TCCHINOOK-8702

February 12, 1987

ASSESSING PROGRESS TOWARDS REBUILDING DEPRESSED CHINOOK STOCKS

REPORT TCCHINOOK (87) 2

A Chinook Technical Committee Report

Produced for the Pacific Salmon Commission
February 11, 1987

EXECUTIVE SUMMARY

The Pacific Salmon Treaty established a chinook conservation program to rebuild depressed stocks by 1998. The goal of the program is to increase production by increasing spawning escapements to levels associated with the maximum sustainable harvest.

This report describes a framework for evaluating progress towards rebuilding depressed chinook stocks under the Pacific Salmon Treaty. The report focuses on documentation of indicator stocks and identification of information requirements and analytical procedures recommended for assessment.

From a technical perspective, determinations may be made concerning the status of individual stocks vis-a-vis their rebuilding schedules. Completion of rebuilding is also straightforward since an individual stock would be rebuilt when, over a period of years, spawning escapements are maintained at or near the escapement goal established by the appropriate management agency. Escapement goals are expected to be reviewed throughout the rebuilding program as productivity information become available.

On a regional or coastwide basis, decisions must be made on the basis of the status of aggregations of stocks. Individual stocks or groups of stocks will be ahead, on, or behind schedule and the rebuilding status of other stocks may be uncertain. Is completion of rebuilding synonymous with rebuilding all depressed stocks or something else? A number of options are presented for consideration. Policy decisions must be made before conclusions can be reached concerning the status of rebuilding on a regional or coastwide basis.

In assessing the status of individual stocks under the rebuilding program, three main elements must be examined: (1) spawning escapement levels; (2) fishery harvest and stock-specific exploitation rates; and (3) production responses to increases in spawning escapements. In developing the rebuilding program, the immediate objective was to stop the decline in escapements of naturally spawning chinook populations and to increase escapements subsequently. The ultimate objective, however, must be to maximize sustainable harvests. A phased approach that reflects expectations for changes in data availability and quality as the rebuilding program progresses is recommended. As more and better data become available, quantitative assessment options can be employed with less uncertainty. A full discussion of these phases is presented in the section entitled "Phases".

INTRODUCTION

A combination of catch ceilings and fishery specific harvest rate restrictions was implemented under the Pacific Salmon Treaty to "attain by 1998 escapement goals established to restore production of natural spawning chinook stocks". The regimes are designed to progressively increase escapements as harvest rates are reduced by maintaining catch ceilings in major mixed-stock fisheries and limiting harvest rates for other fisheries through pass-through provisions, while production responds to spawning escapement increases (Figure 1).

Figure 1(A) illustrates the anticipated pattern of the total chinook catch in a ceilinged fishery before and during the implementation of the chinook rebuilding program.

Figure 1(B) illustrates the anticipated pattern of terminal returns, under average conditions, for a stock before and during the rebuilding program.

Figure 1(C) illustrates the anticipated pattern of spawning escapements, under average conditions, for a stock where terminal fisheries are constrained by exploitation rates until rebuilding is complete.

Figure 1(D) illustrates the anticipated trend of exploitation rates, under average conditions, on a stock throughout the rebuilding program.

In developing methods and criteria to quantitatively evaluate interim progress towards rebuilding, the following factors must be taken into account:

1. Individual stocks are not expected to rebuild at a constant rate over time. Stocks are expected to rebuild at different rates because of variability in survival, life history, productivity and migration/distribution patterns;

2. When the rebuilding program was initiated, there were substantial differences in the degree to which individual stocks were depressed below optimum production levels;

3. Chinook salmon stocks are characterized by multiple ages of maturity. The harvest of a given fishery may be comprised of mature and immature components of several brood year age classes. The full benefits of initial harvest rate reductions by major mixed-stock fisheries during any one year will be spread over 2-3 years of spawning escapements;

4. The quality and availability of historical data bases on escapements are poor for some stocks. This problem is further aggravated by differences in escapement estimation procedures employed for individual stocks over time;

5. The method of rebuilding chosen is expected to yield small responses in escapements of many stocks in the early years of the rebuilding program;

6. Spawning escapement goals may change over time, either increasing or decreasing, as information on stock productivity becomes available;

7. Environmental conditions may accelerate or retard the rate of rebuilding of particular stocks, at different times during the rebuilding program;

8. Error and bias in measurement of data necessary for assessment.

Conceptually, the assessment of rebuilding progress can be described as: (i) developing a series of interim goals or targets for rebuilding; and (ii) monitoring the degree to which these interim goals are being met.

Practical application of this process poses two general problems:

1) For an individual stock with established goals, how should interim targets be chosen and how should progress be measured?

2) How can information for individual stocks be summarized for groups of stocks (for example by region or management unit) to represent general progress towards rebuilding?

As discussed in previous reports of the Joint Technical Committee, there is considerable uncertainty regarding the accuracy of parameters involved in key assumptions underlying the models and assessment methods employed to establish the initial catch ceilings under the rebuilding program: (1) stock productivity; (2) constant natural mortality rates of ocean fish; (3) stable stock distribution; and (4) consistent fishing patterns. The Committee is developing methods to examine the implications of the uncertainty in these parameters for the risk to the successful completion of the rebuilding program. The projections used in establishing the current approach are deterministic, that is, they ignore inherent variability and uncertainty. Further, methods used to implement management regimes have not been considered and experience has already demonstrated that the manner in which catch ceilings are implemented is likely to invalidate some of these assumptions (e.g. differential impacts on fall versus spring type stocks due to the closure of spring fishing periods; size limit changes can affect the age and sex composition of the catch and subsequent escapement; non-retention regulations).

The tools and procedures employed by the Committee to assess rebuilding will evolve over time. As more information becomes available, parameters can be estimated with greater accuracy, assumptions can be more readily tested and any necessary adjustments can be made.

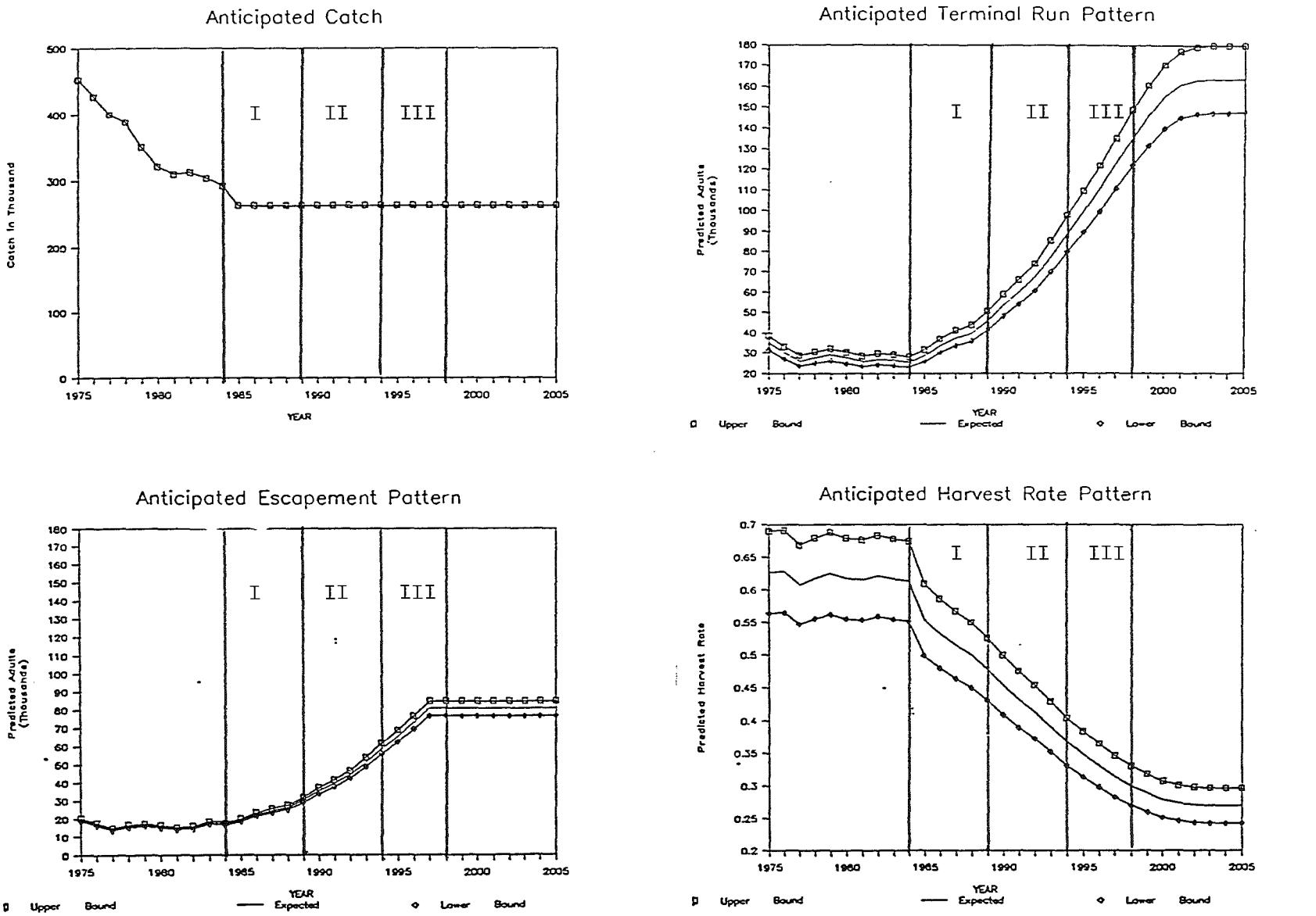

Figure 1. Anticipated trends of catch, terminal run, escapement and exploitation rate under the chinook conservation program with fixed catch ceilings.

EVALUATION FRAMEWORK

General Discussion

Assessment of a multiple brood cycle chinook rebuilding program requires consideration of three basic elements:

1) spawning escapements;
2) fishery harvest rates and stock-specific exploitation rates; and
3) production responses from increased spawning escapements.

The relative emphasis placed on each of these elements will change as the rebuilding program progresses.

The assessment framework requires a long-term commitment to maintain escapement monitoring, indicator stock coded wire tagging, and fishery sampling programs. Stable support for these data collection and tagging activities is essential.

The recommended framework defines the information, measurement and analytical techniques needed to evaluate progress towards rebuilding. Where specific measurements can be developed, actual results will be compared with expectations. Conclusions will be difficult to reach based upon a single year's data, therefore procedures to detect and analyze trends and similarities between stocks will be necessary.

The analytical framework is intended to:

reflect regional differences in assessing responses of indicator stocks;

identify major deviations from expectations which may require recommendations for alterations in the rebuilding management regimes;

include development and/or refinement of analytical procedures for measurable criteria.

Five tasks are required to implement this framework:

(1) establish of a set of indicator stocks for monitoring spawning escapements, stock-specific exploitation rates, and fishery harvest rates;

(2) establish interim targets;

(3) compile data;

(4) analyze data; and

(5) evaluate harvest management actions.

TASK 1: Establishment of Indicator Stocks

A coastwide system of indicator stocks is being established to monitor escapements, stock-specific exploitation, and fishery harvest rates. Indicator stocks are employed since it is impractical to monitor the response of all chinook stocks to the rebuilding program. There are two types of indicator stocks:

1) Escapement indicator stocks: used to monitor spawning escapement levels for naturally propagated stocks.

2) Harvest rate indicator stocks: used to monitor changes in harvest rates resulting from management actions. These will primarily be artificially propagated, coded-wire-tagged stocks which have distribution, maturity, and harvest patterns that are assumed to be similar to natural stocks of concern.

Indicator stocks established by management entities in the United States and Canada to represent chinook production units are summarized in the tables attached to this report. Detailed descriptions of indicators will be provided for reference in regional supplements to this report. These regional summaries identify existing and anticipated harvest rate indicators and escapement indicators that will be used to assess the progress of rebuilding. In addition, available detailed background information is supplied for each indicator stock.

Existing and anticipated escapement indicator stocks are described in regional reports. For each escapement indicator stock the following information is supplied where available:

1) rationale for selection;
2) identification of production represented;
3) current escapement goal;
4) basis for the escapement goal; and
5) escapement enumeration method.

Existing and anticipated harvest rate indicators are described in regional reports. For each harvest rate indicator stock, the following information is supplied:

1) rationale for selection;
2) production represented by the indicator;
3) when the indicator was or is expected to be coded wire tagged; and
4) when tag recovery information was or is expected to become available.

In general, indicators were selected according to the following criteria:

1) representative coverage of most geographic areas, stock production units, and racial types;

2) availability of an appropriate baseline data set;

3) feasibility of obtaining necessary data (e.g. availability of sufficient numbers of juveniles for marking and capability to accurately estimate escapements);

4) availability of major artificial production facilities;

5) expected contribution to fisheries of interest to the Pacific Salmon Commission.

TASK 2: Establishment of Interim Targets

Rebuilding progress of individual stocks can be assessed against interim annual targets for spawning escapements, fishery harvest rates, and stock-specific exploitation rates. For stocks represented in the Canada/U.S. chinook model, a time series of expected harvest rates, stock exploitation rates, and escapements can be generated and used as interim targets. For other stocks, trend lines, step schedules or other measures must be established by the appropriate jurisdiction to depict expected progress under the rebuilding schedule. The Committee has not yet been able to address these topics for 1987 planning.

TASK 3: Compilation and Analysis of Data

Escapements and Terminal Runs

The responses of the terminal runs and the spawning escapements of the escapement indicator stocks are the major direct measures for progress towards rebuilding. Spawning escapements and goals should be expressed in terms of adults, with a breakout by females and males wherever possible. Total escapement numbers alone can be quite misleading since egg deposition is the critical factor in spawning escapements, not total numbers of fish, regardless of age or sex structure.

Harvest Rates

Progress towards rebuilding can be assessed through estimation of the types of fishery harvest rates and stock-specific exploitation rates listed below. The use of harvest rates in trend analysis assumes that stock distribution and fishing patterns, maturation, growth and recruitment are all relatively consistent during the rebuilding program or that adjustments can be made for changes.

1) Age-Fishery Specific: Exploitation rates for fish of one age in a specific fishery can be used individually or averaged for several indicator stocks to develop an age-specific fishery harvest rate index. Because of potential differences in year-to-year stock distribution, it is recommended that exploitation rates be averaged for major contributing stocks for comparison with target reductions in fishery harvest rates. For the near term, age-fishery harvest rates for several stocks should be used for assessing the effect of PSC management regimes.

2) Stock specific: Exploitation rates for all fisheries on individual indicator stocks can be used to assess cumulative effects of all fisheries. There are two sub- types of stock-specific exploitation rates which can be calculated:

   a) exploitation rate for primary age class in harvest;

b) exploitation rate for an entire brood (four to five age classes combined).

Stock-specific exploitation rate calculations are potentially more reliable than fishery-specific harvest rates. Fewer assumptions concerning fish distribution are required and more data can be used to generate the estimate. The disadvantages of stock specific exploitation rates are the difficulty of evaluating the performance of particular fisheries and the length of time required (three to four years) to obtain an estimate.

Production Responses

If sex composition and age structure remain stable, a given spawning escapement level for a stock is expected to produce a certain population size (e.g. catch plus escapement of a given brood). Under such circumstances, the productivity, or number of fish produced per spawning fish, can be expected to vary with the level of escapement. It is extremely important to collect information on the sex and age composition of the spawning population, since these characteristics can greatly affect productivity.

The rebuilding program is premised upon an expectation that increases in spawning escapements will generate increased production in subsequent generations. It is theoretically possible to directly measure such increases for specific indicator stocks. However, such measurements may be suspect because monitoring programs may involve sampling error, and biases such as increasing enhancement may confound results. Indirect measurements of increased abundance (early indication of production with minimal fishery impacts, e.g. jack counts, shaker rates, catch rates, incidental catch levels) may eventually be the best early indicators of success. Specific techniques to evaluate production responses have not yet been developed.

TASK 4: Annual Evaluation

Three types of comparative evaluations should be performed:

1) baseline period;

2) predicted trends; and

3) trends and similarities among indicator stocks.

The effectiveness of these evaluations is dependent on: (1) the quality of the data collected for each of the indicator stocks; (2) the availability of suitable baseline data; and (3) the amount of time allowed to confidently establish the direction and magnitude of observed trends.

Interrelationships between observed changes in spawning escapements, fishery harvest rates, and stock-specific exploitation rates must be taken into account when evaluating rebuilding progress. Examples of combinations of changes in

spawning escapements and fishery harvest/stock exploitation rates are presented in the following table along with potential causes, assuming average environmental conditions.

INTERPRETATION OF CHANGES IN SPAWNING ESCAPEMENT,
FISHERY HARVEST AND STOCK EXPLOITATION RATES

Escapement	Exploitation/ Harvest Rate	Reasons (assuming ceiling management)
Increase	Decrease /No Chg	Abundance and distribution as anticipated
Increase	Increase	Higher abundance of indicator stock and reduced abundance of other stocks or differential harvest
No Chg	Increase /No Chg	Lower Indicator stock abundance or reduced abundance of other stocks or increased vulnerability or true increase
No Chg	Decrease	Lower indicator stock abundance and increased abundance of other stocks or reduced vulnerability
Decrease	Increase /No Chg	Lower indicator stock abundance and decreased abundance of other stocks or increased vulnerability
Decrease	Decrease	Lower indicator stock abundance and lower vulnerability and increased abundance of other stocks or increased vulnerability of other stocks

TASK 5: Effectiveness of Mixed Stock, PSC Management Measures

This category involves assessment of patterns emerging during implementation of the rebuilding program. It includes such topics as differential impacts on stock types (e.g. spring v. fall), changes in induced mortalities, and bias in compliance with established regimes. Impacts of fishing regulations, such as size limits or season structure, on the age and sex composition of spawning escapements must also be considered.

In the early part of the rebuilding program, information from indicator and stock asessment programs will be extremely limited and alternative means of assessing the effectiveness of management measures may be necessary.

PHASED APPROACH TO REBUILDING ASSESSMENT

As the rebuilding program progresses, the relative emphasis placed upon escapements, fishery harvest rates, stock-specific exploitation rates and productivity will change as will the quality and quantity of the data collected from indicator stocks. Initially, the emphasis will be fishery and stock dependent, reflecting differences in the quality and quantity of indicator stock data. Effort should focus on establishing accurate monitoring systems for all indicator stocks to provide a more adequate basis for assessment in the future.

The Committee recommends that the program to assess rebuilding be stratified into three general phases. These phases reflect how the assessment is anticipated to change over the rebuilding schedule.

PHASE I (1984-1988)

The relative usefulness of escapements, fishery harvest rates, and stock exploitation rates in assessing rebuilding will be stock dependent during this period. The rate of rebuilding, annual variability in rebuilding measures and the adequacy of baseline and monitoring programs will determine how rebuilding will be assessed. Major declines in abundance for specific stocks, as indicated by higher than anticipated fishery harvest/stock exploitation rates and/or lower than anticipated escapements, may indicate that further reductions in fishery ceilings or harvest rates are necessary.

During this initial period, changes in spawning escapements will be difficult to assess. For several stocks, no baseline exists for comparisons. For many stocks, changes in spawning escapements may be difficult to detect early in the rebuilding program given the small magnitude of expected response in relation to annual variablity and sampling uncertainties. Where available, coded wire tag data should be analyzed to determine whether observed fishery harvest/stock exploitation rates are consistent with expectations for the fisheries limited by ceilings or harvest rate restrictions. However, major changes in spawning escapements, especially if observed across a series of stocks or regions would be detectable.

It should be possible to develop assessments of changes in exploitation rates of some stocks in response to management actions imposed under the Treaty. The joint chinook model would be used to provide estimates of changes in fishery harvest and stock exploitation rates for comparison with actual results.

Given the uncertainty involved with estimates for a specific stock in a specific fishery, the emphasis will be on analyzing patterns among stocks within fisheries. In the short term, we would expect rebuilding to progress if target reductions in fishery harvest rates are achieved. This comparative information, combined with data from the fisheries and escapements, catch patterns and recruitment estimates would provide the primary indications of whether or not the rebuilding process is on schedule.

In the initial part of the rebuilding program, effort will be concentrated in laying the foundation for the assessment and monitoring systems necessary to evaluate progress towards the rebuilding schedule. Harvest rate and escapement indicator stock programs will be established during this period and analytical tools developed.

Phase II (1989-1993)

During this phase of the program, changes in spawning escapements resulting from PSC management should become more apparent. Increased emphasis would be placed on escapements compared to Phase I. Trends in escapement will be assessed for consistency with harvest rate changes and anticipated productivity responses.

Brood exploitation rates will be estimated and compared with expectations generated by modeling efforts. Data for indicator stocks will be compared to identify potential problems in underlying assumptions regarding stock distribution patterns and fishery impacts.

Fishery harvest rate, brood exploitation rate, and escapement data will be examined for consistency with expectations. Escapement and harvest rate indicators will be evaluated to determine if they are appropriate for production units of concern.

Efforts could be initiated to estimate total production from individual stocks using spawning escapement estimates and harvest profiles from appropriate indicator stocks. Estimated productivity rates will be compared to model expectations to assess the accuracy of stock productivity estimates inherent in the rebuilding program. In addition, productivity estimates may provide information for evaluation of escapement goals.

In a number of cases, productivity estimates may be confounded by enhancement related to indicator stock programs. Under such circumstances, other estimates of production response, such as jack counts, could be developed and evaluated.

Phase III (1994-1998)

Changes in spawning escapement levels should become more and more evident during this period if the rebuilding program is progressing as anticipated. The primary emphasis during this phase would be placed on escapements during this phase. Assessments of stock productivity will continue as data concerning response to spawning escapement levels become available.

The process described herein is limited to the assessment of progress towards rebuilding spawning escapements to goals established by appropriate management jurisdictions. Evaluation of individual stock escapement goals is an ongoing process within managing agencies. It is anticipated that goals will be revised as new information on productivity, escapement levels, fishery harvest rates, and stock-specific exploitation rates become available.

As a product of the indicator stock program, a fairly comprehensive data set of escapements and harvest rates should exist for a wide variety of chinook stocks. Spawning escapement trends should clearly be established and much easier to identify than in earlier phases. In addition, we will have the highest degree of confidence in our estimates of fishery harvest and stock exploitation rates. At this time, information should be sufficient to identify the stocks that will be rebuilt under status quo management and the stocks in need of additional management action.

Assessment measures, anticipated observations, and activities that would occur in each phase of this evaluation framework are summarized in the following table.

