**Independent Multidisciplinary Science Team (IMST)**

**State of Oregon**

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May 30, 2007

Ed Bowles
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Dear Ed,

At the request of the Oregon Department of Fish and Wildlife (ODFW), the Independent Multidisciplinary Science Team (IMST) has reviewed the draft document titled *Native Fish Conservation Plan for the Spring Chinook Salmon: Rogue Species Management Unit* (February 28, 2007 draft). In your March 15, 2007 letter you asked the IMST to focus our review on the "scientific underpinnings" associated with sections titled Current Status, Desired Biological Status, Primary Factors Responsible for Disparity, and Criteria Indicating Deterioration in Status. You also asked that the IMST review the section titled Monitoring, Evaluation and Research Needs to ensure that necessary components for adaptive management have not been overlooked. This letter and attachments contain IMST's review of the Conservation Plan.

As part of this review, IMST has directed 7 recommendations to ODFW. The Native Fish Conservation Policy requires ODFW to solicit scientific review from the IMST and other scientists (Oregon Administrative Rule 635-007-0505(8) (b)). These recommendations (repeated with the key points below) are meant to assist ODFW with the preparation of future native fish recovery plans in ways that will facilitate the scientific review process. Recommendations issued by the IMST require formal responses from state agencies or entities as per ORS 541.409 (see Appendix A of the review for details).

In general, we were unable to determine the scientific rigor and underpinnings of the Conservation Plan for reasons that are explained below. Therefore, the IMST neither agreed with nor disputed ODFW's conclusions or proposed actions. Within the review the IMST has identified several key areas that we feel need to be addressed in order to provide adequate information for technical and scientific reviews. These points are summarized briefly in this letter and are discussed in more detail in the attached review; they are not presented here in any order of priority.

- In general, the Conservation Plan provides little information on the variation associated with the data or model predictions that are presented in figures and tables. Without this, there is no way for us to judge the scientific accuracy and precision of conclusions made by ODFW from data and model predictions. In the attached review,

we have listed several examples of problems encountered in evaluating the presented data and the agency's interpretations and conclusions based on those data. These concerns led to the following recommendations:

  - IMST recommends that ODFW's native fish conservation plans should contain sufficient information on data, data analysis, variance estimates and other critical information, to demonstrate whether or not the plans are scientifically rigorous.
  - IMST recommends that ODFW should follow steps to ensure statistical best practices are used in the conservation planning process.
  - IMST recommends that alternative models and relationships need to be investigated to explain trends and variability in observed data. For example, straight-line models might not be the "best fit" (e.g., Figures 5–7).

- The Plan acknowledges the need for monitoring and evaluation, and IMST is highly supportive of this intent. In addition to monitoring fish population numbers, IMST believes that it is equally important for monitoring to include habitat. The Conservation Plan focuses on water released from Lost Creek Dam and fish counts at Gold Ray Dam, but there is little information regarding the rest of the basin or plans to evaluate the rest of the basin and other possible influences on spring Chinook salmon. The monitoring plan should be better tied to objectives, include interagency monitoring—not just ODFW's monitoring program, and monitoring priorities over time. One recommendation was made related to this point:
  - IMST recommends that ODFW should include measurements of habitat variables as well as monitoring of fish abundances.
- The influences of regional climatic and oceanic cycles are not integrated into the data analysis, or into the interpretations and conclusions drawn by ODFW. Based on figures in the Conservation Plan and known information on El Niño-Southern Oscillations and Pacific Decadal Oscillations, there appears to be a relationship between Rogue River naturally produced spring Chinook salmon and changes in ocean temperatures. As we noted in our review of the recovery plan for coastal coho, such changes in ocean conditions can greatly affect salmon abundance positively or negatively and have the potential to mask the effects of management actions in freshwater. By overlaying these climatic and oceanic cycles onto the fish productivity numbers already presented ODFW staff could significantly change their interpretations of trends in productivity.
- The Conservation Plan (including the monitoring and evaluation sections) does not provide sufficient information regarding the "action items", which is the section of the document that outlines what ODFW actually plans on doing. The action items are verbalized as strategies, not tactics. And, the precise objective of each strategy is not provided. Explicit statements describing the desired outcome of each action are needed before a scientific assessment of the Plan is feasible. The following recommendations were made based on this key concern:

- IMST recommends that ODFW should provide clearly defined measures and criteria for recovery in all conservation plans.
- IMST recommends that ODFW should not recommend the killing of native predators without adequate research on the effectiveness of predator control. Control of non-native species should include both non-game and game fish.
- IMST recommends that if Lost Creek Dam is the factor most strongly associated with decline of spring Chinook salmon in the Rogue River, ODFW should list and evaluate all options relative to retention and operation of the project and prioritize those that would most benefit naturally produced spring Chinook salmon.

In conclusion, the IMST was unable to adequately review the scientific underpinnings of the draft Conservation Plan as it is written. IMST feels that the issues related to data analysis and presentation need to be addressed by the agency to enable an adequate review. The revised information could significantly affect the rest of the Conservation Plan (e.g., the alternative management strategies and the criteria indicating deterioration in status) and it will make the Plan more scientifically defensible. IMST recognizes that the intent of the authors and the Task Force was to create a document that was understandable by the general public but, this overall goal should not automatically exclude properly reporting statistical methods and results.

The review was adopted by the IMST at its May 17, 2007 public meeting. There were no dissenting opinions amongst the IMST regarding this review. The IMST does not normally release reviews to the public or post them to our web site for 30 days after sending the review to the requesting agency. If you would like the Team to post or release the review publicly at an earlier time please let Kathy Maas-Hebner (541-737-6105) know that it is okay to post the review.

The Team would be happy to answer any questions that this review may raise and hope these comments and suggestions are useful in increasing the scientific rigor of the Rogue spring Chinook salmon and future fish conservation plans. The IMST would also be willing to consider reviewing a revised draft of the Conservation Plan.

Sincerely,

Nancy Molina
IMST Co-Chair

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Cc with attachments:
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# IMST Review of ODFW's draft *Native fish Conservation Plan for the Spring Chinook Salmon: Rogue Species Management Unit* (February 28, 2007 draft)

**Released on May 30, 2007**

**Independent Multidisciplinary Science Team**
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**Review Preparation**: This review was prepared by the IMST based on an initial draft by an IMST subcommittee (Vic Kaczynski, Carl Schreck, and Kathy Maas-Hebner (IMST's lead technical support)). Susie Dunham also provided technical assistance to the subcommittee during the review. Kevin Goodson and/or Tom Satterthwaite discussed the preparation, goals, and intended use of the reviewed document at the IMST's March 15 and April 26, 2007 public meetings. The IMST discussed initial review comments at its April 26, 2007 meeting and adopted the final review at its May 17, 2007 meeting.

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## INTRODUCTION

The Independent Multidisciplinary Science Team (IMST) reviewed the Oregon Department of Fish and Wildlife's (ODFW) draft document titled *Native Fish Conservation Plan for the Spring Chinook Salmon: Rogue Species Management Unit* (hereafter the Plan) at the request of ODFW (letter from Ed Bowles dated March 15, 2007). Specifically, ODFW requested that the IMST's review focus on Plan sections titled: Current Status, Desired Biological Status, Primary Factors Responsible for Disparity, Criteria Indicating Deterioration in Status, and the Monitoring, Evaluation and Research Needs. This review responds to the request.

The IMST's review addresses whether the Plan's approach and analyses are credible and consistent with accepted scientific standards, and whether Plan assumptions and uncertainties are reasonable and characterized adequately. The review is confined to matters of scientific rigor, adequacy of evidence to support assertions, and the logic presented in forming conclusions from information.

This review includes a summary of major findings related to the IMST's ability to review the science underlying the Plan and discussion of major overarching issues, followed by major comments, specific comments, and editorial comments.

The IMST concludes its review by issuing seven formal recommendations (see Recommendations section). IMST considers recommendations important to accomplishing the overall mission of the Oregon Plan for Salmon and Watersheds. Recommendations are based on our assessment of the best available science as it pertains to salmonid and watershed recovery and the management of natural resources. Recommendations are directed to one or more agencies or entities that have the ability to implement or affect changes in management or regulation that are needed for implementation. Oregon Revised Statute 541.409 requires that state agencies or entities (e.g. Oregon Plan Core Team) respond to recommendations issued by the IMST.

