

KLAMATH RIVER FALL CHINOOK OVERFISHING CONCERN

The action under this agenda item is intended to determine the criteria and rebuilding measures necessary to end the Overfishing Concern (OC) for Klamath River fall Chinook (KRFC), which was triggered by failing to achieve 35,000 adult natural area spawners in 2004-2006. This action will comprise the Council's initial rebuilding plan for KRFC as specified in the Salmon Fishery Management Plan (FMP) (Agenda Items E.1.a, Attachments 1 and 2). The FMP requires that each OC be assessed individually, and that the specific circumstances leading to the OC be considered in determining if a rebuilding plan is required to end the OC. Therefore, each stock and OC event should be evaluated independent of other stocks or OC events, and no particular precedence should be assumed for any past or future decisions.

At its March 2008 meeting, the Council adopted a set of recommendations comprising a rebuilding plan for KRFC for public review, including criteria for determining the end of the OC. The criteria and one of the recommendations adopted by the Council for public review differed slightly from those recommended by the Salmon Technical Team (STT) led Workgroup that developed the Assessment of Factors Affecting Natural Area Escapement Shortfall of Klamath River Fall Chinook Salmon in 2004-2006 (see Agenda Item D.3.b, KRFC Stock Assessment, March 2008). The two rebuilding plans are presented with the Workgroup criteria as the original and the Council adopted criteria displayed in ~~strikeout~~underline format (Agenda Item E.1.a, Attachment 3).

At its April 2008 meeting, the Council requested additional analyses of the alternative criteria (Agenda Item E.1.a, Attachment 3) and further review by the Scientific and Statistical Committee (SSC). The analysis of the relative risks is presented in Agenda Item E.1.b, STT Report.

The Hoopa Valley Tribe, the Yurok Tribe, and the Salmon Advisory Subpanel (SAS) presented comments at the April 2008 Council meeting relative to the rebuilding plan for KRFC (Agenda Item E.1.a, Attachment 4).

The Council should adopt a final rebuilding plan at this time, which will be implemented through the annual management measures and rulemaking procedures for a regulatory amendment. The rebuilding plan will be incorporated in the 2008 ocean salmon management measures, and in future management measures, as appropriate.

Council Action:

- 1. Adopt a final rebuilding plan, including criteria to identify the end of the Overfishing Concern, for Klamath River fall Chinook.**

Reference Materials:

1. Agenda Item E.1.a, Attachment 1: Summary and Background for the Salmon Fishery Management Plan and Overfishing Concerns.
2. Agenda Item E.1.a, Attachment 2: Excerpt from the Pacific Coast Salmon Plan.
3. Agenda Item E.1.a, Attachment 3: Alternative Rebuilding Plans for Klamath River Fall Chinook.
4. Agenda Item E.1.a, Attachment 4: Tribal and Advisory Body Statements from the April 2008 Council Meeting Concerning the Klamath River Fall Chinook Overfishing Concern.
5. Agenda Item E.1.b, Hoopa Valley Tribal Comments: Hoopa Valley Tribal Comments on Klamath River Fall Chinook Overfishing Concern.
6. Agenda Item E.1.c, STT Report: Salmon Technical Team Analysis of Risks and Benefits of Alternative Rebuilding Criteria for Klamath River Fall Chinook

Agenda Order:

- a. Agenda Item Overview
 - b. Agency and Tribal Comments
 - c. Reports and Comments of Advisory Bodies
 - d. Public Comment
 - e. **Council Action:** Confirm or Establish Criteria for Determining the End of the Overfishing Concern
- Chuck Tracy

PFMC
05/22/08

SUMMARY AND BACKGROUND FOR THE SALMON FISHERY MANAGEMENT PLAN AND OVERFISHING CONCERNS

Two amendments to the Salmon Fishery Management Plan (FMP) have defined and determined the Council's response to overfishing for salmon stocks: Amendment 10, adopted in 1991, which provided the initial definition of overfishing, and Amendment 14, adopted in 2000, which expanded on the determination of overfishing and provided more specificity regarding the Council's response.

Amendment 10 defined overfishing as "...an occurrence whereby all mortality, regardless of the source, results in a failure of a salmon stock to meet its annual spawning escapement goal or management objective for three consecutive years, and for which changes in the fishery management regime offer the primary opportunity to improve stock status." If overfishing occurred, the Council was required to: "appoint a work group to investigate the causes of the apparent shortfall" and "...report ... its conclusions and recommendations ... to the Council." The FMP then specified: "For those actions within Council control, the Council may change analytical or procedural methodologies to improve the accuracy of estimates for abundance, harvest impact and maximum sustained yield (MSY) escapement levels, and/or to reduce ocean harvest impacts when shown to be effective in stock recovery to MSY levels. For those causes beyond Council control, the Council may make recommendations to those entities which have the control to change preseason prediction methodology (e.g., procedures established under *Hoh v. Baldrige*), improve habitat, and review and/or revise escapement goals." There was no specific requirement to determine the end of overfishing, just the above reference to "...stock recovery to MSY levels."

Amendment 14 established two categories to address overfishing, the Conservation Alert (CA) and the Overfishing Concern (OC). The CA addressed circumstances and actions required during the preseason process to prevent overfishing from occurring. The OC provided guidance on determining if overfishing had occurred, and how the Council should respond to that possibility or determination (Agenda Item E.1.a, Attachment 2). Amendment 14 defines an OC as "...if, in three consecutive years, the postseason estimates indicate a natural stock has fallen short of its conservation objective...". When triggered, an OC requires the Council to direct the STT and relevant agencies and tribes to complete an assessment to "... appraise the actual level and source of fishing impacts on the stock, consider if excessive fishing has been inadvertently allowed..., identify any other pertinent factors..., and assess the overall significance of the present stock depression with regard to achieving MSY on a continuing basis." The STT recommendations should include "...any needed adjustments to annual management measures... or ...adjustments to the conservation objective to... reflect the MSY or ensure rebuilding to that level" and "...actions that will recover the stock in as short a time as possible... and provide criteria for identifying stock recovery and the end of the overfishing concern." After reviewing the STT report, the Council will "...specify the actions that will comprise its immediate response for ensuring that the stock's conservation objective is met or a rebuilding plan is properly implemented and any inadvertent excessive fishing within Council jurisdiction is ended. The Council's rebuilding plan will establish the criteria that identify recovery of the stock and the end of the overfishing concern."

The OC provisions in Amendment 14 provide a process to determine the cause of spawning escapement (or other conservation objective) shortfalls before a declaration of a stock being overfished. This process is sensitive to the unique life history characteristics and habitat requirements of salmon, and the possibility of factors outside of Council control contributing to escapement shortfalls.

The language in Amendment 14 allowing a determination of the criteria to end an OC was intended to provide the flexibility to address specific circumstances associated with a particular stock and escapement shortfall. For example, stocks with subcomponents such as KRFC may have different considerations than a more homogeneous stock like North Lewis River fall Chinook, and age structure considerations of Chinook may be different than coho. The FMP clearly tasks the STT with the initial responsibility for assessing these factors and making recommendations to the Council, thus establishing a sound scientific basis for the Council's ultimate decisions on rebuilding. However, it should be noted that any prior determination on ending an OC may or may not be applicable to future OCs.