SUMMARY OF ASSESSMENT PHASES

Phase	Measurements	Observations and Activities
I	Relative changes in fishery harvest rates	Establish baselines for future comparisons
	Spawning escapements	Establish indicator stock system
		Anticipate reductions in fishery harvest rates
		Increase in the age (and potentially sex composition) of fish returning to terminal areas
		Escapement changes in some stocks difficult to detect and interpret
II	Spawning escapement	Increasing rate of increase in terminal run size, catch and escapement
	Stock-specific brood year exploitation rates	Progressive reduction in fishery harvest rates
	Relative changes in fishery harvest rates	Substantial reductions in brood year exploitation rates for individual stocks
	Initiate productivity assessments	Increased abundance of juveniles
		Increase of older and female fish in terminal areas
		Increase in size of fish in catch
		Increased catch rates
III	Spawning escapement	Same as in Phase II, but at accelerated rate
	Relative changes in fishery harvest rates	
	Intensify productivity assessments	

Regional and Coastwide Assessment

A conclusion regarding the progress of rebuilding all natural stocks coastwide or even regionally requires policy decisions as to the definition of "rebuilding". In the assessment of the status of individual stocks, some stocks or groups of stocks will clearly be ahead, on, or behind schedule. The rebuilding status of still other stocks may be uncertain (For example, patterns of escapement may be highly variable with escapements exceeding interim targets in some years but falling below in other years with no clear trend established). Yet these differences must somehow be reconciled to determine if adjustments to management regimes are required.

Regional Summaries

Regional summaries should be prepared annually to address rebuilding progress, reflecting potential differences in establishment of escapement targets, availability of information, and assessment approaches.

Coastwide Summary of Rebuilding Progress

There are serious technical and policy problems in providing an overall coastwide summary of rebuilding progress. Technically, it is difficult to summarize data which are collected by different methods with varying degrees of accuracy and which may represent different approaches to assessment. For instance, one agency may use only the largest and/or healthiest stocks while another may only monitor the weakest (and probably smaller) stocks. These types of approaches can lead to biases when the regional summaries are collated.

There are also important policy questions which must be addressed:

1) When is a "stock" rebuilt? (i.e., how many years must the escapement goal be achieved to count for success?)

2) What proportion of the indicator stocks (within a particular river system, region, coastwide) needs to be rebuilt in order for rebuilding to be complete? (i.e., all, the majority, ___% of the production?)

3) Should we concentrate only on wild and/or hatchery stocks which are in trouble or should a broader crossection of stocks be used for evaluation?

Regardless of how these policy questions are answered, any coastwide assessment of rebuilding should address the questions of relative stock size as well as the proportion of stocks which have achieved rebuilding. In addition, specific reports should be prepared in all regions for stocks which are failing to meet rebuilding criteria.

The preferred method of presenting evaluation results should be determined through an iterative process, with feedback between the policy and technical groups as necessary to find a reporting process that fits technical constraints while satisfying policy requirements. It is not essential that decisions regarding the method be made prior to the 1987 season.

Table 1. Southeast Alaska Natural Chinook Salmon Indicator Stocks

REGION: Southeast Alaska

RUN TYPE: Spring

SOURCES OF PRODUCTION	ESCAPEMENT INDICATORS STOCK (INDEX TRIBUTARY)	HARVEST RATE INDICATORS
SOUTHEAST ALASKA (34 SYSTEMS INCLUDING TRANSBOUNDARY RIVERS)	ALSEK (KLUKSHU) SITUK CHILKAT (BIG BOULDER) TAKU (NAKINA, NAHLIN) KING SALMON ANDREWS CREEK STIKINE (LITTLE TAHLTAN) UNUK CHICKAMIN BLOSSOM KETA	VARIOUS HATCHERY STOCKS TO BE SELECTED E.G. NEETS BAY/WHITMAN CRYSTAL LAKE LITTLE PORT
PERCENT OF PRODUCTION REPRESENTED	80-90%	NA

Table 2. Southeast Alaska and Northern British Columbia Transboundary Chinook Salmon Indicator Stocks

REGION: Transboundary Southeast Alaska/Northern B.C.

RUN TYPE: Spring

SOURCES OF PRODUCTION	ESCAPEMENT INDICATORS STOCKS (INDEX TRIBUTARY)	HARVEST RATE INDICATOR
TRANSBOUNDARY RIVERS OF SOUTHEAST ALASKA AND NORTHERN BRITISH COLUMBIA	ALSEK (KLUKSHU) CHILKAT (BIG BOULDER) TAKU (NAKINA, NAHLIN) STIKINE (LITTLE TAHLTAN) UNUK CHICKAMIN	VARIOUS HATCHERY STOCKS TO BE SELECTED E.G. NEETS/WHITMAN
PERCENT OF PRODUCTION REPRESENTED	100%	NA

Table 3. Canadian Chinook Indicator Stocks

Production Unit	Type	Escapement Goal	Escapement Indicator	Harvest Rate Indicator
Upper Fraser	Spr/Sum	30,400	Test Fishery a/	None currently available b/
Middle Fraser	Summer	17,600	Test Fishery a/	None currently available b/
Thompson	Summer	45,700 d/	Test Fishery a/	Eagle
Lower Fraser	Fall	175,000	Harrison	None currently available c/
Georgia Strait, Vancouver Is Nat	95% Fall 5% Sum	33,300	Cowichan Nanaimo	Qualicum Capilano
Georgia Strait, Mainland Nat Tenderfoot	Summer	7,600	None None	None None
Johnstone St, Upper Georgia St Nat	70% Fall 30% Sum	23,300	Devereux Salmon	Quinsam Campbell
West Coast Vanc Is Natural	Fall	94,100	Kennedy Burman Tashigh	Somass
North Coast Nat	Spr/Sum	72,300	All Area 3 All Area 4	Kalum
Central Coast Nat	Summer	45,200	All Areas 6-8, 9, 10	Atnarko

a/ Test fishery is primary escapement indicator. Trends in each production unit will be by aggregate escapement estimate.

b/ Development of harvest rate indicators contingent upon improved assessment of Indian food fishery.

c/ Contingent upon development of GSI techniques.

d/ Escapement goal is under review.

Table 4. COLUMBIA RIVER SPRING CHINOOK INDICATOR STOCKS

PRODUCTION UNIT	ESCAPEMENT INDICATOR	HARVEST RATE INDICATOR
Willamette River Natural and Hatchery	Willamette Falls Counting Station	Willamette Hatchery North Santiam Hatchery South Santiam Hatchery McKenzie Hatchery Dexter Pond Marion Forks Hatchery Clackamas Hatchery
Cowlitz Spring Hatchery	NONE 1/	Cowlitz Hatchery
Upriver Spring Natural Hatchery	Bonneville Dam Adult Counts	Upper Columbia: Leavenworth Hatchery Snake: Rapid River Hatchery Sawtooth Hatchery

1/ Indicates this stock is managed for hatchery brood stock requirements.

Table 5. COLUMBIA RIVER SUMMER CHINOOK INDICATOR STOCKS

PRODUCTION	ESCAPEMENT INDICATOR	HARVEST RATE INDICATOR
Upriver Summer Chinook Natural Hatchery	Bonneville Dam	Upper Columbia: Wells Hatchery Snake: McCall Hatch

Table 6. COLUMBIA RIVER FALL CHINOOK INDICATOR STOCKS

UNIT	ESCAPEMENT INDICATOR	HARVEST RATE/PRODUCTION INDICATOR
Lower Columbia Fall Wild Chinook	Lewis River Wild	Lewis River Wild
Lower Columbia River Fall Hatchery Chinook		
Natural	NONE 1/	
Hatchery		Cowlitz Hatchery Bonneville Hatchery Stayton Pond
Bonneville Pool Hatchery		
Natural	NONE 1/	
Hatchery		Spring Creek Hatchery
Upriver Bright Fall Chinook		
Natural	McNary Dam Counts	Hanford Reach Natural Spawning
Hatchery		Priest Rapids Hatchery

1/ Indicates this stock is managed for hatchery brood stock requirements.

TABLE 7. PUGET SOUND AND WASHINGTON COASTAL SPRING CHINOOK INDICATOR STOCKS

PRODUCTION UNIT	ESCAPEMENT GOAL	ESCAPEMENT INDICATOR	HARVEST RATE INDICATOR
NOOKSACK/SAMISH			
NOOK.R. NATURALLY SPAWNING	4,000	NOOKSACK RIVER	_1/
HATCHERY	ALL		NOOKSACK HATCHERY & SKOOKUM CR. HATCHERY
SKAGIT RIVER			
NATURALLY SPAWNING	3,000	SKAGIT RIVER	_1/
HATCHERY	ALL		MARBLEMOUNT HATCHERY
SOUTH PUGET SOUND			
WHITE R. NATURALLY SPAWNING	N/A	WHITE RIVER	NONE
HATCHERY	ALL		MINTER CR. HATCHERY
HOOD CANAL			
SKOK. R. NATURALLY SPAWNING	N/A	SKOKOMISH RIVER	NONE
HATCHERY	500		QUILCENE NFH
STRAIT OF JUAN DE FUCA			
DUNG. R. NATURALLY SPAWNING	N/A	DUNGENESS RIVER	NONE
ELWHA R. NATURALLY SPAWNING	N/A	DUNGENESS RIVER	NONE
QUILLAYUTE RIVER			
NATURALLY SPAWNING (INTRO.)		NONE _2/	NONE
HATCHERY (SOLEDUCK)			NONE
HOH RIVER			
NATURALLY SPAWNING	900	HOH RIVER	NONE
QUEETS RIVER			
NATURALLY SPAWNING	700	QUEETS RIVER	NONE
QUINAULT RIVER			
NATURALLY SPAWNING		NONE _2/	NONE
GRAYS HARBOR			
CHEH. R. NATURALLY SPAWNING	1,400	CHEHALIS RIVER	NONE

_1/ APPROPRIATE FINGERLING RELEASES FROM HATCHERIES WITHIN THE REGION.
_2/ INDICATES THAT THIS STOCK/RIVER COMBINATION IS MANAGED FOR HATCHERY ESCAPEMENT OR THAT SPAWNING ESCAPEMENT IS NOT QUANTIFIED.

TABLE 8. PUGET SOUND AND WASHINGTON COASTAL SUMMER CHINOOK INDICATOR STOCKS

PRODUCTION UNIT	ESCAPEMENT GOAL	ESCAPEMENT INDICATOR	HARVEST RATE INDICATOR
SKAGIT RIVER			
NATURALLY SPAWNING	14,900	SKAGIT RIVER	1/
HATCHERY	1,000		MARBLEMOUNT HATCHERY 1+
STILLAGUAMISH/SNOHOMISH			
STILL. R. NATURALLY SPAWNING	2,000	STILLAGUAMISH RIVER	1/
SNOH. R. NATURALLY SPAWNING	5,250	SNOHOMISH RIVER	1/
HATCHERY	N/A		SKYKOMISH HATCH. 0+ & 1+
QUILLAYUTE RIVER			
NATURALLY SPAWNING	1,500	QUILLAYUTE RIVER	POSSIBLE FUTURE
HATCHERY			WILD STOCK PROGRAM 2/

1/ A COMBINATION OF PAST SKAGIT WILD AND PRESENT HATCHERY FINGERLING AND FUTURE STILLAGUAMISH WILD WILL BE USED TO MONITOR THE HARVEST RATES ON THESE STOCKS.

2/ APPROPRIATE FINGERLING RELEASES FROM HATCHERIES WITHIN THE REGION.

TABLE 9. PUGET SOUND AND WASHINGTON COASTAL FALL CHINOOK INDICATOR STOCKS

PRODUCTION UNIT	ESCAPEMENT GOAL	ESCAPEMENT INDICATOR	HARVEST RATE INDICATOR
NOOKSACK/SAMISH			
NOOK. R. NATURALLY SPAWNING	3,100	NONE _2/	_1/
SAMISH R. NATURALLY SPAWNING	*	NONE _2/	_1/
HATCHERY	14,800		NOOKSACK,SAMISH AND LUMNI HATCHERIES
SKAGIT RIVER			
SKAG. R. NATURALLY SPAWNING	*	NONE _2/	NONE
HATCHERY	*		NONE
STILLAGUAMISH/SNOHOMISH			
HATCHERY	3,100		TULALIP HATCHERY
SOUTH PUGET SOUND			
LAKE WA. NATURALLY SPAWNING	5,200	NONE _2/	_1/
GREEN R. NATURALLY SPAWNING	5,800	GREEN RIVER	_1/
PUY. R. NATURALLY SPAWNING	1,500	NONE _2/	_1/
NISQ. R. NATURALLY SPAWNING	1,500	NONE _2/	_1/
HATCHERY	21,050		ISSAQUAH, SUQUAMISH, GREEN, NISQUALLY, AND DESCHUTES HATCHERIES
HOOD CANAL			
SKOK. R. NATURALLY SPAWNING	1,650	NONE _2/	_1/
MISC. R. NATURALLY SPAWNING	2,800	NONE _2/	_1/
HATCHERY	4,050		GEORGE ADAMS HATCHERY
STRAIT OF JUAN DE FUCA			
NATURALLY SPAWNING, ALL	850	HOKO RIVER	
TRIBUTARIES EXCEPT ELWHA	1,300	DUNGENESS RIVER	HOKO RIVER WILD
ELWHA R. NATURALLY SPAWNING	2,700	NONE _2/	
HATCHERY	#		ELWHA REARING CHANNEL

TABLE 9. CONTINUED

PRODUCTION UNIT	ESCAPEMENT GOAL	ESCAPEMENT INDICATOR	HARVEST RATE INDICATOR
WAATCH AND SOOES RIVERS			
HATCHERY		NONE _2/	MAKAH NFH
QUILLAYUTE RIVER			
NATURALLY SPAWNING	3,000	QUILLAYUTE RIVER	QUEETS RIVER WILD
HATCHERY			SOLEDUCK HATCHERY
HOH RIVER			
NATURALLY SPAWNING	1,200	HOH RIVER	QUEETS RIVER WILD
HATCHERY			QUINAULT HATCHERY
QUEETS RIVER			
NATURALLY SPAWNING	2,500	QUEETS RIVER	QUEETS RIVER WILD
HATCHERY			QUINAULT HATCHERY
QUINAULT RIVER			
NATURALLY SPAWNING		NONE _2/	
HATCHERY			QUINAULT HATCHERY
GRAYS HARBOR			
HUMP. R. NATURALLY SPAWNING		NONE _2/	_1/
CHEH. R. NATURALLY SPAWNING		NONE _2/	_1/
HATCHERY			HUMPTULIPS & SATSOP HATCHERIES
WILLAPA BAY			
NATURALLY SPAWNING		NONE _2/	_1/
HATCHERY			WILLAPA BAY HATCHERY

_1/ APPROPRIATE FINGERLING RELEASES FROM HATCHERIES WITHIN THE REGION.
_2/ INDICATES THAT THIS STOCK/RIVER COMBINATION IS MANAGED FOR HATCHERY ESCAPEMENT OR THAT SPAWNING ESCAPEMENT IS NOT QUANTIFIED.
* INDICATES THAT THE PRODUCTION UNIT IS COMBINED WITH ANOTHER PRODUCTION UNIT, I.E. HATCHERY AND WILD COMBINED.

REGIONAL SUMMARY

for

COLUMBIA RIVER CHINOOK INDICATOR STOCKS

Prepared for the
Rebuilding Assessment Subcommittee
of the
Chinook Technical Committee

PACIFIC SALMON COMMISSION

March 1987
5/22/87

Prepared by
Columbia River Inter-Tribal Fish Commission

Regional Summary for Columbia River Chinook Indicator Stocks

General Description

Chinook entering the Columbia River are divided by return timing into spring, summer, and fall segments. The spring and fall returns are divided into management units on the basis of ocean distribution as well as spawning time and age at maturity. Presently, no distinct management units are recognized within the summer chinook returning segment.

Spring Chinook

1) Willamette River Spring Chinook (natural and hatchery)

From 1970 to 1979, Willamette stocks averaged about 24 percent of the spring chinook entering the Columbia River. In recent years (1980 - 1985), the Willamette run averaged about 35 percent of the spring chinook entering the Columbia River. The Willamette spring stocks are managed for a minimum escapement goal of 30,000 at the Willamette Falls counting station. Based on the release of oxytetracycline - marked fish from the 1970 brood, it was estimated that 65 percent of the returning adults were from hatchery releases of smolts, 10 percent from fingerling releases in reservoirs, and 25 percent from natural spawning (Bennett, 1983). It appears recent years returns are composed of about 25 percent natural spawning chinook (B. Bohn, personal communication).

The escapement goal at Willamette Falls is composed of brood stock requirements, a recreational fishery above the falls and a natural spawning component which was estimated using a spawner/recruit based methodology. The present escapement goal miniumum has been met in most years, and the run is generally in healthy condition. The Willamette spring chinook appear to have a far northerly distribution pattern as demonstrated by coded wire tag (CWT) recoveries. This stock was chosen as a harvest rate indicator stock based on its significant contribution to Canadian and Alaskan fisheries. In addition, this stock was chosen to supply harvest rates to determine if differential ocean harvest rates are emerging for spring versus fall stocks as a result of Pacific Salmon Commission (PSC) management action.

2) Cowlitz Type Spring Chinook

The spring chinook that return to the Cowlitz and nearby Washington tributaries are dominated by hatchery production, although about 5 percent of the production spawns naturally. The Cowlitz spring stocks have averaged 10.5 percent of the spring chinook returning to the Columbia for the years 1970 to 1979. In recent years (1980 - 1985), the Cowlitz spring stocks have averaged 20.5 percent of the spring chinook

returning to the Columbia. The egg take needs for the Cowlitz spring chinook program is about 5.9 million eggs. The adult escapement goal is about 2500, which is based on brood stock requirements.

Cowlitz spring stocks appear to contribute significantly to British Columbia, and Washington troll fisheries as shown by CWT recoveries. This stock was chosen as a harvest rate indicator stock based on its significant contribution to Canadian fisheries. Using CWT recoveries, the Cowlitz spring stocks appear to have similar distribution patterns to Spring Creek Hatchery type fall chinook. Therefore, the harvest rates calculated for this stock may be used to determine if differential ocean harvest rates are occurring for spring versus fall stocks due to PSC harvest management action.

3) Upriver Spring Chinook

The 1982 - 1985 spring chinook return above Bonneville Dam has been estimated to be about 34 - 49 percent natural. The 1982 - 1985 average return to Bonneville is about 65,000. The escapement goal at Bonneville Dam is 120,000. However, this goal was set when the composition of returning upriver spring chinook was approximately 70 percent natural. The escapement goal was estimated by two methods with similar results, a) spawner/recruit methodology plus brood stock requirements and b) the number of fish needed to seed each natural production areas at 50 percent and attain full hatchery production.

While some segments of the upriver run have shown increases as a result of hatchery programs (Wenatchee and Rapid River) and protection of spawning habitat (Yakima River), many components remain depressed. At present, information is inadequate to assess ocean harvest rates for upriver spring chinook stocks. Salmon River and Upper Columbia River stocks are being tagged as harvest rate indicators. The composite upriver spring chinook component is designated as a spawning escapement indicator stock. However, as information becomes available this escapement goal may be disaggregated into smaller units.

Summer Chinook

At present no distinct management units are recognized within the summer chinook returning segment. The lack of information necessary to distinguish summer population units may be attributed to the severely depressed state of the population and the relative lack of hatchery production needed to provide tagging information. However, differences do exist between age of summer chinook juvenile outmigrants from the Upper Columbia and Snake Rivers, which may be an indication of distinct units. Currently most production occurs between Priest Rapids and Chief Joseph dams, with

small numbers originating in the Snake River. The escapement goal of 85,000 spawners over Bonneville Dam has not been reached since 1969. Since that time counts have declined steadily, and recent counts have been less than one-third the desired escapement goal. The escapement goal was determined using a spawner/recruit method.

A harvest profile estimated from CWT fingerling releases from Wells Dam Hatchery for the 1974 and 1976 broods, revealed that 78 percent of the overall catch occurred in Alaska and British Columbia. A comparison of the number of recoveries in the ocean fisheries to those in the Columbia reveals a relatively high ocean harvest rate. An Upper Columbia and Snake River component of this stock were chosen as harvest rate indicators. Due to the depressed nature of this segment of the chinook population, the composite summer chinook population (as measured at Bonneville Dam) was designated as a spawning escapement indicator stock.

Fall Chinook

1) Lower Columbia River Fall Wild Chinook (LRW)

Within the LRW group, there is a primary wild stock in the North Fork Lewis River, and wild population substocks in the East Fork Lewis, Cowlitz, and Sandy Rivers. Between 1970 and 1984, the adult return has averaged 36,000 with about 17,000 harvested in the fisheries. Natural escapement to the North Lewis River is about 85 percent of the total LRW escapement, including the Sandy River.

The spawning escapement is enumerated using peak fish counts. At present there is no calculated escapement goal for Lewis River wild fall chinook. However, the 1970-1980 average is 10,000, which is an approximate escapement target. CWT recoveries of the 1977 brood release of the North Lewis River wild stock indicates that the majority of the harvest takes place in Alaska and British Columbia. LRW chinook has been chosen as a harvest rate indicator stock.

2) Lower Columbia River Hatchery Fall Chinook (LRH)

Within the broad group of LRH, there are also three different subunits identified as Willamette River, Cowlitz Hatchery, and all other LRH facilities. The LRH return has averaged about 150,000 fish between 1970 and 1984. There is a portion of naturally spawning hatchery origin fish which contribute to the overall LRH production. About 37 percent of the Willamette fall chinook population is produced by naturally spawning hatchery fish.

The spawning escapement is enumerated using weir counts, peak fish counts and the Willamette Falls counting station. The LRH spawning escapment goal is 35,000 adults. The goal is derived from hatchery brood stock requirements. Based

on CWT recoveries of the 1976 brood, LRH fall chinook significantly contribute to British Columbian fisheries. However, Cowlitz fall chinook maintain a more northerly catch distribution than other LRH stocks. This stock was selected as a harvest rate indicator based on its significant contribution to Canadian fisheries and the fact that it represents a major production unit of the Columbia River.

3) Bonneville Pool Hatchery Fall Chinook (BPH)

BPH fall chinook are produced at Klickitat, Little White Salmon and Spring Creek Hatcheries. Some natural production takes place in the Wind, Big White Salmon, Klickitat, and Hood Rivers. Historically, based on the success of Spring Creek Hatchery releases, BPH fall chinook have been one of the major contributors to chinook fisheries on the Washington coast and in the Columbia River.

The spawning escapement is enumerated using hatchery returns and peak fish counts. The escapement goal is 8200 adults to Spring Creek Hatchery. The escapement goal is derived from brood stock requirements. BPH was selected as a harvest rate indicator stock based on significant contributions to all west coast troll fisheries from Cape Falcon, Oregon up to the north end of Vancouver Island. In addition, it represents a major production group from the Columbia River. This stock is one of the four original harvest rate indicator stocks used in the multi-stock model for the U.S.-Canada negotiations.

