

State and Local Government Agencies — SL

COMMENT SL 01



STATE OF WASHINGTON

DEPARTMENT OF ECOLOGY

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April 1, 2003

Mr. Jim Blanchard
Special Projects Officer
Ephrata Field Office
Bureau of Reclamation
Box 815
Ephrata, WA 98823

Dear Mr. Blanchard:

Thank you for the opportunity to comment on the draft environmental impact statement for the Banks Lake Drawdown. The following comments are presented after reviewing the EIS prepared by the U.S. Bureau of Reclamation, examining potential environmental impacts from a proposed annual drawdown of Banks Lake to supplement late summer flows in the Columbia River, to enhance migration of anadromous salmon smolts and adults. The drawdown is proposed in accordance with the Biological Opinion released by NMFS (now NOAA Fisheries) in December 2000.

Banks Lake lies primarily within Grant County, but also Douglas County and the municipalities of Coulee City and Electric City, which operate boat launches and marinas, as do the state agencies, Washington Department of Fish and Wildlife (WDFW) and Washington State Parks and Recreation Commission (SPRC).

Water Quality

The Draft EIS evaluates impacts to water quality on Banks Lake but does not sufficiently evaluate potential water quality impacts to the Columbia River mainstem below Grand Coulee Dam, Banks Lake, nor the watershed below Banks Lake. In general, potential impacts to water quality need to be more thoroughly investigated before we can lend our full support to the proposal.

Columbia River –

In theory, Banks Lake drawdown early uniform and late scenarios would uphold Clean Water Act goals in providing better flows for juvenile migrating salmon in August and early September. In terms of Columbia River mainstem water quality, our program should lend support these efforts provided that:

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- The increased flows can be shown not cause increases in gas supersaturation above water quality standards.
- The increased flows do not cause increases in temperatures above water quality standards. If these flows are shown to actually have the potential to decrease water quality standards violations for this time of year, our support for this proposal would be strengthened.
- The increased flows can be shown to not increase peaking at the powerhouses, especially at Priest Rapids Dam. The discussion of the cost of replacing power loss by each dam could be clearer. It would seem that there is no net loss of water available to generate hydropower and so the economic exercise is based on speculation of power rates at different times of the year.

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Banks Lake –

The operation proposed involves decreasing the diversion from Lake FDR to Banks, so that irrigation releases provide drawdown. The EIS claims that irrigation releases are from the bottom and generally stay cool.

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The overall effect of the drawdown described is to increase the average heating of Banks Lake due to the smaller volume of water subject to a fairly constant solar heating. The different draw down scenarios would put differing amounts of cool Lake FDR water into Banks, which would at least partially offset the increased heating. However, information about how Banks Lake functions with regard to hydrology and temperature is fairly limited. The analysis appears to be qualitative. We recommend that comprehensive monitoring and modeling effort be undertaken to better understand the hydrologic and temperature regimes in the lake as a function of Lake FDR pumping, lake elevation, and irrigation releases. This will not only benefit the better understanding of the drawdown program, but it will provide information for implementation of the Columbia mainstem temperature TMDL and for addressing temperature listings in the CBIP.

The EIS states: "Dissolved gasses would change very slightly because the ability of water to keep dissolved gas is inversely proportional to the temperature of the water. This means that dissolved gas concentration would be less as the water temperatures increased." This statement is misleading. As temperature rises the saturation concentration drops which results in an increase in percent saturation for a fixed mass of dissolved gas. Water pumped into Banks Lake may be supersaturated with gas from upstream. There is the possibility that temperature increases in Banks Lake could make this condition worse. It is unclear if the fate of dissolved gas into Banks Lake has been studied. This is an area that may merit some additional study.

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This comment from the EIS raises another issue: dissolved oxygen (DO). If temperatures in Banks Lake are warmer, DO concentrations may be lower, especially if combined with low DO from algal respiration. Little information is provided about DO and algal productivity in Banks Lake. This may be another area that needs further study.

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and the Banks Lake RMP should be amended appropriately, if necessary, so that shoreline riparian vegetation establishment is ecological rehabilitation using genetically and ecologically appropriate plant materials and species.

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Mitigation for impacts to public access and recreation should focus on enhancing boating access through lengthening ramps and possibly some limited navigational dredging, and should not result in further degrading shoreline riparian and upland shrub-steppe plant communities. Measures should be developed and implemented, to insure that the 56 informal campsites inventoried in 1998 (page 3-39) do not shift or extend as a result of August drawdowns, increasing damage to the shoreline riparian and upland environments. These measures should be adopted into the Banks Lake RMP (page 4-43).

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Uncoordinated and piecemeal responses to mitigate impacts from the drawdowns are likely at the various public and private marina, boat launch, camping and resort facilities up and down the lake; unless a coordinated planning effort is undertaken. This planning effort, including private concessionaires, private property owners, recreationists, appropriate state and federal agencies, and local governments of Douglas and Grant counties, the municipalities of Coulee City and Electric City, tribal entities, and other stakeholders should be made a priority as part of the selected alternative.

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Protecting cultural and historic resources and aesthetics is also a defined purpose of the Shoreline Management Act (RCW 90.58.020, and RCW 90.58.100[2][g]), consistent with their analysis in this EIS. The proposed alternative and mitigation efforts should be consistent with the SMA and Douglas and Grant counties' SMPs with regard to protecting cultural and historic resources at Banks Lake.

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Wetlands

Chapter 3 Un-vegetated flats are described as "providing good habitat for many species of fish." However, citations make the case that vegetated substrate is up to 10 times as productive. Are these un-vegetated flats the result of the current "upper zone" drawdown?

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Bureau of Reclamation should contrast the two zones. The upper zone as described above, and as observed anecdotally by us on 2-12-03, appears without submergent macrophyte vegetation. What is the condition of the "lower" zone as compared to the upper? This may help forecast the effect of a greater drawdown.

Conversely, a drawdown in late summer, during the growing season may be positive for emergent plants such as bulrush and even willow. Both can survive deeper inundations if they are allowed a period of drying later during the growing season prior to winter senescence. Exposing wetland bottom substrate to air often results in improved productivity due to higher oxygen levels, improved nitrogen recycling, increased root and rhizome growth, and a new seedbed available just prior to seed fall. This is often termed

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the "moist soil" response. It is illustrated in Table 3-1 where several species are noted to prefer a measured drying period during the late growing season. However, the ability of emergent plants to exploit the drawdown may be most dependant on its duration.

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Extending the drawdown into September may be beneficial to emergent vegetation. What is the reason for the September 10 refill date? In some paragraphs it is termed "required" and in others "desired". A second factor is the substrate. If it is primarily sand then rapid drying is to be expected with little potential for vegetation growth, and even loss of that presently existing, due to rapid desiccation. A description of the substrate in the principle areas to be effected may help this discussion. We also suggest you implement testing of techniques to enhance wetland/riparian vegetation establishment under any Action Alternative as a mitigation measure.

Cottonwood trees are clearly an important, but rare, part of the ecosystem here. Is there a reason they are not common in areas that appear as potential habitat? Could their population be enhanced as a mitigation measure for an Action Alternative? For example, erosion is cited as being a limiting factor. Most wetlands supporting cottonwoods are in broad shallow bays. It may be that establishing low tech log boom breakwaters may have merit.

Is there an understanding of the direction and trend of the willow/cottonwood community on the lake? That is, is it decreasing or increasing, and why? Could drawdown be used to increase their coverage? Expanding their coverage should be considered as mitigation under any Action Alternative.

Chapter 4 Vegetation: You split measures of impact into 2 groups: 1) aquatic emergent, and 2) riparian. There needs to be a third group, that of aquatic submergent.

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Preferred Alternative

If an Action Alternative is chosen we suggest the Uniform Draft be selected. In this way the biota may be able to better adapt versus a more rapid change in habitat. The hydrograph for this alternative may more closely emulate the shape of a natural curve.

Suggested Mitigation

If an Action Alternative is selected consider the following as part of a mitigation obligation:

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1. Monitoring -
 - i. Map and contrast the wetland/riparian habitat more accurately then provided for by the National Wetlands Inventory (NWI). Stratify as to 3 zones: i. above 1570'MSL, ii. 1570-1565, and iii. 1560-1565.
 - ii. Document changes and trends under any alternative.
2. Habitat Mitigation -
 - i. From Monitoring locate cottonwood communities, and identify limiting factors, for enhancement and expansion potential.

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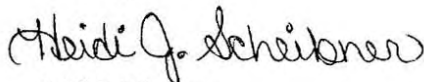
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- ii. Assess In-Kind Off-Site habitat compensation potential of restoration of weedy abandoned farm fields in Northrup Canyon. An agricultural drainage ditch is evident which could be plugged to restore wetland hydrology. The fields are currently dominated by non-native grasses and weeds. Restoration to potential presettlement condition of Palustrine Forested or Riparian wetland habitat types may well benefit Olive-sided flycatchers and sharptailed grouse, two local species of concern as discussed in the DEIS.
- iii. Assess Out-of-Kind On-Site habitat compensation potential of restoration of extensive wheat field agriculture within/adjacent to Steam Boat Rock State Park to native shrub steppe to assist in recovery of pygmy rabbit and Columbian sharptailed grouse, as well as the larger component of local species of concern. There is little sagebrush-dominated shrub steppe remaining on deep soils such as these being farmed to provide goose hunting. Wheat fields are not in limited supply on a local, regional or state area basis.
- iv. Assess Out-of-Kind On-Site habitat compensation potential of restoration and enhancement of existing shrub steppe by closing highly eroded dirt roads on the east shore flats, as represented by Million Mile areas north and south, as well as other sites. These areas are not so large as to preclude human use by walking.

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If you have any questions on the Water Quality comments, please contact Chris Maynard at 360/407-6484 or Paul Pickett at 360/407-6882. If you have any questions on the Shorelands comments, please contact Doug Pineo at 509/329-3416. If you have any questions on the Wetlands comments, please contact Chris Merker at 509/329-3528.

Sincerely,



Heidi J. Scheibner
SEPA Coordinator

2003-0411

COMMENT SL 02

From: "FLORENCE Caplow" <florence.caplow@wadnr.gov>
To: <jblanchard@pn.usbr.gov>
Date: Wed, Mar 12, 2003 6:57PM
Subject: Banks Lake drawdown comments

I am the botanist for the Washington Natural Heritage Program, Department of Natural Resources. We are the program that develops the state "endangered, threatened, and sensitive" rare plant lists, and we work closely with the USFWS on federally listed species.

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I would like to point out that Table 4.4 refers to "State species of concern". Actually, the plants species in Table 4.4 are FEDERAL species of concern. There are a number of species of state wide importance that occur near Banks Lake, though only one occurs directly within the project area. These have not been addressed in your draft EIS.

Thank you,

Florence Caplow

Botanist

Washington Natural Heritage Program

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COMMENT SL 03



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April 10, 2003

Mr. Jim Blanchard
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Mr. John Keys
Commissioner, USBR
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RE: **WSPC COMMENTS CONCERNING USBR'S BANKS LAKE DRAWDOWN PROPOSAL AND DRAFT ENVIRONMENTAL IMPACT STATEMENT**

Dear Mr. Blanchard and Commissioner Keys:

These comments are offered by the Washington State Potato Commission (WSPC) concerning the United States Bureau of Reclamation's (USBR) proposal to draw down Banks Lake in the Columbia Basin of Washington State.

The WSPC is a quasi state agency dedicated to the advancement of potato farming in Washington State. The WSPC works with approximately 350 potato growers throughout Washington. Potatoes are the second largest crop grown in the state, with an annual farmgate value of approximately \$500 million. Washington State accounts for nearly one-third of all potatoes and potato products exported from the U.S., totaling nearly \$500 million in exports from the Ports of Seattle, Portland, and Tacoma in 2001 alone.

A recent study of the economic impacts of the Washington State potato industry show that potato farming and related processing contributes \$3.01 billion annually to the Washington economy. (David Holland & Hun Ho Yeo, *The Economic Impact of the Potato Industry in Washington State*, 1997). This translates into nearly 28,000 jobs. As the Columbia Basin project accounts for nearly 85% of the potatoes grown in Washington State, most of the jobs created by Washington State potato industry reside in the Columbia Basin area. (Id.) This is significant considering that many counties in rural Eastern Washington have some of the highest unemployment rates in the nation. (See U.S. Dep't of Labor, Bureau of Labor Statistics, September 2002, <http://www.bls.gov/web/laumstrk.htm>.)

Currently the financial health of the Washington potato industry is precarious. During the past five years, selling prices for potatoes have been very low, margins are tight, credit is scarce, and losses are mounting for many Washington potato farmers. Potential shortages of water and/or restrictions on irrigation, which could result from the USBR's proposal to drawdown Banks Lake, are of particular concern to the potato growers of Washington State and could have a devastating impact to the entire Washington potato industry.

Based on our review of the USBR's proposed action alternative and Draft EIS for the Banks Lake drawdown, the WSPC opposes both ("No Action" and "Action") alternatives presented. The WSPC urges the USBR to maintain its historic operations of the project—for the August period—with Banks Lake reservoir operations predominantly held within the 1567-1569 ft. elevations.