While the biological/technical aspects of OCs merit individual evaluation, the policy considerations for rebuilding stocks and ending OCs may warrant other approaches. Several instances of overfishing or triggering of an OC have occurred since Amendment 10 passed, including some retroactive application of the definition or criteria. However, the 2004-2006 KRFC OC is the first instance of the Council considering specific criteria for ending an OC.

A chronological summary of Overfishing/OC events leading up to the 2004-2006 KRFC OC is presented below with the recommendations of the various workgroups.

When Amendment 10 passed in 1991, Oregon coastal coho (OCN) had not met their escapement objective since 1986, so the Council formed a workgroup to review the stock status and make recommendations for assuring future productivity of the stock. The recommendations from their report included:

1. Develop an unbiased stock recruitment predictor;
2. Improve spawning escapement methods;
3. Reevaluate the spawner escapement goal;
4. Investigate alternatives to quota management;
5. Reduce coho non-retention fisheries;
6. Develop an ocean fishery mortality model that includes OCN;
7. Conduct sampling to determine seeding levels in OCN rivers;
8. Collect scales from ocean catches to estimate OCN contribution rates;
9. Develop a hatchery indicator stock(s) for OCN;
10. Develop a management strategy that is sensitive to changes in ocean conditions;
11. Evaluate use of supplementation techniques, and;
12. Restore habitat.

In 1990-1992, both KRFC and Sacramento River fall Chinook (SRFC) failed to meet their spawning escapement objectives, and the Council appointed separate workgroups to develop reports. The SRFC report recommendations included:

1. Refine predictor models for SRFC to ensure unbiased projection of the Central Valley Index (CVI);
2. Manage ocean fisheries for attainment of the SRFC escapement goal while recognizing low precision of management models;
3. Support for habitat improvement projects, and;
4. Support for hatchery marking and recovery programs to better estimate contribution rates.

The KRFC report recommendations included:

1. Review of the harvest rate policy in light of substock productivities;
2. Recalibration of the harvest rate model to reflect substock parameters and inriver/ocean harvest rate combinations;
3. Eliminate bias in ocean abundance projection models (e.g., using a zero intercept model);
4. Review hatchery/natural proportion projection methods;
5. Extend the spatial use of the KOHM;
6. When warranted, a) ensure achievement of the floor by use of quotas, b) set preseason management target above spawning escapement floor, and c) evaluate spawner deficit accounting;
7. Improve the allocation decision process;
8. Consideration of mark selective river fisheries;
9. Support for hatchery reform procedures, and;
10. Support for hatchery restoration activities.

For immediate implementation, the KRFC report recommended numbers 1, 2, 3, 5, and 6.

Between 1988 and 1995 a number of Puget Sound Chinook and coho stocks fell below their conservation objective and the Council appointed a workgroup to develop a stock assessment report. At that time, annual management objectives for Puget Sound and Washington Coastal stocks were developed by parties to the *U.S. v. Washington* and *Hoh v. Baldrige* court cases. These annual objectives were used to assess compliance with the FMP overfishing definition, as opposed to long-term MSY objectives as has been the case since passing of FMP Amendment 14 in 2000. The report recommendations were several pages in length and covered topics including habitat restoration, data needs, enhancement efforts, harvest management and forecast methods. Some of the pertinent recommendations were:

1. Expand and enhance use of the Chinook and coho Fishery Regulation Assessment Model (FRAM) for analyzing impacts from all fisheries on Puget Sound stocks;
2. Conduct postseason abundance and exploitation rate analyses to improve run prediction databases;
3. Review current escapement goals;
4. Develop a management plan for Puget Sound Chinook;
5. Develop FMP criteria for rebuilding Strait of Juan de Fuca (SJF) coho;
6. Review SJF coho preseason forecast methods for bias, and;
7. Adopt a range of escapement and exploitation rate target schedules for rebuilding SJF coho rather than relying on a single fixed escapement goal.

Amendment 14 to the Salmon FMP was adopted in 2000 to reflect the requirements of the 1996 Sustainable Fisheries Act, as well as conservation objectives for Puget Sound and Washington Coastal stocks that would be used to determine if an OC was triggered. Prior to Amendment 14, annual management objectives developed by the parties to *U.S. v. Washington* and *Hoh v. Baldrige* were used to determine if those stocks were overfished.

Queets coho were determined to have triggered an OC according to the new criteria adopted in Amendment 14 because they failed to achieve their conservation objective in 1997-1999, even though the stock had been managed under the annual management objectives used to determine overfishing in effect prior to Amendment 14 being adopted in 2000. The Council directed the STT to conduct a stock assessment to determine the probable cause of the escapement shortfall and recommend if a rebuilding plan and criteria to end the OC should be developed. The STT determined that the cause of the shortfalls were related to freshwater and marine environmental conditions and that harvest management factors did not play a role, and in addition the stock met the MSY escapement objective in 2000. The STT did make the following recommendations:

1. Criteria to end the OC and a rebuilding plan were not necessary;
2. A full status review would be necessary if 2001 escapement was below the objective;
3. The CA and OC provisions of the FMP combined with available forecast methods provided adequate protection against overfishing, and;
4. Review of the lower end of the spawning escapement range.

The Council concurred with the STT recommendations and no further action was taken with respect to Queets coho.

PFMC
05/22/08

EXCERPT FROM THE PACIFIC COAST SALMON PLAN

3.2.3 Overfishing Concern

“For a fishery that is overfished, any fishery management plan, amendment, or proposed regulations . . . for such fishery shall—(A) specify a time period for ending overfishing and rebuilding the fishery that shall—(i) be as short as possible, taking into account the status and biology of any overfished stocks of fish, the needs of the fishing communities, recommendations by international organizations in which the United States participates, and the interaction of the overfished stock within the marine ecosystem; and (ii) not exceed 10 years, except in cases where the biology of the stock of fish, other environmental conditions, or management measures under an international agreement in which the United States participates dictate otherwise. . . .”

Magnuson-Stevens Act, § 304(e)(4)

The Magnuson-Stevens Act requires overfishing be ended and stocks rebuilt in as short a period as possible and, depending on other factors, no longer than ten years. For healthy salmon stocks which may experience a sudden reduction in production and/or spawner escapement, the limitation on fishing impacts provided by the Council’s MSY or MSY proxy conservation objectives provide a stock rebuilding plan that should be effective within a single salmon generation (two years for pinks, three years for coho, and three to five years for chinook). However, additional actions may be necessary to prevent overfishing of stocks suffering from chronic depression due to fishery impacts outside Council authority, or from habitat degradation or long-term environmental fluctuations. Such stocks may meet the criteria invoking the Council’s overfishing concern.

3.2.3.1 Criteria

The Council’s criteria for an overfishing concern are met if, in three consecutive years, the postseason estimates indicate a natural stock has fallen short of its conservation objective (MSY, MSP, or spawner floor as noted for some harvest rate objectives) in Table 3-1. It is possible that this situation could represent normal variation, as has been seen in the past for several previously referenced salmon stocks which were reviewed under the Council’s former overfishing definition. However, the occurrence of three consecutive years of reduced stock size or spawner escapements, depending on the magnitude of the short-fall, could signal the beginning of a critical downward trend (e.g., Oregon coastal coho) which may result in fishing that jeopardizes the capacity of the stock to produce MSY over the long term if appropriate actions are not taken to ensure the automatic rebuilding feature of the conservation objectives is achieved.

