Columbia-Snake River Irrigators Association
Eastern Oregon Irrigators Association
Policy Memorandum

DATE: April 28, 2000

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SUBJECT: Comments on the Corps Lower Snake River Juvenile Salmon Migration Draft Environmental Impact Statement

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The CSRIA and EOIA have previously provided to your staff policy/technical comments on the Snake River Draft EIS. The following are additional technical comments and reports that we desire to have placed on the formal comment record:

- Anderson, J. J. 2000. Comments on the Draft Lower Snake River Juvenile Salmon Migration Feasibility Report/Environmental Impact Statement: Appendix A, Anadromous Fish (December 1999). Columbia Basin Research Center, University of Washington, Seattle, Washington.

1 - Pizzimenti, J. J. 2000. Review of the USACE Draft EIS, Lower Snake River Juvenile Salmon Migration Feasibility Report, December 1999. Harza Engineering Company, Portland, Oregon Office.

- Olsen, D., J. Anderson, and P. Pizzimenti. 1998. The Columbia-Snake River Flow Targets/Augmentation Program, A White Paper Review with Recommendations for Decision makers. Prepared by the Pacific Northwest Project, Kennewick, Washington.

- Olsen, D. and J. Richards. 1994. Inter-Basin Comparison Study, Columbia River Salmon Production Compared to Other West Cost Production Areas, Phase II Analysis. Prepared by the Pacific Northwest Project, Kennewick, Washington.

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Comments on the DRAFT Lower Snake River Juvenile Salmon Migration Feasibility Report/ Environmental Impact Statement: Appendix A, Anadromous Fish (December 1999)

by

James J. Anderson

April 2000

The Anadromous Fish Appendix provides a clear and balanced description of the PATH and CRI analyses of Snake River salmon alternative actions. However, recent studies and fish returns not available to the analyses present a significantly different scenario than the ones from PATH and CRI. As a result, the analysis of the recovery actions considered in the Anadromous Fish Appendix is not complete and the actions themselves may not be appropriate for the situation with improved ocean conditions and increased returns of salmon.

The A-Fish Appendix analyses are not up-to-date

The Anadromous Fish Appendix (US Army Corps 1999) considered PATH (Marmorek et al 1998, 1999) and CRI (CRI 2000) analyses of the alternative recovery actions; leaving the hydrosystem as is, improvements in passage and transportation conditions, and dam breaching. The analyses reached very different conclusions as to the effectiveness of these actions. PATH concluded that breaching the lower Snake River dams provides the best chance of recovering chinook. The CRI analysis suggested that
2 salmon are in a dire condition and breaching alone will not recover them. These contradictory results were based on different sets of data representing different conditions and assumptions. Since the studies continue to advance our knowledge and the environment continues to change, it is not unusual that the PATH and CRI analyses arrived at different conclusions. The essential point is that the scientific analyses on which the Anadromous Fish Appendix is based are simply not up-to-date and reflective of the current state of the system.

Transportation effectiveness

PATH concluded that dam breaching would recover the runs, while the CRI analysis
3 indicates that breaching alone would not recover the runs. The reasons for these differences involve the data used in the models and the assumptions on what happen with

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dam breaching and transportation. The PATH optimistic analysis is based on the belief that hydrosystem passage survival is low and transportation lowers fish vitality so they die in the estuary and ocean, in what is referred to as differential delayed mortality, designated D in the models. It is the ratio of the post Bonneville survival of transported fish relative to the post Bonneville survival of in-river passing fish. A low D value means low transport survival. In the 1998 report for spring/summer chinook, PATH favored low D values (about 0.3) and low in-river passage survival (about 20 to 30%). In this scenario, breaching dams stops ineffective fish barging and doubles in-river survival so the stocks recover quickly. The CRI analysis is based on the recent survival studies not incorporated in PATH. These new survival studies show smolt passage survival is about twice what was favored by PATH. Furthermore, results from recent transportation studies suggest that D is over twice (D = 0.8) the level favored by PATH. Thus, the CRI model has low mortality in transportation and dam passage so removing these passage factors does not significantly improve survival and does not recover fish.