4) Upriver Bright Fall Chinook (URB)

The majority of the URB production originates from the natural and hatchery production areas in the main stem of the Columbia between McNary and Priest Rapids Dams. In addition, there are a number of smaller substocks contributing to URB production from Bonneville Hatchery, the Deschutes, Snake, and Yakima Rivers. In recent years it has been determined that 80 percent of URB production is from naturally spawning chinook (Norman WDF, personal communication). The URB adult return has averaged about 117,000 since 1970.

The spawning escapement goal of 40,000 is measured at McNary Dam adult counting facility. The escapement goal is based on evaluation of limited spawner/recruit information, and upon observed stable production over a ten year base period (1964-1973), subsequently adjusted for lost Snake River habitat. This ten year period was selected because it represented a fairly recent period of relatively strong escapements and resultant strong returns to the Columbia River. Historically, most of the ocean harvest of URB fall chinook occurred in British Columbia and Alaska. URB

chinook was selected as a harvest indicator based on its significant contribution to Canadian and Alaskan fisheries. This stock also represents a major production unit for Columbia River chinook. In addition, URB chinook was one of the four original indicator stocks used in the multi-stock model for the U.S.- Canada negotiations. URB chinook is also designated as a spawning escapement indicator stock. In addition, it has been determined that it is feasible to collect sufficient numbers of juveniles to tag for a natural stock harvest rate indicator study. At present plans are being developed to begin a program to tag Upriver Bright fall natural chinook in 1987 at a level of at least 200,000 coded wire tagged fish.

IDENTIFICATION OF INDICATOR STOCKS
COLUMBIA RIVER SPRING CHINOOK

PRODUCTION UNIT	ESCAPEMENT INDICATOR	HARVEST RATE INDICATOR
Willamette River Natural and Hatchery	Willamette Falls Counting Station	Willamette Hatchery North Santiam Hatchery South Santiam Hatchery McKenzie Hatchery Dexter Pond Marion Forks Hatchery Clackamas Hatchery
Cowlitz Spring Hatchery	NONE 1/	Cowlitz Hatchery
Upriver Spring Natural Hatchery	Bonneville Dam Adult Counts	Upper Columbia: Leavenworth Hatchery Snake: Rapid River Hatchery Sawtooth Hatchery

1/ Indicates this stock is managed for hatchery brood stock requirements.

IDENTIFICATION OF INDICATOR STOCKS
COLUMBIA RIVER SUMMER CHINOOK

PRODUCTION	ESCAPEMENT INDICATOR	HARVEST RATE INDICATOR
Upriver Summer Chinook Natural Hatchery	Bonneville Dam	Upper Columbia: Wells Hatchery Snake: McCall Hatchery

IDENTIFICATION OF INDICATOR STOCKS
COLUMBIA RIVER FALL CHINOOK

PRODUCTION UNIT	ESCAPEMENT INDICATOR	HARVEST RATE INDICATOR
Lower Columbia Fall Wild Chinook	Lewis River Wild	Lewis River Wild
Lower Columbia River Fall Hatchery Chinook		
Natural	NONE 1/	
Hatchery		Cowlitz Hatchery Bonneville Hatchery Stayton Pond
Bonneville Pool Hatchery		
Natural	NONE 1/	
Hatchery		Spring Creek Hatchery
Upriver Bright Fall Chinook		
Natural	McNary Dam Counts	Hanford Reach Natural Spawning
Hatchery		Priest Rapids Hatchery

1/ Indicates this stock is managed for hatchery brood stock requirements.

ESCAPEMENT INDICATOR STOCK HISTORY

Indicator Stock:

Willamette Spring Chinook

Production Units Represented:

Willamette naturally spawning and hatchery spring chinook

Why Selected:

The Willamette spring stock appears to contribute to Canadian and Alaskan fisheries.

Date Established:

1985

Current Escapement Goal:

30,000 at Willamette Falls

Basis of Goal:

The goal is composed of brood stock requirements, a recreational fishery above the falls, and a natural spawning component which was estimated using a spawner/recruit based method.

Escapement Estimation Methodology:

Adult fish are counted at the Willamette Falls counting window.

YEAR	SPAWNING ESCAPEMENT	TERMINAL RUN SIZE
1977	40,000	64,400
1978	47,500	83,300
1979	30,500	49,200
1980	27,000	43,400
1981	30,100	56,300
1982	46,200	78,000
1983	30,600	63,200
1984	43,500	84,200
1985	34,500	68,100
1986	39,200	72,800

ESCAPEMENT INDICATOR STOCK HISTORY

Indicator Stock:

Upriver Spring Chinook

Production Units:

Upper Columbia natural and hatchery;
Salmon and Imnaha Rivers natural and hatchery;
Clearwater and Grande Ronde natural and hatchery;
Yakima River natural; and
Tributaries between Bonneville and McNary dams for natural and hatchery.

Why Selected:

While some segments of the upriver run have shown increases as a result of hatchery programs (Wenatchee and Rapid River) and protection of spawning habitat (Yakima River), many components remain depressed.

Current Escapement Goal:

120,000 (70% natural component).

Basis of Goal:

The goal was estimated by two methods with similar results;
a) spawner/recruit methodology plus brood stock requirements and
b) the number of fish needed to seed each natural production area at 50 percent and attain full hatchery production.

Escapement Estimation Methodology:

Adult fish are counted at the Bonneville Dam counting windows.

YEAR	SPAWNING ESCAPEMENT	% NATURAL SPAWNING ESCAPEMENT	TERMINAL RUN SIZE
1977	98,600	67	138,400
1978	124,400	75	127,000
1979	48,100	48	48,600
1980	53,100	52	53,100
1981	61,200	53	63,600
1982	66,700	49	71,100
1983	54,900	45	55,900
1984	46,800	43	47,500
1985	83,100	34	84,700
1986	118,100 1/	33	120,600 1/

1/ Preliminary.

ESCAPEMENT INDICATOR STOCK HISTORY

Indicator Stock:

Upriver Summer Chinook

Production Units Represented:

Upper Columbia natural and hatchery;
Snake River natural and hatchery

Why Selected:

The summer chinook population is extremely depressed. The majority of the harvest appears to take place in Alaska and British Columbia.

Date Established:

1985

Current Escapement Goal:

85,000 at Bonneville Dam

Basis of Goal:

The escapement goal was determined using a spawner/recruit method.

Escapement Estimation Methodology:

Adult fish are counted at the Bonneville Dam counting windows.

YEAR	SPAWNING ESCAPEMENT	TERMINAL RUN SIZE
1977	34,100	34,300
1978	38,400	38,700
1979	27,700	27,800
1980	26,900	27,000
1981	22,400	22,400
1982	20,100	20,100
1983	18,000	18,000
1984	22,300	22,300
1985	23,400	24,300
1986	25,900	26,200

ESCAPEMENT INDICATOR STOCK HISTORY

Indicator Stock:

Lewis River Wild Fall Chinook

Production Units Represented:

Lewis, Cowlitz, and Sandy Rivers natural production

Why Selected:

A major portion of the harvest takes place in British Columbia and Alaska.

Date Established:

1986

Current Escapement Goal:

Approximate target of 10,000.

Basis of Goal:

The goal is based on the 1970 to 1984 average escapement.

Escapement Estimation Methodology:

Peak fish counts.

YEAR	NORTH LEWIS RIVER ADULT SPAWNING ESCAPEMENT	TOTAL LOWER RIVER WILD TERMINAL RUN SIZE 2/
1977	6,930	29,800
1978	5,363	18,500
1979	8,023	32,800
1980	13,882	38,800
1981	17,946	25,000
1982	7,353	13,000
1983	11,756	16,800
1984	6,847	13,300
1985	7,500	13,300
1986	14,500 1/ 3/	21,900 3/

1/ Preliminary count includes jacks.

2/ Terminal run size is composed of the entire Lower River wild production, which includes North Lewis, East Lewis, Cowlitz, and Sandy rivers production.

3/ Preliminary.

ESCAPEMENT INDICATOR STOCK HISTORY

Indicator Stock:

Upriver Bright Fall Chinook (URB)

Production Units Represented:

Hanford Reach natural and hatchery production;
Yakima and Deschutes rivers natural production; and
Snake River natural and hatchery production.

Why Selected:

URB was one of the four original indicator stocks. They contribute significantly to Canadian and Alaskan fisheries.

Date Established:

1985

Current Escapement Goal:

40,000 at McNary Dam.

Basis of Goal:

The current escapement goal is based upon evaluation of limited spawner/recruit information, and upon observed stable production over a ten year base period (1964-1973), subsequently adjusted for lost Snake River habitat.

Escapement Estimation Methodology:

Adult fish are counted at McNary Dam counting windows.

YEAR	SPAWNING ESCAPEMENT	TERMINAL RUN SIZE
1977	37,600	95,100
1978	27,300	85,300
1979	31,200	89,200
1980	29,900	76,800
1981	21,100	66,600
1982	31,100	79,000
1983	48,700	86,100
1984	60,800	129,300
1985	93,300	195,600
1986	113,200 1/	316,200 1/

1/ Preliminary.

Harvest Rate Indicator Stock Histories

Indicator Stock: Willamette Type Hatchery Spring Chinook

Production Units Represented:
Willamette naturally spawning and hatchery spring chinook.

Date Established: 1985 Brood

Prior Tagging History: Started tagging this stock with the 1974 brood.

Why Selected: This stock was chosen as a harvest rate indicator stock based on its significant contribution to Canadian and Alaskan fisheries.

Indicator Stock: Cowlitz Type Hatchery Spring Chinook

Production Units Represented:
Cowlitz, Kalama, and Lewis hatcheries and naturally spawning spring chinook.

Date Established: 1985 Brood

Prior Tagging History: The 1977 Brood has been tagged with a gap in the 1978 and 1979 Broods. This stock has been tagged since 1980 Brood.

Why Selected: This stock was chosen as a harvest rate indicator stock based on its significant contribution to Canadian fisheries. Using CWT recoveries, the Cowlitz spring chinook appear to have similar distribution patterns to Spring Creek hatchery type fall chinook. Therefore, the harvest rates calculated for this stock may be used to determine if differential ocean harvest rates are occurring for spring versus fall stocks due to PSC harvest management action.

Indicator Stock: Leavenworth Hatchery Spring Chinook

Production Units Represented:
Upper Columbia natural and hatchery spring chinook; tributaries between Bonneville and McNary Dam for natural and hatchery spring chinook.

Date Established: 1985 Brood, complete brood recovery information will be available in 1990.

Prior Tagging History: Low level and sporadic historical tagging.

Why Selected: Many components of Upper Columbia spring chinook remain depressed.

Indicator Stock: Rapid River Hatchery Spring Chinook

Production Units Represented: Snake River and lower Salmon River hatchery and natural spawning spring chinook.

Date Established: 1985 Brood, complete brood recovery information will be available in 1990.

Prior Tagging History: Low level and sporadic historical tagging.

Why Selected: Many components of Snake and lower Salmon spring chinook are depressed. Also, to represent the production of this stock in modeling efforts.

Indicator Stock: Sawtooth Hatchery Spring Chinook

Production Units Represented: Middle and upper salmon natural spawning and hatchery spring chinook.

Date Established: 1985 Brood, complete brood recovery information will be available in 1990.

Prior Tagging History: ?

Why Selected: This spring chinook production remains depressed.

Indicator Stock: Wells Hatchery Summer Chinook

Production Units Represented: Upper Columbia natural and hatchery summer chinook.

Date Established: 1985 Brood, complete brood recovery information will become available in 1989.

Prior Tagging History: Sporadic tagging history.

Why Selected: The summer chinook population is extremely depressed. The majority of the harvest appears to take place in Alaska and British Columbia.

Indicator Stock: McCall Hatchery Summer Chinook

Production Units Represented: Snake River natural and hatchery summer chinook.

Date Established: 1985 Brood, complete brood recovery information will become available in 1990.

Prior Tagging History: ?

Why Selected: The Snake River summer chinook population is extremely depressed.

Indicator Stock: Lewis River Wild Fall Chinook

Production Units Represented: Lewis, Cowlitz, and Sandy Rivers naturally spawning lower river fall chinook.

Date Established: 1985 Brood

Prior Tagging History: The 1977 and 1978 Broods were tagged and again from 1982 Brood to the present.

Why Selected: CWT recoveries of the 1977 brood release of the North Lewis River wild stock indicates that the majority of the harvest takes place in Alaska and British Columbia. Also, to represent the production of this stock in modeling efforts.

Indicator Stock: Cowlitz Hatchery Fall Chinook

Production Represented: Cowlitz and Kalama Hatcheries Fall Chinook.

Date Established: 1985 Brood

Prior Tagging History: This stock has been tagged since the 1977 Brood.

Why Selected: This stock appears to contribute significantly to the West Coast Vancouver Island fisheries. In addition, it represents a major production unit of the Columiba River.

Indicator Stock: Spring Creek Hatchery Fall Chinook

Production Represented: Klickitat, Little White Salmon, and Spring Creek Hatcheries Fall Chinook. Natural fall chinook production of Wind, Big White Salmon, Klickitat, and Hood Rivers.

Date Established: 1984 Brood

Prior Tagging History: This stock has been tagged since the 1972 Brood.

Why Selected: Significant contributions to all west coast troll fisheries from Cape Falcon, Oregon up to the north end of Vancouver Island. This stock is one of the four original harvest rate indicator stocks used in the multi-stock model for the U.S.-Canada negotiations.

Indicator Stock: Priest Rapids Hatchery Fall Chinook

Production Represented: Hanford Reach natural and hatchery; Yakima and Deschutes Rivers natural; Snake River natural and hatchery.

Date Established: 1984 Brood

Prior Tagging History: This stock has been tagged since the 1975 Brood. Natural stock tagging will be conducted starting with the 1986 brood.

Why Selected: Significant contributions to Canadian and Alaskan fisheries. This stock is one of the four original harvest rate indicator stocks used in the multi-stock model for the U.S.-Canada negotiations.

DEPARTMENT FISH AND WILDLIFE

MEMORANDUM

INTRA-DEPARTMENT

DATE: January 13, 1987

TO: Howard Schaller, Columbia River Inter-Tribal Fish Commission

FROM: Rod Kaiser, Oregon Department of Fish and Wildlife

SUBJECT: Oregon Coast Chinook Indicator Stock Report

Attached is a draft report for Oregon coastal indicator stocks being developed for inclusion in the CTC Chinook Rebuilding Report. Howard, since I missed the last CTC meeting, I have formatted the reported based on material mailed to me and discussions with you and Mike Fraidenburg. As you will note, we have not yet established an "escapement" indicator stock for the coast. Further agency review will be needed as to whether we have a suitable river system in which we can develop such an assessment.

This report was prepared by Steve Jacobs and myself in the ODFW Ocean Salmon Program.

cc: M. Zirges
J. Martin
B. Bohn
K. Beiningen
S. Jacobs
J. Nicholas

SUMMARY OF CHINOOK ESCAPEMENT AND HARVEST RATE INDICATOR STOCKS FOR THE OREGON COAST (EXCLUDING COLUMBIA RIVER)

General Description of Stocks

Oregon coastal chinook stocks (south of the Columbia River) contribute to ocean fisheries from southeastern Alaska south through California. Analysis of coded-wire tag (CWT) recoveries from West Coast, British Columbia, and southeast Alaska ocean fisheries indicate two major Oregon coastal production units that contribute chinook to distinct geographic regions. Chinook stocks originating south of the Elk River (near Port Orford), and Umpqua River spring chinook, contribute to ocean fisheries off Oregon and California. Stocks originating from the Elk River north to the Nehalem River exhibit northerly migration patterns contributing mostly to SE Alaska and British Columbia ocean fisheries, with lesser amounts harvested off Washington and Oregon coasts. Oregon coastal north migrating chinook stocks originate mainly from natural production and are predominately wild fall run stocks, although minor stocks of spring run fish also contribute to ocean fisheries. Small numbers of public hatchery spring chinook from the Wilson, Trask, and Nestucca rivers are also produced that contribute to ocean fisheries north of Oregon.

While Oregon coastal north migrating chinook stocks collectively contribute significant numbers of fish to ocean fisheries north of Oregon, they have not been identified as having conservation needs under the Pacific Salmon Treaty at this time.

Regional Management Unit

Oregon coastal chinook stocks are managed to achieve an aggregate coastal escapement goal range of 150,000 to 200,000 natural spawning adults. This goal includes predominantly natural spawning fall run fish, with minor levels of natural spring spawners. The north migrating component does not have a separate escapement goal for either fall or spring runs, or for north and south/localized component stocks. Further definition of escapement goals is being evaluated within a chinook management plan being developed by the Oregon Department of Fish and Wildlife (ODFW) for Oregon coastal chinooks stocks. A draft plan should be available in late 1987 or early 1988.

Assessment of Escapement and Indicator Stock from Oregon Coastal Chinook

Available coded wire tag (CWT) data suggests that a portion of the Oregon coastal chinook stocks comprise a north coastal management unit, and are harvested primarily off British Columbia and SE Alaska. These stocks are comprised principally of fall run fish. In response to commitments to the U.S.-Canada Chinook Salmon Interception Treaty, the ODFW is in the process of enhancing their efforts to monitor the status of the stocks comprising the north coastal management unit. This report describes ODFW's approach and progress in this monitoring and indicator stock development effort. As developed by the U.S.-Canada treaty technical committee, chinook stock status is assessed through monitoring indicator stocks. Two types of indicator stocks have been described: exploitation and escapement rate indicator stocks. Exploitation rate indicator stocks are used to monitor fishery contribution and rates of harvest. ODFW has selected Salmon River Hatchery fall chinook as the exploitation rate indicator stock for coastal chinook (Table 1). This stock was selected because:

1. Its distribution of ocean catch is believed to be representative of natural and hatchery fall run stocks comprising the north coastal management unit (Table 2).

2. Its age composition is believed to be typical of stocks comprising the north coastal management unit.

3. Feasibility of estimating escapement of this stock.

The approach used to monitor this stock was developed and tested in 1986. This approach involves representatively coded-wire tagging a portion of the chinook released by the hatchery and subsequently estimating the recovery of these tags in the (1) ocean fishery, (2) in-river sport catch, (3) returns to the hatchery, and (4) natural spawning escapement. Beginning with the 1986 brood year, 100,000 smolts will be coded-wire tagged (two 50,000 tag groups) and released from the hatchery annually. Between 25,000 and 50,000 smolts have been coded-wire tagged from prior brood years, beginning in 1976 (with the exception of the 1981 brood when no fish were tagged). Ocean harvest is estimated by port sampling programs conducted in California, Oregon, Washington, British Columbia, and Alaska. Salmon River sport catch is estimated through a statistical creel survey. Hatchery returns are determined by monitoring recovery of tagged fish by the hatchery. Natural spawning escapement is estimated by conducting a mark-recapture study. This study involves trapping a portion of the returning fish at the hatchery (located 4 miles upstream from the river mouth), marking these fish with anchor tags and subsequently recapturing these marked fish as carcasses on spawning surveys. Although results are still being evaluated, based upon initial efforts in 1986, it appears that this approach is feasible and it will be possible to accurately estimate escapement of this stock with a high degree of precision.

Escapement indicator stocks are used to monitor escapement of natural spawning chinook stocks relative to established spawning goals. Presently we have not identified an escapement indicator stock for Oregon coastal chinook comprising the North Management Unit. ODFW has indexed escapement of these stocks for 36

years by surveying a total of 9.2 miles in 9 index streams. Although we feel this effort is suitable for monitoring long-term trends in escapement, we feel it is inadequate for monitoring escapement relative to established spawning goals and ocean management strategies under the treaty.

Beginning in 1986, with funds supplied through the U.S.-Canada Treaty, ODFW began efforts to improve its efforts to monitor escapement of these stocks. Initial work involved increasing spawning survey effort (increasing the number and frequency of spawning surveys conducted in each major coastal river basin); collecting biological data to compare size composition, age structure and sex composition among these stocks; and evaluating the adequacy of using spawning surveys to monitor escapement. Based on the results of this work, we will select an escapement indicator stock (or stocks) by 1988. The number of indicator stocks that are selected will depend on the variability of escapement and life history parameters among these stocks.

Table 1. Oregon Coast Fall Chinook Stocks

Source of production	Escapement indicator	Terminal run size	Harvest rate indicator	Terminal run size
Nehalem through Elk rivers	None	-	Salmon River Hatchery fall chinook	2,000

Table 2. Harvest rate indicator stock history.

Indicator stock: Salmon River Hatchery fall chinook

Production Units Represented: Oregon Coastal Chinook Stocks

Why Selected: Representative life history and catch distribution, centralized location, feasibility of estimating escapement.

Date Established: 1986 brood

Hatchery of Stock:

Release year	CWT code	Number released	Catch and escapement of CWT releases[1]/					
			CA	OR	WA	BC	AK	Escapement[2]/
1977	9-16-38	26,281	6	4	5	169	210	84
	9-16-37	21,820	16	0	4	248	138	97
1978	7-16-44	23,974	3	1	7	203	30	334
	7-16-43	19,800	3	6	0	57	34	55
1979	7-18-50	21,558	0	6	7	115	143	74
	7-18-49	30,102	0	4	0	50	21	30
1980	7-22-40	26,402	4	3	0	98	44	28
	7-22-39	22,741	0	2	15	173	21	37
1981	7-25-5	27,107	0	1	0	199	94	95
	7-25-4	26,573	0	1	0	44	35	18

1/ The number of expanded recoveries from complete broods only.

2/ Incomplete, only includes returns to Salmon River Hatchery.

DRAFT

SUMMARY OF CHINOOK ESCAPEMENT AND HARVEST RATE INDICATOR STOCKS

For Puget Sound and the Washington Coast

February 9, 1987

Produced by the NORTHWEST INDIAN FISHERIES COMMISSION and the WASHINGTON DEPARTMENT OF FISHERIES with assistance from Dr. Gary Morishima and Dr. Kenneth Henry.

