MEMORANDUM

To: Broad Sense Recovery Group Members
From: Willamette/Lower Columbia Technical Recovery Team
Re: Results of the June 16-17 TRT Meeting to Evaluate the Status of Selected Listed Salmonid Populations in the Lewis River Basin
Date: July 7, 2003

On June 16th and 17th, the Willamette/Lower Columbia Technical Recovery Team met to evaluate the status of listed salmonid populations in the Lewis River Basin. The purpose of this evaluation was to provide an initial assessment of population status to assist in recovery planning, rather than to estimate each population's contribution to the extinction risk of the entire ESU. Another purpose was to test the method for evaluating population status proposed by the TRT in its Interim Report on Viability Criteria (March 2003). This memo includes: a discussion of the evaluation process in regard to critical assumptions necessary for predicting future extinction risks; suggested modifications and clarifications to the protocol described in the Interim Report; draft assessments of the status for a select number of populations in the Lewis River Basin; and a few suggested next steps.

I. Assumptions

A key issue in predicting long-term extinction risk is the assumption about future conditions and population performance. Assumptions regarding future condition are related to the modeling concept of "stationarity." Stationarity is an assumption common to predictive models and is predicated on the idea that a given set of conditions will persist unchanged into the future. The set of assumptions that describe the stationary condition could be fairly simple, such as the assumption that a linear trend will continue into the future, or they can be rather complex, such as an assumption involving long-period environmental cycles (e.g., cycles in marine survival of salmon). An evaluation of extinction risk is meaningful only to the extent that the assumptions about future condition are correct. For example, an estimation of extinction risk based on the assumption that a recently observed linear trend in abundance will continue would be inaccurate if an impassable barrier were built that blocked habitat to a population. In this case, the assumption that the recent trend describes stationary conditions would have been violated.

The TRT assessed abundance and productivity parameters using models with at variety of assumptions about future condition. One common assumption was that that the recent past represents a stationary condition regarding trends and variability in abundance. This assumption was modified with a generally qualitative incorporation of long-period cycles in marine survival. For all the population attributes, assumptions about future condition included natural cycles and natural ecological variation in physical and biotic interactions. Assumptions about future condition were also necessarily made about management actions. For example, in reviewing the status of late-fall run chinook salmon (brights) it was assumed that the current regulated flow regime from Merwin Dam would continue into the future. Where there have been recent changes in the causal factors influencing the viability attributes, and those changes have predictable consequences, it may be more appropriate to base extinction risks on short term rather than long term trends. For example, if harvest intensity has been reduced during the last few years (through the initiation of selective fisheries or an overall reduction in harvest rate)

trends based on recent harvest rates would be more useful than those incorporating historical high harvest rates. Assumptions about the future regarding habitat quantity and quantity are particularly challenging, since habitat has shown a trend (or discontinuous downward bumps) in the recent past and it is likely that habitat will change in the future. However, it is generally difficult to predict the magnitude or even direction of future habitat change. The assumption that habitat will remain "exactly as it is now" is likely to be violated and would not produce a very accurate evaluation of future extinction risk. In addition, such an assumption is inconsistent with the approach for assessing abundance and productivity. Since the abundance and productivity analysis assumes recent trends in abundance will continue, there is an implicit assumption that any trends in habitat change that affect abundance will also continue.

The TRT believes that all assumptions about future condition need to be extremely explicit and determining the assumption set will likely occur on a population-by-population basis. There is no easy solution to problems in setting assumptions about future conditions, but it is critical that the evaluation be transparent.

II. Modifications and Clarifications of the Evaluation Procedures

The meeting of June 16th and 17th provided the TRT the first opportunity to concretely assess the protocol used to determine population status. During the course of the meeting, it was evident that some of the "rules" needed clarification, and in some cases the protocol needed to be modified.

A. Juvenile Outmigrant Evaluation

An important modification discussed by the TRT was interim elimination of the Juvenile Outmigrant (JOM) status determination for those populations with insufficient information available to undertake any meaningful evaluation of JOM status. Under the guidelines established by the TRT, there would have been substantial reductions in the JOM viability level due to uncertainty from poor data or absent data. The TRT did not feel that it was appropriate at this time to modify population viability levels for poor JOM data. Therefore, where possible, whoever is scoring should evaluate population viability using all five characteristics with a weighting of:

$$Population = \frac{2(Abundance\ \&\ productivity) + JOM + Diversity + SpatialStructure + Habitat}{6}$$

However, if whoever is scoring determines that insufficient information is available to make even a cursory evaluation of JOM status, population viability should be determined using the formula:

$$Population = \frac{2(Abundance\ \&\ productivity) + Diversity + SpatialStructure + Habitat}{5}.$$

The TRT agreed that this modification is an interim measure, and they reiterated the importance of JOM measurements in evaluating population viability. The TRT anticipates the incorporation of JOM monitoring in recovery plans, and would include JOM status (and appropriate reductions) in future evaluations of all populations.