Because the Anadromous Fish Appendix is based the outdated PATH analyses, it leaves the reader with the impression that all values of D are equally likely, so the effectiveness of transportation is highly uncertain. This is not the case. The low passage survivals and D values used in PATH have been largely discarded in the recent analyses. Furthermore, a recent analysis showed that the mathematical techniques used in PATH to estimate D were flawed, making Ds based on the studies in the 1970s and 1980s unusable (Anderson 1999). In the newer analyses, only the PIT tag studies have been used (Shaller et al 1999, CRI 2000). The old estimates of D in PATH ranged between 0.3 and 0.66. The new "best" estimates range between 0.59 and 0.8. This convergence is important because, as the analyses assume higher in-river survivals and D values, the benefits of dam breaching diminish and for D values about 0.8 breaching is worse than transportation.

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Extinction estimates

The Anadromous fish Appendix reports the CRI 24 and 100-years extinction estimates for Snake River spring/summer chinook spawner. The analysis is based on a simple extinction model and the CRI report goes into detail addressing the assumptions of the model. In actuality, few of the technical issues raised by critics and by the CRI itself are germane to whether or not the estimated extinction risks are realistic. That is, observation errors, positive or negative effects of density dependence on productivity, effects of fish maturation rates, and the definition of extinction are all relatively inconsequential to the conclusions of the analysis.

The single most important factor in the analysis is the use of spawner/recruit time series between 1980 and 1994. This 15-year data series is within a multi-decadal cyclic ocean regime *unfavorable* to the survival of salmon in the Pacific Northwest (Hare, Mantua and Francis1999, Anderson 2000). Therefore, the extinction projections developed by CRI are unrealistic worst-*case* scenarios.

Do these worst-case predictions have value to decision-makers? The 24-year predictions have value if they are updated with the most recent information on the condition of the stocks and the ocean. A 100-year prediction based on 15 years of data has little value and in fact, the analysis in the Anadromous Fish Appendix substantially biases the perceived risk to the stocks. It ignores a major driving force of the stocks-- variability in salmon productivity resulting from decadal scale ocean cycles.

To illustrate the problem, note that the CRI analysis says that two out of the seven Snake River spring/summer chinook index stocks have 5 to 10% chance of extinction over the next 24 years and four of the seven stocks have a high probability of extinction over 100 years. Thus, if the 1980-1994 trend continues, the stocks are in dire condition; however, if the conditions change the extinction probability changes. To demonstrate the possibilities assume that the survivals experienced in the early 1980s, when the stocks temporary increased, were repeated in the period 1995 through 1999. Note that the CRI data says nothing about these brood years since its data ends in 1994. To make the last
4 five years like the early 1980s, spawners for each index stock from 1995-1999 are
cont. multiplied by the spawner/recruit ratio of the index stocks from 1980-1984. Using this hypothetical time series in the extinction model, the chance of extinction is zero over 24 years and only one of the seven index stocks has a chance of extinction over 100 years.

This exercise illustrates the sensitivity of the extinction model to the data. In particular, the Dennis (1991) extinction model, which is the foundation of the CRI analysis, is highly sensititive to the last data point in the series. The mean rate of change in the population is determined by the difference between the first and last data points (Hinrichsen, R. personal communication). Thus, CRI extinction predictions depend strongly on whether or not 1994 was a good or a bad year. Clearly, this is not a good method to predict the chance of the stocks' existence in the year 2094.

Finally and mostly important, the CRI extinction predictions, are based on stock performance over 15 years of anomalously warm ocean conditions, while in fact the ocean and the fish runs have improved considerably subsequent to years used in the CRI analysis.

Recent fish returns are not considered in the A-fish Appendix

The spawner-recruit data used in the Anadromous Fish Appendix goes through brood year 1994 and presents a bleak picture for the salmon. Fortunately, the newest information on the status of the runs and the ocean suggests a very different situation. Data from 1997 through 2000 show dramatic improvements in early ocean survival and returns of salmon.

