawning concentrations of these fish which return during the optimum time of late August through September are unknown at this time.

7. Evaluation Potential. Good recreational harvest evaluation potential through the existing Kenai River creel census program. The potential subsistence catch could be determined by a monitoring program on the east side set net beaches after

August 15. Escapement assessment would be very difficult because the late run fish are believed to be mainstem spawners and do not utilize the clear lateral tributaries as does the early run. There is seasonal housing available for creel census monitoring in Soldotna.

8. Imprint and Release Sites. Returning adult coho salmon should be as concentrated as possible to ensure maximum recreational harvest. Because of this, release sites should be confined to the lower Kenai River probably at the mouths of Slikok and Soldotna Creeks.

9. Miscellaneous. This project has a lower priority because late Kenai River coho salmon stock size may improve substantially with the elimination of or reductions in the commercial fishery. Also, because of the large size of the stream and possible inclement weather during this period, catch to escapement ratios will be less favorable.

10. Research and Development Needs:

a. Identify major concentration areas of late run spawning coho salmon for brood stock development.

b. Determine optimum coho salmon smolt release size and timing.

Table 3. Listing by Priority of Specific Cook Inlet Streams and Marine Bays Recommended for Enhancement with Desired Number of Fish by Species Recommended for Each Project.***

Name of Site	Anticipated Catch:Escapement	Species							
		Coho		King		Steelhead		Sockeye	
		Catch*	Run**	Catch	Run	Catch	Run	Catch	Run
Little Susitna River	1:1, 3:1	10	20	6	8				
Russian River Early Run	Total Catch							20	20
Willow Creek	3:1	6	8	6	8				
Anchor River	1:1					1	2		
Caswell Lakes	3:1	6	8						
Resurrection Bay	1:1	10	20						
Kenai River Early Run	1:1			5	10				
Knik Arm Tributaries	3:1	9	12						
Kachemak Bay	1:1, 2:1	15	30	2	3				
Kenai River Late Run	1.2	10	30	—	—	—	—	—	—
Total by species		66	128	19	29	1	2	20	20
Total Catch	106,000								
Total Enhancement Run	179,000								

* Minimum desired catch of artificially produced fish.

** Total number of artificially produced fish required to produce desired catch at estimated catch to escapement rates.

*** All totals are in 1,000 increments.