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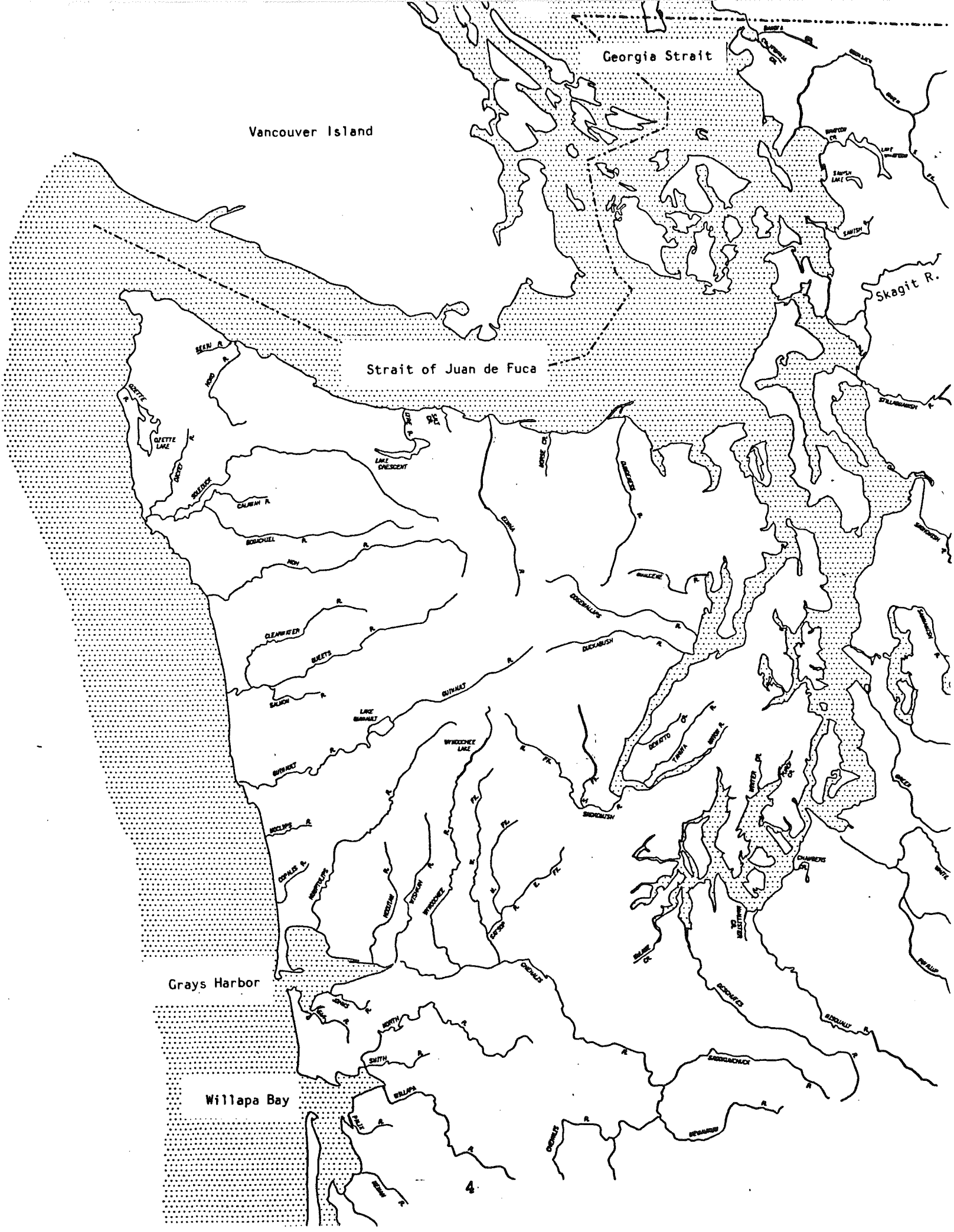
INTRODUCTION

This report has been prepared at the request of the Panels and Commissioners of the Pacific Salmon Commission (PSC). Its purpose is to document the status of the Chinook Indicator Stock program in Puget Sound and on the Washington Coast. (see map on page 4)

The definition and development of the Indicator Stock program is an ongoing process which will take several years to finalize. In particular, the development of wild stock tagging programs and the derivation of MSH escapement levels for some stocks could take several years to finalize.

In the interim, this report describes the current status of the program and outlines those stocks which are currently being used as indicator stocks.


Georgia Strait
Vancouver Island
Strait of Juan de Fuca
Skagit R.
Grays Harbor
Willapa Bay

GENERAL DESCRIPTION OF STOCKS AND ESCAPEMENT GOALS

The majority of chinook catch in Puget Sound is derived from hatchery produced fall chinook stocks. Management efforts are divided between the six management regions within Puget Sound and are directed at important spring, summer and fall races of hatchery and/or naturally spawning stocks within each region. Based on CWT data, Puget Sound stocks contribute mainly to fisheries off the West Coast Vancouver Island, in Georgia Strait and in Puget Sound.

Washington coastal stocks originate in small to medium size rivers. Some stocks are experiencing environmental difficulties in addition to excessive fishing pressures. Management of coastal rivers is typically directed at naturally spawning spring, summer and fall stocks. Hatchery production of chinook occurs primarily in the Soleduck, Quinault, Grays Harbor and Willapa Bay. Based on available CWT data, these stocks exhibit far-north migration patterns and are caught mainly in SE Alaska and off the BC coast in addition to terminal harvests.

Identification and achievement of MSH (maximum sustainable harvest) escapement goals are the major components of the rebuilding program. In both Puget Sound and on the Washington Coast, data for calculating MSH spawning goals are quite limited. The escapement goals for most Puget Sound rivers represent the average escapements observed over a recent historical period. It is possible that these escapement goals are low since chinook runs were heavily exploited when the goals were established.

For Puget Sound, the development of improved MSH escapement goals will only be possible as new spawning escapement data and stock specific ocean fishery catch information is gathered and analyzed. To determine MSH, spawning escapement data will be combined with the results from the harvest rate indicator stock program to estimate spawner/recruit relationships.

Preliminary spawner/recruit analyses have been conducted for several coastal stocks, but the data base is limited both by the number of years of data and the accuracy of the estimates of spawners and recruits. As a result of the preliminary spawner/recruit analyses, a "probing approach" was developed for use in the North Coastal region with the objective of gathering productivity data from a broad range of escapements to better estimate MSH escapement levels.

REGIONAL DESCRIPTION OF PRODUCTION AND MANAGEMENT

Table 1 identifies the production units and the escapement and harvest rate indicator stocks selected within each region to represent Puget Sound and Washington coastal chinook stocks for USC purposes.

Following is an introductory description of the chinook resources and management within each region of Puget Sound and the Washington Coast. The interplay between production units and indicator stock(s) is also discussed.

NOOKSACK/SAMISH

Naturally spawning Spring Chinook in this unit are currently managed to maximize spawning escapement of returning fish. The current goal is to increase naturally spawning escapements so MSH goals can be met. These stocks are severely underescaped and are receiving protection by closing all directed fisheries, (i.e. all fisheries where this stock is the major component of the catch). Both fingerling and yearling hatchery releases of the spring chinook stocks have been designated as harvest rate indicator stocks. The naturally spawning Nooksack River spring chinook stock has also been designated as a spawning escapement indicator stock.

Fall chinook production from this region is predominantly of hatchery origin. Due to the magnitude of production, the diversity of hatchery facilities, and the Canadian request to tag major production units that are contributing to Canadian fisheries, it was decided that hatchery production of fall chinook from each of the 3 main hatcheries would be designated as a harvest rate indicator.

SKAGIT RIVER

The spring, summer and fall chinook stocks from the Skagit River are primarily of natural origin, with minor hatchery components. The Spring stock is currently returning at levels at or below the natural spawning goal and therefore, there are no directed fisheries on this stock. Hatchery rehabilitation projects exist for both spring and summer stocks, but primarily rear yearlings. While both of these stocks are designated as harvest rate indicators, yearling releases do not yield a totally acceptable harvest rate indicator stock to represent naturally spawning production. Consequently, any new fingerling production will also be tagged, to better portray the harvest patterns of this component.

The run timing of Skagit River spring, summer and fall chinook stocks ia currently being evaluated to identify stock differences. The hatchery components of the spring and summer stocks will continue to be tagged as harvest rate indicators during this evaluation since there is no release of fall chinook which could be tagged.

STILLAGUAMISH/SNOHOMISH

Due to the very low level of spring chinook escapement in the Stillaguamish River, the status and size of this natural run is undetermined.

Planning is currently ongoing to capture adult Stillaguamish River summer chinook and to rear the progeny in a hatchery. When this project is implemented, the stocks will be tagged as a harvest rate indicator stock. In addition, hatchery production of summer chinook from this region is being tagged as harvest rate indicator stocks for future comparison with the wild summer run chinook. In addition, the Stillaguamish and Snohomish River naturally spawning stocks are designated as escapement indicator stocks.

Available information on spawning and rearing habitat in the Stillaguamish and Snohomish systems indicates that the current escapement goals of 2,000 for the Stillaguamish and 5,250 for the Snohomish wild fall stocks may be well below the levels needed to produce maximum sustained harvest. The Tulalip Hatchery releases of fingerling fall chinook have been designated as a harvest rate indicator stock.

SOUTH PUGET SOUND

The one remaining spring chinook stock in this region (White River) is designated as an escapement indicator stock, primarily for future years, as it is currently returning at very low levels. The majority of White River spring chinook broodstock was transferred to the WDF hatchery at Minter Creek to build a broodstock which would allow seeding of those areas formerly supporting naturally spawning spring chinook populations. The yearling and possible future fingerling releases of spring chinook from Minter Cr. will be tagged as harvest rate indicator stocks.

Management of fall chinook fisheries in this region are generally directed at achieving hatchery egg take goals. Fall chinook production from this region is predominantly of hatchery origin. Five of the major hatchery units in this region were designated as harvest rate indicator stocks. They were chosen on the basis of numbers of fish released and the likelihood of having different survival and/or migration characteristics. The Green River naturally spawning fall chinook are designated as an escapement indicator stock.

HOOD CANAL

Spring Chinook returning to the Skokomish River and to the Quilcene National Fish Hatchery (USFWS) are protected by terminal area closures when spring chinook are present. The NFH is developing the spring chinook stock which will be used to seed areas which formerly supported naturally spawning populations. The spring chinook from the Quilcene NFH are released as yearlings to enhance survival. This stock is designated as a harvest rate indicator. The naturally spawning spring chinook in the Skokomish River, are designated as an

escapement indicator stock, primarily for future years, since they are currently returning at very low levels.

The majority of fall chinook stocks in this unit originate from hatchery facilities. The mixed stock areas of Hood Canal are typically managed to achieve the egg take goal of the Hoodsport hatchery. The Skokomish River is managed to achieve the egg take goal at the George Adams hatchery. The George Adams stock is also tagged as the fall chinook harvest rate indicator stock for the Hood Canal region.

STRAIT OF JUAN DE FUCA

Abundance levels of naturally spawning spring chinook in this region are not well known. However, small naturally spawning runs exist in the Dungeness and Elwha Rivers. Spawning escapement estimation for the Dungeness River stock began in 1986 (197 fish) and will be conducted annually. The Dungeness River spring chinook has been designated as a spawning escapement indicator stock.

No directed terminal area fisheries have occurred on fall chinook stocks originating in the small rivers tributary to the Strait. Historical estimates of escapement and run sizes are usually little more than educated guesses.

The Elwha River has two fall chinook enhancement facilities, but, returns have not been sufficient to meet egg take requirements. The Elwha Rearing Channel releases are one of two Strait of Juan de Fuca chinook stocks selected as a harvest rate indicator stock. These releases are comprised of fingerlings, volitional summer releases and yearlings. The second harvest rate indicator stock is naturally spawning Hoko River fall chinook. A portion of this naturally spawning stock is taken and reared to fingerling size in a hatchery for release back into the Hoko River. The Hoko River and the Dungeness Rivers are designated as spawning indicator stocks.

WAATCH AND SOOES RIVERS

The Makah National Fish Hatchery releases fall chinook into the Sooes River. There are very few naturally spawning fall chinook in this region. The National Fish Hatchery releases are designated as harvest rate indicator stocks in this region.

QUILLAYUTE RIVER

The spring chinook stock in the Quillayute River is an introduced hatchery stock, with little or no history of native wild stock in the drainage.

The summer stock has, in the past, been mixed with the introduced hatchery springs, but efforts are currently underway to separate and enhance the naturally spawning summer run chinook. The summer chinook are designated as an escapement indicator stock. Efforts are currently underway to capture naturally spawning summer chinook and rear them in a hatchery for release back into the system. These are designated as a

harvest rate indicator stock.

The fall chinook stock includes both hatchery and naturally spawning components. The naturally spawning fall chinook are designated as an escapement indicator stock and the hatchery releases are tagged as a harvest rate indicator stock.

HOH RIVER

Both the spring and fall chinook are primarily naturally spawning stocks, with minor hatchery components. Both races are designated as escapement indicator stocks. The Hoh River spring chinook stock was identified as one possible harvest rate indicator stock, but the development of a program to capture adults and rear the juveniles of the naturally spawning stock has proved to be very complex and therefore other alternatives will be examined.

QUEETS RIVER

The naturally spawning spring chinook run to the Queets River is very depressed and is designated as an escapement indicator stock. The fall chinook run consists of both naturally spawning and hatchery components. A program to capture natural spawners and rear the offspring in a hatchery is currently in place. This stock will be used as both a harvest rate and an escapement indicator stock.

QUINAULT RIVER

The Quinault has a naturally spawning population of spring/summer chinook which is managed secondarily to the native sockeye run which enters the river during the spring and early summer.

The fall chinook stock of the Quinault River is predominantly of hatchery origin with an increasing number of natural spawners due to hatchery straying and subsequent reproduction in the wild. This stock is designated as a harvest rate indicator stock.

GRAYS HARBOR

The naturally spawning spring chinook run is very depressed and in need of rebuilding. Additional research needs to be done to define a MSH escapement goal.

The naturally spawning fall chinook run is also very depressed, although there is a significant hatchery contribution. Fall chinook from the Humptulips and Satsop Hatcheries have both been designated as harvest rate indicator stocks.

WILLAPA BAY

Willapa Bay chinook stocks are managed for hatchery fish which are harvested incidently during coho fisheries. There are no directed terminal fisheries on these stocks. The return of naturally spawning fall chinook has recently been below escapement goals. The Willapa Bay hatchery releases have been designated as a harvest rate indicator stock.

TABLE 1. IDENTIFICATION OF PRODUCTION UNITS AND INDICATOR STOCKS

PUGET SOUND AND WASHINGTON COASTAL SPRING CHINOOK

PRODUCTION UNIT	ESCAPEMENT GOAL	ESCAPEMENT INDICATOR	HARVEST RATE INDICATOR
NOOKSACK/SAMISH			
NOOK.R. NATURALLY SPAWNING	4,000	NOOKSACK RIVER	_1/
HATCHERY	ALL		NOOKSACK HATCHERY & SKOOKUM CR. HATCHERY
SKAGIT RIVER			
NATURALLY SPAWNING	3,000	SKAGIT RIVER	_1/
HATCHERY	ALL		MARBLEMOUNT HATCHERY
SOUTH PUGET SOUND			
WHITE R. NATURALLY SPAWNING	N/A	WHITE RIVER	NONE
HATCHERY	ALL		MINTER CR. HATCHERY
HOOD CANAL			
SKOK. R. NATURALLY SPAWNING	N/A	SKOKOMISH RIVER	NONE
HATCHERY	500		QUILCENE NFH
STRAIT OF JUAN DE FUCA			
DUNG. R. NATURALLY SPAWNING	N/A	DUNGENESS RIVER	NONE
ELWHA R. NATURALLY SPAWNING	N/A	DUNGENESS RIVER	NONE
QUILLAYUTE RIVER			
NATURALLY SPAWNING (INTRO.)		NONE _2/	NONE
HATCHERY (SOLEDUCK)			NONE
HOH RIVER			
NATURALLY SPAWNING	900	HOH RIVER	NONE
QUEETS RIVER			
NATURALLY SPAWNING	700	QUEETS RIVER	NONE
QUINAULT RIVER			
NATURALLY SPAWNING		NONE _2/	NONE
GRAYS HARBOR			
CHEH. R. NATURALLY SPAWNING	1,400	CHEHALIS RIVER	NONE

_1/ APPROPRIATE FINGERLING RELEASES FROM HATCHERIES WITHIN THE REGION.
_2/ INDICATES THAT THIS STOCK/RIVER COMBINATION IS MANAGED FOR HATCHERY ESCAPEMENT OR THAT SPAWNING ESCAPEMENT IS NOT QUANTIFIED.

PUGET SOUND AND WASHINGTON COASTAL SUMMER CHINOOK

PRODUCTION UNIT	ESCAPEMENT GOAL	ESCAPEMENT INDICATOR	HARVEST RATE INDICATOR
SKAGIT RIVER			
NATURALLY SPAWNING	14,900	SKAGIT RIVER	_3/
HATCHERY	1,000		MARBLEMOUNT HATCHERY 1+
STILLAGUAMISH/SNOHOMISH			
STILL. R. NATURALLY SPAWNING	2,000	STILLAGUAMISH RIVER	_3/
SNOH. R. NATURALLY SPAWNING	5,250	SNOHOMISH RIVER	_3/
HATCHERY	N/A		SKYKOMISH HATCH. 0+ & 1+
QUILLAYUTE RIVER			
NATURALLY SPAWNING	1,500	QUILLAYUTE RIVER	_1/ AND POSSIBLE FUTURE
HATCHERY			WILD STOCK PROGRAM

_1/ APPROPRIATE FINGERLING RELEASES FROM HATCHERIES WITHIN THE REGION.
_2/ INDICATES THAT THIS STOCK/RIVER COMBINATION IS MANAGED FOR HATCHERY ESCAPEMENT OR THAT SPAWNING ESCAPEMENT IS NOT QUANTIFIED.
-3/ A COMBINATION OF PAST SKAGIT WILD AND PRESENT HATCHERY FINGERLING AND FUTURE STILLAGUAMISH WILD WILL BE USED TO MONITOR THE HARVEST RATES ON THESE STOCKS.

PUGET SOUND AND WASHINGTON COASTAL FALL CHINOOK 30-Jan-87

PRODUCTION UNIT	ESCAPEMENT GOAL	ESCAPEMENT INDICATOR	HARVEST RATE INDICATOR
NOOKSACK/SAMISH			
NOOK. R. NATURALLY SPAWNING	3,100	NONE _2/	_1/
SAMISH R. NATURALLY SPAWNING	*	NONE _2/	_1/
HATCHERY	14,800		NOOKSACK,SAMISH AND LUMMI HATCHERIES
SKAGIT RIVER			
SKAG. R. NATURALLY SPAWNING	*	NONE _2/	NONE
HATCHERY	*		NONE
STILLAGUAMISH/SNOHOMISH			
HATCHERY	3,100		TULALIP HATCHERY
SOUTH PUGET SOUND			
LAKE WA. NATURALLY SPAWNING	5,200	NONE _2/	_1/
GREEN R. NATURALLY SPAWNING	5,800	GREEN RIVER	_1/
PUY. R. NATURALLY SPAWNING	1,500	NONE _2/	_1/
NISQ. R. NATURALLY SPAWNING	1,500	NONE _2/	_1/
HATCHERY	21,050		ISSAQUAH, SUQUAMISH, GREEN, NISQUALLY, AND DESCHUTES HATCHERIES

PRODUCTION UNIT	ESCAPEMENT GOAL	ESCAPEMENT INDICATOR	HARVEST RATE INDICATOR
HOOD CANAL			
SKOK. R. NATURALLY SPAWNING	1,650	NONE _2/	_1/
MISC. R. NATURALLY SPAWNING	2,800	NONE _2/	_1/
HATCHERY	4,050		GEORGE ADAMS HATCHERY
STRAIT OF JUAN DE FUCA			
NATURALLY SPAWNING, ALL	850	HOKO RIVER	
TRIBUTARIES EXCEPT ELWHA	1,300	DUNGENESS RIVER	HOKO RIVER WILD
ELWHA R. NATURALLY SPAWNING	2,700	NONE _2/	
HATCHERY	*		ELWHA REARING CHANNEL
WAATCH AND SOOES RIVERS			
HATCHERY		NONE _2/	MAKAH NFH
QUILLAYUTE RIVER			
NATURALLY SPAWNING	3,000	QUILLAYUTE RIVER	QUEETS RIVER WILD
HATCHERY			SOLEDUCK HATCHERY
HOH RIVER			
NATURALLY SPAWNING	1,200	HOH RIVER	QUEETS RIVER WILD
HATCHERY			QUINAULT HATCHERY
QUEETS RIVER			
NATURALLY SPAWNING	2,500	QUEETS RIVER	QUEETS RIVER WILD
HATCHERY			QUINAULT HATCHERY
QUINAULT RIVER			
NATURALLY SPAWNING		NONE _2/	
HATCHERY			QUINAULT HATCHERY
GRAYS HARBOR			
HUMP. R. NATURALLY SPAWNING		NONE _2/	_1/
CHEH. R. NATURALLY SPAWNING		NONE _2/	_1/
HATCHERY			HUMPTULIPS & SATSOP HATCHERIES
WILLAPA BAY			
NATURALLY SPAWNING		NONE _2/	_1/
HATCHERY			WILLAPA BAY HATCHERY

_1/ APPROPRIATE FINGERLING RELEASES FROM HATCHERIES WITHIN THE REGION.

_2/ INDICATES THAT THIS STOCK/RIVER COMBINATION IS MANAGED FOR HATCHERY ESCAPEMENT OR THAT SPAWNING ESCAPEMENT IS NOT QUANTIFIED.

* INDICATES THAT THE PRODUCTION UNIT IS COMBINED WITH ANOTHER PRODUCTION UNIT, I.E. HATCHERY AND WILD COMBINED.

ESCAPEMENT INDICATOR STOCK HISTORIES

INDICATOR STOCK: NOOKSACK RIVER SPRING CHINOOK
PRODUCTION UNITS REPRESENTED:
NOOKSACK RIVER NATURALLY SPAWNING SPRING CHINOOK

WHY SELECTED:
THIS IS THE ONLY NATURALLY SPAWNING SPRING CHINOOK STOCK IN THIS REGION

DATE ESTABLISHED: 1985 BROOD YEAR

CURRENT ESCAPEMENT GOAL: 4,000
BASIS OF GOAL:
HISTORICAL INFORMATION REGARDING CATCH AND PRESENT AVAILABLE HABITAT WOULD INDICATE A MUCH LARGER RUN COULD BE SUPPORTED IN THIS SYSTEM. A PRELIMINARY ESTIMATE OF MSH WAS MADE BY A REGIONAL STEERING COMMITTEE.

ESCAPEMENT ESTIMATION METHODOLOGY:
SEVERAL METHODS ARE CURRENTLY UNDER INVESTIGATION

INDICATOR STOCK: SKAGIT RIVER SPRING CHINOOK
PRODUCTION UNITS REPRESENTED:
NATURALLY SPAWNING SKAGIT RIVER SPRING CHINOOK

WHY SELECTED:
IT IS EXPECTED THAT THE DISTRIBUTION CHARACTERISTICS OF THIS STOCK WOULD BE DIFFERENT THAN OTHER SPRING CHINOOK STOCKS IN PUGET SOUND

DATE ESTABLISHED: 1985 BROOD YEAR

CURRENT ESCAPEMENT GOAL: 3,000
BASIS OF GOAL: INTERMEDIATE GOAL

ESCAPEMENT ESTIMATION METHODOLOGY:
AERIAL AND FOOT SURVEYS OF REDD COUNTS

INDICATOR STOCK: WHITE RIVER SPRING CHINOOK
PRODUCTION UNITS REPRESENTED:
NATURALLY SPAWNING WHITE RIVER SPRING CHINOOK

WHY SELECTED:
IT IS THE ONLY REMAINING POPULATION OF NATURALLY SPAWNING SPRING CHINOOK IN THE SOUTH PUGET SOUND REGION

DATE ESTABLISHED: 1985 BROOD YEAR

CURRENT ESCAPEMENT GOAL: REINTRODUCTION OF STOCK TO SYSTEM
BASIS OF GOAL:
INTERIM GOALS WILL BE ESTABLISHED BASED ON ESTIMATES OF MSH ESCAPEMENT DERIVED FROM ESTIMATES OF AVAILABLE HABITAT.