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BRIEF EXECUTIVE SUMMARY OF WSPC COMMENTS

In summary, the WSPC will demonstrate in the following comments that the USBR (in its Banks Lake Drawdown proposal and its related Draft EIS) has:

- Overstated the operating level of Banks Lake;
- Exaggerated the impact of the proposed drawdown on hydropower generation;
- Not adequately considered scientific data which shows flow targets for ESA listed fish cannot be met under the proposed drawdown;
- Failed to show any measurable impact of the proposed drawdown to ESA listed fish;
- Understated the negative impact of the proposed drawdown on the Banks Lake ecosystem; and
- Failed to consider other reasonable alternatives.

USBR OVERSTATES THE OPERATING LEVEL OF BANKS LAKE

The Draft-EIS's presentation of the "No Action" alternative fails to deal adequately with a clear definition of baseline conditions. This leads to a misrepresentation of the baseline conditions under the "No Action" alternative and likely leads to inappropriate operational assumptions that affect the review of the "Action" alternative.

The EIS stipulates that "Historically, the most likely operating range was between 1,567 feet and 1,569 feet."¹ But the "No Action" alternative—and key alternative analysis and impacts—depicts a baseline condition where the elevation starts at 1,570 feet and declines to 1,565 ft. (the "no draft" sub-set of this alternative is recognized). In effect, alternative operations start at 1,570 ft., but the actual baseline condition for no action resides within elevations 1,567 ft. to 1,569 ft.

The end effect of the DEIS baseline for no action is to exaggerate the alternative's impact. If the baseline is assumed to be 1,570 ft., then the "No Action" alternative produces some measurable flow and hydropower generation impacts²; whereas the actual baseline conditions would have almost no affect on either existing flow or hydropower generation.

It appears as though the USBR is attempting to convince a decision-maker or regional audience that some marginally important impact to flows/hydropower exists under the "No Action" alternative, when in fact very little would occur from the historical baseline condition. Further, this may appear to make the "No Action" alternative more attractive than the "Action" alternative, given that the "Action" alternative carries with it more negative impacts, other than simply providing an additional (very small) increment of flow augmentation in August.

Procedurally, the USBR's handling of the "No Action" or baseline alternative appears to be flawed, and it is unlikely that the current depiction of baseline conditions would be in compliance with Council of Environmental Quality (CEQ) Regulations for EIS preparation.³

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¹ USBR. 2003. Banks Lake Drawdown, Draft Environmental Impact Statement. USBR, PNW Region, Upper Columbia Area Office, Ephrata, Washington, January 2003, page 4-28. Cited hereafter as Banks Lake DEIS.

² As well as changes the "No Action" alternative's relationship to the "Action" alternative.

³ Council on Environmental Quality Regulations for Implementing NEPA (Part 1502-Environmental Impact Statement.) Sec. 1502.4 Major Federal actions requiring the preparation of environmental impact statements. (a) Agencies shall make sure the proposal which is the subject of an environmental impact statement is properly defined.

USBR EXAGGERATES IMPACT OF DRAWDOWN ON HYDROPOWER GENERATION

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Further concerning the issue of baseline conditions, the hydropower production analysis is confusing,⁴ and the No Action impact overstates the benefits of actual baseline conditions.

Under the analysis and assumptions provided, it would be inappropriate to include avoided costs for pumping as a benefit under the No Action alternative in Table 4-5, and only the incremental impacts of the Action alternative should be considered in Table 4-6. Stated differently, USBR's version of the No Action alternative should reflect only the increased power generation from 1,570 ft. to 1,565 ft. (85,000 MWh), and the Action alternative should only include the incremental, down-river power generation from 1,565 ft. to 1,560 ft. (85,000 MWh) minus the refill pumping (33,000 MWh) minus the Sept. power loss for refill (93,000 MWh). The end result would be a net power loss from the No Action to Action alternative of 41,000 MWh.

Still because the No Action alternative does not reflect actual baseline conditions, the change from the No Action to Action alternative is misrepresented. The real, incremental impact of the Action alternative is not accurately presented within the EIS.

NMFS FLOW TARGETS FOR ESA LISTED FISH CANNOT BE MET

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Although the DEIS identifies in Appendix C (Hydrologic Report) that the NMFS Flow Target (195,000 cfs at McNary Dam, as used within the DEIS analysis) "is significantly higher than the historic average flows and increasing the addition of 2-8 kcfs will not significantly increase the probability of meeting the BiOp flow objective at McNary,"⁵ the DEIS does not provide for adequate discussion and review of this factor. If anything, the main section of the DEIS is actually misleading on this fundamental point.

Under the "Purpose of" and "Need for Action" section of the DEIS, it is stated that "The purpose of the proposed action is to enhance the probability of meeting flow objectives in the Columbia River at McNary Dam during the juvenile out-migration of ESA-listed salmonid stocks..."⁶ In reality, the flow target cannot be met either during an average water-year condition during August or during low water-year conditions during the spring and summer periods.

A comprehensive technical review of the NMFS flow targets⁷ has been highly critical of the targets for failure to address the hydrological conditions of the Columbia River Basin system. It is noted that the flow targets cannot be met during the month of August (monthly average) under average water-year conditions, either with or without existing water withdrawals from the system; and the flow targets cannot be met during the full spring and summer periods under low water-year conditions, either with or without existing water withdrawals from the system. In effect, the NMFS flow targets have no basis whatsoever in empirical hydrology of the river system.

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Moreover, because the real baseline condition (1,567-1,569 ft.) of the No Action alternative is about half of the effect of a drawdown to 1,565, the amount of incremental flow actually contributed during the month of August would be about 1 kcsf (1,000 cfs) rather than 2 kcfs. This amounts to well under a 1% incremental increase in flows during average water-year conditions and about a 1.3% increase in flows during a low water-year condition like 2001. Pragmatically, such small, incremental changes in flow are imperceptible within the Columbia River measured at McNary Dam.

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⁴ Banks Lake DEIS, pages 4-21—4-23.

⁵ Bank Lake DEIS, Appendix C, Page 5.

⁶ Banks Lake DEIS, pg. 1-1.

⁷ D. Olsen, J. Anderson, J. Pizzimenti, et al., Review of the NMFS Flow Targets/Augmentation Program, Pacific Northwest Project, 1998.

USBR FAILS TO SHOW ANY MEASURABLE IMPACT OF DRAWDOWN TO ESA LISTED FISH

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The DEIS totally fails to identify the direct biological impacts (benefits) to ESA-listed fish runs relative to either the No Action or Action alternatives. This lack of basic information and analysis within the DEIS probably violates CEQ Regulations.⁸

The DEIS simply defers to the NMFS flow targets and RPA 31 as the justification for biological benefits, rather than clearly identifying the likely empirical impacts (benefits). The DEIS does not even describe any biological benefits that may be contained within the NMFS 2000 BiOp, relative to either the No Action or Action alternatives.

The DEIS has not reviewed, nor incorporated, recent technical analyses highly pertinent to this proposed drawdown action. These analyses are summarized below and copies submitted to the USBR with this comment letter.

Submitted to the Northwest Power Planning Council and the federal hydro system managers (BPA, USBR, Corps, and NMFS) in 1998, the "Flow Targets/Augmentation Program Review"⁹ evaluated the flow-survival relationship in detail and concluded that no survival benefits could be observed for spring migrants, and very limited benefits could be detected for summer migrants within the Lower Snake River. And what benefits did emerge were not the result of flow-augmentation per se, but the influence of temperature regulation caused by deep water releases from Dworshak Reservoir.¹⁰

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Analyses included in recent litigation and submitted to the Northwest Power Planning Council as part of its mainstem hydro operations review succinctly clarify the results of UW modeling analyses for flow-survival relationships, for the mainstem Columbia River.¹¹ The modeling covered average (2000) and low (2001) water-year conditions, with proportional water withdrawals from the Mid-Columbia region to John Day Pool, thus emulating the type of impact that would occur from an action such as the Banks Lake Drawdown (with and without conditions). Assuming a 1,000 cfs impact—an amount of water roughly equivalent to the 1,570 ft. to 1,565 ft. alternative—the net change to migrating fall Chinook survival is estimated to be .03%. From an empirical basis, .03% change in survival is not measurable. From an actual (historical) baseline change to 1,565 ft., the impact would be even less.

Other detailed analyses of the flow survival relationship prepared by the Columbia Basin Research Office, University of Washington, further elaborate on the lack of any significant relationship between flow augmentation and migration survival.¹² This research analyzes the past decade of flow-survival data for the mainstem Columbia River system, as well as technical studies conducted by NMFS and other agencies.

⁸ See CEQ Regulations for Implementing NEPA; Secs. 1502.14, 1502.16, and 1502.24.

⁹ D. Olsen, J. Anderson, J. Pizzimenti, et al., Review of the NMFS Flow Targets/Augmentation Program, Pacific Northwest Project, 1998. Report authors are affiliated with Pacific Northwest Project, University of Washington, and HARZA Engineering, respectively.

¹⁰ This observation also was made by the Northwest Power Planning Council's Independent Consultant in a 2002 report on mainstem river operations and management (see report at the Council's web-site).

¹¹ Technical Memorandum from Darryll Olsen, Ph.D., to Larry Cassidy, Chairman, Northwest Power Planning Council, Technical Analyses of Mainstem Water Withdrawals—Salmon Survival Impacts on the Columbia River, July 30, 2002. Memorandum includes recent UW Columbia Basin Research Office modeling runs for fall Chinook impacts on the mainstem Columbia River.

¹² The key research papers include: J. Anderson, The Flow-Survival Relationship and Flow Augmentation Policy in the Columbia River Basin, Columbia Basin Research, University of Washington, September 2002; J. Anderson, Supplement to The Flow-Survival Relationship and Flow Augmentation Policy in the Columbia River Basin, Analysis of New Results, Columbia Basin Research, University of Washington, November 2002; and J. Anderson, Response to the ISAB Review of Flow Augmentation: Update and Clarification (February 2003), Columbia Basin Research, University of Washington, February 2003, and papers cited therein.

From this research, it is concluded that no measurable survival benefits can be observed for spring migrants; and for summer migrants, any relationship is dependent upon significant temperature differentials that are not affected by small to moderate changes to flow regimes. The two most significant variables affecting survival are temperature shifts—such as that occurring in the Snake River under 2001 water-year conditions—and the total distance traveled (not travel time) by juvenile migrants.

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The implications of the above analyses applied to the question of mainstem survival benefits resulting from a Banks Lake drawdown is straightforward: there would be no measurable, or empirically documented, benefits from such an action.

USBR UNDERSTATES THE NEGATIVE IMPACT OF A DRAWDOWN ON THE BANKS LAKE ECOSYSTEM

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A review of the Environmental Consequences of drawing down Banks Lake (Chapter 4) shows the EIS lacks adequate data and analysis to verify many of its conclusions. Many of the conclusions in (Chapter 4) simply do not match the information provided in the Environmental Affects, Chapter 3. This Chapter documents the potential impacts from reservoir drawdowns from the scientific literature and the conditions known to occur around Banks Lake. The conclusions that impacts to biota in and around Banks Lake would be minor are highly speculative and overly optimistic. They rely on generalizations for which little or no data are presented, including some that seem to contradict simple logic. For example, the EIS states that the impacts to dewatering aquatic and emergent vegetation would be mitigated by potentially moist conditions and cool temperatures in August. No data are presented on those conditions or the likelihood that the specific organisms in question could withstand the average or extremes historically known in the area. The following specific comments provide further detail.

It would be reasonable to estimate the total number of acres of littoral zone that will be subject to desiccation by drawdown. No estimates are provided. Such an estimate could also be expressed as a percentage of the habitat this zone represents in Banks Lake. Based on the descriptions of the shallow nature of much of the lake, and the distances that boat ramps would be exposed, it suggests that a large percentage of the productivity zone would be exposed and desiccated.

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The EIS states that the impact from desiccation to the dewatered vegetation is mitigated by the potential for mild temperatures and moisture (rainfall) in August. No weather data were provided. The EIS also stated that the growing season is nearly over in August. It is not clear what vegetation the USBR is referring when it says that August is the end of the growing season. Native terrestrial vegetation may be reduced during winter after killing frosts occur, but these conditions are probably at least two or more months away from drawdown in most years. The aquatic and emergent plants would continue to provide cover and food for at least as long due to the buffering affect of water. Such aquatic and terrestrial vegetation provides important energy that enable animal populations to get through the winter. Reducing or eliminating much of the vegetation months ahead of the natural die-off may not be minor for populations in the riparian or littoral zones of Banks Lake.

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Weather conditions at Banks Lake are generally hot and dry in August and would lead to lethal conditions for the most of the aquatic vegetation and the microscopic animals that would be dewatered in a drawdown. The premature die-off in warm weather would likely lead to significant organic decay, oxidation and impact to water quality. This decay would exacerbate declining water quality that would accompany the warming conditions the EIS predicts in the smaller reservoir volume. Little water quality data were presented, however water temperatures were noted to exceed 80F in the shallows of Banks Lake. Such warm water coupled with decaying vegetation would likely result in low dissolved oxygen. The low dissolved oxygen would likely violate state water quality standards for the uses of Banks Lake. Low DO and warmer water would impact the species most prized in the Lake (cold water salmonids) and lead to increases in species least desired, such as bull head and carp, which are tolerant to high temperatures and low dissolved oxygen. Such potential is not discussed in the EIS.