In general, the Team was unable to determine the scientific rigor and underpinnings of the Plan for reasons that are explained below. Therefore, the IMST can neither agree with nor dispute ODFW's conclusions or proposed actions.

## OVERARCHING ISSUES

### *Data Analysis and Presentation*

In general, the Plan provides little information on the variation associated with the data or model predictions that are provided in the figures and tables. Without this, there is no way for the IMST to judge the scientific accuracy and precision of conclusions made by ODFW from these data and model predictions. In the text below, we have listed several examples of problems encountered in evaluating the data presented and the agency's interpretations and conclusions made from the data. The Specific Comments section of this review also has comments on which figures and tables need measures of variation. The IMST encourages the Plan authors and other ODFW staff involved in preparing future conservation plans to consult statistical references such as Gotelli and Ellison

(2004) and Ramsey and Schafer (2002) to determine the appropriate manner for displaying data summaries (use of means, modes, and medians, and measures of variation), determining significant differences between means, types of regression analyses, and properly reporting regression statistics.

- Figure 3 compares percent returns for about 40 years of pre-1980 data with 3 years of recent data. Given the disparity in sample sizes used to determine these mean percentages, the comparisons would be far more informative if some measure of variability/error was also reported to show the consistency of recent trends.
- With respect to Table 9, the Plan would be strengthened if the biological justification of averaging annual estimates over a 10 year period were further justified. Have acceptable levels of year-to-year variability also been determined? What is the advantage of using average values for evaluating criteria? Given the historical variation in abundance (Figure 2) it seems using the median or 25$^{th}$ percentile may be more statistically appropriate benchmarks if the stated goal is to 'maintain a sustainable level of abundance'.
- The data presented to support the hypothesis stated on page 20 (2$^{nd}$ paragraph) "*Resultant changes in these three factors led to various changes in life history characteristics of NP CHS including (1) an earlier time of ocean entry by juveniles, (2) earlier maturation at younger ages, (3) later migration in freshwater, (4) later spawning time and (5) a change in the race composition of naturally produced chinook salmon produced upstream of Gold Ray Dam (ODFW 2000).*" are not convincing because relevant measures of variability have not been reported throughout the Plan. This, along with the presentation of alternate hypotheses and justification for not considering them, would strengthen the Plan.
- On page 25 (5$^{th}$ paragraph), the authors state "*A predictive line that appeared to "best fit" data from the 1985-2000 brood years suggested that 5,000 spawners would produce about 15,000 recruits, 10,000 spawners would produce about 21,000 recruits, and 15,000 spawners would produce about 26,000 recruits (Figure 5)*". Are these results from a regression analysis? How was the location of the 'predictive line' determined? In order for this analysis to be scientifically defensible the statistical method used should be reported. The regression equation, significance of the slope, and proper prediction intervals should also be calculated and reported for each value. What exactly is meant by 'appeared to best fit'? Were these estimates generated 'by eye'? If so the scientific defensibility of such an approach is questionable. While this may be the "best fit" line (forced through the origin), the scatter is such that one would be reluctant to use the line to predict the number of recruits. The authors offer little justification for making reasonable predictions based on this line. Showing the confidence intervals around regression lines in Figs. 5, 6 and 7 might help make this obvious.
- A further illustration of the problem with the "best fit" approach is in the paragraph describing Figure 7 on page 26. The line in Figure 7 represents a linear regression forced through the origin which has, based on numbers in the text, a slope of 0.036 fry/spawner. The authors state that "*there was a positive*

*relationship between the two variable*s". This may not be true, however, based on the distribution of points. One can argue that the "best fit" line that minimizes deviations from the line may be nearly horizontal, i.e., no relationship between fry catches and parent spawners.

- Based on analyses and modeling reported in ODFW (2000), the Plan authors suggest that shifts in fry emergence and spawning time have occurred since Lost Creek Dam was completed and put into operation. However, without measures of variation to go along with the reported means of emergence and spawning, one cannot verify if these are accurate interpretations of the data. What are the sample sizes and measures of variability behind the average dates in Tables 2–6? These measures would be significant in documenting life history changes due to dams. For example, is variability in migration and spawning dates thereby reducing the life history variability? Or is the variability remaining the same but with a shift to later spawning. While it makes sense that differential survival of juveniles with later emergence times has changed the makeup of runs, examination of measures of variability might improve insight into how dams have changed naturally produced spring Chinook salmon (NP CHS) life histories.

- While the Plan's authors have made a strong case for water temperature as a fundamental driver of life history changes in NP CHS, they have not addressed why potential alternate explanations have been excluded from consideration (e.g., differential harvest of fish with respect to age, hatchery impacts, climate regimes). Some explanation of how these factors might also contribute to the observed life history changes would strengthen the scientific basis of the conservation plan.

  For example, Table 2 presents parent spawning dates and average date of fry emergence from the gravel from 1972–1994 as reported in ODFW (2000). It appears that emergence shifted one month earlier but the authors have not considered other environmental factors that could have been affecting fry emergence since 1972. How does the El Niño-Southern Oscillation relate to the apparent shift in fry emergence timing? Climatologists have indicated that 1975–1994 was dominated by El Niño events but a regime shift has occurred and we are now in a period dominated by La Niña events similar to 1948–1973; a period dominated by cool wet weather, abundant snow and floods. The overlap with the shift in the climatic regime also applies to Table 3–6.

- The presence and influence of hatchery fish in fish counts and subsequent analysis over time is not clear. The presence of marked fish released from Cole M. River Hatchery varies from year to year (as did those from Butte Falls Hatchery) but it wasn't until 1999 that 100% of the smolts were marked and those fish didn't return until 2004. Figure 2 shows estimated passage of Chinook at Gold Ray Dam from 1942–2006 and separates hatchery and wild fish for the entire range of years. However, Figure 3 indicates that the migration timing of spring Chinook could not be estimated from 1981–2002 because only a small portion of hatchery fish returning were marked. If that is the case why are hatchery and wild fish separated in Figure 2 for the 1981–2002 time period? Also in Figure 3, the caption notes that prior to 1981 unmarked hatchery fish were only a small percentage of the return. Why isn't that noted in Figure 1 where the hatchery and

wild fish are shown separately? How does the discrepancy with being able to account for hatchery fish affect ODFW's ability to determine the impact hatchery fish have on naturally produced fish?

- Additionally, the Plan relies heavily on assumptions and conclusions made in ODFW (2000). The data covered in this document only go through 1994. Have new analyses been conducted with data collect collected since 1994 to see if the conclusions reported in ODFW (2000) still appear to be accurate? Much of the analysis reported in ODFW (2000) was based on simulation models? Have the Conservation Plan authors revisited the assumptions used and conclusions made from these simulation models? How would the assumptions change with the shift in climate and oceanic conditions (1975–1994 was strongly influenced by El Niños and has shifted to a period dominated by La Niñas) that has occurred since the original analysis was completed?
- The use of averages of smolt migratory timing in Table 6 is unclear. If there are smolts that migrate throughout the year, then it might be very misleading to think in terms of averages. In fact, it would be difficult to calculate an average if one does not know when to start the year, selecting a date that is relevant to a salmon, which the calendar year is not. What is likely ecologically important is the variation in migratory timing; this could be one of the phenotypes that is worth managing.

***Monitoring and research needs***

The Plan acknowledges the need for monitoring and evaluation, and IMST is highly supportive of this intent. In addition to monitoring fish numbers, the IMST believes that it is equally important for monitoring to include habitat. The Plan focuses on water released from Lost Creek Dam and fish counts at Gold Ray Dam and there is little information regarding the rest of the basin, or plans to evaluate the rest of the basin and possible influences on spring Chinook salmon. The monitoring plan should be better tied to objectives, include interagency monitoring — not just ODFW's monitoring program, and monitoring priorities. A few critical points and questions follow.