B. "Zero Rule", No data

During the initial development of procedures for determining Viability, the TRT established a "Zero rule", in which a population's overall viability score would be zero if a single viability attribute level were determined to be zero. In situations where there is no information for a specific viability attribute, it was usually possible to infer information from other viability attribute (although there would be considerable uncertainty in the risk determination and most probably a very low data quality determination). Thus, it was unlikely that when a large body of experts, each with ten viability votes, evaluated a population that all of them would concur on a zero determination, so the "zero rule, was unlikely to ever be invoked, unless a population had been extirpated. Additionally, the "Zero rule" could result in a loss of information about a population. The TRT agreed that the "Zero Rule" should be eliminated from the evaluation procedure.

C. Habitat Evaluation

There was extensive discussion among TRT members regarding evaluation of freshwater habitat. Specifically, whether the attribute should be considered in the context of existing accessible habitat or whether the existing conditions across the historical range of a population should be considered. The TRT concluded that accessible habitat should be evaluated as the determination of a population's viability level and that, until such time as passage was provided beyond any impassable barriers, only accessible portions would be evaluated. Areas above impassable barriers might be considered if they had a significant impact on water quality in a basin. However, the TRT also concluded that it would be useful to include an evaluation of habitat conditions within the historical range (including above presently impassable barriers) as a part of the characterization of limiting factors.

The TRT recognized the value in assessing habitat above barriers to determine if that habitat could contribute to meeting viability goals.

D. Spatial Structure

Although the TRT had originally recognized a considerable overlap in the habitat and spatial structure determinations, it was concluded that the definition for spatial structure criteria needed to be more focused to further reduce redundancy. Some overlap or correlation between viability categories is to be expected and cannot be eliminated. In general, spatial structure is a "fish-centric" attribute, whereas habitat describes biotic and abiotic attributes. There is some correlation in the two characters, in that spatial structure describes, in part, the effect of habitat quality. The TRT revised the definition of spatial structure to include: the distribution of fish (range and quantity), connectivity between fish aggregations within a population, and the susceptibility of the population to catastrophic events. By default, this means that quality of habitat will be explicitly incorporated in development of the Habitat attribute evaluation.

E. Use of Models in Describing and Predicting Population Viability:

The TRT review of viability status for Lewis River salmonid populations utilized a number of different descriptive models. While the TRT found these models generally useful in the

determination of population viability, there was some concern that the assumptions and uncertainties underlying each model were not necessarily transparent. Ricker, Beverton-Holt, or "hockey-stick" based population models give very different estimates of carrying capacity and intrinsic productivity, depending on the characteristics of the available data set. Furthermore, the accuracy of the model parameters is also dependant on the characteristics of the data available. Model selection for any population should be based on a combination of statistical rigor and precautionary approach. However, it was noted that there was inherent value in seeing the results of different models, and when possible multiple models should be presented.

Finally, the TRT analysis utilized models under varying assumptions, such as with or without harvest. This approach provided additional information about the status of a population and the sensitivity of a population to various factors for decline (similar to comparisons of accessible and historical habitat).

F. Data Quality

A key element in characterizing each of the Viability criteria was determining the quality of the data available. In determining the status of Lewis River populations, different members of the TRT initially gave the same information substantially different quality ratings. Further discussion by the TRT was necessary to standardize these ratings; however, it was clear that specific guidelines should be provided for evaluating data quality. Several specific rating rubrics were suggested for different types of data (trends, abundance, age structure, etc); however, for convenience a generalized rubric is provided below, with specific suggestions provided in the appendix.