ESCAPEMENT ESTIMATION METHODOLOGY:
STREAM FOOT SURVEYS

INDICATOR STOCK: SKOKOMISH RIVER SPRING CHINOOK
PRODUCTION UNITS REPRESENTED:
NATURALLY SPAWNING SPRING CHINOOK STOCKS FROM THE SKOKOMISH RIVER AND OTHER HOOD CANAL TRIBUTARIES

WHY SELECTED:
THE SKOKOMISH RIVER ONCE SUPPORTED IMPORTANT NATURALLY SPAWNING STOCKS WHICH HAVE ALL BUT DISAPPEARED. THERE ARE NO OTHER NATURALLY SPAWNING SPRING CHINOOK STOCKS IN THIS REGION

DATE ESTABLISHED: 1985 BROOD YEAR

CURRENT ESCAPEMENT GOAL: REINTRODUCTION OF STOCK
BASIS OF GOAL:
INTERIM GOALS WILL BE ESTABLISHED BASED ON ESTIMATES OF MSH ESCAPEMENT DERIVED FROM ESTIMATES OF AVAILABLE HABITAT.

ESCAPEMENT ESTIMATION METHODOLOGY:
FOOT AND FLOAT SURVEYS OF REDD COUNTS

INDICATOR STOCK: DUNGENESS RIVER SPRING CHINOOK
PRODUCTION UNITS REPRESENTED:
NATURALLY SPAWNING POPULATIONS OF SPRING CHINOOK IN THE DUNGENESS AND ELWHA RIVERS.

WHY SELECTED:
THERE ARE CURRENTLY BETTER ESTIMATES OF ESCAPEMENT AVAILABLE FROM THE DUNGENESS THAN THE ELWHA RIVER.

DATE ESTABLISHED: 1986 BROOD YEAR

CURRENT ESCAPEMENT GOAL: INCREASE ESCAPEMENTS
BASIS OF GOAL:
INTERIM GOALS WILL BE ESTABLISHED BASED ON ESTIMATES OF MSH ESCAPEMENT LEVELS DERIVED FROM ESTIMATES OF AVAILABLE HABITAT

ESCAPEMENT ESTIMATION METHODOLOGY:
SEVERAL METHODS ARE CURRENTLY BEING INVESTIGATED

INDICATOR STOCK: HOH RIVER SPRING CHINOOK
PRODUCTION UNITS REPRESENTED:
IN COMBINATION WITH THE QUEETS RIVER NATURALLY SPAWNING SPRING CHINOOK STOCK, THEY WILL REPRESENT ALL NATURALLY SPAWNING SPRING STOCKS ON THE COAST

WHY SELECTED:
ESCAPEMENT ESTIMATES ARE ALREADY BEING MADE FOR THIS STOCK

DATE ESTABLISHED: 1985 BROOD YEAR

CURRENT ESCAPEMENT GOAL: 900 + or -
BASIS OF GOAL:
CURRENTLY MANAGED FOR A RANGE TO ALLOW THE COLLECTION OF INFORMATION NEEDED TO BETTER DEFINE MSH ESCAPEMENT LEVELS

ESCAPEMENT ESTIMATION METHODOLOGY:
FLOAT AND FOOT SURVEYS OF THE RIVER SYSTEM

INDICATOR STOCK: QUEETS RIVER SPRING CHINOOK
PRODUCTION UNITS REPRESENTED:
IN COMBINATION WITH THE HOH RIVER NATURALLY SPAWNING SPRING CHINOOK STOCK, THEY WILL REPRESENT ALL NATURALLY SPAWNING SPRING STOCKS ON THE COAST

WHY SELECTED:
ESCAPEMENT ESTIMATES ARE ALREADY BEING MADE FOR THIS STOCK

DATE ESTABLISHED: 1985 BROOD YEAR

CURRENT ESCAPEMENT GOAL: 700 + or -
BASIS OF GOAL:
CURRENTLY MANAGED FOR A RANGE TO ALLOW THE COLLECTION OF INFORMATION NEEDED TO BETTER DEFINE MSH ESCAPEMENT LEVELS

ESCAPEMENT ESTIMATION METHODOLOGY:
FLOAT AND FOOT SURVEYS OF THE RIVER SYSTEM

INDICATOR STOCK: CHEHALIS RIVER SPRING CHINOOK
PRODUCTION UNITS REPRESENTED:
NATURALLY SPAWNING SPRING CHINOOK IN THE CHEHALIS RIVER

WHY SELECTED:
ESCAPEMENT ESTIMATES ARE ALREADY BEING MADE FOR THIS STOCK

DATE ESTABLISHED: 1985 BROOD YEAR

CURRENT ESCAPEMENT GOAL: 1,400
BASIS OF GOAL:
MINIMUM ESTIMATE OF MSH ESCAPEMENT LEVEL

ESCAPEMENT ESTIMATION METHODOLOGY:
FLOAT AND FOOT SURVEYS OF THE RIVER SYSTEM

INDICATOR STOCK: SKAGIT RIVER SUMMER CHINOOK (CURRENTLY INCLUDES FALLS)
PRODUCTION UNITS REPRESENTED:
NATURALLY SPAWNING SUMMER CHINOOK IN THE SKAGIT RIVER

WHY SELECTED:
IT IS THOUGHT THAT THERE MAY BE DIFFERENCES BETWEEN THE DISTRIBUTIONS OF STOCKS FROM THE SKAGIT AND STILLAGUAMISH RIVERS AND IT IS AN IMPORTANT NATURALLY SPAWNING POPULATION

DATE ESTABLISHED: 1986 BROOD YEAR

CURRENT ESCAPEMENT GOAL: 14,900
BASIS OF GOAL:
PRELIMINARY ESTIMATE OF MSH ESCAPEMENT LEVEL.

ESCAPEMENT ESTIMATION METHODOLOGY:
COMBINATION OF AERIAL, FOOT AND FLOAT SURVEYS

INDICATOR STOCK: STILLAGUAMISH RIVER SUMMER CHINOOK (CURRENTLY INCLUDES FALLS)
PRODUCTION UNITS REPRESENTED:
STILLAGUAMISH RIVER NATURALLY SPAWNING SUMMER CHINOOK

WHY SELECTED:
IT IS THOUGHT THAT THERE MAY BE DIFFERENCES BETWEEN THE DISTRIBUTIONS OF STOCKS FROM THE SKAGIT AND STILLAGUAMISH RIVERS AND IT IS AN IMPORTANT NATURALLY SPAWNING POPULATION

DATE ESTABLISHED: 1985 BROOD YEAR

CURRENT ESCAPEMENT GOAL: 2,000
BASIS OF GOAL:
RECENT YEARS OBSERVED ESCAPEMENT (IT IS BELIEVED TO BE WELL BELOW THE LEVEL NEEDED TO ACHIEVE MSH)

ESCAPEMENT ESTIMATION METHODOLOGY:
FOOT SURVEYS OF THE RIVER

INDICATOR STOCK: QUILLAYUTE RIVER SUMMER CHINOOK
PRODUCTION UNITS REPRESENTED:
QUILLAYUTE RIVER NATURALLY SPAWNING SUMMER CHINOOK

WHY SELECTED:
IT IS AN IMPORTANT COMPONENT OF THE NATURALLY SPAWNING CHINOOK STOCKS IN THE QUILLAYUTE RIVER.

DATE ESTABLISHED: 1986 BROOD YEAR

CURRENT ESCAPEMENT GOAL: 1,500
BASIS OF GOAL:
PRELIMINARY ESTIMATE OF MSH ESCAPEMENT LEVEL.

ESCAPEMENT ESTIMATION METHODOLOGY:
FOOT SURVEYS OF THE RIVER SYSTEM

INDICATOR STOCK: GREEN RIVER FALL CHINOOK
PRODUCTION UNITS REPRESENTED:
GREEN RIVER NATURALLY SPAWNING FALL CHINOOK

WHY SELECTED:
THIS IS THE ONLY MAJOR FALL CHINOOK RUN MANAGED TO ACHIEVE A NATURAL SPAWNING GOAL IN PUGET SOUND.

DATE ESTABLISHED: 1985 BROOD YEAR
CURRENT ESCAPEMENT GOAL: 5,800
BASIS OF GOAL:
RECENT YEARS OBSERVED ESCAPEMENT (IT IS BELIEVED TO BE WELL BELOW THE LEVEL NEEDED TO ACHIEVE MSH)

ESCAPEMENT ESTIMATION METHODOLOGY:
FLOAT AND FOOT SURVEYS OF THE RIVER SYSTEM

INDICATOR STOCK: HOKO RIVER FALL CHINOOK
PRODUCTION UNITS REPRESENTED:
IN COMBINATION WITH THE DUNGENESS RIVER NATURALLY SPAWNING FALL CHINOOK STOCK, THEY WILL REPRESENT ALL NATURALLY SPAWNING FALL STOCKS IN THE STRAIT.

WHY SELECTED:
SPAWNING ESCAPEMENT ESTIMATES ARE BEING MADE IN CONJUNCTION WITH THE HOKO RIVER HARVEST RATE INDICATOR PROGRAM WHICH UTILIZES WILD STOCKS.

DATE ESTABLISHED: 1985 BROOD YEAR
CURRENT ESCAPEMENT GOAL: 850
BASIS OF GOAL:
RECENT YEARS OBSERVED ESCAPEMENT, (IT IS BELIEVED TO BE WELL BELOW THE LEVEL NEEDED TO ACHIEVE MSH)

ESCAPEMENT ESTIMATION METHODOLOGY:
FOOT SURVEYS IN THE SYSTEM

INDICATOR STOCK: DUNGENESS RIVER FALL CHINOOK
PRODUCTION UNITS REPRESENTED:
IN COMBINATION WITH THE HOKO RIVER NATURALLY SPAWNING FALL CHINOOK STOCK, THEY WILL REPRESENT ALL NATURALLY SPAWNING FALL STOCKS IN THE STRAIT

WHY SELECTED:
EXTENSIVE EFFORT IS CURRENTLY BEING EXPENDED ON THE DUNGENESS RIVER SYSTEM TO GATHER ACCURATE ESTIMATES OF ESCAPEMENTS.

DATE ESTABLISHED: 1986 BROOD YEAR
CURRENT ESCAPEMENT GOAL: N/A
BASIS OF GOAL:
INTERIM GOALS WILL BE ESTABLISHED BASED ON ESTIMATES OF MSH ESCAPEMENT LEVELS DERIVED FROM ESTIMATES OF AVAILABLE HABITAT

ESCAPEMENT ESTIMATION METHODOLOGY:
FOOT SURVEYS IN THE SYSTEM

INDICATOR STOCK: QUILLAYUTE RIVER FALL CHINOOK
PRODUCTION UNITS REPRESENTED:
QUILLAYUTE RIVER NATURALLY SPAWNING FALL CHINOOK

WHY SELECTED:
IT IS AN IMPORTANT COMPONENT OF THE NATURALLY SPAWNING CHINOOK STOCKS IN THE QUILLAYUTE RIVER

DATE ESTABLISHED: 1986 BROOD YEAR
CURRENT ESCAPEMENT GOAL: 3,000
BASIS OF GOAL:
PRELIMINARY ESTIMATE OF MSH ESCAPEMENT LEVEL.

ESCAPEMENT ESTIMATION METHODOLOGY:
FOOT AND BOAT SURVEYS.

INDICATOR STOCK: HOH RIVER FALL CHINOOK
PRODUCTION UNITS REPRESENTED:
IN COMBINATION WITH THE QUEETS RIVER NATURALLY SPAWNING FALL CHINOOK STOCK, THEY WILL REPRESENT OTHER NATURALLY SPAWNING FALL STOCKS ON THE COAST

WHY SELECTED:
ESCAPEMENT ESTIMATES ARE ALREADY BEING MADE FOR THIS STOCK

DATE ESTABLISHED: 1985 BROOD YEAR

CURRENT ESCAPEMENT GOAL: 1,200 + or -
BASIS OF GOAL:
CURRENTLY MANAGED FOR A RANGE TO ALLOW THE COLLECTION OF INFORMATION NEEDED TO BETTER DEFINE MSH ESCAPEMENT LEVELS

ESCAPEMENT ESTIMATION METHODOLOGY:
FLOAT AND FOOT SURVEYS OF THE RIVER SYSTEM

INDICATOR STOCK: QUEETS RIVER FALL CHINOOK
PRODUCTION UNITS REPRESENTED:
IN COMBINATION WITH THE HOH RIVER NATURALLY SPAWNING FALL CHINOOK STOCK, THEY WILL REPRESENT OTHER NATURALLY SPAWNING FALL STOCKS ON THE COAST.

WHY SELECTED:
ESCAPEMENT ESTIMATES ARE ALREADY BEING MADE FOR THIS STOCK

DATE ESTABLISHED: 1985 BROOD YEAR

CURRENT ESCAPEMENT GOAL: 2,500 + or -
BASIS OF GOAL:
CURRENTLY MANAGED FOR A RANGE TO ALLOW THE COLLECTION OF INFORMATION NEEDED TO BETTER DEFINE MSH ESCAPEMENT LEVELS

ESCAPEMENT ESTIMATION METHODOLOGY:
FLOAT AND FOOT SURVEYS OF THE RIVER SYSTEM

HARVEST RATE INDICATOR STOCK HISTORIES

INDICATOR STOCK: SKOOKUM CR. HATCHERY RELEASE OF ZERO AGE SPRING CHINOOK.

PRODUCTION UNITS REPRESENTED:
NOOKSACK RIVER NATURALLY SPAWNING SPRING CHINOOK AND NOOKSACK/SAMISH REGION HATCHERY PRODUCTION OF ZERO AGE SPRING CHINOOK

DATE ESTABLISHED: 1985 BROOD
PRIOR TAGGING HISTORY: STARTED TAGGING THIS STOCK WITH 1981 BROOD YEAR.

WHY SELECTED: A HARVEST RATE INDICATOR STOCK IS NEEDED TO PROVIDE INFORMATION ON THE NOOKSACK RIVER NATURALLY SPAWNING SPRING CHINOOK STOCK.

INDICATOR STOCK: NOOKSACK HATCHERY YEARLING RELEASE SPRING CHINOOK

PRODUCTION UNITS REPRESENTED:
NOOKSACK/SAMISH REGION YEARLING HATCHERY RELEASES

DATE ESTABLISHED: 1985 BROOD
PRIOR TAGGING HISTORY: ?

WHY SELECTED: TO REPRESENT THIS UNIT OF HATCHERY PRODUCTION

INDICATOR STOCK: MARBLEMOUNT HATCHERY YEARLING RELEASES OF SPRING CHINOOK

PRODUCTION UNITS REPRESENTED:
YEARLING SPRING CHINOOK PRODUCTION FROM THIS REGION

DATE ESTABLISHED: 1985 BROOD YEAR
PRIOR TAGGING HISTORY: ?

WHY SELECTED: TO MONITOR YEARLING SPRING CHINOOK PRODUCTION FROM THIS REGION

INDICATOR STOCK: MINTER CR. HATCHERY YEARLING RELEASES OF SPRING CHINOOK

PRODUCTION UNITS REPRESENTED:
YEARLING SPRING CHINOOK PRODUCTION FROM THIS HATCHERY

DATE ESTABLISHED: 1985 BROOD YEAR
PRIOR TAGGING HISTORY: ?

WHY SELECTED: TO GATHER INFORMATION WHICH MAY HELP IN THE REBUILDING OF THE WHITE RIVER NATURALLY SPAWNING SPRING CHINOOK

INDICATOR STOCK: QUILCENE NATIONAL FISH HATCHERY YEARLING SPRING CHINOOK

PRODUCTION UNITS REPRESENTED:
QUILCENE HATCHERY YEARLING SPRING CHINOOK PRODUCTION

DATE ESTABLISHED: 1985 BROOD YEAR
PRIOR TAGGING HISTORY: ?

WHY SELECTED: TO GATHER INFORMATION WHICH MAY HELP IN THE REBUILDING OF THE SKOKOMISH RIVER NATURALLY SPAWNING SPRING CHINOOK.

INDICATOR STOCK: MARBLEMOUNT HATCHERY RELEASES OF YEARLING SUMMER CHINOOK

PRODUCTION UNITS REPRESENTED:
YEARLING RELEASES OF SUMMER CHINOOK FROM THE SKAGIT RIVER

DATE ESTABLISHED: 1985 BROOD YEAR
PRIOR TAGGING HISTORY: ?

WHY SELECTED: TO REPRESENT THE PRODUCTION OF THIS STOCK IN MODELING EFFORTS.

INDICATOR STOCK: SKYKOMISH HATCHERY RELEASE OF YEARLING SUMMER CHINOOK

PRODUCTION UNITS REPRESENTED:
PRODUCTION OF YEARLING SUMMER CHINOOK FROM THE STILLAGUAMISH/SNOHOMISH REGION

DATE ESTABLISHED: 1985 BROOD YEAR
PRIOR TAGGING HISTORY: ?

WHY SELECTED: TO REPRESENT THE PRODUCTION OF THIS STOCK IN MODELING EFFORTS.

INDICATOR STOCK: STILLAGUAMISH HATCHERY RELEASE OF "WILD" FINGERLING SUMMER CHINOOK

PRODUCTION UNITS REPRESENTED:
NATURALLY SPAWNING STOCKS OF SUMMER CHINOOK IN THE STILLAGUAMISH AND THE SNOHOMISH RIVERS.

DATE ESTABLISHED: THIS PROGRAM IS UNDER DEVELOPMENT

PRIOR TAGGING HISTORY: THIS STOCK HAS BEEN TAGGED SPORADICALLY AND AT LOW LEVELS SINCE 1981 BROOD.

WHY SELECTED: THIS PROGRAM IS NECESSARY TO ASSIST IN THE REBUILDING OF THE STILLAGUAMISH RIVER NATURALLY SPAWNING SUMMER CHINOOK STOCK.

INDICATOR STOCK: QUILLAYUTE (SWEDE HOLE) RELEASE OF "WILD" FINGERLING SUMMER CHINOOK

PRODUCTION UNITS REPRESENTED:
HATCHERY AND NATURALLY SPAWNING STOCKS OF SUMMER CHINOOK IN THE QUILLAYUTE RIVER.

DATE ESTABLISHED: THIS PROGRAM IS UNDER DEVELOPMENT

PRIOR TAGGING HISTORY: THIS STOCK HAS BEEN TAGGED SPORADICALLY AND AT LOW LEVELS IN PRIOR YEARS.

WHY SELECTED: THIS PROGRAM IS NECESSARY TO ASSIST IN THE REBUILDING OF THE QUILLAYUTE RIVER NATURALLY SPAWNING SUMMER CHINOOK STOCK.

INDICATOR STOCK: NOOKSACK, SAMISH AND LUMMI BAY HATCHERY PRODUCTION OF ZERO AGE CHINOOK

PRODUCTION UNITS REPRESENTED:
HATCHERY PRODUCTION OF EACH FACILITY AND COLLECTIVELY FOR THE NOOKSACK/SAMISH REGION, ALL PRODUCTION OF FALL CHINOOK.

DATE ESTABLISHED: 1985 BROOD YEAR

PRIOR TAGGING HISTORY: SPORADIC HISTORICAL TAGGING OF THIS STOCK

WHY SELECTED: TO REPRESENT THE PRODUCTION OF THIS STOCK IN MODELING EFFORTS.

INDICATOR STOCK: TULALIP HATCHERY RELEASES OF ZERO AGE FALL CHINOOK

PRODUCTION UNITS REPRESENTED:
NATURALLY SPAWNING AND HATCHERY PRODUCED FALL CHINOOK STOCKS IN THE STILLAGUAMISH/SNOHOMISH REGION.

DATE ESTABLISHED: 1986 BROOD YEAR
PRIOR TAGGING HISTORY: ?

WHY SELECTED: TO REPRESENT THE PRODUCTION OF THIS STOCK IN MODELING EFFORTS.

INDICATOR STOCK: ISSAQUAH, SUQUAMISH, GREEN R., NISQUALLY AND DESCHUTES HATCHERY PRODUCTION OF FINGERLINGS.

PRODUCTION UNITS REPRESENTED:
HATCHERY PRODUCTION OF EACH FACILITY AND COLLECTIVELY FOR ALL PRODUCTION OF ZERO AGE FALL CHINOOK IN SOUTH PUGET SOUND.

DATE ESTABLISHED: 1985 BROOD YEAR
PRIOR TAGGING HISTORY: SPORADIC HISTORICAL TAGGING

WHY SELECTED: TO REPRESENT THE PRODUCTION OF THIS STOCK IN MODELING EFFORTS.

INDICATOR STOCK: GEORGE ADAMS RELEASE OF ZERO AGE FALL CHINOOK
PRODUCTION UNITS REPRESENTED:
ALL ZERO AGE HATCHERY RELEASES AND NATURALLY SPAWNING FALL CHINOOK IN THE HOOD CANAL REGION.

DATE ESTABLISHED: 1985 BROOD YEAR
PRIOR TAGGING HISTORY: ?

WHY SELECTED: TO REPRESENT THE PRODUCTION OF THESE STOCKS IN MODELING EFFORTS.

INDICATOR STOCK: HOKO RIVER PONDS "WILD" FALL CHINOOK
PRODUCTION UNITS REPRESENTED:
NATURALLY SPAWNING FALL CHINOOK FROM ALL TRIBUTARIES TO THE STRAIT OF JUAN DE FUCA, EXCEPT, THE ELWHA RIVER.
DATE ESTABLISHED: 1985 BROOD YEAR
PRIOR TAGGING HISTORY: NONE

WHY SELECTED: THE ONLY AVAILABLE WILD STOCK TO TAG FROM THIS REGION

INDICATOR STOCK: ELWHA REARING CHANNEL FALL CHINOOK
PRODUCTION UNITS REPRESENTED:
NATURALLY SPAWNING AND HATCHERY PRODUCED FALL CHINOOK FROM THE ELWHA RIVER.

DATE ESTABLISHED: 1985 BROOD YEAR
PRIOR TAGGING HISTORY: SPORADIC, LOW LEVEL TAGGING IN PREVIOUS YEARS.

WHY SELECTED: A STOCK WAS NEEDED TO MODEL THE PRODUCTION OF THIS SYSTEM.