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Ocean survival was good in 1997: Survival of wild Snake River spring/summer chinook improved by a factor of three or more over the returns of the early 1990s. Based on returns of the 2-ocean fish, fish migrating in 1997 have a smolt to adult ratio (SAR) of 1.55% (Williams personal communication). The return of the 3-ocean fish should increase the SAR to 3 or possibly 4%. In comparison, SARs in the early 90s were about 0.5%.

Further evidence for good survival comes from the early returning males (jacks). The percent of jack returns from the 1997 smolt outmigration was twice the1992-1996 average (DART 2000).

Ocean survival in 1998 was better: The percent of jack returns from the 1998 smolt migration was twelve times the1992 –1996 average (DART 2000).

Good survivals in 1997 and 1998 produce good returns in 2000: Good survivals during smolt ocean entry in 1997 and 1998 equate to good returns of 2- and 3-ocean fish this year. Through April 25 alone, the adult spring chinook passage at Bonneville dam was 50% greater than the averaged total seasonal return over the past 10 years (Figure 1).

Furthermore, for this year the one-day maximum of 8635 adults was nearly equal to the entire 12000 fish return in 1995. The return from 1995 came from the 1992 and 1993 out-migrations, which figured significantly in the CRI extinction analysis.

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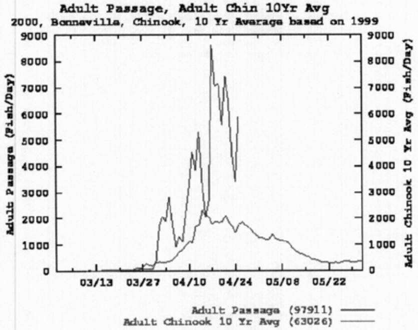

Figure 1. Spring chinook adult returns past Bonneville Dam. Through April 25, the total return was 50% larger than the entire 10-year averaged run (From DART).

Ocean survival in 1999 looks like the best yet: Through April 25, the jack return was ten times the 1999 return to this date (Figure 2). This is particularly striking since the 1999 return was the best since jacks were recorded in 1977.

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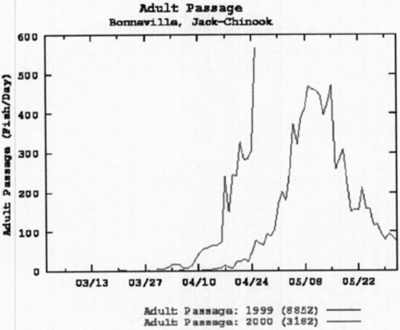

Figure 2 Spring chinook jack passage at Bonneville Dam. For 2000, passage through April 25 was ten times larger than through the same date in 1999.

Adult returns next year could be very large: Based on the record returns of jacks last year and the 3 to possibly 10 fold increase in jacks this year, it is possible that very large numbers of spring chinook will return to the Columbia River over the next few years.

Ocean evidence is not considered in the A-fish Appendix

The working hypothesis is that these increased returns are the result of the Eastern North Pacific returning to the cool surface water regime favorable to Columbia River salmon (Anderson 2000, Hare, Mantua and Francis1999). There is evidence for this.

6 **Zooplankton species changed**: Off Oregon "warm water" zooplankton species common year-round throughout most of the 1990s were consistent with weak, but persistent, El Niño conditions throughout this period. However, in May 1999 "cold water" species dominated solely. The switch may be ephemeral, due entirely to the present La Niña, or it could be a harbinger of another climate shift in the northern California Current (Peterson 2000).

The ocean is cooler: The Pacific Decadal Oscillation index (PDO), which is an indicator of ocean regime shifts (Hare, Mantua and Francis1999), exhibited a major shift into the negative condition favorable to west coast salmon production. The reversal in 1998 is representative of cooler coastal waters off the Columbia River.

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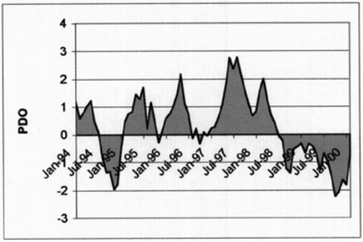

Figure 3. Monthly PDO pattern showing a reversal in the ocean conditions. This reversal may possibly indicate an ocean regime shift.