Data Quality Rating	Description
4	Empirical data acquired through established standardized procedures. Extensive sampling across a number of sample periods. For characters such as habitat, spatial structure, and diversity a number of different components have been sampled. Uncertainty in data has been quantified.
3	Mixture of empirical and expanded data. Coverage could be intensive for a few years or less intensive for a longer period. Systematic sampling procedures. For characters such as habitat, spatial structure, and diversity a limited number of components have been sampled. Some quantitative assessment of data quality.
2	Primarily expanded data. Coverage may be intermittent over a number of years. Sampling limited in frequency and intensity. Uncertainty in data only qualitatively assessed.
1	Some expanded data, some information from correlated characters or similar populations. Coverage only for a limited number of years and using simplified procedures.
0	No data available.

In discussing each population, the source and accuracy of the information used should be made available to the reviewers. The TRT agreed that, as much as is possible, the information on each

population be presented in a standardized template. The format and contents of this template are currently being reviewed by members of the TRT. Further, it was considered essential that much of the information be made available to reviewers well ahead of the actual determination. Having the information in a standardized template would speed the review process and help to minimize inconsistencies.

III. Population Scores

As a result of the meeting, several populations from the Lewis River Basin were evaluated. The status determinations presented below represent the opinions of a limited number of TRT members and are not necessarily representative of the entire TRT. Further, it was the intent of the TRT members present to revise their determinations, where necessary, following a general discussion of the assumptions and criteria used. For example, in evaluating the Lewis River late-fall run (brights) chinook salmon several TRT members evaluated habitat using conditions in the historical range, while other considered only accessible habitat. The scores presented do not reflect a standardized evaluation using the guidelines set forth in this memo. Additionally, the TRT members present included an estimate of the overall population status. This estimate is not intended for incorporation into the viability determination, but was useful in validating the procedure.

Population Attribute Evaluations and Data Quality

Note: *Numbers listed below each Risk category reflect the distribution of category characterizations (as a percentage of the total scores).*

Chum Salmon

Attribute / Risk Category	0.00	1.00	2.00	3.00	4.00	Attribute Average	Data Quality
Productivity	79	21	00	00	00	0.21	1.86
JOM	Not Scored	Not Scored	Not Scored	Not Scored	Not Scored	Not Scored	Not Scored
Diversity	4	41	41	13	00	1.63	1.71
Habitat	20	54	23	4	00	1.13	2.43
Spatial Structure	20	27	29	24	00	1.57	2.14

Population Risk Category	Population Estimate	Overall Estimate
	0.95	1.17

Spring-run Chinook Salmon

Attribute / Risk Category	0.00	1.00	2.00	3.00	4.00	Attribute Average	Data Quality
Productivity	90	10	00	00	00	0.10	2.17
JOM	Not Scored	Not Scored	Not Scored	Not Scored	Not Scored	Not Scored	Not Scored
Diversity	25	60	15	00	00	0.90	1.50
Habitat	68	32	0.00	00	00	0.32	3.00
Spatial Structure	83	17	00	00	00	0.17	3.17

Population Risk Category	Population Estimate	Overall Estimate
	0.32	1.02

Early (tule) Fall-run Chinook Salmon

Attribute Risk Category	0.00	1.00	2.00	3.00	4.00	Attribute Average	Data Quality
Productivity	00	50	43	8	00	1.58	2.00
JOM	00	100	00	00	00	1.00	1.00
Diversity	00	15	65	20	00	2.05	2.00
Habitat	00	20	60	20	00	2.00	2.00
Spatial Structure	00	15	50	35	00	2.20	2.50

Population Risk Category	Population Estimate	Overall Estimate
	1.88	1.80

Late (Bright) Fall-run Chinook Salmon

Attribute Risk Category	0.00	1.00	2.00	3.00	4.00	Attribute Average	Data Quality
Productivity	00	5	27	53	15	2.78	2.67
JOM	00	5	30	47	18	2.78	2.17
Diversity	00	7	33	53	7	2.60	2.83
Habitat	00	13	55	28	3	2.22	2.67
Spatial Structure	00	28	52	20	00	1.92	3.00

Population Risk Category	Population Estimate	Overall Estimate
	2.51	2.58

IV. Next Steps

After this scoring exercise the TRT concluded there was a need for additional work on delisting criteria and data needs for population and habitat evaluation. The TRT suggestions of next steps include:

1) Determine data needs to evaluate future trends in habitat conditions.
2) Modify JOM criteria to distinguish trend analysis from data quality effects.
3) Develop specific data quality metrics for each population attribute.

In addition, the TRT recognized the need to discuss with Ex Com members the best approach to completing the task of scoring current population status. Considerations will include who will do the evaluation (TRT or others) and when.