3.2.3.2 Assessment

When an overfishing concern is triggered, the Council will direct its STT to work with state and tribal fishery managers to complete an assessment of the stock within one year (generally, between April and the March Council meeting of the following year). The assessment will appraise the actual level and source of fishing impacts on the stock, consider if excessive fishing has been inadvertently allowed by estimation errors or other factors, identify any other pertinent factors leading to the overfishing concern, and assess the overall significance of the present stock depression with regard to achieving MSY on a continuing basis.

Depending on its findings, the STT will recommend any needed adjustments to annual management measures to assure the conservation objective is met, or recommend adjustments to the conservation objective which may more closely reflect the MSY or ensure rebuilding to that level. Within the constraints presented by the biology of the stock, variations in environmental conditions, and the needs of the fishing communities, the STT recommendations should identify actions that will recover the stock in as short a time as possible, preferably within ten years or less, and provide criteria for identifying stock recovery and the end of the overfishing concern. The STT recommendations should cover harvest management, potential enhancement activities, hatchery practices, and any needed research. The STT may identify the need for special programs or analyses by experts outside the Council advisors to assure the long-term recovery of the salmon population in question. Due to a lack of data for some stocks, environmental variation, economic and social impacts, and habitat losses or problems beyond the control or management authority of the Council, it is likely that recovery of depressed stocks in some cases could take much longer than ten years.

In addition to the STT assessment, the Council will direct its Habitat Committee (HC) to work with federal, state, local, and tribal habitat experts to review the status of the essential fish habitat affecting this stock and, as appropriate, provide recommendations to the Council for restoration and enhancement measures within a suitable time frame.

3.2.3.3 Council Action

Following its review of the STT report, the Council will specify the actions that will comprise its immediate response for ensuring that the stock's conservation objective is met or a rebuilding plan is properly implemented and any inadvertent excessive fishing within Council jurisdiction is ended. The Council's rebuilding plan will establish the criteria that identify recovery of the stock and the end of the overfishing concern. In some cases, it may become necessary to modify the existing conservation objective/rebuilding plan to respond to habitat or other long-term changes. Even if fishing is not the primary factor in the depression of the stock or stock complex, the Council must act to limit the exploitation rate of fisheries within its jurisdiction so as not to limit recovery of the stock or fisheries, or as is necessary to comply with ESA consultation standards. In cases where no action within Council authority can be identified which has a reasonable expectation of providing benefits to the stock unit in question, the Council will identify the actions required by other entities to recover the depressed stock. Upon review of the report from the HC, the Council will take actions to promote any needed restitution of the identified habitat problems.

For those fishery management actions within Council authority and expertise, the Council may change analytical or procedural methodologies to improve the accuracy of estimates for abundance, harvest impacts, and MSY escapement levels, and/or reduce ocean harvest impacts when shown to be effective in stock recovery. For those causes beyond Council control or expertise, the Council may make recommendations to those entities which have the authority and expertise to change preseason prediction methodology, improve habitat, modify enhancement activities, and re-evaluate management and conservation objectives for potential modification through the appropriate Council process.

3.2.3.4 End of Overfishing Concern

The criteria for determining the end of an overfishing concern will be included as a part of any rebuilding plan adopted by the Council. Additionally, an overfishing concern will be ended if the STT stock analysis provides a clear finding that the Council's ability to affect the overall trend in the stock abundance through harvest restrictions is virtually nil under the "exceptions" criteria below for natural stocks.

ALTERNATIVE REBUILDING PLANS FOR KLAMATH RIVER FALL CHINOOK

The original recommendations in the Salmon Technical Team (STT) stock assessment for the criteria to end the Overfishing Concern (OC) and rebuild Klamath River fall Chinook (KRFC) are shown with strikeout/underline format to illustrate the changes adopted by the Council for public review:

1. Consider the OC of KRFC ended when a natural spawning escapement of at least 35,000 adults is achieved in three out of four consecutive years ~~with or when~~ a natural spawning escapement of at least 40,700 adult KRFC (SMSY) or more in at least one of those three is achieved in two consecutive years.
2. Target a natural spawning escapement of 40,700 adult KRFC until the Overfishing Concern is ended (the rebuilding period). ~~3. When implementing *de minimis* fisheries during the rebuilding period, provide for an age-4 ocean impact rate of no more than 10 percent when preseason stock abundance forecasts result in pre-fishing spawning escapement projections of less than about 54,000, plus an additional requirement of introducing a sliding scale, which would reduce the allowable rate linearly from no more than 10 percent at a projected natural spawning level of 30,000 to 0 percent at a projected natural spawning level of 22,000.~~
3. No further modifications in parameterizing the Klamath Ocean Harvest Model (KOHM) components are recommended at this time.
4. During periods of stock rebuilding, fall fishing opportunity in areas impacting KRFC abundance should be restricted.
5. The practice of reopening the upper Klamath and Trinity rivers to recreational fishing once hatchery egg take goals are met should be suspended during rebuilding periods or when an OC is imminent.
6. All river fishery strata should be sampled at a minimum sampling rate of 20 percent for catch and biological information, including coded-wire tags (CWTs) used to estimate impact on natural area spawners and returns of hatchery fish.
7. No change to the current Fishery Management Plan conservation objective for KRFC.
8. Encourage implementation of a 25 percent constant fractional marking program at Iron Gate Hatchery.
9. Encourage further research on disease issues in the Klamath Basin as they relate to population dynamics and fishery management.
10. Encourage expanded studies of tributary and mainstem production and survival rates of KRFC.

11. Encourage studies of early-life marine survival rates for KRFC.

12. Continued Council involvement in the Federal Energy Regulatory Commission (FERC) relicensing process, and consideration of Council recommendations by FERC.

Additional information on the recommendations contained in the STT stock assessment and the analyses that support them can be found in the stock assessment, which was distributed as Agenda Item D.3.b, KRFC Stock Assessment in the Council's March 2008 briefing book (http://www.pcouncil.org/bb/2008/0308/D3b_KRFC.pdf), or upon request from the Council office (pfmc.comments@noaa.gov).

PFMC
5/22/08

Z:\!PFMC\MEETING\2008\June\Salmon\E1a_Att3_Alts.doc

TRIBAL AND ADVISORY BODY STATEMENTS
FROM THE APRIL 2008 COUNCIL MEETING
CONCERNING THE
KLAMATH RIVER FALL CHINOOK OVERFISHING CONCERN

HOOPA VALLEY TRIBAL COMMENTS ON
CRITERIA FOR ENDING OVERFISHING CONCERN FOR
KLAMATH RIVER FALL CHINOOK

The Hoopa Valley Tribe is submitting these comments relative to PFMC's preliminary action to define the criterion for ending an overfishing concern for Klamath River Fall Chinook (KRFC). KRFC failed to meet minimum conservation escapement levels (35,000 adult natural area spawners) in 2004, 2005, and 2006. The Salmon Technical Team (STT) recently completed its report titled "Factors Affecting the Natural Area Escapement Shortfall of Klamath River Fall Chinook Salmon in 2004-2006" which included technical representation by the Hoopa Valley Tribe.