- The Plan and previous analyses in ODFW (2000) and Cramer et al. (1985) indicate that changes in stream temperature since the construction of Lost Creek Dam have caused shifts in emergence and spawning times. Areas of cool water infusion (hyporheic flow, springs, refugia) have been identified in other rivers as being attractive for holding areas for spring Chinook salmon and summer steelhead (page 19). Are stream temperature survey data available? We found no indication that stream temperatures are being monitored but rather estimated from reservoir releases and air temperatures. Stream temperature monitoring and use of thermal infrared remote sensing could aid ODFW in identifying, enhancing and protecting cold water refugia in key sections for Chinook. Existing water temperature information needs to be presented.
- On Page 5 (1st paragraph), the authors indicate that directed surveys of fishery resources in the Rogue River basin began in the 1940s and were reported in 1946; more extensive surveys of fish populations, stream habitat, and recreational

fisheries were conducted from 1949–1954 and documented in unpublished reports by the US Fish and Wildlife service in 1955. The lack of recent data affects the credibility of the assumptions and conclusions made in the Plan.

- The only habitat information referenced in the Plan was published in 1955 by the US Fish and Wildlife Service as part of the surveys conducted upstream of Gold Ray Dam prior to the construction of the Lost River Dam and the Cole M. River Hatchery. There appears to be no assessment of current habitat quantity, quality, or distribution for spawning, juvenile fish rearing and migration, protection from warm water temperatures, predators, or for adult migration.
- On Page 17 (4th paragraph), the authors state "*One index on the amount of spawning habitat available to CHS can be derived from visual surveys of spawning areas conducted in the 1940s. While contemporary survey procedures are more accurate, the historic surveys likely convey a general idea of the distribution of spawning habitat currently available to CHS*". This statement and the assumption that the 1940s surveys are "likely" to convey a general idea of available spawning habitat ignores more than 60 years of human and natural disturbances (e.g. loss of riparian areas, road constructions, floods and debris flows, etc.) within the river basin that could reduce or impair the amount of habitat since the time those early surveys were completed. See McIntosh et al (2000) for the amount habitat may change over that time.
- The Plan ignores major fish barriers such as Savage Rapids Dam (constructed in 1921) and Gold Hill Diversion Dam (constructed in the early 1940s), both of which are down stream from Gold Ray Dam. What impact have these barriers had on fish returns reaching the fish counting station at Gold Ray Dam? What will be the effects of the expected removal of these two dams? How will the change be reflected in fish counts at Gold Ray? What other passage issues exist in the basin that affect spring Chinook salmon?

***Climatic and oceanic cycles***

Inspection of Figure 2 suggests that some important changes occurred in either the ocean or the river that have differentially affected Rogue River NP CHS, hatchery spring Chinook salmon (CHS) and naturally produced fall Chinook salmon (NP CHF). The discussion below also indicates that a change occurred. This is an interesting riddle. A regional change in the California Current temperature regime and survival rates of juvenile hatchery coastal coho in the California Current did occur beginning about 1976 (Peterson et al. 2006). This reference summarizes the most up to date information on California Current conditions and obvious salmon relationships. Chinook responses are summarized in Peterson et al. (2006) but they are for Columbia River Chinook which may not respond the same as Rogue CHS because Columbia Chinook mostly mature in the Gulf of Alaska and North Pacific Ocean. Similarly, the implications related to questions and discussions in the next two paragraphs could be significant to NP CHS and need to be addressed within the Plan.

Where do Rogue NP CHF mature in the Pacific Ocean? Are they north migrating or do they reside in the California Current? Rogue NP CHS would not necessarily track North Umpqua NP CHS because the latter, like all coastal Chinook north of Cape Blanco, are north migrating. Coastal coho and Rogue CHS should respond similarly as both enter and mature in the California Current. These data could be compared. Some relationships appear between Rogue NP CHS (your Figure 2 but with the time axis moved back 3 years) and Pacific decadal oscillations in temperature (in Peterson et al. 2006). There was a cool current (high biological productivity) from about 1945 to 1976 and Rogue NP CHS returns were greater during that time. Returns then became quite variable and the hatchery CHS returns equaled and then surpassed the NP CHS returns. IMST does not have the Rogue hatchery CHS jack return data. We suggest that ODFW compare the jack return data to the California Current information in Peterson et al. (2006). This might illuminate natural ocean survival relationships. We also suggest that ODFW compare the Rogue hatchery coho returns for the same reason.

From 1985 to 1989, returns were relatively high for Rogue NP CHS, hatchery CHS, and NP CHF suggesting a response to good ocean conditions. Figure 13 shows relatively high smolt production in 1983 and 1984, which would feed into the 1985 to 1989 returns. The 1996 and 2002 hatchery CHS population spikes seem to correspond to 1992 and 1999 cool productive years in the California Current. The NP CHS population did not show the same responses. Figure 13 shows relatively high smolt production in 1992, which appears to feed into the 1996 hatchery CHS population spike. Again the NP CHS did not show the same response. Sometimes negative results mean something. What changes occurred in the river beginning about 1978 and especially about 1992? Annual plots of estimated fry and smolt productions might help explain some of this. On page 34, there is a brief discussion of three potential limiting factors that might affect naturally produced Chinook salmon. The discussions could be expanded here and also include how the hatchery CHS population has differed relative to the natural ones.

***Strategies without tactics and outcomes without measures***

One of IMST's main concerns is that the Plan (including the monitoring and evaluation sections) does not provide sufficient information regarding the "action items", which is the section of the document that outlines what ODFW actually plans on doing. The action items are verbalized as strategies, not tactics. And, the precise objective of each strategy is not provided. Strategies include the "big picture" ideas and how ODFW plans to achieve larger goals. In contrast, tactics are specific actions created and selected to reach specific and measurable goals. The Plan neither links strategies and broader goals to specific actions nor does it identify, in either quantitative or qualitative terms, the desired outcomes or how they will be measured. How will ODFW know if it has achieved its overall goals for the Plan or if the tactics need to be changed?

For example, water temperature has been identified as a limiting factor for NP CHS. The larger goal is to reduce water temperatures at critical times of the year. One strategy would be to add extra water to the river at those critical times. The Plan basically stops at

that point. In order to be a comprehensive plan to achieve a goal the following questions would need to be answered:

- When is the water temperature too high?
- What is the ideal water temperature at that time and why?
- What is the specific numerical temperature (or range) for which ODFW will manage?
- How many additional fish can ODFW expect to be produced in the river by reducing the water temperature? How is it known that the change in temperature could result in the additional fish?
- How much water is needed to significantly reduce water temperatures? How was that amount determined and how may the amount vary by year?
- What are the options available to obtain that water? Which one is most likely to provide the amount of water or does a combination of methods need to be used? How will ODFW go about securing the extra water (e.g. buying it, creating a reservoir on a tributary)?
- When can the water be obtained (i.e., what year) and over what time frame (i.e., how many years can ODFW obtain the water in this manner)? How much money is needed and how will it be obtained?
- How will the change in water temperatures be monitored?
- How will the change in water temperature be reflected in the NP CHS populations (e.g. more spawners on redds, more smolts, etc.)? How will the population be monitored and linked back to the changes in water temperature?
- How will ODFW know if the actions did or did not lead to the desired result?
- What will ODFW do if one or more actions cannot be accomplished?

IMST recognizes that it is difficult to predict precisely when the various actions could be initiated and completed. However, timelines with milestones are an important element of management Plans. Being proactive in the State's actions is also warranted to prevent future declines in NP CHS stocks.

## MAJOR COMMENTS

These comments address issues that may affect other portions of the document and along with the overarching issues would be considered first before the specific and editorial comments listed in the next sections.

It does not appear that a limiting factors analysis was conducted for NP CHS. The authors state that there are a number of factors that contributed to the decline of and changes in the life history of NP CHS and that both current and historical types of *possible* limiting factors were considered as part of the assessment. The lack of a formal analysis may be because of the authors' apparent assumption that blockages to additional habitats by the Lost Creek Dam and Cole M. River Hatchery along with management of water from the Lost Creek Lake are the most limiting factor to the fish or it could be that adequate data are lacking on freshwater and ocean habitat. If Lost Creek Dam is unlikely to be breached, some type of analysis could still be done to determine what other factors are

limiting fish production and colonization of other areas. Similar types of analysis may help to identify other factors that are more easily managed by the State and could be used to mitigate for the Lost Creek Dam and warmer waters discharged from the lake.