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Some of the more drought resistant emergent vegetation would be spared. However, by the data presented, the most valuable plants and native vegetation would largely be killed and the least desired species, mostly exotics, would thrive. For emergent vegetation, the exotic reed canary grass would probably thrive, as would cattails. Both are considered of low value to wildlife, although conflicting information is presented on cattails between Chapters 3 and 4.

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For riparian vegetation, the EIS indicates that except for the exotic Russian olive, the other native woody plants would likely suffer further population impact. Although mature woody plants might "withstand" brief periods of drought, seedlings with shallow roots would not fare as well. The EIS points out that one of the more valuable riparian species, black cottonwood, already has little recruitment. Thus, if any recruitment does occur, the drawdowns would likely eliminate any small chance for long term stability of this tree species.

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The further degradation of woody plants and trees could affect terrestrial species such as eagles and hawks. An immediate affect of drawdown would distance the perches used by birds further away from the reservoir. Perches are often used for hunting purposes by raptors including eagles. Thus even though larger trees might not be immediately killed by temporary changes in the freatic zone, birds might abandon these trees as no longer suitable feeding habitat in the short term. Should any contain nests, this could have a more dramatic long-term effect. No data were provided that assured that a continuing practice of annual drawdown would not affect the health of even mature trees; and it would most likely to affect seedling and understory vegetation that have much shallower root systems and would be less drought tolerant. The EIS instead speculated on soil characteristics and their potential to hold moisture. No data on soils were provided.

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In summary, the EIS generalizes that drawdown impacts on the biota in and near the Lake will be minor because drawdowns will be within the "legally" mandated five-foot pool elevations and only be temporary. The plants and animals of the littoral and riparian zones do not respond to the legal limits of drawdown and many of them cannot live without water even temporarily. Many of these species have direct and important value to recreational use or have tribal value in the region. A number of them fall into the category of "species of special concern". The toehold that many of these species have in the basin is already tenuous due to the extensive development and changes that have occurred in the past. Those populations that remain have adapted to conditions in Banks Lake which for the most part includes a stable pool elevation limited to infrequent fluctuations of about two feet. Raising the pool above this level, then dropping it five feet in a matter of days will have significant changes in the physical environments of the littoral and riparian zones around Banks Lake. They will not likely be minor in terms of their affect on biota. Such changes were not well documented with data or modeled with any rigor in the EIS.

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Due to the complex fish fauna, it is difficult to predict the interactions that are likely to occur in Banks Lake. No assessment of species importance is provided. The impact assessment is reduced to a one-dimensional discussion of potential predator-prey interaction of adult fish and juvenile fish. It is not predictive or even speculative of how the existing fish and riparian populations of Banks Lake will ultimately change. It does not document what the population levels are in any approximation to one another, much less what they will be in the future. When Lower Granite Reservoir was dropped for only a few days in a test of drawdown in 1992, enormous changes occurred in the feeding ecology of smallmouth bass there. Crayfish populations were largely killed and smallmouth bass switched from this species to salmon smolts as a primary food (Dave Bennett, U. Idaho, personal communication). This was the exact opposite of what was the drawdown was predicated to do (enhance salmon survival). It is nearly impossible to predict the changes in complex biological communities. It is a certainty that there will be measurable physical changes to water quality and riparian and littoral zone habitats in Banks Lake if regular drawdowns occur. And these will lead to changes in the biota of the Lake just as surely as dewatering the boat ramps on the lake will affect the recreational usage. The organisms in Banks Lake littoral and riparian habitats are not, for the most part, visitors. They live there permanently and cannot move to another Lake. These unpredictable changes and losses are being traded for a potential alternative benefit to salmon. The biological data are clear both in Banks Lake and the Columbia River. Drawing down Banks Lake will have definite and

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measurable changes to the physical and biotic conditions of the Lake and for the most part these will be negative. But it will have no measurable change in the biota of the Columbia.

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USBR FAILS TO CONSIDER OTHER REASONABLE ALTERNATIVES

The USBR's approach to the Banks Lake drawdown project purpose and need and the alternatives considered is improperly constrained as a choice between compliance with the Endangered Species Act ("ESA") through implementation of action 31 of the 2000 Federal Columbia River Power System ("FCRPS") BiOp reasonable and prudent alternative or no action to comply with the ESA.

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The purpose of the proposed action is to enhance the probability of meeting flow objectives in the Columbia River at McNary Dam during the juvenile out-migration of ESA-listed salmon stocks by altering the August drawdown of Banks Lake from elevation 1565 down to elevation 1560, to comply with Action 31 of the Reasonable and Prudent Alternatives of the Federal Columbia River Power System Biological Opinion, issued December 21, 2000.

DEIS p. S-1 (emphasis added): This framing of the purpose and need wrongly presumes that (1) an alternative course of action is needed because historic Banks Lake operations jeopardize the continued existence of listed salmonid species and/or adversely modify critical habitat; (2) flow objectives for the Columbia River at McNary Dam must be satisfied to prevent likely jeopardy or adverse modification of critical habitat; and (3) a Banks Lake drawdown in accordance with Action 31 will, in fact, increase the probability that flow objectives will be achieved to assure that listed species will not be jeopardized by the USBR's operations.

The technical comments and technical analysis offered above demonstrate that the Columbia River flow objectives cannot be scientifically justified and that Banks Lake operations, under existing conditions or under proposed modifications, have no positive or negative effect on likely jeopardy to ESA-listed salmonids or designated critical habitat. The USBR's decision-making and environmental analysis are fatally flawed by the unfounded premise that the agency's only decision-making choice is to implement action 31 "in compliance" with the 2000 FCRPS BiOp. Because of this unduly narrowed focus, the USBR fails to take a hard look at the broader purpose and need for implementing the 2000 BiOp reasonable and prudent alternative actions and a broader, reasonable range of alternatives for satisfying the objectives of the Columbia Basin Project while also complying with the ESA.

a. **The Purpose and Need Are Too Narrow and Circular.**

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The USBR has narrowly defined the purpose and need for action as implementation of RPA action 31 in the FCRPS 2000 BiOp. DEIS p. 1-1. The USBR's approach is circular and results in an unreasonably narrow range of alternatives – action or no action. In essence, the purpose of the action is the proposed action – RPA action 31. Stated differently, the USBR has proposed a single alternative action to current operations at Banks Lake because an alternative action has been advised by the National Marine Fisheries Service (NMFS). The USBR never asks why an alternative action has been advised by NMFS, whether NMFS' advice is justified, or whether there are other alternatives that would satisfy ESA requirements without implementing RPA action 31. Under NEPA, "an agency may not define the objectives of its action in terms so unreasonably narrow that only one alternative from among the environmentally benign ones in the agency's power would accomplish the goals of the agency's action, and the EIS would become a foreordained formality." Citizens Against Burlington, Inc. v. Busey, 938 F.2d 190, 196 (D.C. Cir. 1991) (cited with approval in City of Carmel-By-The-Sea v. United States Dept. of Transp., 123 F.3d 1142, 155 (9th Cir. 1997)). The purpose and need for the Banks Lake drawdown action is unreasonably narrow and is clearly designed to justify a foreordained action without serious or critical analysis by the USBR.

Because it is unreasonably narrow, the USBR's concept of purpose and need is offered without any acknowledgment of or integration with the broader purposes of the Columbia Basin Project, of which Banks Lake

is a component. 16 U.S.C. §§ 835-835m. According to USBR, the decision to be made is whether or not to implement the proposed action – action 31, but the purpose and need suggest that USBR has only examined how to implement action 31 without taking a hard look at the question why action 31 is needed for purposes of compliance with the ESA or how it is related to the program of over 100 actions "required" by the FCRPS BiOp. Indeed, the DEIS for the Banks Lake draw down is not tiered to a broader programmatic EIS for the USBR's program of actions under the FCRPS BiOp. The only NEPA document referenced by the DEIS is an environmental assessment (EA) for the Banks Lake Resource Management Plan (RMP) (2001). The Banks Lake RMP and EA do not provide a programmatic approach to decisions regarding implementation of the 2000 FCRPS BiOp. In fact, the RMP makes no reference to management for threatened and endangered fish species, and it explains that the fish flow requirements of the 2000 FCRPS BiOp are a given legal constraint on project operations that is not questioned or analyzed

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The absence of a broader context for the proposed action strongly suggests that the USBR has violated NEPA by neglecting any effort to take a comprehensive and informed decision-making approach toward implementation of the FCRPS RPA actions. In fact, a biological opinion and incidental take statement are not exempt from NEPA and require compliance with NEPA when they are implemented as actions with a significant impact on the environment. Ramsey v. Kantor, 96 F.3d 434, 444 (9th Cir 1996). This requirement is not satisfied by an EIS to consider a single action that is part of the larger program of action under the FCRPS BiOp. In the absence of a programmatic analysis to which the single EIS is tiered, the USBR's narrow approach to NEPA compliance results in unlawful segmentation and an incomplete analysis that is inadequate for lawful decision making by the USBR.

b. USBR Has a Duty to Make An Independent Determination on What Agency Actions Are Authorized and Required for Compliance with the Endangered Species Act.

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As a matter of law, the authority and duties of the USBR are not narrowly constrained by the 2000 FCRPS BiOp. Consultation under the ESA does not empower NMFS to simply dictate the actions undertaken by the consulting federal agency through the Section 7 process. Westlands Water Dist., 2002 U.S. Dist. LEXIS 25905 *172-73 (E.D. Cal. Dec. 10, 2002) (NMFS acted in excess of authority when it required the proposed action as a reasonable and prudent measure to minimize take). The implementation of any action remains within the discretion and control of the action agency – here, the USBR.

Following the issuance of a biological opinion, the Federal agency shall determine whether and in what manner to proceed with the action in light of its section 7 obligations and the Service's biological opinion. 50 C.F.R. § 402.15(a) (2001). When the Section 7 consultation regulations were finalized, NMFS described the biological opinions as "advisory" documents:

One commenter questioned the ultimate authority of the Service to issue binding procedural regulations under section 7. In no way does the Service intend to use the consultation procedures of section 7 to establish substantive policy for Federal agencies. The Service performs strictly an advisory function under section 7 by consulting with other Federal agencies to identify and help resolve conflicts between listed species and their critical habitat and proposed actions. As part of its role, the Service issues biological opinions to assist the Federal agencies in conforming their proposed actions to the requirements of section 7. However, *the Federal agency makes the ultimate decision as to whether its proposed action will satisfy the requirements of section 7(a)(2)*. The Service recognizes that the Federal agency has the primary responsibility for implementing section 7's substantive command, and the final rule does not usurp that function. The Service is satisfied that the final rule is within the scope of the authority provided in the Act.

51 Fed. Reg. 19926 (June 3, 1986) (emphasis added).

Federal agencies are not absolutely bound by the terms of a biological opinion. To the contrary, they are required to exercise independent judgment because they may not rely blindly on a biological opinion to justify their actions. Resources Ltd. v. Robertson, 35 F.3d 1300, 1304 (9th Cir. 1994) (an action agency's decision to rely on a biological opinion must not be arbitrary and capricious); Pyramid Lake Paiute Tribe v. U.S. Dept. of the Navy, 898 F.2d 1410, 1415 (9th Cir. 1999); Stop H-3 Ass'n v. Dole, 740 F.2d 1442, 1459 (9th Cir. 1984) (same); Center for Biological Diversity v. Rumsfeld, 198 F. Supp.2d 1139 (D. Ariz. 2002) (same). The USBR can and should consider the 2000 FCRPS biological opinion and may even rely on the opinion if it is valid, but the USBR still must exercise independent judgment on what actions are necessary or appropriate to comply with the requirements of the ESA.


Accordingly, the primary role of ESA Section 7 consultation is to require federal agencies to avail themselves of the opportunity to obtain expert information and advice on impacts to listed species before any activity they authorize, fund or carry out takes place. The ESA neither expands nor contracts the power given to any other federal agency; rather, agencies such as the USBR remain governed and obligated by their duties under their own enabling authorities. Platte River Whooping Crane Critical Habitat Maintenance Trust v. Federal Energy Regulatory Commission, 962 F. 2d 27, 34 (DC Cir. 1992). Because Action 31 in the 2000 FCRPS BiOp is not justified by scientific fact, the USBR has the discretion and the duty to reject RPA action 31 and continue historic operations. In the DEIS, the USBR fails to consider a reasonable range of alternatives because the Bureau defines the purpose and need based on an improper view of its own authority and discretion that rules out any action other than RPA Action 31.

CONCLUSION

The WSPC concludes that the USBR proposed drawdown actions ("No Action" and "Action" alternatives) would have no positive measurable impacts to the survival of migrating juvenile Columbia River salmon; and they would give false credence to the technically flawed flow targets currently within the NMFS 2000 BiOp. Conversely, such actions would negatively affect native or local ecological habitat and resources, could negatively affect on-site recreation resources (as discussed in the DEIS) and possibly hydropower production, and unlawfully encroach upon the statutory authorization for the project. The benefits are either very unclear or nonexistent, while the costs are apparent.