1. Hoopa Valley Tribal representatives have advocated for the criterion for ending an overfishing concern as recommended by STT's Recommendation 1, in which the 35,000 natural escapement floor would need to be exceeded for three of four consecutive years. Such a criterion would provide assurance that periods of prolonged low stock recruitment had been transited.
2. PFMC's alternative and preliminary criterion offered on 11 March 2008 in Sacramento could rely on only two consecutive years with escapements in excess of 40,700 natural adults (MSY escapement level identified by STT). With credit for the 2007 adult natural escapement, the overfishing concern would potentially be ended in 2008 on the strength of a single brood (Brood Year 2004). Meanwhile, evidence shows that the 2003 brood was depressed and the 2005 brood returned record low jacks in 2007. Hence, reliance upon a single brood to end the overfishing concern, would ignore a significant signal indicating the stock is suffering from low recruitment.
3. The Hoopa Valley Tribe has been supportive of the 35,000 escapement floor since its inception in the late 1980s. This standard has been recently confirmed by the STT as a reasonable threshold for conservation to ensure against prolonged periods of low productivity of the Klamath fall Chinook, while a more appropriate management target in every year would be the MSY escapement level of 40,700 adults.
4. The Hoopa Valley Tribe had recommended increasing the escapement floor in the early-mid 1990's when KRFC underwent a stock-depression. The issue was elevated to an FMP amendment issue which was ultimately rejected by PFMC after considerable engagement with the Tribe. However, in the present case, the PFMC is contemplating elevation of the escapement level by unilateral action, to the exclusion of substantive engagement with the Hoopa Valley Tribe. Together with the Yurok Tribe, the Hoopa Valley Tribe shares a property right to the anadromous fish of Klamath Basin (50% of the harvestable surplus of KRFC).
5. Concern over the PFMC's preliminary criterion is particularly heightened as 2008 ocean management is profoundly constrained by the depressed abundance of Central Valley Chinook. This presents the PFMC with the appealing opportunity to end the concern over Klamath fall Chinook while managing for Central Valley Chinook constraints. However, in the event that the overfishing concern for Klamath were lifted by this criterion, PFMC would likely pursue harvest flexibility under Amendment 15 for 2009 management assuming Central Valley Chinook are no longer constraining.

6. The Hoopa Valley Tribe was opposed to Amendment 15 as it threatened to undermine the 35,000 floor in years of low abundance leading to heightened concerns for natural stock productivity and in particular the probability for falling below minimum viable threshold escapement levels for sub-basin stocks.
7. In summary, the Hoopa Valley Tribe opposes the PFMC's preliminary criterion for ending the overfishing concern for KRFC. The criterion was generated by the PFMC in the absence of substantive consultation with Klamath-Trinity Basin Co-managers. Moreover, the criterion falls short of a meaningful protective measure to ensure recovery of KRFC while hastening implementation of Amendment 15 to KRFC's further detriment.

HOOPA VALLEY TRIBAL COMMENTS FOR
FINAL ACTION ON 2008 SALMON MANAGEMENT MEASURES

My Name is Michael Orcutt and I am the director for the Hoopa Valley Tribe's Fisheries Department.

- (1) The Hoopa Valley Tribe is greatly concerned that the Council's proposed criterion for ending the Klamath River Fall Chinook Overfishing Concern is an inadequate conservation standard. We have provided previous testimony detailing our concerns.
- (2) In the event that the Council fails to adopt Recommendation 1, as written in Salmon Technical Team's (STT's) March 2008 Klamath River Fall Chinook Overfishing Review (35,000 natural escapement floor would need to be exceeded for **three** consecutive years in four), the Tribe will manage its fishery to clear the 35,000 floor.
- (3) In the event that Council adopts Recommendation 1 today without exception as specified in the STT Report. The Hoopa Valley Tribe will manage its fishery consistent with meeting the 40,700 adult fall Chinook maximum sustainable yield escapement level.
- (4) Postponing a decision on this matter may not provide adequate time for Klamath tribal fisheries to adjust their management process.
- (5) Questions were raised earlier in week about conservation rationale by Tribes advocating a lowered escapement level than that contemplated in the present options. Tribes need to maximize harvest opportunities when abundance allows. Lacking adoption of Recommendation 1 by the Council would shift the conservation burden on Tribes in 2008, with no commitment by other fisheries to share this burden in 2009.

PFMC
04/10/08



YUROK TRIBE

190 Klamath Boulevard • Post Office Box 1027 • Klamath, CA 95548

April 2, 2008

Mr. Donald K. Hansen, Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 200
Portland, Oregon 97220-1384

Re: Criteria for ending the "Overfishing Concern" and 2008 management objectives

Dear Mr. Hansen:

In light of recommendations contained within the Salmon Technical Team's (STT) Report titled *Factors Affecting the Natural Area Escapement Shortfall of Klamath River Fall Chinook Salmon in 2004-2006*, and the Pacific Fishery Management Council's potential modification of these recommendations, the Yurok Tribe is in a bit of a quandary regarding the natural spawning escapement target, harvestable surplus, and resultant allocation that we will target during the coming year. We support the recommendations of the Salmon Technical Team's (STT) Report titled *Factors Affecting the Natural Area Escapement Shortfall of Klamath River Fall Chinook Salmon in 2004-2006*; in particular the criterion that recommends the overfishing concern end when Klamath fall Chinook have met the minimum spawning escapement objective of 35,000 natural spawners during three of four years. We are opposed to the modified criterion that was proposed at the March PFMC meeting, which would consider the overfishing concern as ended when Klamath fall Chinook abundance has exceeded 40,700 natural spawners during two consecutive years. Therefore, I would like to clarify that if the criterion recommended in the Report (i.e. the overfishing concern is ended when a natural spawning escapement of at least 35,000 adults is achieved in three out of four consecutive years) is not adopted, then we will manage our fishery to target the 35,000 natural spawning escapement objective during 2008.

The Yurok Tribe has always managed our fishery resource in a conservative manner, especially during times of low abundance. We believe that the criterion requiring fall Chinook to achieve the minimum spawning escapement objective during three of four years is in-line with this management philosophy. Targeting MSY (40,700) during this overfishing concern period also seems to be a conservative management approach. However, modifying the criterion to consider the overfishing concern as ended after MSY (40,700 natural spawners) has been met in two consecutive years is not protective enough because it could be achieved by the presence of only one relatively strong cohort; the 2004 brood. We are also concerned that the modified criterion

could result in our fishery being the only fishery constrained as a result of the overfishing concern.

During 2007 the Klamath fall Chinook run was dominated by age-3 fish (2004 brood year), with relatively low abundance of age-4 fish (brood year 2003) and extremely low abundance of age-2 fish (brood year 2005 fish). Hence, the relatively strong 2004 brood is surrounded by the weak broods of 2003 and 2005. Given that the 2007 run exceeded the 40,700 target, if this abundance is exceeded again during 2008, then we will have ended the overfishing concern based primarily upon the strength of a single brood (2004). This does not seem reflective of the Magnuson-Stevens Act intent that fishery management plans contain conservation and management measures to prevent overfishing, end overfishing, and rebuild the fishery.

The proposed modified criterion of meeting MSY two years in a row could result in the Yurok Tribal fishery being solely impacted by targeting 40,700 during the overfishing concern period. Ocean sport and commercial fisheries will not be affected by Klamath impacts during 2008 because of constraints they are unfortunately faced with from the low abundance of Sacramento fall Chinook. Klamath fall Chinook impacts that typically would be harvested in the ocean will be rolled into the inriver recreational fishery, resulting in an allocation near or above the upper limit of that fishery's harvest capacity. However if the Yurok Tribe was to target 40,700 fish during 2008, instead of our typical target of the 35,000 minimum conservation objective, our allocation would be reduced from approximately 25,000 to 21,000 fish; both well within the harvest capacity of the Yurok Tribe. Therefore, given that the 40,700 target was already met during 2007 without any affect to fisheries, a natural escapement of more than 40,700 during 2008 would end the overfishing concern with no Klamath impact constraints being placed upon fisheries other than the Yurok Tribe; this is not acceptable nor equitable from our perspective.