Future impacts from climate change (e.g. ISAB 2007) and population growth are not presented nor are the potential impacts on NP CHS over time and how those impacts could be mitigated by the conservation plan and improvement in habitat. The Plan mentioned that more water may be diverted from Lost Creek reservoir to meet increased demands by municipalities and agriculture but it does not offer ways to offset those impacts.

An influence diagram would be an asset to the Conservation Plan. It would help to demonstrate how various environmental and management factors affect the various life stages of NP CHS. It would also inform an adaptive management plan.

- Figs. 5, 6 and 7 – How were recruits, fry, and smolts estimated and what are their confidence intervals? How can 5.5 thousand spawners yield 15 thousand recruits, 200 fry, and 1.3 million smolts? Is this a measure of sampling error?
- Figs. 5, 7, 8, and 9 – Adjust harvest by ocean productivity and hatchery releases.
- Fig. 14 – Fifty percent (50%) harvest and 0 extinction risk seems contrary to trough patterns in Fig. 13, and the declines in Figs 10 and 12. What are the confidence intervals of this curve?
- p. 7, 6th paragraph – What about age-selected mortality and genetic selection? The authors state "*Catches in freshwater are also dominated by specific age classes (ODFW 2000). Older age classes contribute to the river fisheries at higher rates than younger age classes.*" How does this pressure (that presumably increases as human population size increases) confound life history changes attributed to temperature and early emergence associated with dam installation - described below later in the section?
- p. 8, 2nd paragraph – A reference is made to attempts made to restore the historical timing of fry emergence by changing reservoir outflow water temperatures. These attempts were found to be partially successful. The authors do not indicate if stream temperatures below the dam were successfully returned to pre-dam temperatures. If the temperatures were returned to pre-dam levels, what other factors could have prevented a successful shift in fry emergence. Could it be reflecting the modeling that was done and reported in ODFW (2000)? The authors do not present new data to show if the trends seen from 1972–1994 and reported in Table 2 are still present.
- p. 9 – What are the effects of increasing the number of small recruits and decreasing the number of jumbo recruits?
- p. 10 & 11 – Why does this SMU not include the Applegate and Illinois Rivers? Is there any monitoring in the Illinois? It is noted that adult CHS have been observed in the Applegate, Pistol, Illinois, and Chetco Rivers but only

sporadically as determined from unpublished ODFW observations. Is there any knowledge about the historical abundances of CHS in these rivers? Is their sporadic presence due to recent declines or have they always been intermittently populated? Over what time period were the unpublished ODFW observations made? How does excluding these populations affect their persistence and any positive contribution they might make to the persistence to the Rogue SMU?

- p. 12, 4th paragraph – Given this statement "*Differential estimates of migration timing could not be developed for naturally produced CHS during 1980-2002 because unmarked hatchery fish composed a substantial portion of the returns.*" how accurate are estimates of NP CHS declines and how reliable are the data presented in Figure 2?
- p. 14, 2nd paragraph from bottom – "*A period of 10 years was chosen...*" What is the justification for length of period? Wasn't 50 years chosen for coastal coho? Why a much shorter time interval?
- p. 14, last paragraph – Why set elements 1 and 2 aside? Why not include #1 as part of the risk of being wrong? Why must elements be complementary? What are examples of non-complementary elements?
- p. 15, 2nd paragraph – It is unclear what "liberal" means with reference to the goals? How were criteria adjusted for fish abundance and life history characteristic? Also, "iterative" process is correct, not "iteration".
- Table 9 – The derivation of Table 9 criteria appears to have occurred primarily through popular selection by the advisory committees. This process lacks scientific rigor. Can these criteria be supported or explained by information in hand? The desired abundance criterion was 15,000 adults passing over Gold Ray Dam. What was the justification for selecting 15,000 adults? In Figure 2, the most stable time period to evaluate a baseline was from about 1950 to 1976. Using the old fashioned method of connecting the low abundance points during this time, one draws a relatively straight line at about 15,000 adults. 15,000 adults is the low range of returns for this relatively stable time period. Returns after 1976 were highly variable. The midpoint of returns from 1950 to about 1976 was about 20,000 adult CHS. A desired abundance criterion of 20,000 adults would be more conservative and should have a higher probability of rebuilding the depressed CHS run. Fewer fish would be available to the fisheries.
- Table 9, # 2 – It is difficult to evaluate the desired passage-timing criterion, 60% by 15 June, from the limited information presented. Table 4 only gives average dates of passage. The text describes the trend to migrate later compared to pre and early post Lost Creek Dam construction. Figure 3 has monthly passage information for wild CHS for 1942-1980 and from 2003-2006, and for hatchery CHS from 2003-2006. Why just the selected years? Lumping April, May and June wild CHS returns in Figure 3 (by estimating the bar chart values), about 80% plus passed Gold Ray Dam during the 1942 to 1980 months. About 60% passed Gold Ray Dam during the 2003-2006 for these months. Is the 2003-2006 passage result the basis for the passage-timing criterion, the present status? Isn't it desirable to

attempt to return to earlier passage timing? Information in the previous reservoir operation effects section (page 10) stated that a fishery goal of restoring the life history attributes of NP CHS could not be achieved because of limited amounts of cold water that could be stored in Lost Creek Lake. Lost Creek Dam constraints are mentioned on page 15. Is 60% all that can be achieved?

- Table 9, # 3 –The percent jacks criterion, no more than 10%, appears to represent the status quo (9% average reported on page 12 for 2003-2006). Is this objective constrained by practical limitations from Lost Creek Dam operations or could the jack criterion be less than 10%?
- Table 9, #s 4 & 5 – What are the bases for the chosen percentages? The 40% spawning criterion above the Highway 62 Bridge at Shady Cove appears arbitrary. On page 12, 77% spawned upstream of Shady Cove from 1974-1981. From 2004-2006, an average of 48% spawned upstream of Shady Cove. A 50% upstream spawning criterion is a better fit to the recent spawning pattern but why shouldn't the goal be even higher? Has the distribution of spawning gravels changed significantly since the construction of Lost Creek Dam? Construction of the dam removed a very large proportion of sediment recruitment.

  The no more than 15% hatchery fish-spawning criterion appears arbitrary. Historically (1974-1981) hatchery fish only accounted for 1-2% of the NP CHS. During 2004-2006, hatchery CHS were 9 to 12% of the naturally spawning CHS (page 13). A less than 10% hatchery fish-spawning goal is a better fit to the recent data but why couldn't the goal be even less considering the 1974 to 1981 data? The data suggest an increasing hatchery fish influence into the Rogue NS CHS population.
- Table 10 – The comments for Table 9 also apply to Table 10. In addition, in the Current Status column, the 45% migration timing value should be checked. Visual approximation of the sum of the April, May, and June values in Figure 3 suggested 60% for 2003–2006.
- p. 17–The correlation of fry to smolt abundance may well indicate a spawning habitat limitation (page 19). What was the correlation other than "highly"?
- p. 19 – If spawning habitat is deemed a greater limiting factor than rearing habitat, why not consider breaching Lost Cr. Dam? This dam is associated with decreased channel complexity, flows, and spawning gravels, plus increased agricultural diversions, disease from Cole Rivers Hatchery, inbreeding, and anglers.
- p. 19, 2nd paragraph – How do the findings "indicate" that spawning not rearing habitat is more limiting? It is not clear and there have been no recent habitat surveys for the river.
- p. 19, 4th paragraph – If areas of cool water infusions (e.g. hyporheric flow, springs) and deep pools have been identified as holding areas for other salmonids, why would holding sites be unknown for Rogue CHS. What isn't known and does not appear to be part of the proposed monitoring are surveys to determine the extent and distribution of holding areas in the Rogue River system.