The WSPC believes that the above mentioned drawdown proposals are ill-conceived measures that should receive no further review or action. Furthermore, the WSPC urges that historical operating regimes at the Banks Lake Project be maintained.

Sincerely,



Pat Boss
Executive Director

cc: Washington State Potato Commissioners and Government Relations Committee Members
U.S. Senator Patty Murray
U.S. Senator Maria Cantwell
U.S. Representative Doc Hastings
U.S. Representative George Nethercutt
U.S. Representative Greg Walden

Enclosures

***The Columbia-Snake River
Flow Targets/Augmentation Program***

***A White Paper Review
With Recommendations for Decision Makers***

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Eastern Oregon Irrigators Association
Idaho Water Users Association
Northwest Irrigation Utilities
Washington State Water Resources Association**

February 1998

***The Columbia-Snake River
Flow Targets/Augmentation Program***

***A White Paper Review
With Recommendations For Decision Makers***

Executive Summary

1.0. A White Paper Review.

- This white paper examines the Columbia-Snake River flow targets/augmentation program, and its implications for important water management actions within the Pacific Northwest.
- Evaluations of hydrologic, biological, and economic data indicate that the existing NMFS water policy and flow targets/augmentation program needs to be reassessed and changed.

2.0. The Emerging NMFS Water Policy.

- Through its flow targets/augmentation program, the NMFS is developing a water policy within the Columbia River Basin drainage of "zero net loss."
- The NMFS policy calls for no further water withdrawals from the Columbia-Snake River mainstems, tributaries to the main river system, and related groundwater sources; and it directs federal and state agencies to review the impacts of existing water withdrawals on its flow targets program.
- The NMFS policy challenges state authority to grant *future* water rights for municipal, industrial, or irrigation uses. By calling for a "review" of existing water withdrawals, the policy postures toward challenging *existing* state-granted water rights.
- Under the NMFS water policy, future (new) water allocations from within the Columbia River Basin drainage are to be used solely for instream fish flows.

3.0. NMFS Water Policy Justification, Flow Targets and Augmentation.

- > The NMFS flow targets/augmentation program follows on the development of the fish flow augmentation program devised by the Northwest Power Planning Council during the 1983-1994 period.
- > An initial "water budget" requested by the Council amounted to about 3.75 million acre-feet (MAF), but has grown with the preparation of each new Council Fish and Wildlife Program; the NMFS 1995 BIOP now calls for as much as 13-16 MAF for dedicated flow enhancement.
- > The highest level of flow augmentation produced about 10.6 MAF, occurred during the 1994 drought water-year; about 0.8 MAF was released from the Brownlee Project and above, about 1.9 MAF was released from Dworshak Reservoir, with the remaining water being released from upstream Columbia system reservoirs.
- > In the 1994 low water-year, about 0.5 MAF was provided from the Brownlee Project and above during the *summer period*; and about 1.0 MAF came from Dworshak Reservoir.
- > Within the NMFS flow augmentation program, the "flow targets" serve as operational guides for in-season water management, determining when to use available water for flow augmentation.

4.0. River System Hydro Regulation Studies and the Flow Targets.

- > The USBR hydro regulation studies demonstrate that the NMFS flow targets cannot be met in all months (affecting seasonal averages), during low or average water-years, because they require more water than the hydrologic system can provide--with or without the effects of net irrigation depletions from the Snake-Columbia River Basin.
- > During low and average water years for the summer flow augmentation period, the NMFS flow targets exceed water levels that would be available under natural river system conditions, with or without the effects of net irrigation withdrawals.
- > During a drought year, net irrigation depletions represent large volumes of water for the months of July and August. But the net irrigation depletions *are not* the primary reason why the NMFS flow targets cannot be met; the problem rests with the flow targets themselves--the targets are well beyond the Basin's hydrologic capability.
- > The annual natural run-off within the Basin is highly variable; the yearly net variation in flows for a 50-year water record substantially exceeds or overshadows net irrigation withdrawals, measured at McNary Dam.

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- Given the hydrological capabilities of the river system, the NMFS summer flow targets of 200 kcfs (Columbia River) and 50-55 kcfs (Snake River) cannot be met during low water conditions, even with the complete elimination of all irrigation depletions. Basin hydrology limits summer flows to well below the NMFS target level.

5.0. *Biological Basis for Flow Targets/Augmentation.*

- Largely based on historical data depicting year-to-year flow and juvenile fish survival relationships, it has been assumed that flow augmentation could be used to increase flows during low water-year conditions, in an attempt to produce survival rates observed in high water years.
- Data collected for spring migrants since 1992 (1993-1997 data sets) indicate that the *within year relationship* between different flow regimes and fish survival through the hydro system corridor is weak. This means that attempts to use flow augmentation to improve spring migrant survival will provide very little or limited benefits.
- The year-to-year correlations between flow and survival—reflecting vastly different flow levels between years—support the hypothesis that ecological factors associated with drought conditions are principally responsible for fish survival.
- The year-to-year observations move toward the conclusion that better water-year conditions, in general, provide for greater fish survival than drought conditions.
- The flow-survival data collected on fall chinook is more variable and less well defined than for spring migrants. Given the existing data, flow is one variable correlated with survival, in some cases, but it has less predictive capability than other variables (such as migration timing and fish size through the upper river system). Also, some relationships, such as observed numbers of marked fish detections between years, are inconsistent among years (although dam-smolt collection operations may have been different among years, making detection comparisons difficult).
- Snake River summer flow augmentation is being used to enhance the transportation collection efficiency for fall chinook. But flow augmentation is not the only method available to increase collection efficiency. Structural changes at the projects, such as the current installation of double-length screens and/or surface collector technology, may be able to achieve the same goal and provide benefits for spring migrants, as well.
- During the summer period, Lower Snake River water temperatures can and do exceed levels that negatively affect migrating juveniles and adults. The use of some flow augmentation (from Dworshak Reservoir) to improve migration conditions should continue to be reviewed; and the biological benefits and costs should be better understood.

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- Because of the uncertainty surrounding the effects of flow augmentation on overall fall chinook survival, it is difficult to support either an increase or decrease in the amount of storage currently being used for flow augmentation (1.5 MAF) to protect summer migrants, for a drought year like 1994. *But resource managers should be cautious in making conclusions about the benefits gained from this flow regime, because shaping flows within a drought year will not produce the benefits fish receive under a high water-year.*

6.0. *Economic Trade-offs of Flow Augmentation.*

- Using sport and commercial fisheries values and fish abundance estimates for the 1987-1991 period (relatively high catch period), the annual direct net value of the upriver (above Bonneville Dam) salmon and steelhead contributions to ocean and inriver fisheries is about \$25 million. It is acknowledged (and has been measured) that salmon do retain an existence value that exceeds their direct commercial or use value.
- Applying some favorable economic and biological assumptions to the benefits of flow augmentation, the annual direct net economic value of the upriver contributions to commercial and sport fisheries is about \$2.25 million per one million acre-feet of water used for flow augmentation—representing a *future value* estimate over 10 life-cycles (1995S).
- Flow augmentation causes economic impacts to hydroelectric power operations and could create future economic impacts to irrigated agriculture. For one million acre-feet of flow augmentation, the cost to hydro power operations is estimated to be about \$8-10 million (BPA system costs). For Basin irrigated agriculture, the direct net value of one million acre-feet of water is estimated to be about \$40-70 million; one estimate for the Upper Snake River Basin suggests about \$49 million per one million acre-feet of water provided for flow augmentation (includes hydropower benefits).
- Both economic trade-off analyses and cost-effectiveness analyses strongly support the position that *any flow augmentation program should be optimized to maximize fish benefits for the costs incurred to other water resource sectors.*

7.0 *Recommendations for Decision Makers.*

7.1 *The NMFS Water Policy.*

- Decision makers should be fully aware of the emerging NMFS water policy and its implications for state water management.

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- The NMFS water policy--bred from the flow targets/augmentation program--directs that all future (new) water allocations from the Columbia River Basin drainage area should be used solely for fish protection.
 - The NMFS water policy is a single-purpose, resource use strategy that subjugates new water withdrawals for other types of social and economic activity or growth within the Basin. The policy is one-dimensional in nature, and it directly or indirectly challenges state legislative authority to govern water management.
 - The NMFS senior management, working with state water resource managers, should reevaluate and change this policy to better reach the needs of biological and economic optimization.

7.2 *Review and Restructure the Flow Targets/Augmentation Program.*

- The existing data and analyses strongly suggest that the correlation between incremental flow increases and juvenile spring migrant survival is relatively inelastic, or that the survival benefits are small.
- The existing data suggest that estimated river system flow benefits--though limited--favor the fall chinook. But there is considerable uncertainty surrounding the effects of flow augmentation on overall survival. This includes factors related to direct inriver survival benefits, migration timing, inter-year detection differences, and the use of flow to increase transport collection efficiency.
- It is more clear that flow augmentation is a measure providing marginal survival benefits and has limited effectiveness as a recovery measure.
- In contrast to some of the biological impacts, the economic trade-offs of flow augmentation are more predictable. Flow augmentation does increase costs to the hydropower system, and it could create significant costs to the irrigation (and other) sectors.

Given the data and analyses presented within this paper, the following review and changes are suggested for the flow augmentation program.

Optimization Review:

- The flow targets/augmentation program would benefit from a detailed technical review that focuses on the *optimization of water use; its source, delivery timing, temperature effects, and a clear identification of the biological or physical attributes to be targeted. This also includes applying principles of cost-effectiveness, to compare the biological benefits gained for the costs incurred.*

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- > The existing flow augmentation program does not optimize water use for either survival benefits (benefit per unit of flow) or economic costs (benefit per dollar cost) to the river system.

A flow augmentation program that better reflects a step toward optimization of the existing water resources is summarized below.

Low Water Conditions, Snake River System:

- > For the summer period (July-August), provide for experimentation a *maximum of 0.5 MAF* from the Brownlee Project and above consistent with state law and obtained from willing sellers or lessors; and a *maximum of 1.0 MAF* from Dworshak to be used for fall chinook migration and/or adult temperature control. Data to review this experimental regime would be collected through 1999, consistent with the existing NMFS decision-making process.

Low Water Conditions, Columbia River System:

- > Direct flow augmentation releases solely for the fall chinook migration. For the summer period (July-August), provide for experimentation *0-4.0 MAF*, as recommended jointly by federal and state fish and water resources managers.

Average Water Conditions, Snake River System:

- > For the summer period (July-August), provide for experimentation a *maximum of 0.5 MAF* from the Brownlee Project and above consistent with state law and obtained from willing sellers or lessors; and a *maximum of 1.0 MAF* from Dworshak to be used for fall chinook migration and/or adult temperature control. Data to review this experimental regime would be collected through 1999, consistent with the existing NMFS decision-making process.

Average Water Conditions for the Columbia River System:

- > Direct flow augmentation releases solely for the fall chinook migration. For the summer period (July-August), provide for experimentation *0-4.0 MAF*, as recommended jointly by federal and state fish and water resources managers.

The Restructured Flow Augmentation Program:

- > The above restructuring of the flow augmentation program would have the greatest deviation from the existing program by eliminating the current spring flow augmentation regime.

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- During the summer period, the restructured program would limit flow augmentation in the Snake River Basin to a level not to exceed operations that occurred in the summer of 1994 (drought conditions).
 - Without a better technical justification for the summer flow augmentation, *resource managers should refrain from taking actions to increase this flow augmentation regime.*
 - It is equally important that adequate data be obtained and appropriate analyses undertaken in order to optimize and provide a supportable technical justification for the current summer flow augmentation program.

7.3. *Future Considerations for Flow Augmentation Management and Evaluations.*

It appears that using flow augmentation within a single season is not an effective recovery tool for spring chinook migration within the mainstem. What is less clear is whether mainstem flow augmentation is an effective management tool for fall chinook within the mainstem; or how flow augmentation can or should be used to improve survival within tributaries. Given these latter uncertainties and issues beyond the scope of this paper, the following recommendations are provided.

- In the case of Snake River fall chinook, the existing data on collection efficiency (FGE) and its relationship to flow is difficult to interpret. The need exists to establish data that verifies the interaction between flow augmentation and structural improvements to FGE, and cost-effectiveness analysis should be used to assess risk and economic trade-offs.
- Resource managers may want to give consideration to changing the focus of flow augmentation efforts away from mainstem actions to improving habitat conditions within some tributaries. The NMFS Recovery Plan should better recognize this factor by taking into account criteria for demonstrating real biological benefits, prioritizing major production tributaries, and measuring the cost-effectiveness and benefit-cost of tributary flow enhancement actions.
- *Direct actions to implement flow augmentation measures should defer to the existing authority of state water rights and should allow for "locally developed" solutions within specific watersheds.* This could include an implementation of efficiency measures, water transfers, and the development of new water storage projects to benefit both fish and economic interests.

***The Columbia-Snake River
Flow Targets/Augmentation Program***

***A White Paper Review
With Recommendations For Decision Makers***

1.0. A White Paper Review.

Intricate technical features underlying the Columbia-Snake River flow augmentation program have likely overwhelmed an ability of many regional decision makers or resource managers to track, much less to understand or fully appreciate. The flow augmentation program, its implementation, and its impacts are complex.