In summary, I request that the PFMC adopt the criterion for ending the overfishing concern period as recommended by the STT's Report (i.e. the overfishing concern is ended when a natural spawning escapement of at least 35,000 adults is achieved in three out of four consecutive years). If the PFMC adopts the modified criterion as suggested at the March PFMC meeting, or if other Fisheries are managed to target 35,000 natural spawners, then the Yurok Tribe will manage its 2008 fall Chinook fishery to target the 35,000 natural spawning escapement objective.

Sincerely,



 Maria Tripp, Chair

SALMON ADVISORY SUBPANEL REPORT ON THE
KLAMATH RIVER FALL CHINOOK REBUILDING STRATEGY

In regard to Recommendation 4, which states “During periods of stock rebuilding fall fishing opportunity in areas impacting Klamath River fall Chinook (KRFC) abundance should be restricted,” the Salmon Advisory Subpanel recommends it be modified to recommend that fall fishing impacts be modeled preseason with consideration for a revision to the birth date for KRFC. If it is not possible to model harvest impacts in all fall fisheries, then we recommend that the word “restricted” be changed to “use a precautionary approach.”

We also suggest adding a recommendation to develop a workgroup to investigate the mitigation needs and develop a propagation and release strategy that strives to optimize natural production as well as hatchery mitigation, rather than continually targeting minimum spawning escapement objectives. More progressive hatchery practices would address concerns regarding genetic integrity and expedite recovery of KRFC at a level in substantial excess of the floor. Failure to consider the downstream degraded conditions generated by the dams as a component of the mitigation responsibility results in all associated mortality becoming the burden of parties not responsible for the shortfall caused by these dams. This results in the fisheries being held accountable for the decline of the stock of concern when restricting harvest results in no tangible benefit toward rebuilding the stock.

PFMC
4/10/08

HOOPA VALLEY TRIBAL COMMENTS ON
KLAMATH RIVER FALL CHINOOK OVERFISHING CONCERN

The Hoopa Valley Tribe is submitting these comments on the Pacific Fishery Management Council's (PFMC) pending action relative to the Klamath River fall Chinook (KRFC) Overfishing Concern. Tribal technical representation contributed to the Salmon Technical Team's (STT) recently completed report titled "Factors Affecting the Natural Area Escapement Shortfall of Klamath River Fall Chinook Salmon in 2004-2006." Together with the Yurok Tribe, the Hoopa Valley Tribe shares a property right to the anadromous fish of Klamath Basin (50% of the harvestable surplus of KRFC).

- (1) In the event that the PFMC fails to adopt Recommendation 1, as written in the STT's March 2008 Klamath River Fall Chinook Overfishing Review (35,000 natural escapement floor would need to be exceeded for three of four consecutive years), the Tribe will manage its fishery to clear the 35,000 floor for Klamath River natural area adult spawners.
- (2) PFMC's alternative and preliminary criterion offered on March 11, 2008 in Sacramento could rely on only **two** consecutive years with escapements in excess of 40,700 natural adults (maximum sustained yield escapement level identified by STT). With credit for the 2007 adult natural escapement, the overfishing concern would potentially be ended in 2008 on the strength of a single brood (Brood Year 2004).
- (3) Evidence shows that the 2003 brood was depressed and the 2005 brood returned record low jacks in 2007. Hence, reliance upon a single brood to end the overfishing concern, would ignore a significant signal indicating the stock is suffering from low recruitment.
- (4) Concern over PFMC's preliminary criterion is particularly heightened as 2008 ocean management is profoundly constrained by the depressed abundance of Central Valley Chinook. This presents PFMC with the appealing opportunity to end the concern over Klamath fall Chinook while managing for Central Valley Chinook constraints. However, in the event that the overfishing concern for Klamath were lifted by this criterion, PFMC would likely pursue harvest flexibility under Amendment 15 for 2009 management assuming Central Valley Chinook are no longer constraining.
- (5) The Hoopa Valley Tribe was opposed to Amendment 15 as it threatened to undermine the 35,000 floor in years of low abundance leading to heightened concerns for natural stock productivity and in particular the probability for falling below minimum viable threshold escapement levels for sub-basin stocks.
- (6) The Hoopa Valley Tribe views the STT's recommendations as consistent with a comprehensive rebuilding plan for Klamath fall Chinook. However, the report could have been strengthened by further exploring the role of hatchery practices upon recruitment. A recommendation to scale back fingerling production in exchange for increased yearling production at Irongate and Trinity River hatcheries was not included in the final report. Reductions in the present 7-9 million fingerlings currently being released between both facilities would reduce competition with naturally produced out-migrant Chinook. Regrettably, insufficient time was provided to fully explore the technical merits of this recommendation. The Hoopa Valley Tribe therefore would urge PFMC to direct the STT to focus consideration of such a recommendation in the future.

(7) In summary, the Hoopa Valley Tribe opposes PFMC's preliminary criterion for ending the overfishing concern for KRFC. The criterion was generated by the PFMC in the absence of substantive consultation with Klamath-Trinity Basin Co-managers. Moreover, the criterion falls short of a meaningful protective measure to ensure recovery of KRFC¹ while hastening implementation of Amendment 15 to KRFC's further detriment.

¹ The Pacific Coast Salmon Plan at § 3.2.3 Overfishing Concern states: "*a stock rebuilding plan should be effective within a single salmon generation (...three to five years for chinook).*"

SALMON TECHNICAL TEAM ANALYSIS OF RISKS AND BENEFITS OF ALTERNATIVE REBUILDING CRITERIA FOR KLAMATH RIVER FALL CHINOOK

INTRODUCTION

Klamath River fall Chinook (KRFC) failed to meet the minimum escapement goal of 35,000 natural-area adult spawners in 2004, 2005, and 2006, triggering an Overfishing Concern. In 2007 a workgroup was convened by the Council, consisting of members of the Salmon Technical Team (STT) and additional members from other management agencies, to evaluate factors contributing to these escapement shortfalls and develop recommendations for recovering the stock and ending the Overfishing Concern. The recommendations of this workgroup were presented to the Council in a report by the STT at the March 2008 Council meeting. At this meeting the Council tentatively adopted management measures and criteria for ending the Overfishing Concern for KRFC. The management measures included managing for a minimum of 40,700 natural-area adult spawners until the Overfishing Concern is ended.

The management measures and criteria adopted by the Council included most of the recommendations of the workgroup with two exceptions. 1) The workgroup recommended implementation of a sliding scale for the maximum allowable *de minimis* fishing mortality rate, until the Overfishing Concern is ended. The sliding scale would have placed a cap on the age-4 ocean impact rate that increased linearly from 0 percent at a projected adult natural spawner escapement of 21,000, to 10 percent at the minimum targeted escapement of 40,700 adult natural spawners until the Overfishing Concern was ended. The Council rejected this recommendation. 2) The workgroup recommended ending the Overfishing Concern when a minimum of 35,000 natural-area adult spawners was achieved in 3 of 4 consecutive years, with a minimum of 40,700 natural-area adult spawners in at least one of the years. In lieu of this recommendation, the Council adopted a modified criterion for ending the Overfishing Concern: attainment of a minimum of 35,000 adult natural spawners in 3 of 4 consecutive years, or the attainment of 40,700 natural-area adult spawners for 2 consecutive years.