- p. 25, Spawning Escapement –In method 2, a description of the estimation of initial ocean survival rates and the method would be helpful. Method one yields estimates of recruits per spawners. Method two yields estimates of smolts per spawners – freshwater productivity. Method three yields indices of fry per spawners – again freshwater productivity. These three methods have different degrees of usefulness and this could be mentioned. There is very high variability in Figures 5, 6, 7 (and 17). What causes the high variability? Are the estimates of smolts per parent spawners (Figure 6) correlated to estimates of fry per parent spawners (Figure 7) for the same years?
- p. 25 – Average linear predictions seem unrealistic given a changing environment. Consider multiple hump-shaped curves linked to environmental drivers.
- p. 26, 1st paragraph – The predictions listed for Figure 6 are not consistent with the line drawn in Figure 6, confidence intervals not withstanding.
- p. 29, top of page – This equation discounts ocean harvest. Why? How are natural and hatchery Chinook separated? Also the equation is not consistent with the equations provided in the captions of Figures 8 and 9. It appears that a term may be missing from the equation in the Figure 8 and 9 captions. Also, the meaning of the terms "escapement at river entry" and "number of fish that entered freshwater" are not clear to a non-expert and are not defined in Appendix A. Are these referring to the same thing and how are they measured?
- p. 31, 2nd paragraph – "*...but it is not possible to separate naturally produced fish from hatchery fish within those records because only a portion of the CHS of hatchery origin exhibited fin clips prior to the 2004 return year.*" What are the implications of this for the accuracy of Figures 2 and 3?
- p. 34 3rd paragraph – What is the confidence in the conclusion that the average rate of recruitment is much greater than the ODFW benchmark? How was the average 4.3 fish/spawner determined? A 5-year rolling average plot of adult returns could, at least, give an indication of productivity trends.
- p. 48 – The discussion of adaptive management needs provides sound reasons for using adaptive management but a comprehensive adaptive management plan is not presented.

**SPECIFIC COMMENTS**

- The use of acronyms for naturally produced spring Chinook salmon (NP CHS) and spring Chinook salmon (CHS) are confusing. It is difficult to know if hatchery fish are included in the CHS category or excluded; similar comment for fall Chinook salmon.
- In several places (e.g. pages 4, 11, 17) the authors cite "ODFW unpublished data" or "ODFW unpublished observations". To be credible, the authors should indicate when and how those data were collected and analyzed, and if and where they are archived. This is particularly a problem with statements about certain areas being used only sporadically for spawning by CHS. One could assume that the

spawning use was sporadic because the sampling intensity and frequency in these areas was also sporadic.

- Measurable criteria need to be well defined within the document.
- Fig. 2. If all counts are estimates, provide confidence intervals.
- Figs. 2 & 3. How were hatchery fish marked? What number and proportion each year? And how were unmarked fish, especially strays, identified?
- Figs. 5–7 & 15. These do not appear to be linear patterns. Try using multiple hump-shaped curves to examine patterns. Identify points by year and evaluate changes in productivity based on hatchery releases, ocean condition, harvest, or seasonal anomalies.
- Fig. 11. Use the same y-axis for fall and spring Chinook, the units (i.e. number of fish) are the same. Based on the figure it appears that 60,000 spring Chinook is equal to 40,000 fall Chinook
- Fig. 10. Why did Chinook decrease between 1946 and 2005 in the Rogue, but not in the North Umpqua?
- Fig. 12. Why did spring Chinook decrease between 1946 and 2005, but not fall Chinook?
- Fig. 13. Briefly explain the troughs and peaks in recruits and smolts.
- Table 1 – Why not include "minimize loss of phenotypic plasticity of CHS"? Should item 5 refer to CHS not CHF? In item 8, Table 1 Item 8, how do the present flows affect the summer steelhead fishery and what flow change (regime) could minimize the effect?
- p. 6, 3rd paragraph – Why are there no spring releases of CHS? What were the historical patterns in NP CHS?
- p. 7, under "General Aspects" – Rogue species management unit (SMU) spring Chinook salmon are more often an ocean-type Chinook and different from more typical stream-type spring Chinook populations in Oregon. A brief sentence explaining the difference would help the readers of the Plan.
- p. 8, 3rd paragraph – A citation is needed to substantiate the claim that "*...spawning time is a highly inheritable trait...*"
- Table 4 – is the average length for both pre- and post-dam fish? Was there variation over time in average length for the age classes?
- p. 9, 1st paragraph – A citation is needed to substantiate the claim that "*...migration timing in chinook salmon is also highly heritable...*" With respect to the next sentence beginning "*As an example...*", this <u>is not</u> an example of "heritability" because one cannot separate effect from "natural" variables like size or temporal differences.
- p. 9, 3rd paragraph – What is the evidence for the statement "*...threshold size that triggers an active downstream migration as smolts*"?

- Table 5 – What are the confidence bounds on the reported estimates?
- Fish counters at Gold Ray Dam apparently can differentiate CHS by size; see Table 5. Perhaps ODFW could get more current and informative age distribution data from the fish counters. Table 5 suggests that fish less than 20″ would be age 2, 20-27″ age 3, 28-32″ age 4, 33-35″ age 5, and over 36″ age 6. But the text in this section states that ages 4, 5 and 6 are all over 24″ and thus are adults; apparently the fish counters do not attempt to break down fish other than over and under 24″. Can the age distribution be refined by size categories from the Gold Ray Dam fish counts?
- p. 10, 1st paragraph – The authors state "*These findings for NP CHS fish were confirmed by analysis of coded-wire tagged CHS released at Cole M. Rivers Hatchery."* but were these data collected for NP CHS as well or were results from hatchery fish extrapolated to NP CHS?
- p. 10, 2nd paragraph – It is unclear which biological attributes are being referenced. It is better to list the specific attributes.
- p. 11 and 12 – The data on fish passage presented under Abundance would be better presented in a table along with measures of variability, statistical comparisons between time periods, and or the inclusion of some type of trend analysis.
- p. 11, last paragraph – Are there any data on how "*the abundance of CHS of hatchery origin increased during the last 30 years, and reached the highest level ever recorded in the 1990s*" coincides with the observed life history changes of NP CHS?
- p. 11 and 15. – On p. 11, spring and fall Chinook are deemed to differ genetically, but on p. 15, it is stated that there is no means to differentiate them. Which is correct, and how or why?
- p. 12, 4th line under Migration timing. – In a number of places the word "proportion" is used when a more appropriate word would be "percentage".
- p. 12 – Has the distribution of spawning gravel areas changed since the USFWS's early surveys or the construction of Lost Creek?
- p. 13, 3rd paragraph – The sentence, "*Prior to the development of specific numerical criteria, a series of generalized options were developed as related to potential fishery management scenarios were developed (Table 8).*" is not clear and hard to interpret.
- p. 13, 4th paragraph – Or is it better to make hatchery fish very different from wild fish?
- Table 9, # 6 – How is population persistence estimated? How will it be determined? Is there a monitoring program? What is the confidence interval around the model estimates presented in the criteria?
- Table 10 caption – What is a "singular element"?

- p. 16, Table 11 – This table is poorly organized. The information could be conveyed in a more efficient manner. Do all the factors affect both abundance and life history or should it be expressed as abundance and/or life history? With regards to a few of the "unmanageable" 1) Ocean rearing habitat unable to be managed – what about managing the effects fishing has on food webs; 2) Current patterns of what in the ocean (under habitat quality); and 3) why can't predators and/or competitors in the ocean be managed through target fisheries?
- p. 17 –Why is efficacy of transporting adults for release in upstream areas termed "unknown"? This is not an uncommon practice, at least not in Washington State in the Cowlitz and Lewis Rivers. Doesn't ODFW transport hatchery adults downstream to enhance sport fisheries below hatcheries? Upstream of Lost Lake, the survival rates of juveniles passing downstream through the Lost Creek Project is unknown but perhaps could be estimated.
- p. 17 –Where would additional water to supplement flows in Big Butte Creek originate? The temperature regime of Big Butte Creek was mentioned but not described. It should be. Is the regime attractive for NP CHS?
- p. 17– Significant spawning gravel losses (page 19) may have already occurred. There were historical spawning gravel surveys (Table 12). If there haven't been surveys since then, this appears to be a data need for comparative purposes. Are the present spawning gravels stable?
- Table 12 – Were any of the gravel estimates checked for accuracy by conducting a field survey in recent years? Reorganization of the table (i.e., less reliance on footnotes) would improve the conveyance of information. How does accessible spawning gravel translate into stream miles?
- p. 19, 5th and 6th paragraphs – Are stream temperature surveys available? If so, pertinent temperature information should be summarized and presented.
- Table 13 – How were the mortality rates estimated? What was the data source? What errors are associated with the estimates? What were the water temperatures? The text suggests that mortality was related to increased water temperature but without temperature data the argument is not convincing.
- p. 20, 3rd paragraph – There are no data present in Table 14 reporting the amount of redd scouring or numbers of stranded fry, only changes in flow. Fine sediment has been shown to adversely affect egg and alevin incubation survival – is this a concern for the Rogue River? If redd scouring is occurring as indicated, than spawning gravels in some areas are not stable. Spawning gravel surveys with evaluations of stability could be used to help evaluate the potential problem and to determine possible solutions.
- p. 21 – Are unscreened and/or poorly maintained water diversions specific problems along the Rogue River? If so, what is the extent of the problem and can they (diversions) be addressed within the Plan?