Making this complex technical and policy system more coherent or understandable is difficult, but one approach to doing so is through the preparation of a white paper. A white paper must deal relatively succinctly with several technical, management, and policy issues.

A white paper review should serve three important purposes for decision makers and resource managers. First, it should provide basic information about policies and program actions, clarifying where possible the key implications surrounding their implementation. Second, it should highlight the primary technical features that are an essential component of program actions, addressing their strengths or weaknesses. And third, a white paper should present clear recommendations for improving program actions; for example, by suggesting how resources used for action implementation can be made more effective or *optimized*.

This white paper covers many of the major hydrological, biological, and economic factors relevant to the flow targets/augmentation program.

2.0. The Emerging NMFS Water Policy.

Natural resources policies are usually the foundation for new programs or management actions—programs or actions are derived from policy formulation and establishing objectives. But in the case of the NMFS flow targets/augmentation program, it is the program that is driving the development of the "NMFS water policy," and the program is attempting to shape water policies for the Pacific Northwest states.

The "NMFS water policy" for the Columbia-Snake River Basin drainage area can be viewed from within three sources: 1) the NMFS (1995) Proposed Recovery Plan for Snake River Salmon; 2) a revised draft NMFS (1997a) Recovery Plan still in review and development; and 3) a NMFS (1997b) biological opinion (BIOP) issued as part of a recent consultation with the Corps of Engineers (Corps) concerning building a new irrigation pumping station along the Lower Columbia River.

The first two sources (NMFS 1995, 1997a) contain similar directives to federal and state agencies concerning the issuance of new water rights or permits:

In recent years, the states have placed moratoria on new water withdrawal permits from the Snake and Columbia Rivers. These moratoria should continue and the states should expand them to the tributaries and to those groundwater resources that are part of the Snake and Columbia River system. In addition, the BOR should not promote additional irrigation in the Columbia River Basin. The Corps and state water resource agencies should not allow new water withdrawal permits that result in a net loss of flow and should review existing water withdrawal permits that reduce [the] system's ability to meet flow objectives (NMFS 1997a, pg. 70).

NMFS further states that upstream water diversions from the Snake and Columbia River system are a major reason why instream flow objectives (targets) for fish cannot be met and cites the USBR (1997) report as documentation.

The NMFS water policy also seeks to extend federal regulatory control to cases where existing state water permits are being perfected. This is illustrated by the agency's biological opinion (NMFS 1997b) on the Inland Land Project, regarding a Corps permit for a new Columbia River pump station. Here the pump station permit applicant holds a state-granted water permit that is being perfected--the construction phase is commencing to put the water resource allowed under the state permit to beneficial use. In this circumstance, NMFS brings forth its "zero net impact" goal, calling for no further depletions from the river system and concluding that "issuance by the U.S. Army Corps of Engineers (Corps) of a permit to construct a pumping facility in the Columbia River would jeopardize the continued existence of listed Snake River salmon...and result in destruction or adverse modification of their critical habitat" (NMFS 1997b, pg. i-ii, 14). The NMFS

based its determination on the collective or cumulative effects of water withdrawals within the Columbia River Basin.

Within the Inland Land Project BIOP (NMFS 1997b), NMFS also instructed the Corps to pursue Section 7 (Endangered Species Act) conservation measures that included a review of all existing pump station permits, and to decide whether such permits should be candidates for further consultations with NMFS prior to spring 1999. And NMFS indicated that if the states of Oregon, Washington, and Idaho adopted comprehensive programs to address instream flow restrictions in the Columbia River Basin, then that action may alleviate NMFS' concerns about the cumulative effects of water withdrawals.

NMFS senior staff maintain that the "NMFS water policy" does not deny or restrict the issuance of new water permits (NMFS 1997c). From their perspective, any new development or water use could proceed forward by providing replacement flows for the water withdrawn, by engaging in conservation measures, or by accomplishing water right transfers through open water markets (NMFS 1997b, 1997c).

But essentially, the NMFS water policy seeks to discourage or eliminate any new (additional) water withdrawals for municipal, industrial, or irrigation development within the Columbia River Basin; and it appears to challenge directly or indirectly the legislative authority of states to regulate, manage, and allocate water rights. The NMFS water policy is pervasive and absolute in nature, and it seeks to direct all future water allocations within the Basin to a single priority--instream flows for migrating fish populations.

Summary Observations and Comments:

- > Through its flow targets and augmentation program, the NMFS is developing a water policy within the Columbia River Basin drainage of "zero net loss."
- > The NMFS policy calls for no further water withdrawals from the Snake-Columbia River mainstems, tributaries to the main river system, and related groundwater sources; and it directs federal and state agencies to review the impacts of existing water withdrawals on its flow targets program.
- > If adopted, the NMFS policy would effectively abrogate or challenge state authority to grant future water rights for municipal, industrial, or irrigation uses. By calling for a "review" of existing water withdrawals, the policy postures toward challenging existing state-granted water rights.
- > Under the NMFS water policy, future (new) water allocations from within the Columbia River Basin drainage are to be used solely for in-stream fish flows.

3.0. NMFS Water Policy Justification, Flow Targets/Augmentation Program.

Much of the justification for the NMFS water policy may be attributed to the NMFS "flow targets" developed within the its 1995 Biological Opinion (NMFS 1995). The 1995 BIOP calls for dedicated amounts of water storage and releases during the spring and summer migration periods, to enhance existing flow levels through the Snake-Columbia River mainstem system. The NMFS flow augmentation program is principally aimed at attempting to improve survival levels for Snake River Endangered Species Act (ESA) listed salmon.

3.1. Development of the Flow Targets/Augmentation Program.

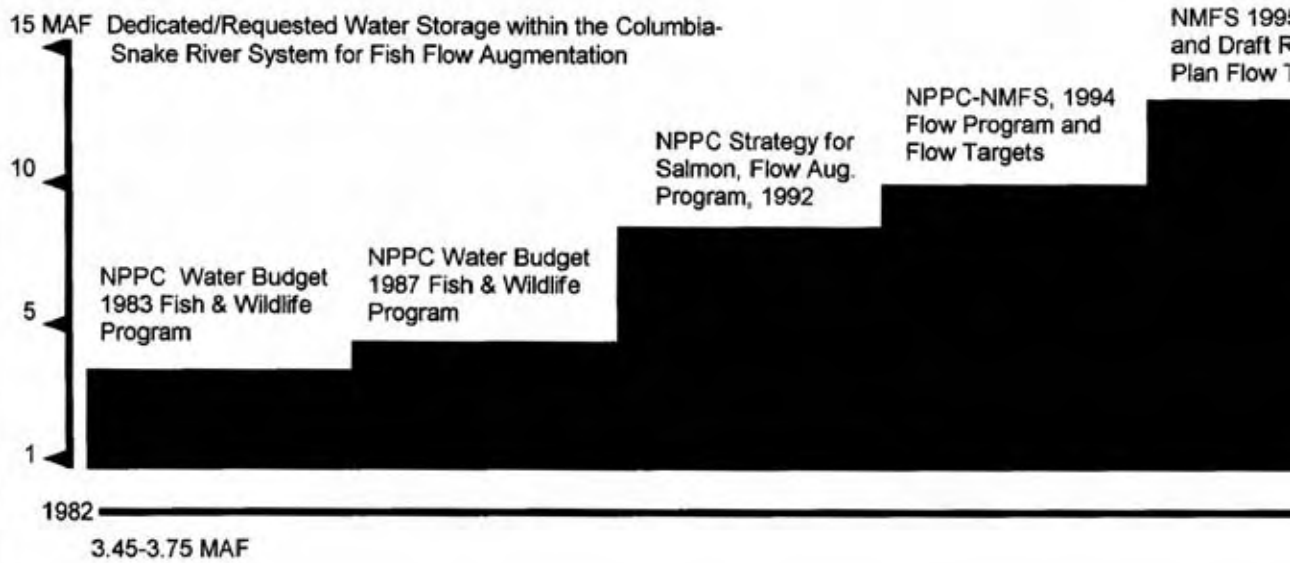
The origin of the NMFS flow targets/augmentation measures can be readily traced to the flow enhancement program produced by the Northwest Power Planning Council (Council) during the 1983-1994 period. The NMFS flow target/augmentation measures are largely an extension of the Council's flow enhancement program, as developed and applied through several Columbia Basin Fish and Wildlife Programs. The Council's authority to recommend flow regimes or adopt flow enhancement measures is derived from the Northwest Power Act.

In 1983, the Council proposed a "water budget" for flow enhancement, to be used during the spring migration period (NPPC 1983; Corps 1994). Water volumes from storage reservoirs were made available specifically to "enhance" existing water regimes, with the water being released during the spring migration period. At this time, much of the emphasis behind the flow enhancement program was to hasten juvenile migrant travel time through the reservoirs and hydroelectric power corridor.

Since 1983, the water volumes either requested or made available for flow enhancement programs have increased substantially, as depicted by the "stair-step" rate of growth presented in Figure 1. The volume of water requested for flow enhancement or augmentation has increased from about 3.75 MAF to about 13-16 MAF. The flow enhancement requests or dedications have increased with the preparation of each successive Council Fish and Wildlife Program and, in more recent years, with the development of the NMFS biological opinions for hydroelectric power system operations (1994 and 1995). Significant increases in dedicated water volumes have resulted from the ESA listings of Snake River salmon.

The present flow augmentation program is part of the NMFS 1995 Biological Opinion (1995) and Proposed Recovery Plan for Snake River Salmon (NMFS 1995). According to NMFS, this program should be capable of providing as much as 13-16 MAF of water for fish flows, to be released during the spring (May 10--June 20) and summer (June 21-August 31) migration seasons.

**Figure 1. Milestones of the Flow Augmentation/Targets Program
Columbia-Snake River System**



The NMFS flow enhancement program adopts flow objectives or "targets" to direct the need for flow augmentation water releases. The NMFS views the flow targets as key to its flow program operating criteria:

These flow objectives serve two important functions. First they represent the average flows that NMFS believes provide suitable in-river conditions for migrating fish and, as such, they provide a useful yardstick for measuring the acceptability of particular operating strategy...Second they serve to guide the in-season management process which helps determine when to use available water for flow augmentation (NMFS 1995, V-2-19).

The NMFS states that the flow objectives are not "intended as hard constraints on river operations, but as a guide for determining how to allocate scarce water."

The NMFS flow targets are measured at Lower Granite Dam for the Snake River, and at the McNary Dam for the Lower Columbia River system (total river basin system water flow or run-off). For the spring period, the flow targets are 85-100 kcfs and 220-260 kcfs, at Lower Granite Dam and McNary Dam, respectively; for the summer period, the flow targets are 50-55 kcfs and 200 kcfs, respectively at each project. The targets are supposed to reflect water run-off forecasts and the actual water available in the system.

Estimates of the actual water volume releases under the Council and NMFS flow augmentation programs are presented in Table 1 and Figure 2. For example, during a low water-year condition like 1994, about 10.6 MAF of water was provided for fish flows. Most of this water was released during the spring period, about 7.8 MAF. About 1.5 MAF came from the Snake River system during the summer period, with about 0.5 MAF from the Brownlee Project or above.

Summary Observation and Comments:

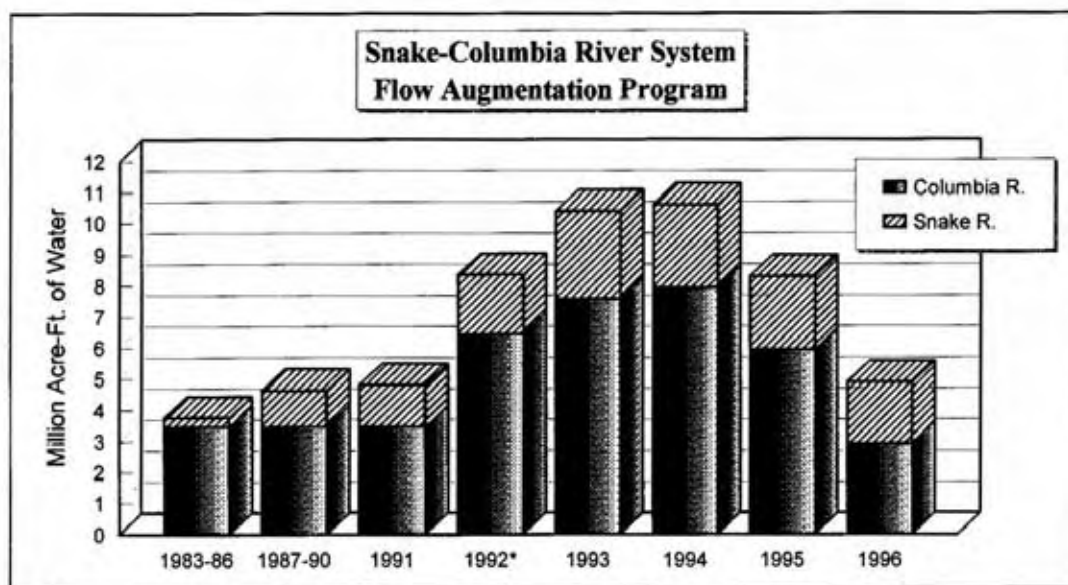
- The NMFS flow targets/augmentation program follows on the development of the fish flow augmentation program devised by the Northwest Power Planning Council during the 1983-1994 period.
- An initial "water budget" requested by the Council amounted to about 3.75 MAF, but has grown with the preparation of each new Council Fish and Wildlife Program; the NMFS 1995 BIOP now calls for as much as 13-16 MAF for dedicated flow enhancement.
- The highest level of flow augmentation produced, about 10.6 MAF, occurred during the 1994 drought water-year; about 0.8 MAF was released from the Brownlee Project and above, about 1.9 MAF was released from Dworshak Reservoir, with the remaining water being released from upriver Columbia system reservoirs.