INDICATOR STOCK: MAKAH NATIONAL HATCHERY RELEASE OF ZERO AGE FALL CHINOOK
PRODUCTION UNITS REPRESENTED:
MAKAH NATIONAL HATCHERY RELEASE OF ZERO AGE FALL CHINOOK

DATE ESTABLISHED: 1987 BROOD YEAR
PRIOR TAGGING HISTORY:SMALL RELEASE NUMBERS IN SOME YEARS

WHY SELECTED: TO REPRESENT THE PRODUCTION OF THIS STOCK IN MODELING EFFORTS.

INDICATOR STOCK: SOLEDUCK HATCHERY RELEASE OF ZERO AGE FALL CHINOOK
PRODUCTION UNITS REPRESENTED:
SOLEDUCK HATCHERY RELEASE OF ZERO AGE FALL CHINOOK

DATE ESTABLISHED: 1985 BROOD YEAR
PRIOR TAGGING HISTORY: ?

WHY SELECTED: TO REPRESENT THE PRODUCTION OF THIS STOCK IN MODELING EFFORTS.

INDICATOR STOCK: SALMON RIVER PONDS "WILD" FALL CHINOOK

PRODUCTION UNITS REPRESENTED:
NATURALLY SPAWNING FALL CHINOOK STOCKS IN THE QUILLAYUTE, HOH AND QUEETS RIVERS, AS WELL AS HATCHERY PRODUCTION FROM WILD STOCKS IN THESE RIVERS.

DATE ESTABLISHED: 1985 BROOD YEAR
PRIOR TAGGING HISTORY: SEVERAL YEARS OF TAGGING WILD AND HATCHERY RELEASES IN THIS SYSTEM.

WHY SELECTED: MODELING OF THESE STOCKS IS NECESSARY TO ASSIST IN REBUILDING AND MSH ASSESSMENT.

INDICATOR STOCK: QUINAULT HATCHERY ZERO AGE RELEASES OF FALL CHINOOK

PRODUCTION UNITS REPRESENTED:
ZERO AGE RELEASES OF FALL CHINOOK IN THE HOH, QUEETS AND QUINAULT RIVERS.

DATE ESTABLISHED: 1985 BROOD YEAR
PRIOR TAGGING HISTORY: SPORADIC LOW LEVEL TAGGING IN RECENT YEARS.

WHY SELECTED: TO REPRESENT THE PRODUCTION OF THESE STOCKS IN MODELING EFFORTS.

INDICATOR STOCK: HUMPTULIPS AND SATSOP SPRINGS RELEASES OF ZERO AGE FALL CHINOOK

PRODUCTION UNITS REPRESENTED:
NATURALLY SPAWNING AND ZERO AGE FALL CHINOOK STOCKS FROM THE GRAYS HARBOR REGION.

DATE ESTABLISHED: 1985 BROOD YEAR
PRIOR TAGGING HISTORY: SPORADIC LOW LEVEL TAGGING IN RECENT YEARS.

WHY SELECTED: TO REPRESENT THE PRODUCTION OF THESE STOCKS IN MODELING EFFORTS, TO ASSIST IN THE REBUILDING OF THE NATURALLY SPAWNING STOCKS.

INDICATOR STOCK: WILLAPA BAY HATCHERY RELEASES OF ZERO AGE FALL CHINOOK

PRODUCTION UNITS REPRESENTED:
NATURALLY SPAWNING AND ZERO AGE FALL CHINOOK STOCKS FROM THE WILLAPA REGION.

DATE ESTABLISHED: 1985 BROOD YEAR
PRIOR TAGGING HISTORY: SPORADIC LOW LEVEL TAGGING IN RECENT YEARS.

WHY SELECTED: TO REPRESENT THE PRODUCTION OF THESE STOCKS IN MODELING EFFORTS.

87-2 TIP

DRAFT

SOUTHEAST ALASKA REGIONAL SUMMARY

IDENTIFICATION OF INDICATOR STOCKS AND ASSESSMENT OF REBUILDING OF NATURAL CHINOOK SALMON STOCKS

Prepared for the

Rebuilding Assessment Workgroup
of the
Chinook Technical Committee

PACIFIC SALMON COMMISSION

DRAFT OF

February 5, 1987

Prepared by

Alaska Department of Fish and Game

Juneau, Alaska

SUMMARY

This report has been prepared for the Rebuilding Assessment Workgroup of the PSC Chinook Technical Committee. It's primary purpose is to describe the natural chinook escapement indicator stock program in Southeast Alaska and how these indicator stocks will be used to monitor and assess progress of the chinook rebuilding program.

There are currently eleven natural chinook escapement indicator stocks in Southeast Alaska. Included are: Alsek, Situk, Chilkat, Taku, King Salmon, Andrews Creek, Stikine, Unuk, Chickamin, Blossom and Keta. Some of these are also transboundary systems. These indicator stocks represent an estimated 80 to 90 percent of the total potential natural chinook production from the 34 chinook systems in this region. Escapements are monitored annually in each of the indicator systems (or index tributaries) primarily through aerial surveys of peak escapements, and in several cases by counting weirs. Comparative escapements are generally available since 1975. The period 1975-80 is used as the base period for comparing changes in escapements since the rebuilding program for Southeast Alaska chinook stocks began in 1981.

Several hatchery chinook stocks will also be selected as harvest rate indicator stocks. These are expected to include Neets Bay, Crystal Lake and Little Port Walter.

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SOUTHEAST ALASKA REGION
NATURAL CHINOOK SALMON INDICATOR STOCKS

[Transboundary chinook stocks are included in this section for purposes of completeness and continuity in discussing the Southeast Alaska region natural chinook stock rebuilding program, escapement indicator stocks, and fisheries management regimes relating to stock rebuilding. However, a separate transboundary chinook section has also been prepared in which a more detailed description of transboundary chinook stocks and the joint Canada / U.S. rebuilding program, is presented.]

GEOGRAPHICAL REGION

The Southeast Alaska region encompasses an area of approximately 480 nautical miles from Cape Suckling on the north to Dixon Entrance on the south (Fig. 1). Naturally spawning chinook salmon stocks occur throughout the mainland portion of the region, however only one stock originates in an island system. The region consists of five main salmon management areas - Yakutat, Juneau, Sitka, Petersburg and Ketchikan (Fig 1).

Management of regional fisheries relative to chinook salmon is coordinated on a coastwide basis vis-'a-vis the Pacific Salmon Commission, and on a regional basis by the Alaska Board of Fisheries (Board), the Alaska Department of Fish and Game (ADF&G), and, for portions of the region in the Fisheries Conservation Zone, the National Marine Fisheries Service. In addition to regionwide chinook regulations (such as annual, all-gear catch ceilings; regionwide troll regulatations; etc.), area and stock specific chinook management regulations are also implemented both preseason and inseason as needed.

DESCRIPTION OF NATURAL CHINOOK STOCKS

Natural chinook salmon runs have been documented in 34 rivers and streams in the Southeast Alaska region and transboundary areas. Names and locations of these stocks are listed in Table 1; approximate locations are shown in Fig. 2. As indicated above, all natural spawning chinook from this region originate in mainland rivers and streams except for the King Salmon River stock, a minor chinook run of several hundred spawning near the northern end of Admiralty Island. (A few chinook salmon have occasionally been observed in other systems, however no other permanent natural spawning chinook stocks have been documented to date.)

Nearly all Southeast Alaska and transboundary natural chinook are "spring" type fish which enter spawning systems during the spring and early summer months. After emergence the following spring, the vast majority of fry remain in freshwater rearing areas for one year, migrating seaward the following spring as age 2 smolt. After 2, 3, or 4 years of ocean residence, most chinook then return to spawning areas as 4-, 5- or 6-year fish. Major spawning results from 5- and 6-year fish as the majority of 4-year fish are males.

Of the 34 natural chinook salmon stocks in this region, 3 are classified as major (potential production greater than 10,000), 9 as medium (production 1,500 to 10,000) and 22 as minor (production less than 1,500). Based on relative escapement goals as a measure of potential production, the major stocks are thought to account for about 69 percent of potential production, medium stocks 22 percent and minor stocks 9 percent.

Potential optimum production (catch plus escapement) from all stocks combined is thought to be in the range of 128,000 to 160,000 based on current ADF&G management escapement goals totaling approximately 64,000 chinook and assumed return per spawner rates of 2 to 2.5. (It appears that the more southerly stocks in the region may have somewhat higher productivity rates than this while productivity of more northerly stocks may be less.)

Information on migratory patterns of natural spawning chinook salmon in this region is somewhat limited. However, coded wire tagging of several natural chinook stocks indicates that, following migration from freshwater, immature, ocean rearing fish tend to follow a northerly migration pattern. (Coded wire tagged hatchery stocks exhibit a similar migration pattern.) A higher percentage of progeny from the more southerly stocks subsequently tend to remain in marine areas of the region during ocean residency. Most of the more northerly stocks tend to leave the region and move to offshore ocean rearing areas. Maturing chinook generally follow a southerly migration pattern enroute from ocean rearing areas to spawning systems.

Six of the 34 documented natural chinook systems in the Southeast Alaska region are also transboundary rivers, originating in Canada and flowing to the sea through the Southeast Alaska panhandle. These include the three major systems (Alsek, Taku and Stikine) and three of the medium systems (Chilkat, Unuk and Chickamin). The proportion of spawning which occurs on each side of the boundary varies substantially between systems as shown below.

APPROXIMATE SPAWNING DISTRIBUTIONS OF CHINOOK SALMON IN TRANSBOUNDARY RIVERS

River	Stock Size Classification	Approx. Percent Spawning Canada	Alaska
Alsek	major	95-100%	0-5%
Chilkat	medium	10-20%	80-90%
Taku	major	95-100%	0-5%
Stikine 1/	major	90-95%	5-10%
Unuk	medium	0-5%	95-100%
Chickamin	medium	0-5%	95-100%

Size Classification: major: greater than 10,000;
medium: 1,500 to 10,000

1/ Does not include Andrews Creek.

Proprietorship of natural chinook salmon spawning and rearing in the transboundary rivers is shared under provisions of the Pacific Salmon Treaty and management is coordinated between the two jursidictions.

FISHERIES AND CHINOOK SALMON MANAGEMENT

General Description of Fisheries

Harvest of natural chinook stocks originating in the Southeast Alaska region occurs primarily in Southeast Alaska fisheries. Transboundary stocks are also harvested by Canadian fisheries in Canadian portions of the rivers. Although some harvest of the more southerly stocks occurs in northern B.C. fisheries, it appears to be a small percentage of the total harvest. High seas fisheries are known to harvest some Southeast Alaska and transboundary natural chinook stocks, however the magnitude of this harvest is unknown. Detailed information on harvest distribution of natural chinook stocks is not available due to the limited nature of coded wire tagging of natural stocks and the absence of stock specific stock identification techniques.

Chinook salmon are harvested in the Southeast Alaska region by directed troll and recreational fisheries, and incidentally by net fisheries targeting on other species. In 1986 when the total

chinook catch was 280,000 (prelim.), approximate harvest percentages by gear were: troll - 84%; recreational - 8%; incidental net - 8%. (Only several hundred chinook are taken annually in subsistence food fisheries.) Nearly all of the chinook harvest in Southeast Alaska fisheries occurs in marine waters with less than one percent being taken in several inriver fisheries, primarily in the Yakutat area. Annual chinook catches by all Southeast Alaska fisheries are currently limited under catch ceilings established by the Pacific Salmon Commission.

In addition to natural chinook stocks originating in the region, Southeast Alaska fisheries also harvest Alaskan hatchery chinook, and natural and hatchery chinook from British Columbia coastal areas and the Pacific Northwest. It is not currently possible to estimate total harvest of Southeast region natural chinook stocks either individually or in aggregate since the bulk of the harvest occurs in mixed stock fisheries and stock identification techniques are not available. Southeast Alaska salmon fisheries are regulated to take into account management needs of both local and non-Alaskan chinook stocks. Management for non-Alaska chinook stocks is coordinated with management of other coastal fisheries through the Pacific Salmon Commission.

Natural Chinook Stock Rebuilding Program

In 1981 a rebuilding program was initiated for Southeast Alaska and transboundary natural chinook stocks with the objective of rebuilding depressed stocks within 15 years or approximately 3 cycles. To achieve this, regulations implemented since the mid-1970s to restrict chinook catches in intermediate and terminal troll, net and recreational fisheries were continued. In addition, more restrictive regulations were implemented including regionwide spring troll closures, other stock specific time/area troll closures, and limits on annual regionwide chinook salmon catches by all gear. (Annual catch limits have been implemented since 1980 for conservation of both Alaskan and non-Alaskan natural chinook stocks.) A brief summary of major regulations is shown in the following table.

REGULATIONS RESTRICTING S.E. ALASKA CHINOOK SALMON CATCHES SINCE INITIATION OF A NATURAL STOCK REBUILDING PROGRAM IN 1981

Restrictions	Comments
Regionwide spring troll closures	Troll fishery closed April 15 - May 14 to protect migrating spring spawners; extended to June 14 in 1982 in portions of District 1 to protect later migrating southern stocks.
Annual chinook catch limits	Progressively more restrictive limits placed on all gear chinook catches, from approx. 340,000 in 1980 to 254,000 in 1986.
Delayed summer season troll opening.	In response to decreasing chinook catch limits, summer troll season opening dates have been delayed, from May 15 in 1981 to June 20 in 1986. This has been necessary to limit chinook only closures, and associated chinook hook and release, during summer coho fisheries.
No directed net fisheries	Continued since mid-1970s.

ESCAPEMENT INDICATOR STOCKS

Eleven of the 34 natural chinook stocks in the Southeast Alaska and transboundary areas are currently used as escapement indicator stocks (Table 2). These indicator stocks have been selected on the basis of importance, enumerability of spawners (glacial water in many systems prevents aerial or foot surveys), and funding availabililty. In several systems, chinook escapements are enumerated incidentally to the monitoring of sockeye escapements. Due to glacial water and physical characteristics of watersheds in some of the larger systems, spawning escapements can only be enumerated in select tributaries which are then considered index or indicator tributaries for the system. Chinook escapements to the indicator systems - or index tributaries - are monitored annually to provide an "index" or relative measure of chinook escapements to the region. Comparable estimates of spawning escapements to indicator systems have been obtained for most years since 1975.

The eleven indicator stocks are used in aggregate to monitor general trends in chinook stock status for development of regionwide management regulations. In addition, information on individual or geographically grouped stocks (for example the Behm

Canal stocks) is also used for development of area or stock specific management regulations.

The actual relative proportion of total region chinook escapement contributed by the indicator stocks is unknown since escapements to non-indicator stocks are not directly enumerated. However, estimates of total region escapements are derived by expanding indicator or index escapements to account for aerial survey counting rates, and for unsurveyed tributaries and systems. In 1986, directly enumerated escapements (by weir or aerial/foot surveys) accounted for approximately 40 percent of the estimated total escapement. Expansion of index counts both for survey counting rates and unsurveyed tributaries within indicator systems in 1986 indicates that escapement indicator systems contributed approximately 80 percent of the estimated total region chinook escapement. Thus, while the exact contribution of indicator stocks to the total region escapements is unknown, and varies between years, it is thought to be in the range of 80 to 90 percent of the total region escapement.

Distribution of chinook indicator stocks by stock size is summarized in the following table.

S.E. ALASKA REGION CHINOOK ESCAPEMENT INDICATOR STOCKS
SUMMARIZED BY SIZE CATEGORY

Size Category	Total No. of Systems	Indicator Systems Number	Category Percent
Major	3	3	100%
Medium	9	7	78%
Minor	22	1	5%
Totals	34	11	

Geographical distribution of chinook escapement indicator stocks is summarized in the following table.

GEOGRAPHICAL DISTRIBUTION OF CHINOOK INDICATOR STOCKS

ADF&G Mgm't Area	Total No. of Systems	No. of Indicat. Stocks	Indicator Stock/Tributary (T = Transboundary)
Yakutak	9	2	Alsek / Klukshu (T); Situk
Juneau	3	3	Chilkat / Big Boulder (T); Taku / Nakina, Nahlin (T); King Salmon R.
Petersburg	11	2	Stikine / Little Tahltan (T); Andrews Creek
Ketchikan	11	4	Unuk (T); Chickamin (T); Blossom; Keta
Totals	34	11	

(No naturally spawning chinook stocks occur in the Sitka management area.) It should be emphasized that the management areas shown are broad, all species salmon management areas and do not represent specific chinook managment units.

Chinook escapements are currently enumerated by counting weirs on two of the indicator systems and by aerial and/or foot surveys on the other nine systems. The Canadian Dept. of Fisheries and Oceans operates a weir on the Klukshu tributary of the Alsek River, and ADF&G operates a weir on the Situk River. (Both weirs are operated primarily for sockeye enumeration but also provide chinook escapement counts.) Weirs have been operated in some years on Andrews Creek and the King Salmon River. Weirs are operated throughout the summer season while aerial and foot surveys are generally conducted during peak chinook spawning periods from mid-July to mid-August.

The proportion of total spawning escapements directly enumerated in indicator systems varies between systems depending on the counting method or type of survey (weirs or aerial/foot surveys), and the proportion of total spawning area or tributaries surveyed. For purposes of comparison and aggregation of indicator stocks, estimates of <u>total</u> annual spawning escapements for each indicator stock and, subsequently for all stocks, are derived by expanding index escapement counts for (1) survey counting rates; (2) proportion of spawning in index areas or tributaries; and (3) proportion of systems surveyed within each of the three size categories.

Survey counting rates represent the proportion of total spawning fish enumerated or counted by the particular survey or counting

method used. If chinook are counted at a weir, the counting rate is 1.00; i.e. virtually all spawning fish are assumed to have passed through the weir. If index escapement estimates are based on aerial surveys of peak spawning, only a percentage of the total number of spawners is normally counted due to protracted spawning and spawner distribution; percentages used for indicator systems range from 62.5 to 80 percent. Survey counting rates are based on general knowledge of spawning patterns by fisheries management and research biologists, and in some cases, on comparative escapement estimates from weirs and aerial surveys.

Tributary expansion factors are used for four of the eleven indicator systems to estimate total system escapements since not all chinook producing tributaries of these systems are surveyed. The percentage of total system escapements represented by surveyed or index tributries ranges from 14 percent (Big Boulder tributary of the Chilkat River) to 64 percent (Klukshu tributary of the Alsek River). These percentages are also based on general knowledge of chinook production from system watersheds by fisheries biologists familiar with the systems.

For illustration, expansion of index escapement counts to estimates of total escapements for 1986 are shown in Table 3. Survey counting rate and tributary expansion factors are shown for each indicator system. To derive an estimate of the total region chinook escapement, average escapements of indicator stocks in the medium and minor stock size categories are assumed for non-indicator stocks.

ESCAPEMENT TRENDS AND REBUILDING STATUS

Relatively complete and comparable annual escapement data for the eleven indicator stocks is available since 1975. This data is summarized in Table 4. The 6-year period, 1975-80, prior to the beginning of the rebuilding program in 1981 is used as the base period for measuring changes in escapements during the rebuilding period.

Escapement trends for the overall region and for indicator stocks are summarized below. Comparisons are made primarily between the 1975-80 base periods and 1981-85, the first five years, or approximately the first cycle, of the 15-year rebuilding program. In addition, 1986 escapements are reviewed and relative achievement of escapement goals is discussed. All escapement data is from Table 4.

Trends in Total Region Escapements

During 1981-85, the first 5-year period of the 15-year rebuilding program, the average total region chinook escapement increased by 49 percent to 39,000 from 26,000 in 1975-80. In 1986, the first year of the second 5-year period, the estimated total region escapement of 46,000 reflected an increase of about 18 percent above the 1981-85 average escapement of 39,000.

Annual escapements have fluctuated substantially since the beginning of the rebuilding program in 1981 from a maximum of 52,000 in 1981 to a minimum of 25,000 in 1983. As shown in Figure 3, escapements declined from 1981 to 1983, but then increased each year from 1984 through 1986. This trend in total region escapements was due primarily to a similar trend in escapements to two major systems, the Taku and Stikine rivers, which represent a large proportion of the total region escapement. Reduced escapements in the Taku and Stikine in 1983, and to a lesser degree in 1982 and 1984, appeared to be due primarily to poor brood year survival. Similar trends were not observed in escapements to other indicator systems.

Trends in Escapement Indicator Stocks

[It should be noted that for individual indicator stocks, relative changes in estimated total escapements are the same as relative changes in directly observed index escapements since expansions for survey counting rates and index tributary contributions represent a fixed scalar multiplier.]

During 1981-85, average escapements increased in nine of the eleven indicator systems compared to the 1975-80 base period (Figure 4). Increases ranged from 16 percent for the Taku to 457 percent for the Chilkat. Escapements more than doubled, i.e. increased by more than 100 percent, in five of the indicator systems, and nearly doubled in a sixth system, the Stikine (+98% increase).

Average escapements decreased in two of the indicator systems during 1981-85, compared to the base period 1975-80. Both of the two systems, the Alsek (-30%) and the Situk (-37%), are in the Yakutat management area and represent the most northly of the indicator systems. The more southerly stocks have generally experienced larger increases in escapements, a pattern which will be discussed below. In the case of the Situk, it should be noted that while the average 1981-85 escapement showed a decline relative to the base period, escapements during the last three years, 1984-86, have improved with an average increase of 14 percent relative to the base period.

In 1986, escapements to indicator stocks generally reflected further improvements, increasing in 9 of the 11 indicator systems relative to both 1985 and average 1981-85 escapements. Escapements decreased in two systems, the Chilkat and Stikine, in 1986.

One pattern appears to be developing in the relative response of different indicator stocks to the escapement rebuilding program. Stocks in the southern portion of the region have shown larger, more consistent increases in escapements than the central and more northerly stocks. Summary data is shown below.

CHANGES IN TOTAL CHINOOK ESCAPEMENTS FOR INDICATOR STOCKS GROUPED ACCORDING TO THREE GEOGRAPHICAL REGIONS

Location (Stocks)	Average Total Escapement 1975-80	1981-85	Percent Change
Southern (Unuk, Blossom, Chickamin, Keta)	2,200	4,815	+119%
Central (Stikine, Andrews, King Salmon, Taku, Chilkat)	14,881	23,526	+ 58%
Northern (Yakutat) (Alsek, Situk)	6,058	4,133	- 32%

As seen in the above table (and Figure 5), the four indicator stocks in the Behm Canal area experienced an average increase of 119 percent during 1981-85; the four indicator stocks in the more central portion of the region increased by 58%; escapements to the Alsek and Situk rivers in the Yakutat area decreased by 32 percent.

At least two factors are thought to be contributing to this pattern. First, and probably most important in terms of relative impact, the more southerly stocks were apparently being harvested by local marine fisheries at higher rates prior to the rebuilding program, and therefore benefited to a greater extent from fishery restrictions implemented for rebuilding. The central and more northerly stocks, were being harvested at lower rates, and subsequently benefited less from fishery restrictions.