- p. 21, 4th paragraph – The sentence beginning with "*Projections indicated...*" seems to be a circular argument. How can 2001 be "sufficient" if adult spawning is limiting as stated earlier in the Plan?
- Table 15 – In the caption, it is unclear what is being impacted by a reduction in water. Should this specify "impact on mortality rates of adult Chinook salmon"? How did actual mortality rates meet predicted values? On page 24, 2nd paragraph, the authors cite estimated mortality rates to be 17%, this does not agree with Table 15.
- p. 22 – Why not add competition with hatchery fish to this list?
- p. 24 – What are the effects of increased temperature and decreased flow on these diseases?
- p. 27, # 4 – What does "*...for an appreciable period of time*" mean? Be more specific.
- p. 27, # 10 – An interpretation was made that the life history traits (earlier freshwater entry and earlier spawning) are heritable and thus the hatchery CHS are genetically different although the genetic assessment showed no difference. Could the earlier adult freshwater entry and earlier spawning be explained by faster juvenile growth rates and earlier ocean entry?
- Table 17 – It seems that the errors associated with these estimates could differ substantially. It would be easier to get an accurate estimate of NP fish spawning in the controlled hatchery environment compared to sampling the river to determine the proportion of hatchery fish spawning there. Report error estimates!
- p. 28, 1st paragraph – The listed goals are appropriate.
- p. 28, 3rd paragraph – How will numbers 1 and 2 be accomplished?
- p. 28 –Hatchery releases increase harvests, but not natural production. These are separate, and possibly opposing, objectives.
- p. 29, 2nd paragraph – With respect to the statement beginning "*In addition, the entire length of the Rogue...*". Has this changed over the time of interest? If not, the statement is irrelevant.
- Table 18 – This table is not really needed. One can convey the same information in the text using much less space.
- p. 29, 3rd paragraph – With respect to mortality related to fishing, if 39% isn't "primary" than what other, individual factor is larger? Using Hankin and Healey (1986), maximum sustainable yields (MSY) for early and mid maturing populations were about 50 and 40% respectively. MSY leaves no room for errors and uncertainties. Table 19 indicates that ocean harvest rates above 15% could result in excessive total mortalities. A 15% ocean harvest rate could result in a total mortality rate that is excessive for early-run NP CHS and just tolerable for the mid-run fish.

- p. 29, last paragraph – "*However, there is a chance that fishing was a primary factor that contributed to the current low numbers of early-run CHS.*" This should be elaborated on earlier in the document. The document would be clearer and easier to read if alternative hypotheses and evidence for what has caused declines in NP CHS were outlined at the beginning and supporting information detailed in turn.
- p. 30, 1st paragraph and Table 19 – Are the differences in harvest rates statistically significant?
- p. 30 – What is the rationale for a 40% harvest rate? Does this rate allow for uncertainty?
- Tables 19 and 20 – Do the authors feel the estimates are conservative, likely maximum values, or somewhere in between? Some elaboration on how these assumptions might bias these results (direction; magnitude) would strengthen the Plan.
- Table 20 – What is the basis for the assumed fishing mortality rate of15%? What are the errors associated with the estimates reported in the table? Additionally, wouldn't the estimated high mortality rates for early run NP CHS eventually skew the genetics to later returning adults?
- p. 32, 2nd paragraph – What is the basis for the increase of anglers for each additional 15,000 CHS?
- p. 32, 3rd paragraph – The closing sentence in this section suggests that the Plan may have to consider a variable harvest rate scheme based on varying levels of California Current productivity, perhaps similar to that used for coastal coho.
- p. 33, 2nd paragraph – The statement "*These changes indicate that the production of NP DHF increased...*" is not evident in the data provided.
- p. 34, last paragraph – What is the effective population size ($N_E$) needed? Should $< N_E$ = extinction? A table explaining how each modification and assumption is expected to change modeling results (direction and magnitude) would be useful in helping a more general audience understand this process. Also explain how the period for which the spawner/recruit relationship was drawn will affect the results.
- p. 34 – Support the assumption that hatchery production is 50% of natural production. Also there is a contradiction here (no hatchery spawning in the wild vs. 5–13% on p. 25 & 27). Is this merely a function of sampling distance from the hatchery?
- p. 35, 1st paragraph – How does the assumption, that the recruitment rates of hatchery fish were ½ those of NP CHS, affect model results? How do hatchery fish fit into the model? What are the confidence intervals around the model results.

- p. 35, 2nd paragraph – "*However, there is significant error around these estimates due to the poor fit of the stock recruitment relationships,...*" Please show this graphically in Figure 14.
- Figure 14 – Figure 14 shows exponential extinction probabilities above a 50% harvest rate and MSY leaves no room for error and uncertainty. The discussion of uncertainty is relevant. Poor marine survival will significantly add to harvest mortalities. The observation that lowered harvest rates are needed during years of poor marine survival is scientifically defensible and consistent with harvest strategies for other salmonid stocks.
- p. 35, *Alternative Management Strategies* – The selection of Alternatives 8 and 9 at this point is understandable but not scientifically rigorous. A ranking of expected relative successes would be useful to the public and fisheries managers. A qualitative matrix of probable outcomes relative to desired statuses might work for these 2 alternatives. It would be complex.
- Table 22 – The strategies are vague. With the exception of 1c and 2c, no target goals are given, so how can one determine if goals have been met? Why is genetic risk not listed in the table? In Alternative 8 and 9, increasing juvenile NP CHS productivity in non-historical habitats may help to compensate for continued selective harvest of early-run and mid-run fish only if the selective harvest is held at or below the present level.
- p. 37, 1st paragraph – What is the basis of the first sentence? Why is there a "reasonable chance" that adoption of this alternative will result in reaching desired status? What if the assumption is wrong?
- p. 37 – Fishery enhancement, irrigation, and municipal uses are given equal priority, but these are competing uses, and decreased peak flows mean decreased habitat regeneration.
- p. 37, Strategy 8.1, Assumption 9 – The assumption that gravel will continue to decrease has not been directly addressed in the Plan. What type of actions will be taken to prevent further decreases and to increase gravel availability? Is this what is meant under Action 1.18?
- p. 37 – Management Strategy 8.1, how would Action 1.7 (manage Lost Creek Lake to minimize passage of CHF upstream of Gold Ray Dam, page 38) work?
- p. 38 – Have the disadvantages of introducing Chinook been weighed? If so, how?
- p. 38 – Management Strategy 8.2, Actions 2.1 and 2.3 – How and where can water be stored in or adjacent to Big Butte and Little Butte Creeks?
- p. 38 – Management Strategy 8.2, Action 2.4 – How will upstream passage be improved? How will improvements be maintained over time?
- p. 39, Strategy 8.3 – Why are non-native bass not considered here for increased mortality? Were the strategies used to decrease predation by pikeminnows on the

Columbia River successful? How much impact do avian and mammalian predators have on CHS?