Table 1. Columbia-Snake River
Flow Augmentation Program
1994-1996

Flow Augmentation	Estimated	Estimated	Estimated
<i>Spring Period:</i>	1994	1995	1996
Snake River (MAF)			
Dworshak	0.87	0.83	0.27
Brownlee and Above	0.33	0.35	0.41
Total Snake R.	1.20	1.18	0.68
Columbia R. (MAF)			
Arrow (Canada)	----	(1.47)	(0.14)
Libby/Hungry H.	----	1.60	0.36
Grand Coulee	----	3.70	(0.07)
Total Columbia R.	6.60	3.83	0.15
Total Flow Aug.	7.80	5.01	0.83
<i>Summer Period:</i>			
Snake River (MAF)			
Dworshak	1.02	0.92	0.95
Brownlee and Above	0.46	0.26	0.35
Total Snake R.	1.47	1.18	1.30
Columbia R. (MAF)			
Arrow (Canada)	0.20	1.60	1.33
Libby/Hungry H.	0.00	(0.43)	0.35
Grand Coulee	1.13	0.94	1.09
Total Columbia R.	1.33	2.11	2.77
Total Flow Aug.	2.80	3.29	4.07
Spr-Sum Total Flow Aug.	10.60	8.30	4.90

Data Source: Bonneville Power Administration, Dittmer Control Center, Portland, Oregon
August-December 1997. Estimates are based on net with/without fish operations impacts to
the hydro system.

Figure 2. Columbia-Snake River
Flow Augmentation Program
1983-1996



	Usable 1983-86	Usable 1987-90	Est. 1991	Est. 1992*	Est. 1993	Est. 1994	Est. 1995	Est. 1996
Snake River (MAF)								
Dworshak	-----	-----	-----	-----	2.298	1.89	1.75	1.21
Brownlee & Above	-----	-----	-----	-----	0.525	0.79	0.61	0.76
Total Snake R.	0.3	1.18	1.36	1.9	2.823	2.68	2.36	1.97
Columbia R. (MAF)								
Arrow (Canada)	-----	-----	-----	-----	-----	-----	0.13	1.19
Libby/Hungry H.	-----	-----	-----	-----	-----	-----	1.17	0.71
Grand Coulee	-----	-----	-----	-----	-----	-----	4.64	1.02
Total Columbia R.	3.45	3.45	3.45	6.45	7.58	7.93	5.94	2.92
Total Flow Aug.	3.75	4.63	4.81	8.35*	10.40	10.61	8.30	4.89

Data Source: Bonneville Power Administration, Dittmer Control Center, Portland, Oregon August 1997; USACE, 1994; and NPPC, Strategy for Salmon, 1992. Estimates are based on net with/without fish operations impacts to the hydro system.

* A 1992 estimate from BPA is higher than the values indicated below. The BPA estimate is about 10.79 MAF, with 8.68 MAF from the Columbia system and 2.11 MAF from the Snake.

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- In the 1994 low water year, about 0.5 MAF was provided from the Brownlee Project and above during the summer period; and about 1.0 MAF came from Dworshak Reservoir.
 - Within the NMFS flow augmentation program, the "flow targets" serve as operational guides for in-season water management, determining when to use available water for flow augmentation.

4.0. River System Hydro Regulation Studies and the Flow Targets.

The relationship between Columbia River Basin hydrologic (water run-off) conditions and the NMFS flow targets is best described by the hydro regulation and water depletion studies being conducted by the U. S. Bureau of Reclamation (USBR). These studies (USBR 1997) provide estimates of water flows at specific points along the river system, based on 50-year (or 60-year) water records. The studies further specify the average monthly flow levels given four different hydro (flow) regimes: 1) a natural flow condition; 2) natural flows with irrigation depletions; 3) current flow conditions under the NMFS 1995 BIOP regulation, including irrigation depletions; and 4) current flows with the effects of irrigation depletions removed.

Under the natural flow regime, the effects of all reservoir storage operations and water depletions are removed; natural flows represent a Columbia River system that existed prior to the mid-1800s and before irrigation and hydroelectric power dam were constructed. Under the natural flows with the effects of reservoir storage removed regime, water withdrawals would be met only by natural flow water conditions; irrigation depletions would exist but without water storage reservoirs.

Representing the current flow regime, flow and water depletion conditions would depict the existing 1995 BIOP hydro regulation, with existing water depletions and fish flow enhancement. Under the current flows and with the effects of irrigation depletions removed, the existing reservoir system is assumed to be in place, but no water is being diverted for irrigation, and the reservoirs are operated to their limits to meet the NMFS 1995 BIOP flow targets.

4.1. Flow Regime Hydrology and Flow Target Implications.

Analyses of the USBR (1997) hydro regulation data highlight several operational features inherent to the four major flow regimes, and illustrate an ability of the river system to meet the NMFS flow targets during key water-years and under different water depletion conditions. The analyses also offer a better understanding of how the different net variations in water-year flows compare to net water depletions.

Figure 3 examines the four major flow regimes under a low water-year condition (1976-77), with average monthly flows (across the 50-year water record) measured at the McNary Dam. The regulation data display the "shape" of the different flow regimes and of the peak flow months, May and June. The data also depict the impact of the net irrigation depletion levels, the difference between the BIOP with irrigation versus the no irrigation with storage flow levels.

With low water-year conditions, the Columbia River Basin net system irrigation depletion amounts to about 29% of the total system run-off during the peak irrigation month of July; and about 25% during the month of June.

Figure 3 also displays the river system's ability to meet the NMFS flow targets. For example, during the spring period, the average monthly flows cannot reach the flow target level of 220 kcfs, either with or without the effects of net irrigation depletions. During the summer period, the same situation holds true, with both the BIOP and no irrigation flow regimes considerably less than the flow target of 200 kcfs. It should be emphasized that neither the natural flow nor dedicated reservoir storage for fish flow can meet the 200 kcfs target.

The river flow regimes for average water conditions, measured at McNary Dam, are presented in Figure 4. In July and August, net irrigation depletions account for about 16% and 20% of the total system run-off (see Figure 5). During an average annual run-off period, the net irrigation depletion (about 13 million acre-feet) amounts to about 6-7% of the total flow measured at the mouth of the Columbia River, approximately 200 million acre-feet (Corps 1995).

Under average water conditions, the spring flow target of 260 kcfs is met under all four water regimes. But the summer flow target for August of 200 kcfs cannot be met, either with or without net irrigation depletions. And the natural flow regime falls below the summer flow target, in August, as well.

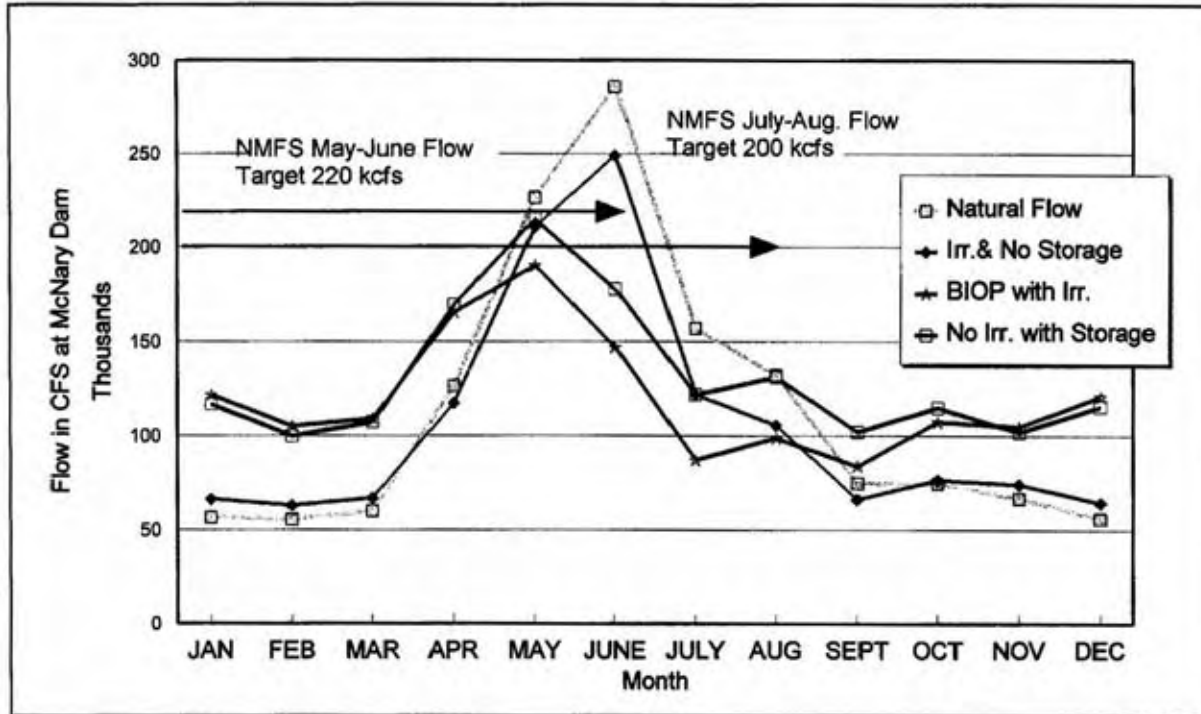
Similar types of hydro regulation analyses can be made for flows measured at the Lower Granite Dam, using the USBR hydro regulations. In Figure 6, a low water-year (1976-1977) condition is examined, in relation to the four major flow regimes. Under this water condition, net irrigation depletions amount to about 40% and 50% of the total run-off during the months of July and August.

From Figure 6, it is apparent that neither the spring (85 kcfs) nor summer (50 kcfs) flow targets can be met, with or without system net irrigation depletions. Even under the natural flow regime, the flow targets are substantially beyond the hydrologic capabilities of the river system to meet. There are no river conditions that can come close to the flow targets under low water conditions.

In Figure 7, flow regimes at Lower Granite Dam are presented under average water conditions (monthly average for the 50-year water record). Net irrigation depletions amount to about 27% and 39% for the peak water use months of July and August (see Figure 8).

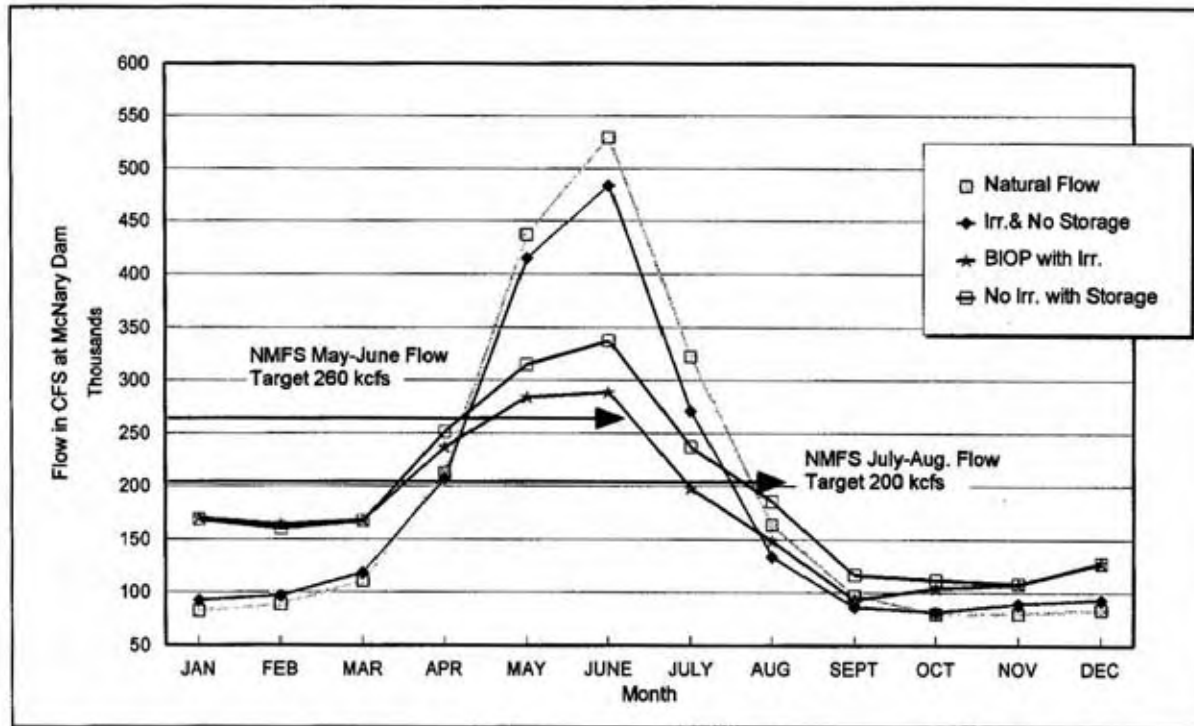
Figure 7 also displays the effects of net irrigation depletions on the ability of the river system to reach flow target levels. During the spring period, the flow target (100 kcfs) can be met by the four major flow regimes. However during the summer period, in August, the monthly average flow for the four water regimes drops below the flow target (55 kcfs) level. *In August, the net irrigation depletion flow is equal to the water level that would occur under a natural flow regime, about 31 kcfs at Lower Granite Dam.* Both the net irrigation depletion and natural flow regimes fail to achieve the flow targets.