Coded wire tagging of both natural and hatchery stocks has demonstrated a greater tendency for the more southerly stocks to

contribute, both as immature and mature fish, to marine fisheries throughout the region, particularily to the Southeast Alaska troll fishery where the major chinook catch restrictions have been imposed. This appears to be due in part to the general northerly migration pattern of most juvenile chinook after they enter the ocean, which results in the more southerly stocks remaining in Southeast Alaska waters to a greater extent during ocean residency. (Coded wire tagging of Taku natural chinook fry, for example, suggests that Taku stocks are available to the Southeast Alaska troll fishery primarily as mature fish during spring spawning migrations periods, which have been closed to fishing during the rebuilding program, with few recoveries of immature fish being made at other times of the year.)

A second factor which appears to be contributing to this pattern is the higher, and more consistent, survival rates for the more southerly chinook stocks, which spawn and rear in generally milder climatic conditions. (Productivity of other salmon species is also generally higher, and more consistent, in the southern portion of the region.) More variable returns have been noted for the central and northern stocks, particularily the Stikine, Taku, and Chilkat.

If the more northerly stocks were in fact contributing to marine fisheries at a lower rate, a weaker response in escapements might be expected when conservation measures were implemented. However, the observed decline in escapements in the Alsek and Situk would not be expected. (It should be noted that inriver catches were reduced substantially in 1981-85 compared to 1975-80, and that total inriver returns declined in both systems in spite of significantly expanded conservation measures.) Returns during 1981-85 may have declined due to factors such as less favorable environmental conditions, increased predation, impacts of high seas fisheries, or some combination of these. Large concentrations of seals have been observed near the mouth of the Alsek during spring migrations of salmon (P. Kissner, Pers. Comm.). Regarding potential impacts by high seas fisheries, known changes in fishing patterns since the late 1970s would have been expected to reduce - rather than increase - impacts on chinook returning to these areas (S. Ignell, Pers. Comm.).

If the pattern of weaker escapement responses in the central and northerly stocks is due primarily to lower harvest rates on these stocks by local marine fisheries prior to rebuilding, which it appears to be, this could have important implications relative to the appropriateness of current escapement goals for some systems. For example, if current inriver returns to the Alsek represent nearly total returns from parent escapements, this would imply that escapements during 1975-80 were in fact producing at approximately a 1:1 rate. This further implies, given a Ricker type reproduction curve, that the 1975-80 escapements (average = 4,500) were above optimum levels, and in fact near natural

equilibrium levels. If this is the case, the current management goals of 5,000 (ADF&G) would be too high to maximize sustainable harvest levels. On the other hand, larger catches were reported historically from the Dry Bay fishery at the mouth of the Yakutat; an average catch of 12,700 was taken during the 14-year period 1914-27. It is not known to what extent these catches represented overfishing, however, catches - and estimated inriver returns - have been much less in recent years. A similar situation exists for the Situk.

The above considerations should be taken into account in the review of escapement goals currently being conducted.

General Assessment of Rebuilding Status

[A more detailed assessment of rebuilding progress is currently being conducted. The following represents a general assessment based on escapement trends observed to date.]

Current management escapement goals for the indicator stocks have been established and are also shown in Table 4. Data is not available for spawner/recruit analysis of optimum escapement levels. However, the goals shown, which were initially established in 1981, are considered to be first working estimates of optimum spawning levels. These goals are based on: (1) maximum escapements observed prior to 1981 when natural chinook stocks were significantly depressed and it was felt unlikely that even maximum escapements substantially exceeded optimum spawning levels; (2) observed utilization of surveyed spawning areas; and (3) historical catch patterns in some terminal area fisheries. Index escapement goals were initially established for indicator or index systems and then expanded to total system escapement goals using the methods described in the previous section. Expansion of index escapement goals to total escapement goals is shown in Table 5. Management escapement goals are currently being reevaluated taking into account information obtained since the beginning of the rebuilding program in 1981.

Estimated total region chinook escapements during the base period 1975-80 averaged 26,000 or about 41 percent of the region goal of 64,000. During 1981-85, the first five years of the rebuilding program, the average escapement increased to 39,000 or 61 percent of the goal. In 1986, the estimated total escapement of 46,000 represented 72 percent of the management goal.

Relative achievement of escapement goals has varied substantially between indicator stocks during the first five years of the rebuilding program. Average 1981-85 escapements ranged from 36 to 126 percent of the respective management goals (Table 6 and Fig. 6). Numbers of indicator stocks achieving different levels of escapement goals are summarized below.

NUMBERS OF S.E. ALASKA REGION CHINOOK INDICATOR STOCKS ACHIEVING DIFFERENT LEVELS OF ESCAPEMENT GOALS DURING 1975-80 COMPARED TO 1981-85

Percent of Goal	1975-80 Base Period Number	Percent	1981-85 First Cycle Number	Percent
0 - 25%	3	27%	0	0%
25 - 50%	5	45%	2	18%
50 - 75%	2	18%	5	45%
75 - 100%	1	9%	4	36%
	11		11	

In 1986, management escapement goals were met or exceeded in seven of the eleven indicator systems.

A general assessment of rebuilding progress is summarized below. This assessment is based on current management goals and escapement trends observed to date (data in Tables 4 and 6).

1.) Indicator stocks ahead of schedule.

Five of the eleven indicator stocks appear to be substantially ahead of the rebuilding schedule at this point. These include the four Behm Canal systems (Unuk, Chickamin, Blossom and Keta) and the King Salmon River. Relatively large percentage increases have occurred since the beginning of the rebuilding program and current escapements are generally near or above management goals. Goals are expected to be generally met or exceeded during the second cycle.

2.) Indicator stocks for which rebuilding progress is uncertain.

Rebuilding progress is currently uncertain for four indicator stocks, Andrews Creek, Stikine, Chilkat and Situk, due lack of clear, recent trends in escapements since 1981. In each case, escapements have fluctuated substantially, with some increases relative to 1975-80 and some decreases. For the Situk, escapements declined during the first three years of the rebuilding program (1981-83 average = 556 compared to 1975-80 average = 1557), but increased during the last three years (1984-86 average = 1771). If the 1984-86 escapement pattern continues, during which escapements averaged 84 percent of the escapement goal, the Situk stocks would appear to be on schedule. Escapements to the Chilkat initially showed large increases

(1981-84 averge = 1,324; 1975-80 average = 213), but then declined in 1985 (625) and 1986 (170) to levels substantially below the goal of 2,000 spawners. If 1985-86 escapements represent a poor brood year survival and escapements return to 1981-84 levels, the Chilkat stock could return to schedule. No clear trends exist for the other two stocks at this point.

3.) Indicator stocks behind schedule.

Two of the eleven indicator stocks appear to be behind schedule, the Alsek and Taku rivers. Except for 1986, escapements to the Alsek since 1981 have generally been below base period escapements as indicated above. Following a large increase in the Taku escapement during the first year (1981 escap. = 17,889; 1975-80 average = 7,978), escapements declined during the next three years (1982-84 average = 5,910). Although Taku escapements increased in 1985 (10,851) and 1986 (12,178), they still remain substantially below the goal of 25,600.

Summary

As seen above, rebuilding progress for escapement indicator systems during the first six years of the rebuilding program has been mixed. Five of the eleven indicator systems are ahead of schedule and near escapements goals; two systems appear to be behind schedule, and four systems reflect uncertain progress due to lack of clear trends in escapements. This assessment is based on current management escapement goals. The appropriateness of these goals, particularily for the more northern stocks, is being reviewed in light of new information obtained since the rebuilding program began in 1981.

Escapements during the second cycle or five year period, 1986-90, should benefit from increased escapements during the first cycle which occurred to some extent in all but two systems. In addition, regulations limiting chinook harvest during the second cycle are expected to be more restrictive on average than during the first cycle when regulations were first being imposed and progressively became more restrictive. It is important, however, that escapement trends during the early part of the second cycle be carefully monitored for indicator systems with inadequate responses during the first cycle.

Primary reference sources for index escapements:

1975-85: Kissner, Paul D. 1986. (In Process) A study of chinook salmon in Southeast Alaska. Alaska Dept. of Fish and Game, Annual Report 1985-86; Project F-10-1, 27 (AFS-41)

1986: ADF&G (P. Kissner) and CDFO (S. Johnston) mgm't records.

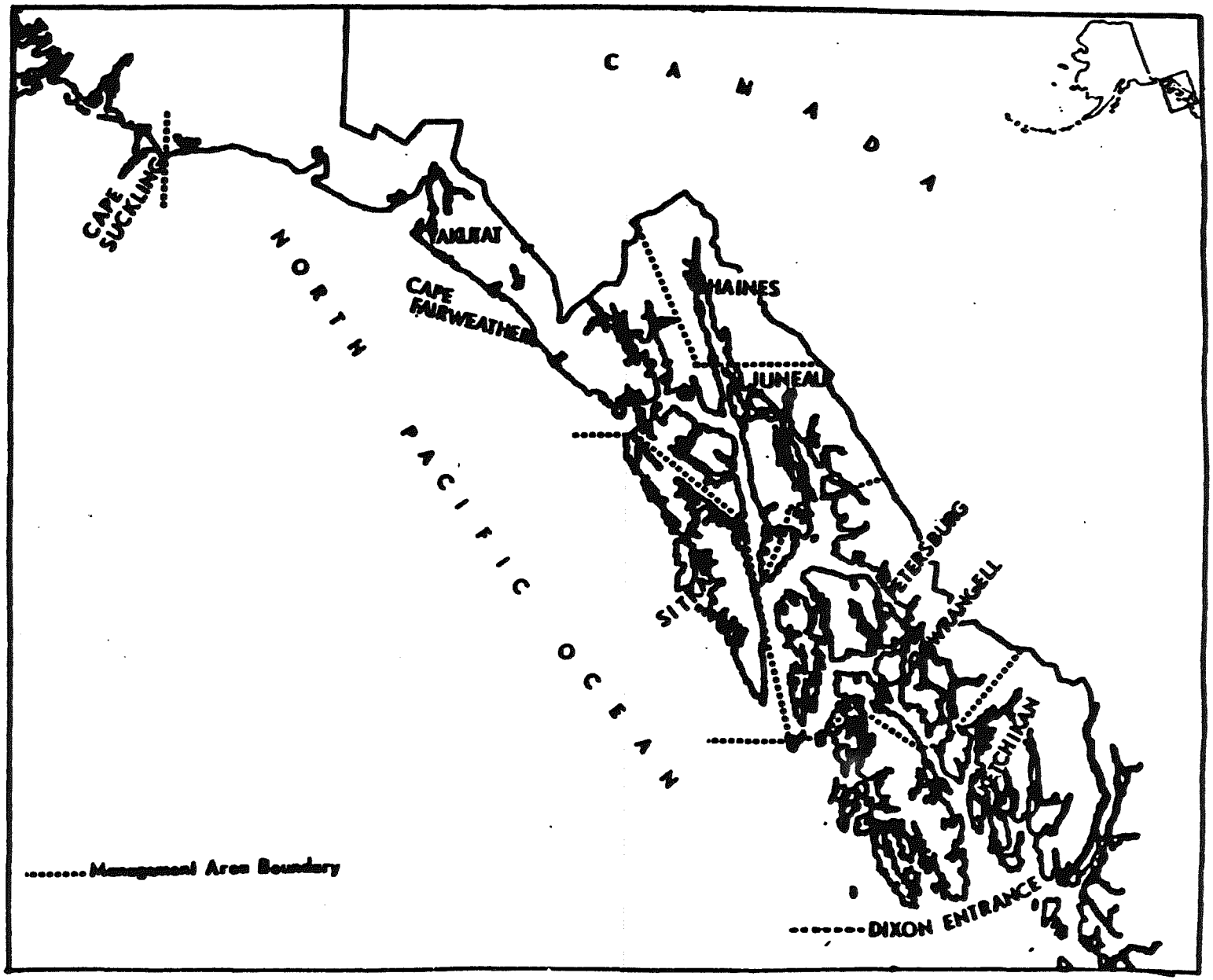

Figure 1. Map of Southeast Alaska region showing salmon management areas.

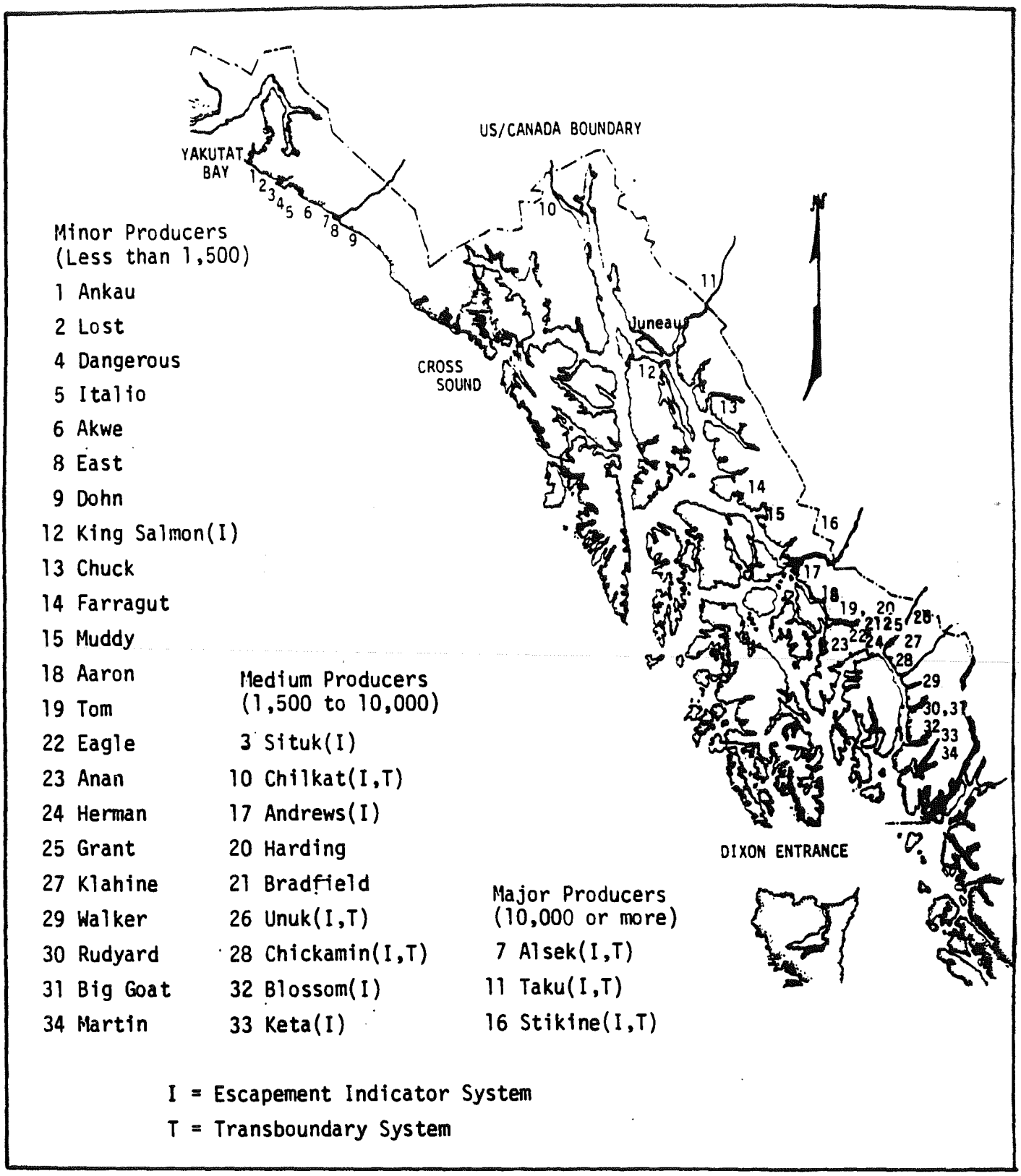

Figure 2 . Approximate locations of natural chinook salmon systems in Southeast Alaska and transboundary areas. (ADF&G 1/87)

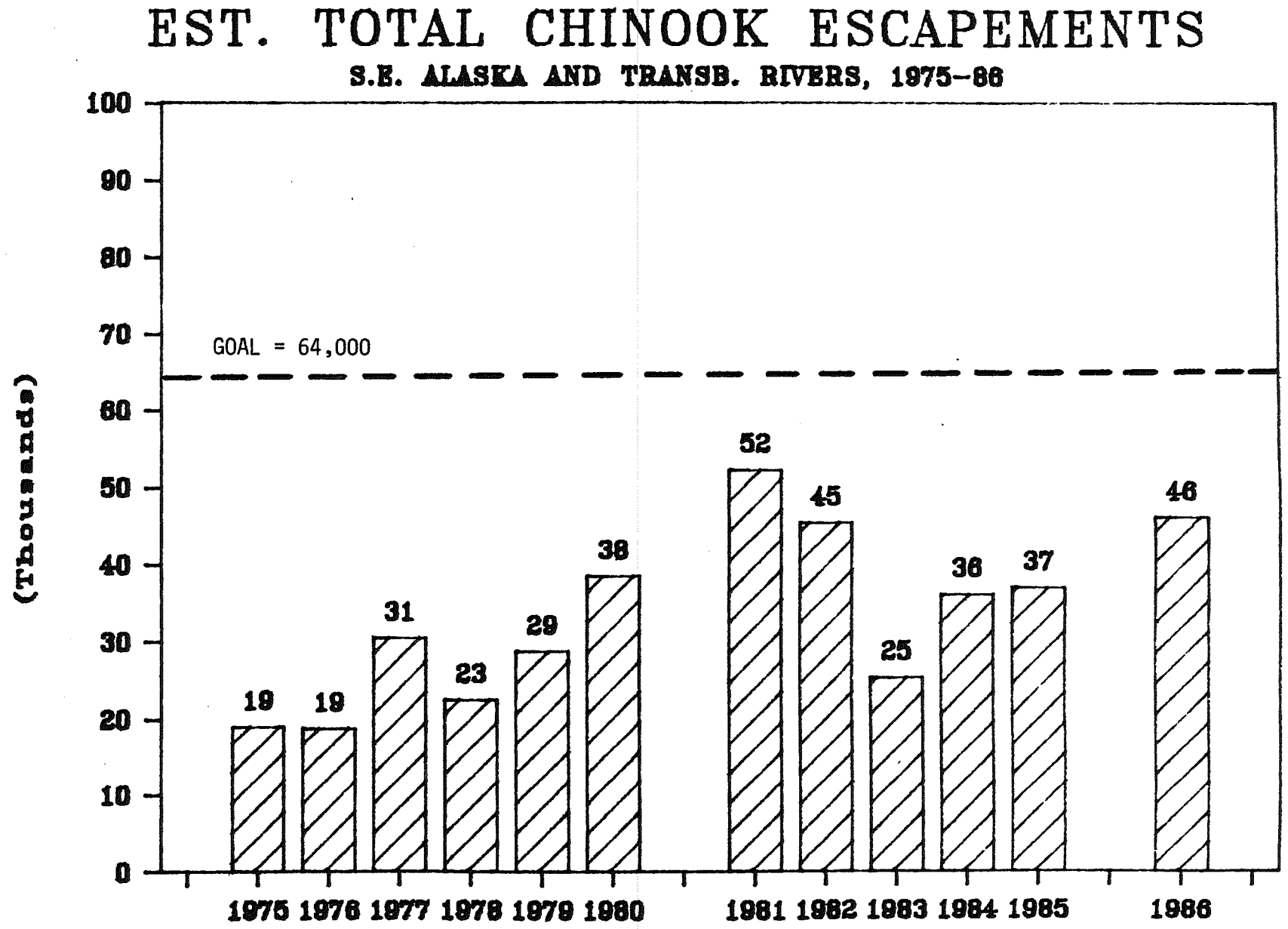

Figure 3. Estimated total chinook salmon escapements to Southeast Alaska and transboundary systems, 1975-86. (Rev. ADF&G 2/4/87)

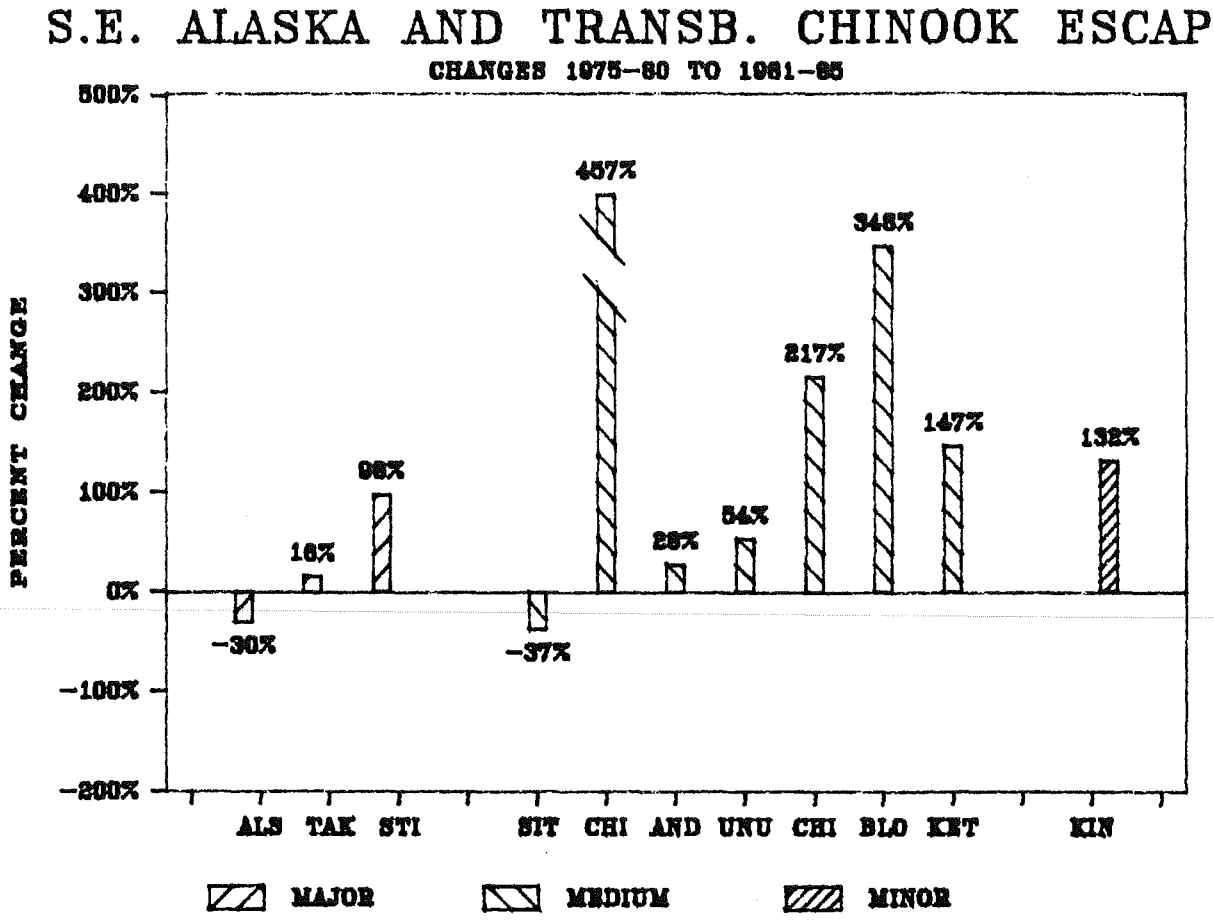

Figure 4. Percent changes in average chinook salmon escapements between 1975-80 and 1981-85 for Southeast Alaska and transboundary indicator stocks. (ADF&G 2/4/87)