- p. 39, Strategy 8.4, Assumption #6 – Table 19 indicated that ocean harvest rates above 15% result in excessive mortalities for NP CHS and a 15 % ocean harvest rate appears excessive for early-run fish. Assumption #7 – A 15,000 escapement goal appear to be low in recovering the NP CHS population, this also applies to Action 4.2 on page 40. There is no Assumption # 8 listed. Assumption # 9 is not self-explanatory, other than indicating that the Plan will try to provide maximum harvest opportunities. There will be conservation needs as well.
- p. 39 and 40, Strategy 8.4 – Has ODFW considered slot size management? If it were practical here, this would afford better protection to retain older females in the breeding population. Action 4.5 is not self-explanatory. Perhaps this action should appear under Strategy 8.5.
- p. 39 & 43 – What if the Klamath dams are breached and the stocks improve as a result? Although hatchery and natural fish have similar life histories, hatchery fish mature at younger ages, migrate and spawn earlier, and harbor more disease.
- p. 40, Strategy 8.5 – Why 10% hatchery fish here versus none on p. 34 and in the Chilcote model, 5-13% on p. 25 & 27, and 15% in Table 10? How can this plan be implemented without a Cole Rivers Hatchery plan? How would Assumption #5 compensate for selective harvest of older CHS?
- p. 42 – Strategy 9.2 assumes insignificant impacts on native fish. Why?
- p. 42 – Management Strategy 9.2, Action 2.2 –How much water will be obtained? How will it be attained? And how effective will it be?
- p. 42 and 43, Strategy 9.4 – This is significantly different than 8.4 as it focuses harvest on hatchery fish and affords more protection to NP CHS. Some of the same questions and comments for 8.4 apply here. In Action 4.7, it was stated that substituting hatchery CHS production for coho production, would only occur if hatchery CHS compose less than 20% of the naturally spawning CHS. This would result from going from about 10% now to up to 20% of the spawning population being hatchery fish. What are the genetic repercussions of this change? The hatchery change and targeted fishery goal is not the issue. The issue is how to keep the hatchery fish proportion from increasing in the NP CHS population.
- p. 44, Strategy 9.5 – Wouldn't managing hatchery CHS to minimize the risk of genetic changes among NP CHS mean zero (0) hatchery fish? Action 53 – What additional measures would be used? The increase in allowable proportion of hatchery fish is a concern even though it would only be allowed in a portion of the spawning area. What are the genetic implications?
- p. 44 – Criteria Indicating Deterioration – Include some estimate of abundance in this criteria list. The list also needs milestones.
- Table 23 – Conservation criterion 5 is 25% hatchery fish in the naturally spawning CHS population. According to this, no action would occur until the

hatchery CHS exceeded 25%. So the Plan has gone from 10% status quo, to 15%, to 20%, to 25% in one area, to 25% hatchery fish in the naturally spawning population above Gold Ray Dam. This appears too liberal based on arguments made in the State's Oregon Coast Coho Conservation Plan.

- p. 45 – As with coho, include some sort of productivity or recruit/spawner criterion. Also consider declining trends in criteria, not just fixed criteria. How do alternatives 8 and 9 differ? How are the projected effects of global warming and land use change factored into these alternatives, e.g., increased summer temperatures, decreased summer flows, increased El Niño frequency and intensity?
- p. 46 – The discussion on needing to refine the model, future research, monitoring and evaluation is technically sound. See earlier comments on the need to expand monitoring efforts to include habitat and stream temperature.
- p. 46, *Evaluation Needs* – A few additional items may be appropriate. Can upstream passage at the falls on Big Butte Creek be accomplished in a practical way? Could enough gravel/cobble sediment be dumped upstream of Shady Cove to compensate for the sediment source lost to Lost Creek Lake? (Is there an appropriate supply, cost, etc.?) Could large wood be placed to stabilize spawning gravels? Could slot size management be enacted to protect large female NP CHS? Evaluate the practicality of purchasing all or part of the 34,000 acre feet of storage that could be lost in the future.
- If fish have equal water rights as indicated on p. 37, explain why water for out of stream uses will increase.
- p. 47 – IMST strongly agrees. We need to know the power to detect change in each of these criteria. See McGarvey (2007). Why may Gold Ray Dam be removed? How do the criteria, status, and trends for Rogue spring Chinook compare with those of other spring and fall Chinook populations?

## EDITORIAL COMMENTS

The text of the Plan would benefit by having the document edited for readability. Many sentences include repetitive words or phrases that slow the reader. Soliciting the services of a professional editor may be an efficient solution to these issues. The following are some examples rather than a complete listing.

- Single-spaced, Courier 10 font is difficult to read. Times New Roman and Arial fonts are used most often in publishing because of legibility. Tables, particularly with a lot of text are easier to discern if they are in a font that is different from the text. For review of subsequent Plans IMST requests that a font size of at least 12 be used.
- Chinook should be capitalized (Nelson et al. 2003).

- For most of this document “historical” is the correct word, not “historic”. By definition, historic refers to having considerable historical importance such as a place, event, or document.
- Not all acronyms are defined in the text, e.g. NP CHF and CHF.
- Acronyms (e.g. CHF, CHS) are not appropriate in the reference section unless the cited reference included them in the title.
- The use of line numbers on each page would aid reviewing and revising.
- Page 12, first line – add the word “adult” before spring Chinook salmon
- Page 12, 2nd paragraph under *Migration Timing* – using “from 1942-1980” rather than “historically” is a more specific description of Fig. 3.
- Table 8 Caption – Consider these edits “ Six options ~~designed to~~ that characterize ~~some~~ generalized attributes ~~associated with~~ of potential management....”
- Page 15 – Consider adding detail to clarify how many agreed: “...was preferred by four of 8? public advisory committee members, six of 6? technical advisory...”
- Tables 9 and 23. Criteria and definitions (adults vs. jacks) are mixed within the table. Definitions are better put in table footnotes.
- Page 15 – Consider editing sentences as “...exist between ~~singular~~ elements of desired status and ~~singular~~ elements of current status.” and “The magnitude of the ~~gaps~~ differences range widely...”. And in the next paragraph “...a number of ~~possible~~ factors that possibly contributed to...”
- Page 16, Table 11 caption – Consider editing as “~~Generalized p~~ Parameters identified as ~~potential~~ factors that potentially ~~impact~~ affect...”
- Page 20, 3rd sentence – Using “An increase” rather than “Changes” is a clearer way to present the information to the reader.

## RECOMMENDATIONS

IMST recommendations are based on our assessment of the best available science as it pertains to salmonid and watershed recovery and the management of natural resources. Recommendations are directed to one or more agencies or entities that have the ability to implement or to affect changes in management or regulation that are needed for implementation (see Appendix B for further discussion on development of IMST recommendations). The IMST considers each recommendation important to accomplishing the mission of the Oregon Plan for Salmon and Watersheds. Under Oregon Revised Statute 541.409, state agencies and entities (e.g., Oregon Plan Core Team) are required to respond to IMST recommendations (see Appendix A for information regarding formal responses, desired format, and evaluation of responses by IMST).

The Native Fish Conservation Policy requires ODFW to solicit scientific review from the IMST and other scientists (Oregon Administrative Rule 635-007-0505(8)(b)). Recommendations 1–6 are meant to facilitate the scientific review process and are pertinent to the draft Rogue River spring Chinook conservation plan and future ODFW native fish recovery and conservation plans.

**Recommendation 1. IMST recommends that ODFW's native fish conservation plans should contain sufficient information on data, data analysis, variance estimates and other critical information, to demonstrate whether or not the plans are scientifically rigorous.**

**Recommendation 2. IMST recommends that ODFW should follow steps to ensure statistical best practices are used in the conservation planning process.**

**Recommendation 3. IMST recommends that ODFW should include measurements of habitat variables as well as monitoring of fish abundances.**

**Recommendation 4. IMST recommends that ODFW investigate alternative models and relationships to explain trends and variability in observed data. For example, straight-line models might not be the "best fit"(e.g., Figures 5–7).**

**Recommendation 5. IMST recommends that ODFW should provide clearly defined measures and criteria for recovery in all conservation plans.**

**Recommendation 6. IMST recommends that ODFW should not recommend the killing of native predators without adequate research on the effectiveness of predator control. Control of non-native species should include both non-game and game fish.**

**Recommendation 7. IMST recommends that if Lost Creek Dam is the factor most strongly associated with the decline of spring Chinook salmon in the Rogue River, ODFW should list and evaluate all options relative to retention and operation of the project and prioritize those that would most benefit naturally produced spring Chinook salmon.**

## LITERATURE CITED

Gotteli, N.J. and A.M. Ellison. 2004. A Primer of Ecological Statistics. Sinauer Associates, Inc. Sunderland, Massachusetts.