Figure 3. Columbia River Basin Water Flows
Estimated Low Water Condition (1976-77), Average Monthly Flows at McNary Dam



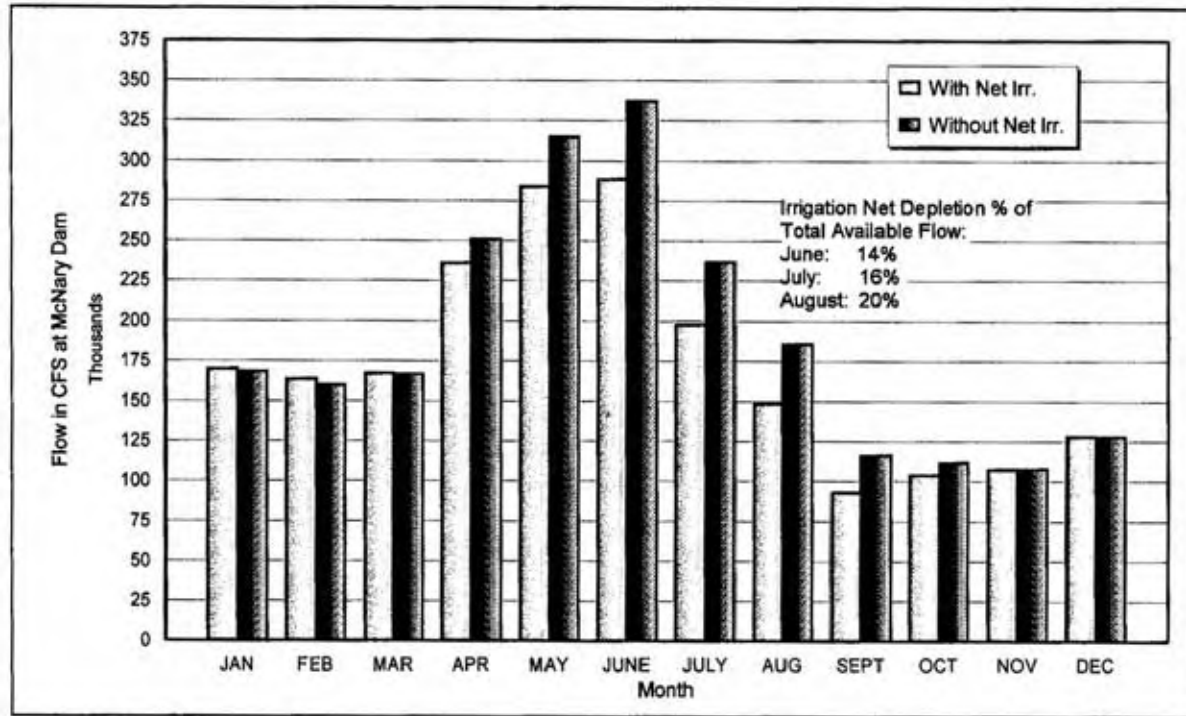
Data Source: USBR, Cumulative Effects of Water Use, Interim and Draft Reports, March-October 1997.

Figure 4. Columbia River Basin Water Flows
Estimated Average Water Condition, Average Monthly Flows at McNary Dam



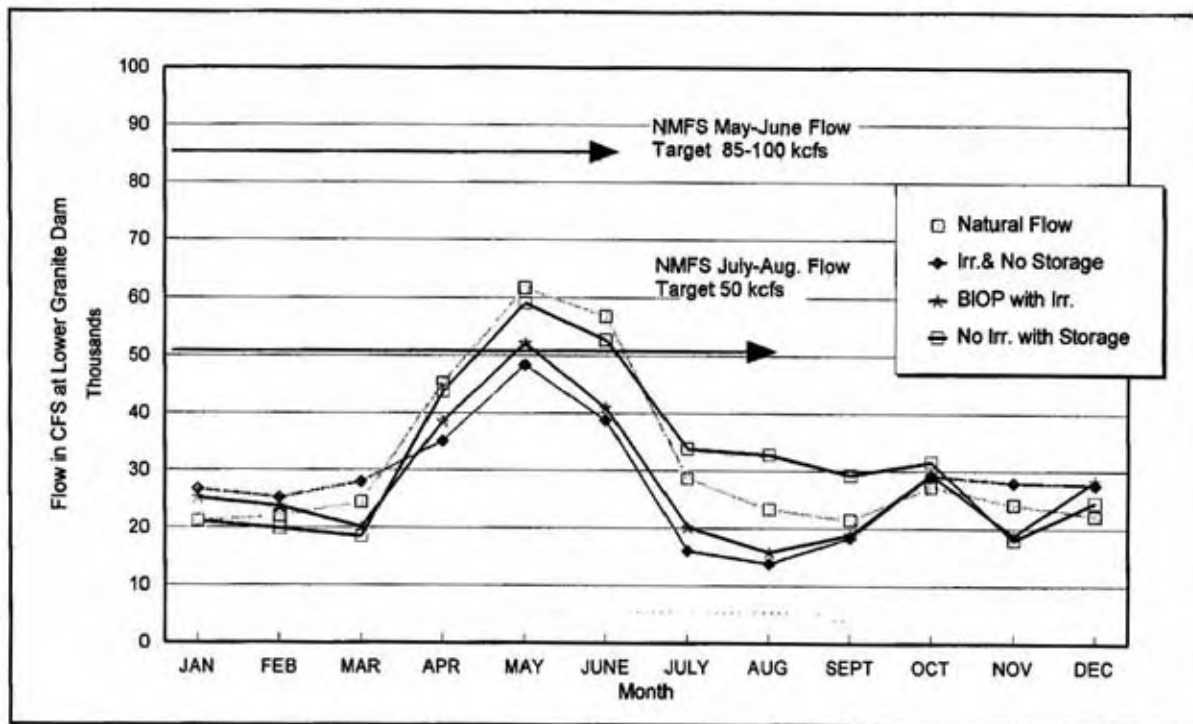
Data Source: USBR, Cumulative Effects of Water Use, Interim and Draft Reports, March-October 1997.

**Figure 5. Columbia River Basin Water Flows
With/Without Net Irrigation Depletion, Average Monthly Flows at McNary Dam**



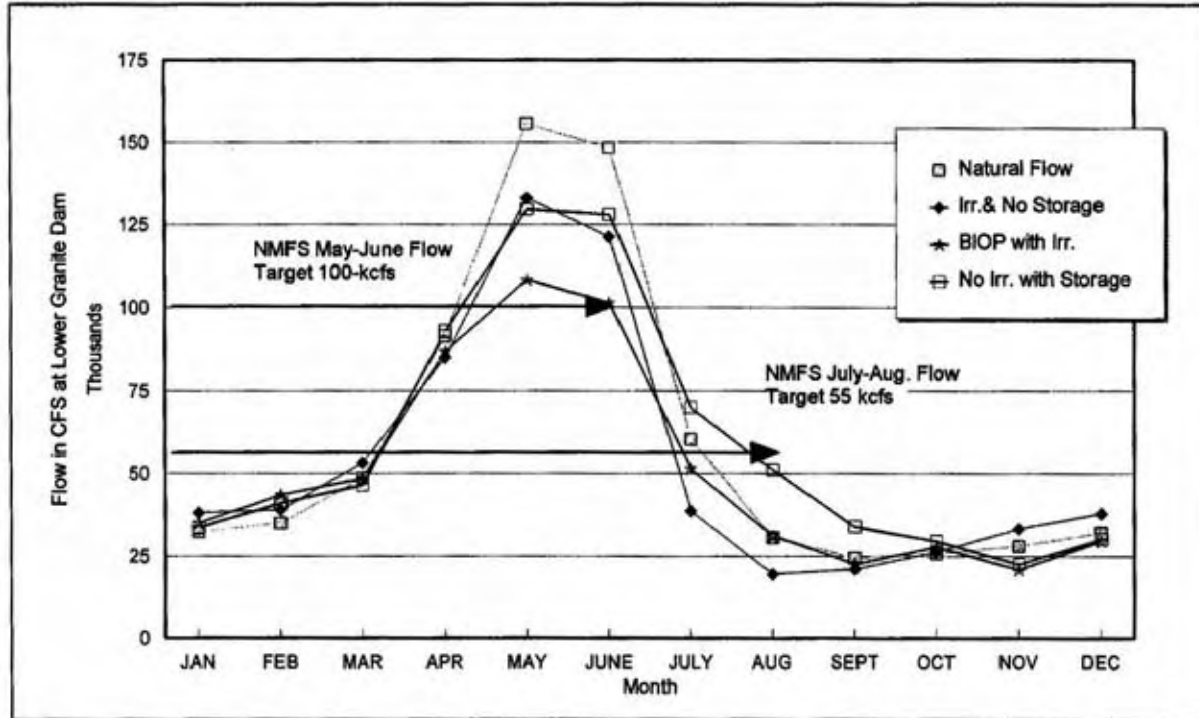
Data Source: USBR, Cumulative Effects of Water Use, Interim and Draft Reports, March-October 1997.

Figure 6. Columbia River Basin Water Flows
 Estimated Low Water Condition (1976-77), Average Monthly Flows at L. Granite Dam



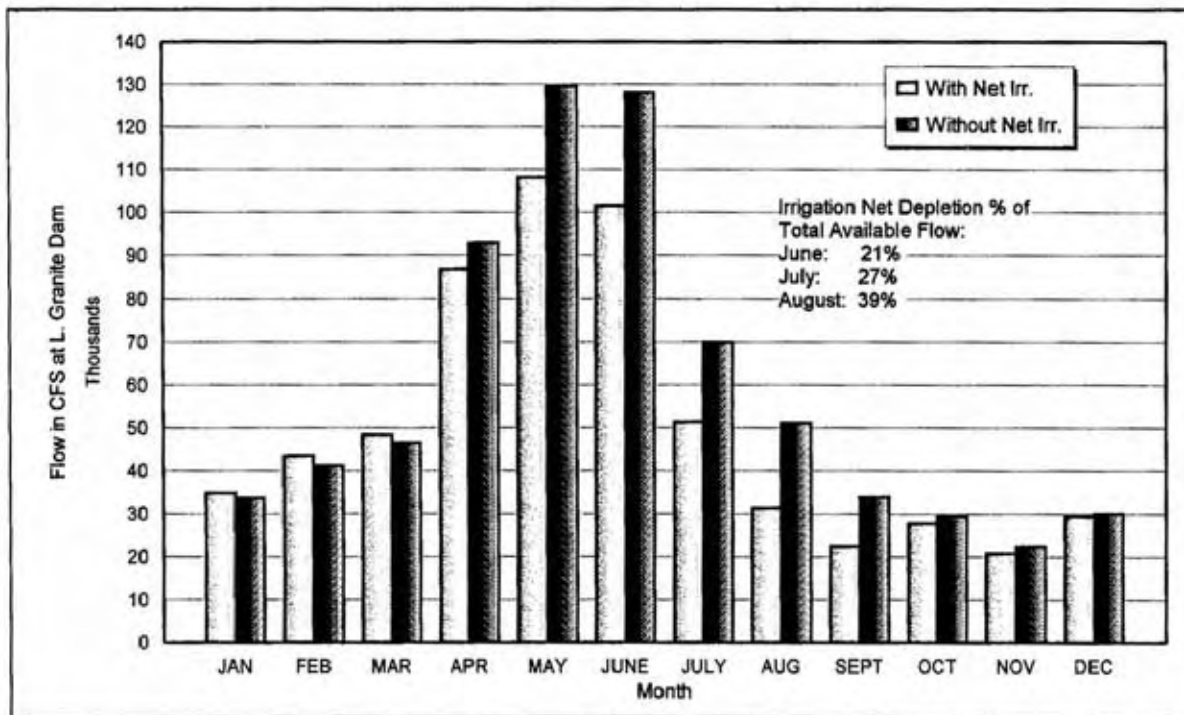
Data Source: USBR, Cumulative Effects of Water Use, Interim and Draft Reports, March-October 1997.

Figure 7. Columbia River Basin Water Flows
 Estimated Average Water Condition, Average Monthly Flows at L. Granite Dam



Data Source: USBR, Cumulative Effects of Water Use, Interim and Draft Reports, March-October 1997.

Figure 8. Columbia River Basin Water Flows
With/Without Net Irrigation Depletion, Average Monthly Flows at L. Granite Dam



Data Source: USBR, Cumulative Effects of Water Use, Interim and Draft Reports, March-October 1997.