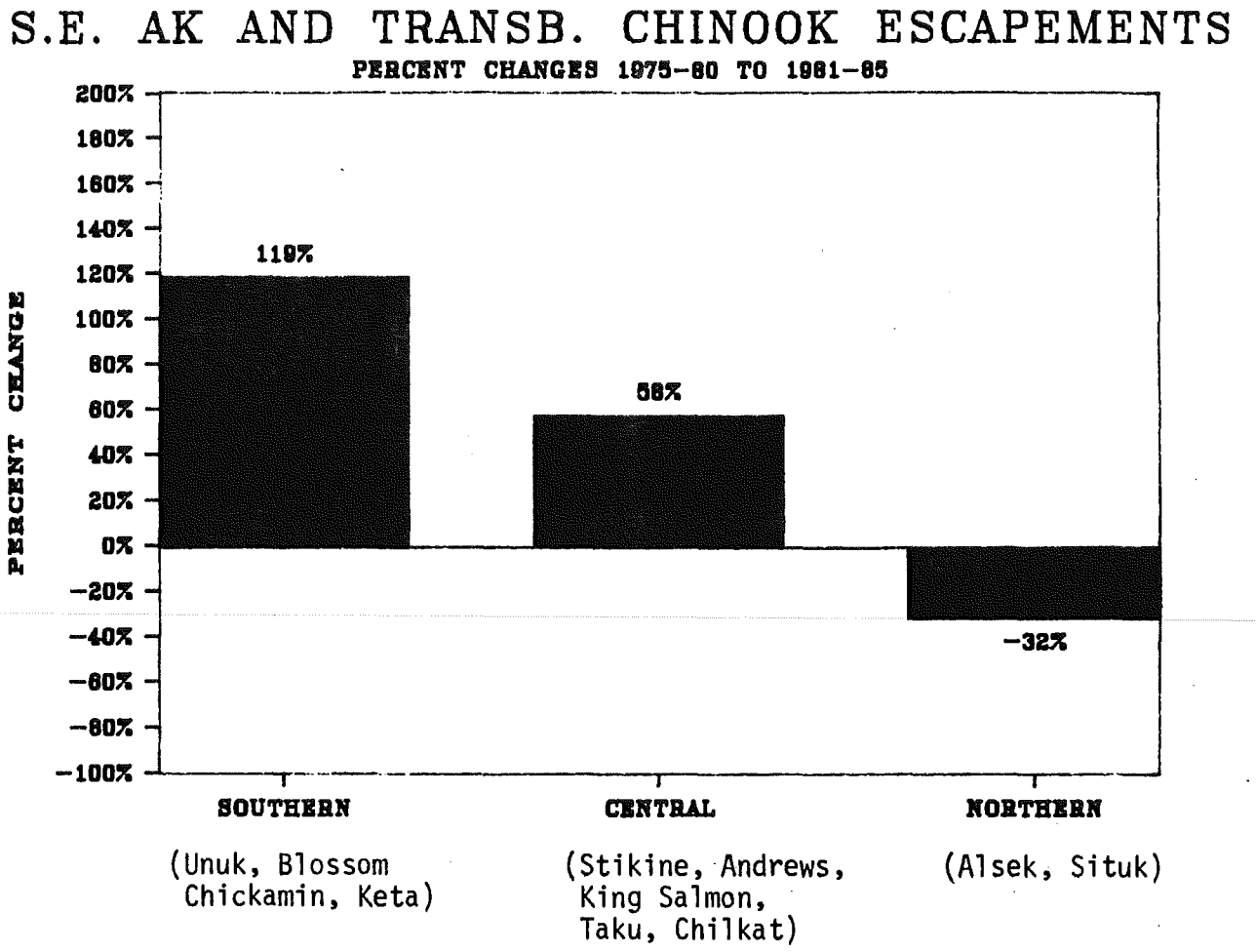

Figure 5 . Percent changes in average chinook escapements from 1975-80 to 1981-85 for Southeast Alaska (and transboundary) indicator stocks grouped according to geographical regions.

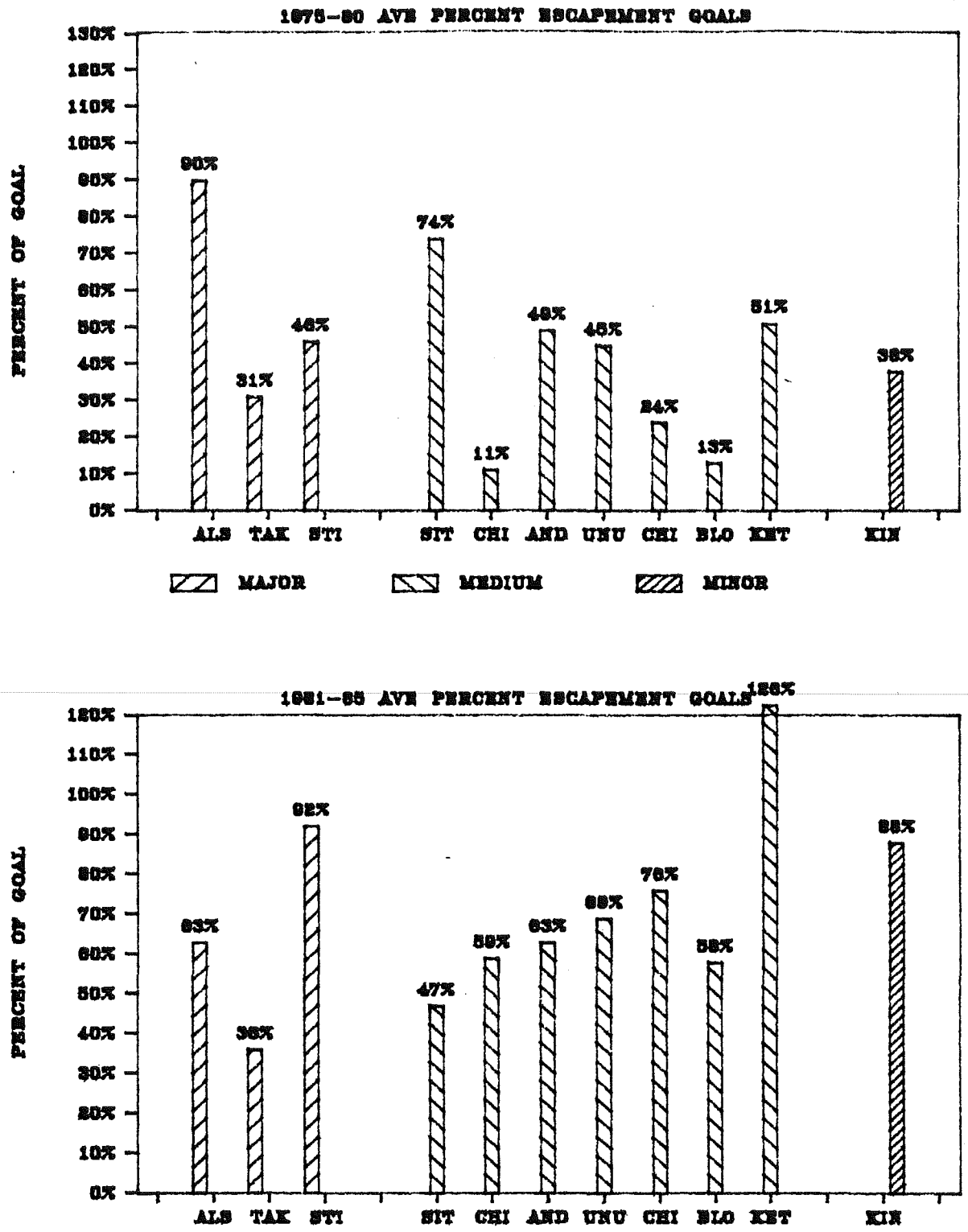

Figure 6. Average percent of chinook salmon escapement goals achieved during 1975-80 and 1981-85 for escapement indicator stocks in Southeast Alaska and transboundary areas. (ADF&G 2/4/87)

TABLE 1. NATURAL CHINOOK SALMON SYSTEMS IN SOUTHEAST ALASKA INCLUDING TRANSBOUNDARY RIVERS WITH ESCAPEMENT INDICATOR SYSTEMS SHOWN (ADF&G 12/86; FILE: SYSTEMS.TAB) - CONT.

Map Index No.	Approximate Location Latitude(N)	Longitude(W)	Statistical Area Codes Area	Subarea	System	Escapement Indicator System (*)	Primary Type of Count	System Name (T = Transb.)/ Indicator Trib.
			MAJOR SYSTEMS (RUN SIZE 10,000 OR GREATER)					
7	59° 03'	138° 34'	182	30	010	*	Weir	Alsek (T) /Kluckshu
11	58° 59'	133° 09'	111	32	032	*	Aerial	Taku (T) /Nakina, Nahlin
16	57° 14'30"	128° 19'00"	108	Various		*	Aerial	Stikine (T) /Little Tahltan
			MEDIUM SYSTEMS (RUN SIZE 1,500 to 10,000)					
3	59° 26'30"	139° 33'00"	182	70	010	*	Weir	Situk
10	59° 12'30"	135° 28'30"	115	32	025	*	Aerial/ Foot	Chilkat (T) /Big Boulder Cr.
17	56° 40'10"	132° 15'00"	108	40	020	*	Weir/Foot	Andrews Cr.
20	56° 12'15"	131° 37'00"	107	40	049			Harding
21	56° 13'30"	131° 30'45"	107	40	052/053			Bradfield
26	56° 95'	131° 05'	101	75	030	*	Aerial	Unuk (T)
28	55° 47'	138° 58'	101	71	004	*	Aerial	Chickamin (T)
32	55° 23'45"	130° 36'28"	101	55	020	*	Aerial	Wilson-Blossom
33	55° 20'10"	130° 28'29"	101	30	030	*	Aerial	Keta

Table 1. NATURAL CHINOOK SALMON SYSTEMS IN SOUTHEAST ALASKA INCLUDING TRANSBOUNDARY RIVERS WITH ESCAPEMENT INDICATOR SYSTEMS SHOWN (ADF&G 12/86)

Map Index No.	Approximate Location Latitude(N)	Longitude(W)	Statistical Area Codes Area	Subarea	System	Escapement Indicator System (*)	Primary Type of Count	System Name (T = Transb)/ Indicator Trib.
			MINOR SYSTEMS (RUN SIZE LESS THAN 1,500)					
1	59° 32'50"	139° 48'20"	183	50	010			Ankau
2	59°27'20"	139°36'30"	182	80	010			Lost
4	59° 20'55"	139° 18'00"	182	60	010			Dangerous
5	59° 19'40"	139° 14'30"	182	50	010			Italio
6	59° 17	139° 03'	182	40	010			Akwe
8	59°05'20"	138°26'30"	182	20	010			Eask Alsek
9	59° 04'10"	138° 20'55"	182	10	010			Doame
12	58° 02'30"	134° 20'30"	111	17	010	*	Aerial	King Salmon
13	57° 35'00"	133° 21'15"	110	32	009			Chuck
14	57°09'30"	133°08'45"	110	14	007			Farragut
15	56° 54'10"	132° 49'05"	108	60	003			Muddy
18	56° 21'	131° 59'	107	40	024			Aaron
19	56° 12'40"	131° 40'45"	107	40	047			Tom
22	56° 10"	131° 36	107	40	055			Eagle
23	56° 10'50"	131° 53'05"	107	20	001			Anan
24	59°25'	136°06"	101	75	005			Hermann
25	56° 01'30"	131° 11'30"	101	75	010			Grant
26	56° 02'30"	131° 06'00"	101	75	050			Klahini
29	55° 45'10"	130° 42'00"	101	71	028			Walker
30	55°33'	130°52'	101	60	015			Rudyerd
31	55° 32'	130° 35'	101	60	030			Big Goat
34	55°09'30"	130°31'45"	101	30	060			Marten

TABLE 2. SOUTHEAST ALASKA NATURAL CHINOOK SALMON INDICATOR STOCKS
(FILE: SEAKIND.WK1; DISK: 1986 CTC RBLD)

REGION: SOUTHEAST ALASKA

RUN TYPE: SPRING

	ESCAPEMENT INDICATORS		HARVEST RATE INDICATORS	
SOURCES OF PRODUCTION	STOCK/SYSTEM	TERMINAL RUN SIZE	STOCK/SYSTEM	TERMINAL RUN SIZE
SOUTHEAST ALASKA (34 SYSTEMS INCLUDING TRANSBOUNDARY RIVERS)	ALSEK		SELECTED S.E. AK HATCHERIES TO BE DETERMINED. E.G. NEETS BAY CRYSTAL LAKE LITTLE PORT	
	SITUK			
	CHILKAT			
	TAKU			
	KING SALMON			
	ANDREWS CR.			
	STIKINE			
	UNUK			
	CHICKAMIN			
	BLOSSOM			
	KETA			

PERCENT OF PRODUCTION REPRESENTED 80-90%

TABLE 3. PRELIMINARY ESTIMATES OF TOTAL 1986 CHINOOK SALMON ESCAPEMENTS TO SOUTHEAST ALASKA AND TRANSBOUNDARY RIVERS. (REVISED ADF&G 12/5/86)

Index System / Tributary	1986 Escap. Index	Index Systems: Survey Expans. Factor	Index Systems: Tribut. Expans. Factor	Index Systems: Est. Total Escap.	Totals: Categ. Expans. Factor	Totals: Est. Total Escap.
Major Category (Transboundary) Systems (3 total)						
Alsek/Klukshu	2708 (W)	1	1/.64	4231		
Taku/Nakina, Nahlin	5480 (A)	1/.75	1/.60	12178		
Stikine/Little Tahltan	1254 (A)	1/.625	1/.25	8026		
Major Subtotals	9442			24435	1	24435
Medium Category Systems (9 total)						
Situk	2067 (W)	1	1	2067		
Chilkat/Big Boulder	19 (F)	1/.80	1/.14	170		
Andrews Creek	707 (F)	1/.625	1	1131		
Behm Canal Systems						
Unuk	2126 (A)	1/.625	1	3402		
Chickamin	1677 (A)	1/.625	1	2683		
Blossom	1278 (A)	1/.625	1	2045		
Keta	690 (A)	1/.625	1	1104		
Subtotals	5771			9234		
Medium Subtotals	8564			12601	9/7	16202
Minor Category Systems (22 total)						
King Salmon R.	199 (A)	1/.80	1	249		
Minor Subtotals	199			249	22/1	5473
All Systems Totals	18205			37285		46109

Notes: (1) (W) = weir count; (A) = aerial survey estimates; (F) = foot survey estimates.
(2) Escapement estimates include large, 3-ocean and older chinook only; jacks are not included except for Alsek/Klukshu weir count.
(3) Total escapement estimates = (index escapements) x (expansion factors).

Data Sources: All systems except transboundary rivers:
ADF&G management records (Pers. Comm. P. Kissner, D. Ingledue)
Transboundary river systems:
Alsek/Klukshu weir count - CDFO mgm't records (S. Johnson)
Taku and Stikine - joint CDFO (S. Johnson), ADF&G (P. Kissner)

TABLE 4. ESTIMATED TOTAL CHINOOK SALMON ESCAPEMENTS TO ESCAPEMENT INDICATOR SYSTEMS AND TO ALL SOUTHEAST ALASKA AND TRANSBOUNDARY (T) RIVERS, 1975-86.
(INDEX ESCAPEMENTS HAVE BEEN EXPANDED FOR SURVEY COUNTING RATES AND UNSURVEYED TRIBUTARIES.)
(REV. ADF&G 1/27/87; FILE: SUMVER2.WK1)

	MAJOR SYSTEMS				MEDIUM SYSTEMS										MINOR SYSTEMS			TOTAL
Year	Alsek (T)	Taku (T)	Stikine (T)	Major Subt.	Situk	Chilkat (T)	Andrews	Unuk (T)	Chickamin(T)	Blossom	Keta	Behm Subt.	Medium Unsurv.	Medium Subt.	King Salm.	Minor Unsurv.	Minor Subt.	ALL SYSTEMS
1975	4501	4609	4480	13590	1567	188	371	88	562	245	325	1220	951	4287	53	1102	1155	19032
1976	1944	8278	2560	12782	1933	223	404	317	195	109	134	755	948	4263	81	1707	1788	18833
1977	4913	10000	5120	20033	1872	223	456	1866	376	179	368	2789	1526	6866	168	3517	3685	30584
1978	4650	4987	4045	13682	1103	214	388	2824	290	229	627	3970	1621	7296	71	1497	1568	22546
1979	6880	6593	7462	20935	1754	214	327	922	224	86	682	1914	1202	5411	110	2310	2420	28766
1980	4120	13402	13677	31199	1125	214	281	1683	418	142	307	2550	1192	5362	88	1837	1925	38486
Ave 75-80	4501	7978	6224	18704	1557	213	371	1283	344	165	407	2200	1240	5581	95	1995	2090	26375
1981	3302	17889	21338	42529	643	1670	511	1170	608	254	526	2558	1538	6920	126	2652	2778	52227
1982	3688	8407	18112	30207	434	500	635	2162	806	552	1206	4726	1799	8094	324	6798	7122	45423
1983	3938	3018	3802	10758	592	1080	366	1770	890	942	1315	4917	1987	8942	260	5460	5720	25420
1984	2594	6307	8282	17183	1726	2045	355	2939	1622	813	976	6350	2993	13469	248	5197	5445	36097
1985	2227	10851	10227	23305	1521	625	510	1862	1531	1134	998	5525	2340	10521	146	3072	3218	37044
Ave 81-85	3150	9294	12352	24796	983	1184	475	1981	1091	739	1004	4815	2131	9589	221	4636	4857	39242
Percent change 1981-85 from 1975-80																		
Number	-1352	1316	6128	6093	-574	971	104	697	747	574	597	2616	891	4008	126	2641	2766	12868
Percent	-30%	16%	98%	33%	-37%	457%	28%	54%	217%	348%	147%	119%	72%	72%	132%	132%	132%	49%
Mgm't Goals	5000	25556	13440	43996	2100	2009	750	2880	1440	1280	800	6400	3217	14476	250	5250	5500	63971
Percent of Goals																		
Ave 75-80	90%	31%	46%	43%	74%	11%	49%	45%	24%	13%	51%	34%	39%	39%	38%	38%	38%	41%
Ave 81-85	63%	36%	92%	56%	47%	59%	63%	69%	76%	58%	126%	75%	66%	66%	88%	88%	88%	61%
Preliminary 1986 Escapements																		
Number	4231	12178	8026	24435	2067	170	1131	3402	2683	2045	1104	9234	3600	16202	249	5224	5473	46110
1986 Change from 1985																		
Number	2004	1327	-2201	1130	546	-455	621	1540	1152	911	106	3709	1260	5681	103	2152	2255	9066
Percent	90%	12%	-22%	5%	36%	-73%	122%	83%	75%	80%	11%	67%	54%	54%	71%	70%	70%	24%
1986 Percent of Goal	85%	48%	60%	56%	98%	8%	151%	118%	186%	160%	138%	144%	112%	112%	100%	100%	100%	72%

TABLE 5. PROJECTED TOTAL MANAGEMENT ESCAPEMENT GOALS FOR NATURAL CHINOOK SALMON SYSTEMS IN SOUTHEAST ALASKA AND TRANSBOUNDARY RIVERS. REVISED ADF&G: 10/17/85

Indicator System / Index Tributaries (T=transb.)	Indicator Systems: Index Escap. Goal	Survey Expans. Factor	Tribut. Expans. Factor	Total Escap. Goal	Categ. Expans. Factor	Total Escap. Goal
		Major Systems (3 total)				
Alsek/Klukshu (T)	3200 (W)	1	1/.64	5000		
Taku/Nakina, Nahlin (T)	11500 (A)	1/.75	1/.60	25556		
Stikine/Little Tahltan (T)	2100 (A)	1/.625	1/.25	13440		
Major Subtotals	16800			43996	1	43996
		Medium Systems (9 total)				
Situk	2100 (W)	1	1	2100		
Chilkat/Big Boulder (T)	225 (A)	1/.80	1/.14	2009		
Andrews Creek	750 (W)	1	1	750		
Behm Canal Systems						
Unuk (T)	1800 (A)	1/.625	1	2880		
Chickamin (T)	900 (A)	1/.625	1	1440		
Blossom	800 (A)	1/.625	1	1280		
Keta	500 (A)	1/.625	1	800		
Subtotals	4000			6400		
Medium Subtotals	7075			11259	9/7	14476
		Minor Systems (22 total)				
King Salmon R.	200 (A)	1/.80	1	250		
Minor Subtotals	200			250	22/1	5500
All Systems Totals	24075			55504		63971

Notes: (1) (W) = weir count; (A) = aerial survey peak escapement estimate.
(2) Total escapement goals = (index goals) x (expansion factors).

TABLE 6. SUMMARY OF ESCAPEMENT TRENDS FOR SOUTHEAST ALASKA AND TRANSBOUNDARY NATURAL CHINOOK SALMON INDICATOR STOCKS SINCE THE BEGINNING OF A REBUILDING PROGRAM IN 1981. (FILE: STATUS.TAB; DISK: PSC CTC REBUILDING; ADF&G 2/87).

Indicator Stocks (T = transb.)	Percent Increase 81-85 vs 75-80	Percent of Goal Ave 81-85	Goal 1986	Years Goal Achieved
1. Stocks ahead of schedule.				
Unuk (T)	+ 54%	69%	118%	2/6
Chickamin (T)	+217%	76%	186%	3/6
Blossom	+348%	58%	160%	1/6
Keta	+147%	126%	138%	5/6
King Salmon	+132%	88%	100%	4/6
2. Stocks for which progress is uncertain. (1981-86 Escapement trends uncertain.)				
Andrews Cr.	+ 28%	63%	151%	1/6
Stikine (T)	+ 98%	92%	60%	2/6
Chilkat (T)	+457%	59%	8%	1/6
Situk	- 37%	47%	98%	1/6
[Average escapement to Situk during 1984-86 increased by 14% over 1975-80 base period and averaged 84% of goal.]				
3. Stocks behind schedule.				
Taku (T)	+ 16%	36%	48%	0/6
Alsek (T)	- 30%	63%	85%	0/6