Hankin, D.G. and M.C. Healy. 1986. Dependence of exploitation rates for maximum yield and stock collapse on age and sex structure of chinook salmon (*Oncorhynchus tshawytscha*) stocks. Canadian Journal of Fisheries and Aquatic Sciences. 43: 1746–358.

Independent Science Advisory Board (ISAB). 2007. Climate change impacts on Columbia River basin fish and wildlife. ISAB report # 2007-2. Northwest Power and Conservation Council. Portland, OR.

McGarvey, D.J. 2007. Merging precaution with sound science under the Endangered Species Act. BioScience. 57(1): 65–70.

McIntosh, B.A., J.R. Sedell, R.F. Thurow, S.E. Clarke, and G.L. Chanlder. 2000. Historical changes in pool habitats in the Columbia River basin. Ecological Applications. 10(5): 1478–1496.

Nelson, J. S., E.J. Crossman, H. Espinosa-Perez, L.T. Findley, C.R. Gilbert, R.N. Lea, and J.D. Williams. 2003. The "names of fishes" list, including recommended changes in fish names: Chinook salmon for chinook salmon, and *Sander* to replace *Stizostedion* for the sauger and walleye. Fisheries 28(7):38-39.

Peterson, W.T., Hooff, R.C., Morgan, C.A., Hunter, K.L., Casillas, E., and Ferguson, J.W. 2006. Ocean conditions and salmon survival in the Northern California current. http://www.nwfsc.noaa.gov/research/divisions/fed/ecosysrep.pdf.

Ramsey, F. and D. Schafer. 2002. The Statistical Sleuth: A Course in Methods of Data Analysis. Thomson Learning, Duxbury. Pacific Grove, CA.

## APPENDIX A: Recommendation Background

The IMST creates several types of reports[1]. The largest reports are created in response to the IMST's continuing evaluation of the State's science needs necessary to pursue the mission and goals of the Oregon Plan for Salmon and Watersheds (Oregon Plan). These reports are generally topic-oriented and often called "landscape-level reports". An example of this type of report is Technical Report 2002-1, *Recovery of Wild Salmonids in Western Oregon Lowlands*. The landscape-level reports present IMST's independent evaluation of the state of the science regarding the resources being considered and support the evaluations with a comprehensive scientific literature review. These reports also receive extensive peer and technical review[2].

A second type of report the IMST generates is in response to specific requests by the Governor's Office, Legislature, state agency, or other entity to either provide guidance or to review draft reports or proposals involving topics related to the Oregon Plan. An example of this type of report is our 2005 evaluation of the State of Oregon's draft *Viability Criteria and Status Assessment of Oregon Coastal Coho*, the draft *Policy to Evaluate Conservation Efforts (PECE) analysis*, and the draft *Synthesis of Viability Analysis and Evaluation of Conservation Efforts*. A third type of report is called a "letter report" that may be prepared in response to specific questions, such as IMST's 2002 report addressing issues related to instream aggregate (gravel and sand) mining regulated by the Oregon Division of State Lands and how operations may affect salmonid habitat.

In the second and third types of reports, the IMST is often asked whether the scientific approach, analyses, and/or interpretations are credible and consistent with accepted scientific standards, and whether the assumptions and uncertainties are reasonable and accurately characterized. In both of these two types of reports, the IMST generally evaluates the scientific literature being used to support the agency's or State of Oregon's draft report or proposed actions, rather than produce a comprehensive review of available scientific literature.

Depending on the nature of the report being generated (more commonly contained in the landscape-level reports), the IMST may develop a series of scientific questions and answers that help to organize the report and to aid a reader's understanding of the topic. The scientific questions are created by the IMST and are judged to be relevant and useful to understanding the issues, resources or subjects being analyzed. In general, IMST develops and answers each science question, then summarizes its findings and conclusions for each question. Next, the IMST develops recommendations from specific findings and conclusions or from a synthesis of several findings and conclusions. The recommendations are often grouped into broad subject areas for convenience and the

[1] All three types of reports are an undertaking of the entire Team, although subcommittees often are assigned leading responsibilities; subcommittee composition is based on Team member expertise and interest with topic areas. Minority opinions may be appended or incorporated within any IMST report.
[2] Although technical reports may be subject to technical and peer review, release of draft documents is restricted by the IMST in order to insure accuracy of content prior to release to a wider audience. IMST's policy is stated in the Team's Charter and Operating Guidelines: http://www.fsl.orst.edu/imst/charter.pdf

order does not imply priority. The IMST considers each recommendation important to accomplishing the mission and goals of the Oregon Plan.

Recommendations are based on IMST's assessment of the best available science pertaining to salmonid recovery, watershed function and the management of Oregon's natural resources. Recommendations are directed to one or more agencies (or entities) that have the ability to implement, or alter management actions or regulations that are needed for implementation. **The IMST emphasizes that it looks beyond the State's *current* ability to implement the recommendations because current legal, regulatory, or funding situations may need to be modified over time.** The IMST's believes that if an agency (or entity) agrees that a recommendation is technically sound and would aid the recovery of salmonid stocks and watersheds, the agency (or entity) would then determine what impediments might exist to prevent or delay implementation and work toward eliminating those impediments. The IMST also assumes that each agency (or entity) has the knowledge and expertise to determine how best to identify and eliminate impediments to implementation and to determine appropriate time frames and goals needed to meet the intent of the recommendation. The IMST also recognizes that an agency (or entity) may already have ongoing activities that address a particular recommendation; therefore, inclusion of such an "overlapping" recommendation should be seen as reinforcement for the continuation of such actions.

**Formal Responses to Recommendations**

Oregon Revised Statute (ORS) 541.409, which created the IMST, specifies that agencies are to respond to the recommendations of the IMST, stating "(3) If the Independent Multidisciplinary Science Team submits suggestions to an agency responsible for implementing a portion of the Oregon Plan, the agency shall respond to the Team explaining how the agency intends to implement the suggestion or why the agency does not intend to implement the suggestion". State agencies are expected to formerly respond to IMST recommendations within six months after a report is issued.

Once formal responses are received, the IMST reviews the scientific adequacy of each response and determines if further action or consideration by the agency (or entity) is warranted. Ultimately, each recommendation response is assigned to one of four general categories:

- **Adequate** means that the IMST supports the decision of the agency
- **Intermediate** means that the IMST does not fully support the agency decision because the decision will decrease the likelihood of accomplishing the goals of the Oregon Plan in a timely manner, but not doom it to failure. IMST notes its concerns but stops short of suggesting that the recommendation be reconsidered.
- **Inadequate** means that the IMST feels the decision by the agency will seriously detract from achieving the goals of the Oregon Plan, and the IMST strongly suggests that the decision be reconsidered.

- **Indeterminate** means that IMST cannot tell what the agency decided to do with the recommendation, or lacks sufficient information to fully evaluate the response.

IMST believes that the key characteristics of a good response are:

- It includes a short, clear statement that the agency (or entity) (a) accepts or agrees with the recommendation or (b) that it rejects or disagrees with it. In some cases, an agency (or entity) may be reluctant to agree or accept a recommendation because it sees significant difficulties in implementing it. However, IMST believes if the recommendation is sound, then the agency (or entity) should work towards eliminating the impediments to implementation that it sees.
- It provides short, clear descriptions of what the agency (or entity) intends to do to implement recommendations it accepts (including how it might remove impediments) or, as required by ORS 541.409, that it provides specific reasons why it rejects the recommendations. Discussion betweens agency or legislative staff and Team members at IMST meetings should also help clarify agency (or entity) and IMST perspectives, and most importantly, advance the mission and goals of the Oregon Plan.

Responses that include these characteristics will be more easily characterized by IMST as ***Adequate, Intermediate*** or ***Inadequate***, avoiding the use of ***Indeterminate.***

The IMST evaluations of the responses are then delivered to each responding state agency (or entity) and the agency (or entity) has an opportunity to discuss the IMST evaluations of their responses. Agencies (or entities) are also encouraged to update the IMST their progress on implementing recommendations.

Finally, IMST includes any formal responses to recommendations and IMST's evaluation of the responses in its reports to the Governor and the State Legislature (e.g., Joint Committee on Salmon and Stream Enhancement or other natural resource committees as appropriate).