Both of these departures from the workgroup recommendations decrease the expected spawning escapement of KRFC. By not implementing a *de minimis* sliding scale for the age-4 ocean impact rate, greater harvest impacts could occur during the Overfishing Concern. By allowing the Overfishing Concern to end with the attainment of two consecutive years of at least 40,700 natural-area adult spawners, the Overfishing Concern could end sooner than if the workgroup recommendation was adopted. However, the degree to which these departures increase risks to KRFC is extremely difficult to assess. At the March Council meeting, members of the Scientific and Statistical Committee (SSC) suggested that the Stochastic Spawner-Recruit Model (SSRM) be used to evaluate the risks specifically associated with the workgroup recommended and the Council modified criteria for ending the Overfishing Concern.

METHODS

The SSRM, as currently configured, does not have the capability of specifically modeling either alternative of the criteria for ending the Overfishing Concern. However, it can be used to approximate the potential range of difference in risks between the alternative criteria. The SSRM has the capability of modeling different escapement floors used as fishery targets, and allows the specification of current abundance and recent observed escapements as initial conditions. It simulates the population and fisheries for 40 years and reports performance measures for years 1-5, 6-40, and over the entire 40 year period.

Natural-area spawning escapement of KRFC in 2007 was over 59,000 adults, and the projected escapement to the River mouth in 2008 is 76,900 potential natural-area adult spawners. Under option II (the criteria tentatively adopted by the Council) there is a good chance that the Overfishing Concern could be ended in 2008 with the attainment of two consecutive years of at least 40,700 natural-adult spawners. This would allow management for the escapement floor of 35,000 adult natural-area spawners in 2009, year 2 of the simulation. However, the age-3 forecast abundance in 2008 is the lowest on record, so absent a very strong return of 2-year old fish in 2008, there is a very good chance that the 35,000 floor will not be met in 2009. Under option I (the criteria recommended by the KRFC workgroup), failure to meet the floor in 2009 and again in 2010 would result in the Overfishing Concern persisting for a minimum of 5 years.

The primary consequence of ending the Overfishing Concern is that the minimum natural-area adult spawning escapement that could be targeted, without reducing fisheries to *de minimis* impact levels, would decrease from 40,700 to 35,000. Therefore, simulating the population with current abundance and forecasts, and evaluating performance over the first 5 years with alternative escapement floors, may approximate the alternative criteria. Assuming a minimum escapement goal of 35,000 probably overstates the risks associated with option II because there is some chance that the criteria for ending the Overfishing Concern will not be met this year. It further includes management for the escapement floor of 35,000 in year 1 of the simulation, while the goal should be 40,700 in year 1 under both options. Assuming a minimum escapement goal of 40,700 probably understates the risks associated with option I because there is a reasonable chance that the Overfishing Concern could end prior to the 5-year evaluation period (although there is also some chance that it could extend longer). Hence these approximations likely provide an upper bound on the expected differences in risks associated with the two options, as assessed by the metrics of the SSRM.

In order to evaluate the alternative criteria, a 40 year period was simulated for 1,000 trials using the SSRM. For each trial, initial conditions included the observed adult natural-area spawning escapements from 2006 and 2007, the 2008 forecasts for ages 3-5 ocean abundance, and the percentage of each brood destined to return to hatcheries. Option I trials employed a 40,700 minimum escapement goal and option II trials used a minimum escapement goal of 35,000. Both runs used the same initial seed for the random number generator and thus included identical sequences of pseudo-random numbers.

RESULTS

Selected performance measures from the SSRM simulation are presented in Table 1 (detailed output are attached). As expected, targeting a higher natural-area spawning escapement results in lower frequencies of falling below escapement benchmarks or failing to meet consultation standards. Differences are small when viewed in absolute terms because of the large random variability in forecasting and management implementation. However the same differences are not so small when considered in a relative sense. For example, the frequency of failing to achieve 35,000 natural-area spawners increases from 0.330 to 0.363 between option I and option II. That is an absolute increase of 0.033, but a relative increase of 10 percent. The frequency with which escapement and age-4 ocean harvest rate fails to meet various benchmarks increases when the minimum adult natural-area escapement target decreases from 40,700 to 35,000 by a relative difference ranging from 10 percent to 39 percent depending on the benchmark. At the same time, the expected harvest increases by 1 percent, and if KRFC were assumed to be the primary limiting stock in ocean fisheries south of Cape Falcon, differences in economic benefits between the options would also be about 1 percent.

Table 1. Short term (years 1-5) results for some performance measures from SSRM resulting from alternate minimum escapement targets. Both alternatives include the California Coastal Chinook Endangered Species Act consultation standard capping age-4 ocean harvest rate at 16%, and allow 10% *de minimis* age-4 ocean impact rate when escapement is projected to be below the target.

Performance measure	Minimum natural escapement target		Absolute difference	Relative difference
	40,700 (Option I)	35,000 (Option II)		
Frequency escapement <35,000	0.330	0.363	0.033	10%
Frequency escapement <12,000	0.018	0.025	0.007	39%
Frequency tributary escapement <720	0.128	0.147	0.019	15%
Frequency age-4 ocean harvest rate >16%	0.320	0.342	0.022	7%
Average ocean harvest (hatchery + wild)	27,452	27,688	236	1%
Average tribal harvest (hatchery + wild)	42,631	43,097	466	1%