The cool ocean should persist: The eastern North Pacific region is under the influence of cold surface temperature anomalies that will persist beyond the current La Niña. These conditions will result in the fertilization of surface layers (Freeland 2000).

A regime shift: Scientists at the Jet Propulsion Laboratory in Pasadena, studying the satellite observations of Pacific sea-surface data, have observed a multiple-year trend that may represent an ocean regime shift (JPL 2000). Many reports from the March 2000 conference of the North Pacific marine community (PICES 2000) support this suggestion.

Important actions are not considered in the A-fish Appendix

7 The analyses and recovery actions discussed in the Anadromous Fish Appendix are based on the premise that the Snake River Stocks are in dire condition and may require immediate and extensive measures to keep them from going extinct. The fish returns themselves, collaborated by the recent ocean studies, suggest that over the next few years, and, possibly longer, the stocks will return in significantly higher numbers than anyone imagined previously. This divergence between analysis and reality should alert the region to carefully reevaluate the recovery strategies. While the region has been actively debating dam removal, additional flow augmentation, and moratoriums on water withdrawals, this new information presents a very different set of challenges and considerations. Below are three actions that warrant further consideration with of increased returns.

Separate Harvest

First, fish managers must be prepared for the increasing demand for harvest of these returning stocks. Although it is good that this year's returns are strong and even larger returns are possible next year, this does not necessarily mean wild stocks will benefit. The runs may reach the levels of the1960s and 70s, but whereas before they were mostly of wild fish, today about 90% of the run is of hatchery fish. Increasing harvest on the abundant hatchery runs can overharvest weaker wild runs. If this happens, the benefits of good ocean conditions may be lost and we will have missed a valuable opportunity to improve the endangered stocks.

8 However, it is not simply enough to restrict all harvest, because with improved ocean conditions the hatchery capacities can be exceeded, forcing the hatchery fish to spawn in the streams. Under some circumstances, this spawning might weaken the wild fish through interbreeding and competition for stream resources. Thus, ideally, the hatchery fish need to be selectively harvested, leaving the wild fish to spawn.

Effective selective harvest of hatchery fish requires two factors: all hatchery fish need to be marked, and live capture harvest techniques need to be used on the fisheries. Currently neither of these conditions are imposed. A substantial number of hatchery fish are not marked and few of the fisheries use live capture techniques.

Improve hatchery practices and reduce hatchery output

Increased ocean survival presents a special problem for hatcheries. Over the last two decades, hatchery returns have declined and so the hatchery managers have increased the production of smolts. Under better ocean conditions high smolt production can result in returns exceeding hatchery capacity, causing the adults to spawn in the river with the
9 wild stocks. Although this may be beneficial for hatcheries with brood stocks that closely match their associated native stocks, it can be detrimental if the hatchery and native stocks are different. To deal with these problems, hatchery managers may need to reduce smolt output in the next few years and begin to aggressively improve hatchery management with the goal of producing smolts that are genetically and behaviorally compatible with the native stocks.

Reduce flow augmentation

Flow augmentation is not addressed in the Anadromous Fish Appendix. It should be included since augmentation is a major Lower Snake River mitigation action and the continuation or modification of augmentation with the different alternatives has not been considered. Studies have failed to show a relationship between flow and smolt survival
10 within the hydrosystem (NMFS 2000, Olsen et al 1998). Furthermore, a relationship between flow and survival cannot be simply extrapolated to a relationship between flow augmentation and survival. This was demonstrated in an analysis of summer flow augmentation from the Hells Canyon complex. This augmentation increases water temperature and increases the predation rate on the smolts (Anderson, Hinrichsen and Van Holmes 2000). Eliminating summer augmentation from the Snake River dams will improve fish survival.

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(Note this document has gone through several drafts and corrections Initial draft set the best estimate of D at 0.4. The last Draft in 2000 set the estimate at D = 0.59)

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