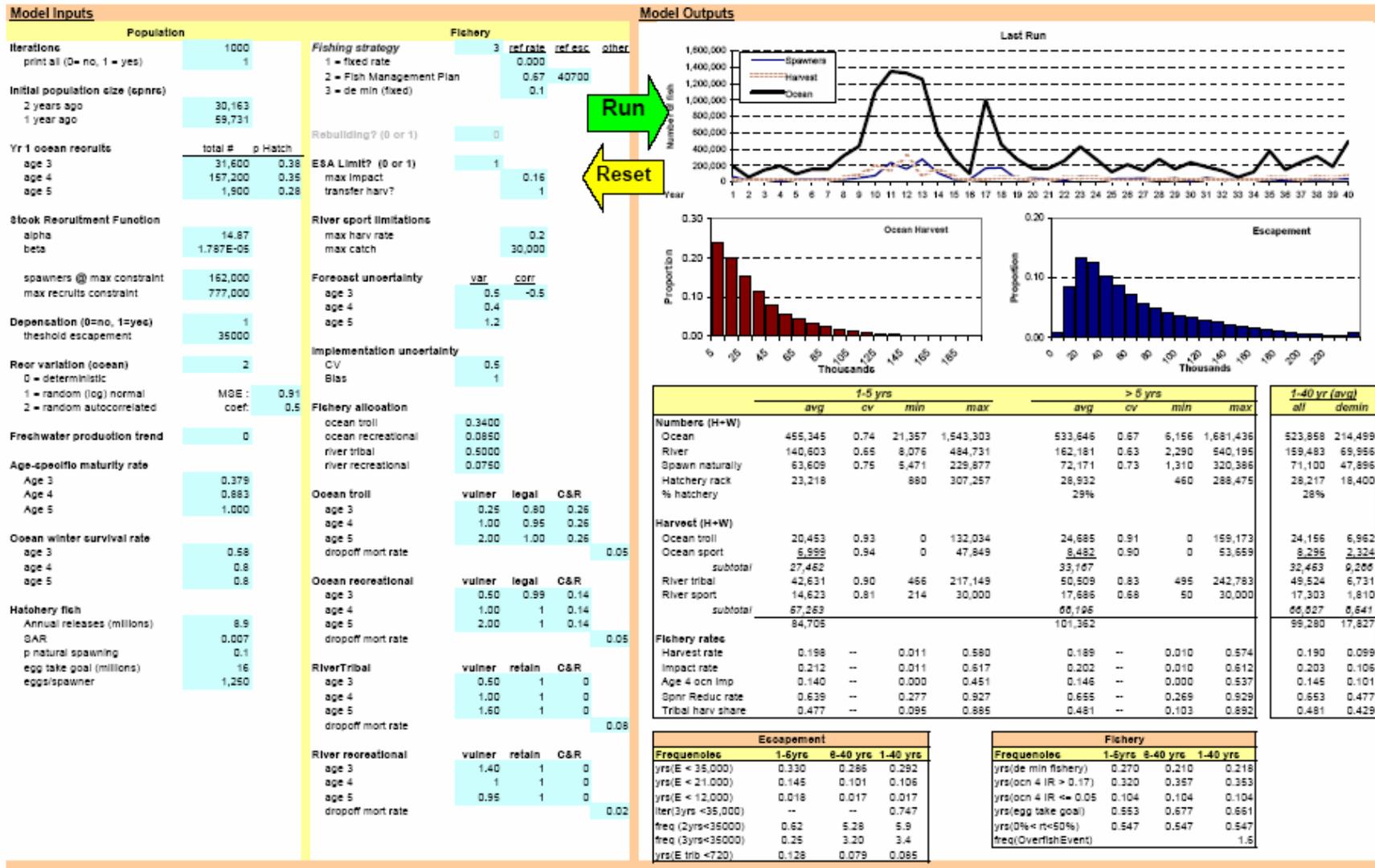
CONCLUSIONS

Simulations performed with the SSRM evaluated the absolute and relative differences in key management metrics with two alternative minimum natural-area escapement targets. These simulations presuppose that the Overfishing Concern will be active in 2009 under option I, and that it will have ended prior to 2009 under option II. Due to these assumptions, the differences in risks (e.g., failure to meet the 35,000 escapement threshold) and benefits (e.g., increased harvest) described should represent the upper bound estimates.

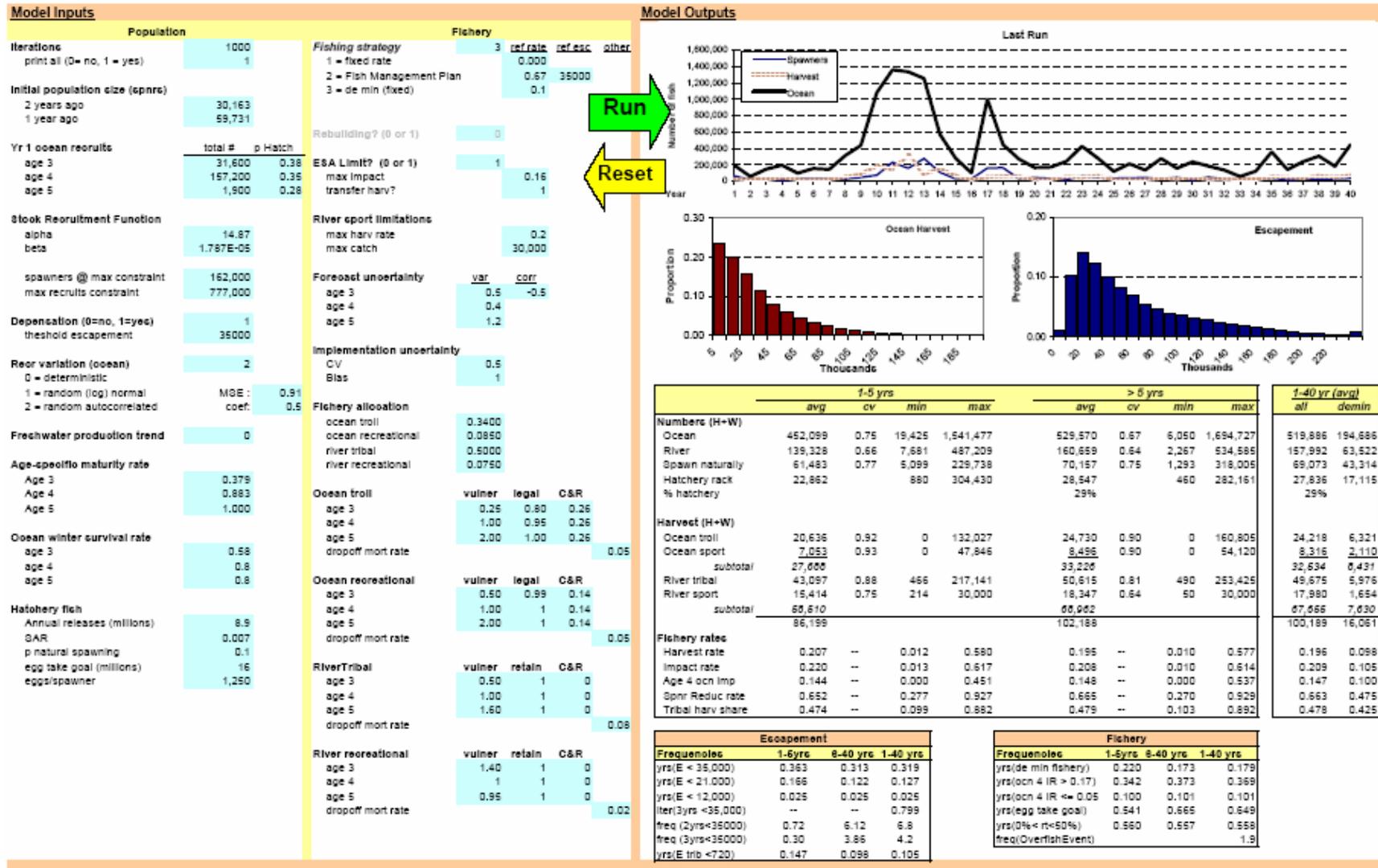
As demonstrated in Table 1, the SSRM predicts small absolute differences in risks and somewhat larger relative differences in risks between option I and option II. At the same time, the relative difference in benefits, as measured by increased ocean and tribal harvest, are nearly negligible.

The SSRM identifies and quantifies the core metrics associated with the targeting of different minimum escapement levels. A full management strategy evaluation, with the minimum natural escapement target changing dynamically with simulated escapement values, is beyond the capabilities of the SSRM. However, since the level of risks and benefits between the two options are likely to be encompassed by the results presented here, it is unlikely that a full management strategy evaluation would provide substantially more information on which to base a decision.

Option I SSRM output.



Option II SSRM output.



SALMON ADVISORY SUBPANEL REPORT ON
KLAMATH RIVER FALL CHINOOK OVERFISHING CONCERN

The Salmon Advisory Subpanel (SAS) reiterates its statement from the April Council meeting included in Attachment 4.

A majority of the SAS supported the Council proposed alternative for criteria to end the current Overfishing Concern, while a minority supported the Workgroup recommendation. The SAS would be more willing to support harvest restrictions to increase escapement if some of the productivity and mitigation issues were addressed.

The SAS supports recommendations 3 and 5-12 as presented in Attachment 3. Recommendation 5 is important not only for reducing direct impacts on adult spawners, but also incidental impacts from redd disturbance by wading fishermen.

The SAS also requests that coded-wire tag (CWT) information used by California Department of Fish and Game (CDFG) for Klamath River fall Chinook (KRFC) run reconstruction for the return years 2005-2007 be made available to the SAS immediately, and for future years as it becomes available prior to the March Council meeting.

PFMC
6/8/08

SCIENTIFIC AND STATISTICAL COMMITTEE REPORT ON KLAMATH RIVER FALL CHINOOK OVERFISHING CONCERN

The Scientific and Statistical Committee (SSC) focused its review for this agenda item on Agenda Item E.1.a Attachment 3 (Alternative Rebuilding Plans for Klamath River Fall Chinook), the Salmon Technical Team (STT) Report (Agenda Item E.1.c), and Agenda Item E.1.c Supplemental STT Report 2. Mr. Chuck Tracy was present to report on the STT conference call that resulted in Supplemental STT Report 2.

There are two proposals for the criteria to end the overfishing concern (OC) and rebuild Klamath River fall Chinook (KRFC):

The original STT proposal - Consider the OC of KRFC ended when a natural spawning escapement of at least 35,000 adults is achieved in three out of four consecutive years, with a natural spawning escapement of 40,700 adult KRFC or more in at least one of those three years.

The proposal forwarded for public review by the Council - Consider the OC of KRFC ended when a natural spawning escapement of at least 35,000 adults is achieved in three out of four consecutive years, or when a natural spawning escapement of at least 40,700 adult KRFC is achieved in two consecutive years.

At the March Council meeting, the SSC recommended a more quantitative assessment of the recommendation for ending the KRFC OC proposed in “Assessment of factors affecting natural area shortfall of Klamath River fall Chinook salmon in 2004-2006” (Agenda Item D.3.b March 2008 Council meeting). The Stochastic Spawner-Recruit Model (SSRM) was suggested as a possible tool for evaluating the recommendation. Subsequently, the STT used the SSRM to evaluate the difference between their recommendation and the Council’s modified proposal, and reported the results in the STT Report (Item E.1.c). In its Supplemental Report 2, the STT concluded “The results of this analysis indicate that differences in outcomes between these two management regimes are small in terms of expected benefits to the fishery or risks to the population.” However, the STT expressed concern about “the plausibility of some of the SSRM results.” One particular concern, as reported by Mr. Tracy, was that tribal harvest share did not show the expected increase of several thousand fish under the higher escapement option.

The SSC also has concerns about the usefulness of the SSRM as a tool to quantitatively evaluate and compare the two proposals. Specifically, some of these concerns are:

- The model does not appear to capture the annual variability in marine survival that the KRFC stock has experienced. This variability is likely to affect the resiliency of the stock.
- The metrics produced by the model that were compared may not be the metrics that are best suited for comparing the projected long-term performances of the proposals.
- Experience with stochastic life-cycle models such as the SSRM has shown that they are relatively insensitive to changes in exploitation rates or escapement goals.

- The model structure and parameterization resulted in high resiliency of the stock to recover from depressed spawner levels. Even with no spawner floor the model predicts that escapements would exceed 35,000 over half the time in the next 5 years.

Given these concerns about interpreting the results of the SSRM output and its suitability for comparing these two proposals, the SSC recommends that the two proposals also be evaluated and compared based on underlying biological principles. STT describes the basic difference between the two proposals: “the STT criteria requires that a minimum of two strong recruitments be demonstrated following the Overfishing Concern, whereas the Council criteria requires only two strong spawning events be demonstrated.” (Agenda Item E.1.c Supplemental STT Report 2). The SSC agrees in principle that multiple successful spawning events are more indicative of recovery than a single event that provides two adequate escapements. In addition, spawning escapements of 35,000 or 40,700 should not be described as “strong” given that 35,000 is the escapement floor.

In order to evaluate the short-term population dynamics of stocks at low abundance, models need to be developed that allow for a more realistic evaluation of alternative management strategies that could be applied not only to KRFC, but to other salmon stocks as well.

PFMC
6/8/08

SALMON TECHNICAL TEAM REPORT ON
KLAMATH RIVER FALL CHINOOK OVERFISHING CONCERN

The salmon fishery management plan (FMP) anticipates two possible causes of an Overfishing Concern being triggered by the failure, in three consecutive years, of a stock to meet its conservation objective: normal variation in stock abundance, or the beginning of a critical downward trend. The FMP anticipates the need for modifications to status quo harvest management (additional rebuilding measures) only in the latter case.

The criteria recommended by the Salmon Technical Team (STT) for ending the Overfishing Concern include attaining a minimum of 35,000 adult natural area spawners in three out of four consecutive years, with at least 40,700 spawners in at least one of those years. The rationale for the three out of four consecutive years portion of this recommendation was that even if a stock is entering a critical downward trend, the recruitment of a single strong year class could provide sufficient spawners to meet the 35,000 adult natural area spawner floor in two consecutive years. Such an event may not signify recovery of the stock, but could simply reflect random variability. Requiring that the escapement floor be met in three out of four consecutive years requires recruitment of at least two strong year classes, either from the low escapements that triggered the Overfishing Concern, or from the initial escapement that exceeds the floor.

The criteria proposed by the Council in March include meeting the 35,000 adult natural area spawner floor in three of four consecutive years or attaining a minimum of 40,700 adult natural area spawners in two consecutive years. The rationale presented by the Council for the latter criterion was that, given the age structure of Chinook salmon populations, two successive years of fully seeding the habitat should be sufficient to insure that recruitment of subsequent generations will be adequate. The primary difference between the STT-recommended and Council-proposed criteria is that the STT criteria requires that a minimum of two strong recruitments be demonstrated following the Overfishing Concern, whereas the Council criteria requires only two strong spawning events be demonstrated.

At the March Council meeting, the Scientific and Statistical Committee (SSC) suggested that the Stochastic Spawner-Recruit Model (SSRM) be used to evaluate the risks and benefits of proposed criteria for ending the Overfishing Concern. Using the SSRM, the STT analysis contrasts the criteria proposed by the STT and that proposed by the Council by simulating two scenarios: management during the Overfishing Concern under Amendment 15 with an escapement floor of 40,700 and management under Amendment 15 with an escapement floor of 35,000. The results of this analysis indicate that differences in outcomes between these two management regimes are small in terms of expected benefits to the fishery or risks to the population. These results in turn suggest that significant differences in the expected benefits and risks between the STT-recommended and the Council-proposed criteria for ending the Overfishing Concern are unlikely. The STT believes the two scenarios examined in the analysis were appropriate for characterizing the maximum expected differences between the STT-recommended and Council-proposed criteria, however the STT questions the plausibility of some of the SSRM results. In the time available to complete this analysis, the STT was not able to fully evaluate the SSRM model structure and its assumptions, and is therefore uncertain about the accuracy of the analysis results.