4.2. River System Net Flow Variability.

Another factor to consider in reviewing the effects of either flow augmentation or irrigation net depletions is year-to-year system variability, the dramatic changes that can occur in total volume water run-off. System control is very limited, with or without flow augmentation, and changes to net year-to-year flows typically overshadow the net irrigation depletion for the Columbia River Basin system.

Figure 9 displays the net differences in flow levels, as measured at the McNary Project, using the USBR (1997) hydro regulation for the 1995 BIOP operations (which includes net irrigation depletions). Net flow differences are described for the months of June, July, and August for a 50-year water record. The net flow levels depict between year flow differences. For example, if the flow in one year (for June) averaged 200 kcfs and in the next year increased to 250 kcfs, then the net flow difference would be 50 kcfs; or conversely, if the flow decreased from 250 kcfs to 200 kcfs, the net flow difference would be 50 kcfs.

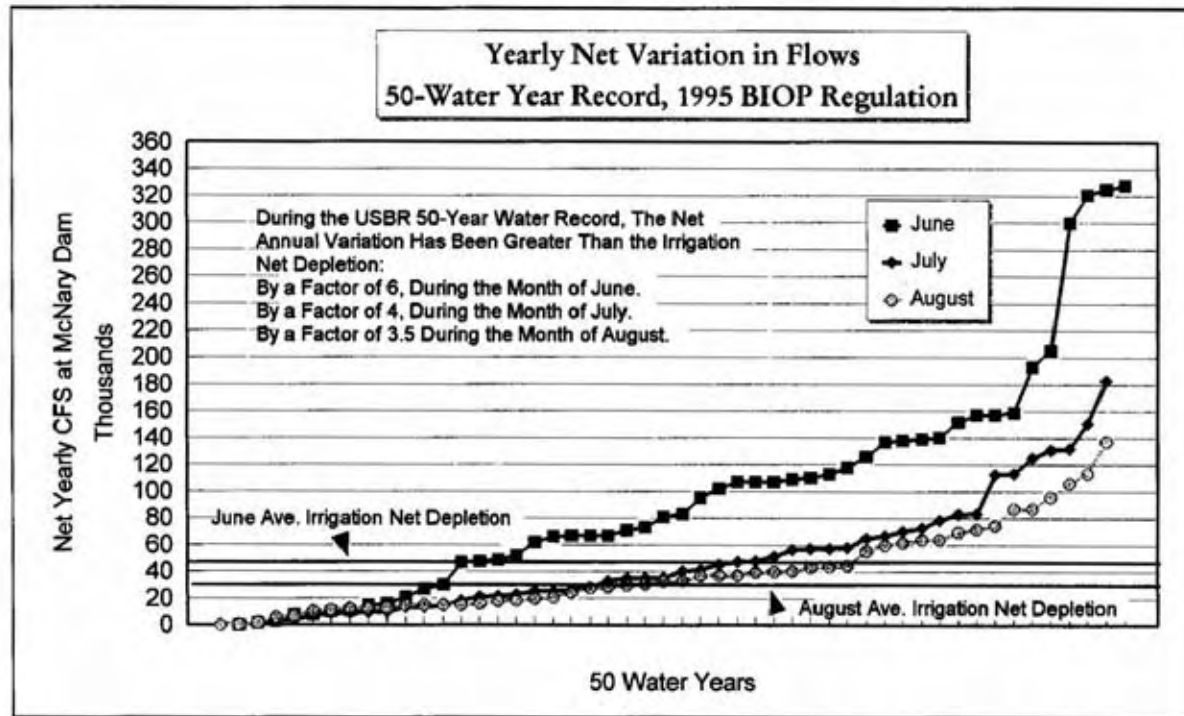
In Figure 9, it is apparent that the yearly net variation in flows can exceed the net irrigation depletion by as much as a factor of 3.5 to 6 (250 to 500%), depending on the month selected. The 50-year water record indicates that the variation in net flows exceeds net irrigation depletions in a majority of years for the months of June and August. In July (similar net irrigation depletion level as in June), the net yearly variation in flows exceeds the net irrigation depletion in about one-third of the water record years.

This wide-ranging variability in net flow levels means that efforts will be insignificant to use either flow augmentation or marginal decreases to irrigation withdrawals to "recreate" or "simulate" high volume flow years within the Lower Columbia River system.

Summary Observations and Comments:

- The USBR hydro regulation studies demonstrate that the NMFS flow targets cannot be met in all months, during low or average water-years, because they require more water than the hydrologic system can provide, with or without the effects of net irrigation depletions.
- During low and average water years for the summer flow augmentation period, the NMFS flow targets exceed water levels that would be available under natural river system conditions, and with or without the effects of net irrigation withdrawals.
- The net irrigation depletions *are not* the primary reason why the NMFS flow targets cannot be met; the problem rests with the flow targets themselves--the targets are well beyond the Basin's hydrologic capabilities.

Figure 9. Columbia River Basin Water Flows
 Net Irrigation Diversion Compared to Yearly Net Flow Changes



Data Source: USBR, Cumulative Effects of Water Use, Interim and Draft Reports, March-October 1997.

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- **The annual natural run-off within the Basin is highly variable; the yearly net variation in flows for a 50-year water record substantially exceeds or overshadows net irrigation withdrawals, measured at McNary Dam.**
 - **Attempts will be insignificant to use either flow augmentation or marginal decreases to irrigation withdrawals to "recreate" or "simulate" high volume flow years within the Lower Columbia River system.**

5.0. *Biological Basis for Flow Targets/Augmentation.*

5.1. *History of the Flow-Survival Relationship.*

A central element of the NMFS (1995) Salmon Recovery Plan is flow augmentation, in which spring and summer flows are increased by releases from storage reservoirs or, by implication, through the reduction of irrigation water withdrawals. The justification for these actions is based on the general relationship: *additional river flow = higher fish survival*. This principle, with origins predating any data, is based on the belief that increased river flows decrease fish travel times and thus decreases the exposure of juveniles to predation and other in-river hazards. In addition, in terms of the recent Normative River concept (ISG Review 1996), increased flows create a hydro system that more closely mimics the natural river prior to the development of the dams. While early evidence and analyses appeared to support a strong flow survival relationship, the recent studies do not.

Historically it has been observed that higher yearly average flows are correlated with higher fish survival, measured as either in-river survival of juveniles or as smolt-to-adult return rates. While it is not disputed that the relationship involves complex interactions of environmental and human factors, it also has been believed that some of the benefits of the observed year-to-year correlations can be obtained through manipulation of the hydro system flow *within a year*. Thus, there is a fundamental belief that by increasing the water flow in a dry year some of the benefits of a wet year can be created. This strategy is at the foundation of the flow targets of the 1995 NMFS Biological Opinion. By regulating hydro system flows and reducing system-wide irrigation withdrawals, fish managers attempt to put sufficient water through the hydro system during the smolt migration to avoid low flows and the high mortalities believed to occur with them.

In the past, a strong flow-survival relationship was widely accepted. But the recent evidence supports a weak flow-survival relationship, and the quantitative difference between the strong and weak responses is vast. For example, in 1990, an analysis conducted with the System Planning Model (SPM) predicted that from a base 93 kcfs Ice Harbor flow an additional 47 kcfs of flow would increase spring chinook survival by 180% (CBFWA 1990). But with more recent data and model analyses, we have revised the potential increase to 1.5%. This newer estimate is over a hundred times weaker than the older one.

From an historical perspective, the evidence supporting first a strong response and then a weak response evolved in two distinct periods, with a shift at the beginning of the 1990s (see Table 2). Using research from the '60s, '70s, and '80s, analyses published in the early 1980s purported a strong flow-survival hypothesis. Succeeding studies and analyses in the 1990s have reevaluated the data and key information, and from this work a weak flow-survival hypothesis has emerged. The existing management plans were developed with the belief in a strong flow-survival relationship and place flow augmentation as a central management tool. Although the NMFS Recovery Plan decision scheduled for 1999

**Table 2. Historical Progress of the Flow-Survival Relationship
Key Studies and Programs/Plans**

Year	Supporting a Strong Flow-Survival Relationship	Supporting a Weak Flow-Survival Relationship
1980s	Sims and Ossinder 1980s (70s-80s Spring Chinook Studies)	
1983	NPPC Fish & Wildlife Program*	
1987	NPPC Fish & Wildlife Program*	
1990	CBFWA Integrated System Plan*	
1992	Petrosky 1992 (Adult Return Rates Correlated with Travel Time)	Marsh and Achord 1992 (PIT Tag Study Suggests High Survival-1973 Water Conditions)
1993	Hilborn, et al, 1993 Berggren and Filardo 1993 (*Fall Chinook Flow- Travel Time Relationship)	
1994	Cada, et al. 1994 (Some Relationship Between Flow and Survival) NMFS 1994 BIOP*	Giorgi, et al. 1994 (No Fall Chinook Flow-Travel Time Relationship) Olsen and Richards 1994 (Ocean Conditions Are Affecting All West Coast Chinook Runs)
1995	NMFS 1995 BIOP*	Williams and Mathews 1995 (Low Survival Tied to Trash Conditions at Dams) Skalski, et al. 1996 (Fall Chinook Survival Depends on Lower River Stock Selection)
1996		Anderson 1996 (Climate-Cycle Correlates with Ocean Survival)
1997		Smith, et al. 1997a (1993-1997 Data) (No With-Year Relationship Between Flow-Survival for Spring Migrants) Giorgi, et al. 1997 Smith, et al. 1997b (No Clear Relationship for Within Year Flow Survivals, Fall Chinook)
1998	FLUSH Model Has Strong Relationship Via Delayed Mortality	CRiSP Model Has Weak Relationship Via Delayed Mortality

* Fish mitigation and recovery programs.

will likely include flow measures, *the Recovery Plan should reconcile its flow augmentation program with the more recent data and modeling analyses.*

5.2. Strong Flow-Survival Relationship.

The early belief of a strong flow effect was based on NMFS studies conducted on a yearly basis between the mid-1960s and the mid-1980s. Fish were tagged and released in Snake River tributaries and collected at John Day or The Dalles Dam on the Lower Columbia. Sims and Ossiander (1981) presented a graph of seven data points displaying average spring chinook smolt survival versus average flow between 1973 and 1979. The data suggested a strong relationship between smolt survival and flow, but it was driven by the two lowest flow years (1973 and 1977). Excluding these years, the relationship was flat; that is, no discernible relationship was evident between the average yearly flow and the estimated survival for the year.

Resource managers embraced the "Sims-Ossiander relationship" and formalized it in a computer model, the Passage Analysis Model, as developed by the Northwest Power Planning Council staff. They concluded that one reason for the decline in stocks over the 1970s was decreased spring flows associated with the hydro system. It was then assumed that, if water from storage reservoirs was released into the river in the spring, the effect of high flow water years could be recreated, and smolt survival would increase.

This leap of faith from seven data points to a fully developed theory of the impact of shaping river flows, within a year, was scientifically overly simplistic and has been criticized in numerous documents (Steward 1994, Williams and Matthews 1995, NMFS 1995). The evidence now suggests that ocean environment, fish condition, poor dam operations and adverse passage conditions, especially in the two lowest flow years, had more to do with the apparent flow-survival relationship than flow itself. These issues were unknown at the time, but managers thought by simply "re-shaping" the seasonal outflow profile from storage reservoirs, they could rebuild the fish runs in the basin.

If the flow survival relationship was only based on the Sims and Ossiander (1981) study, the aggressive flow enhancement measures would not have been adequately justified. In 1991, though, the strong flow-survival hypothesis received additional support through an analysis illustrating that spring chinook adult return rates were larger for years with shorter water travel time during the smolt migration season (Petrosky 1992). The data spanned the period 1960 through 1987, and fish managers refined their hypothesis by inferring that decreasing water travel time would increase adult returns. Although the focus shifted from flow to water travel-time and from smolts to adults, the promise was the same: modest increases in flow, within a year, would recreate the strong benefits in survival that had been observed in earlier years.

Also, evidence for a relationship between flow and travel time for spring chinook was published by Berggren and Filardo (1993). More evidence was added with an analysis

of the coded wire tagged adult returns of fall chinook from the Priest Rapids hatchery on the mid-Columbia (Hilborn, et al., 1993). The authors attempted to remove the impact of variable ocean conditions by comparing survival of the Mid-Columbia stock to a downstream hatchery stock. The authors concluded that a significant relationship existed between smolt-to-adult survival and an index of river flows during smolt out-migration.

The evidence on spring chinook and steelhead smolt survivals (Sims and Ossiander 1981), spring chinook smolt-to-adult ratios (Petrosky 1992) and recruitment of fall chinook adults (Hilborn, et al., 1993) merged in the early 1990s into a qualitative belief that year-to-year differences in flow or travel time were associated strongly with year-to-year differences in survival. Cada, et al., (1994) reviewed historical data and studies and did identify inconsistencies in the flow survival hypothesis. Nonetheless, they concluded that there was a relationship between flow and survival—particularly between large volume flow differences—that needed further definition and elaboration.

The belief also that within a year water shaping and augmentation of flow could benefit smolt or adult survival was accepted, even though it was largely unsupported by empirical data or theory. Consequently, the practice became a foundation of the NMFS 1995 BIOP flow targets and augmentation program. The underlying belief was that changes to the hydro system operations, within a smolt migration year, would produce significant improvements in returning adults.

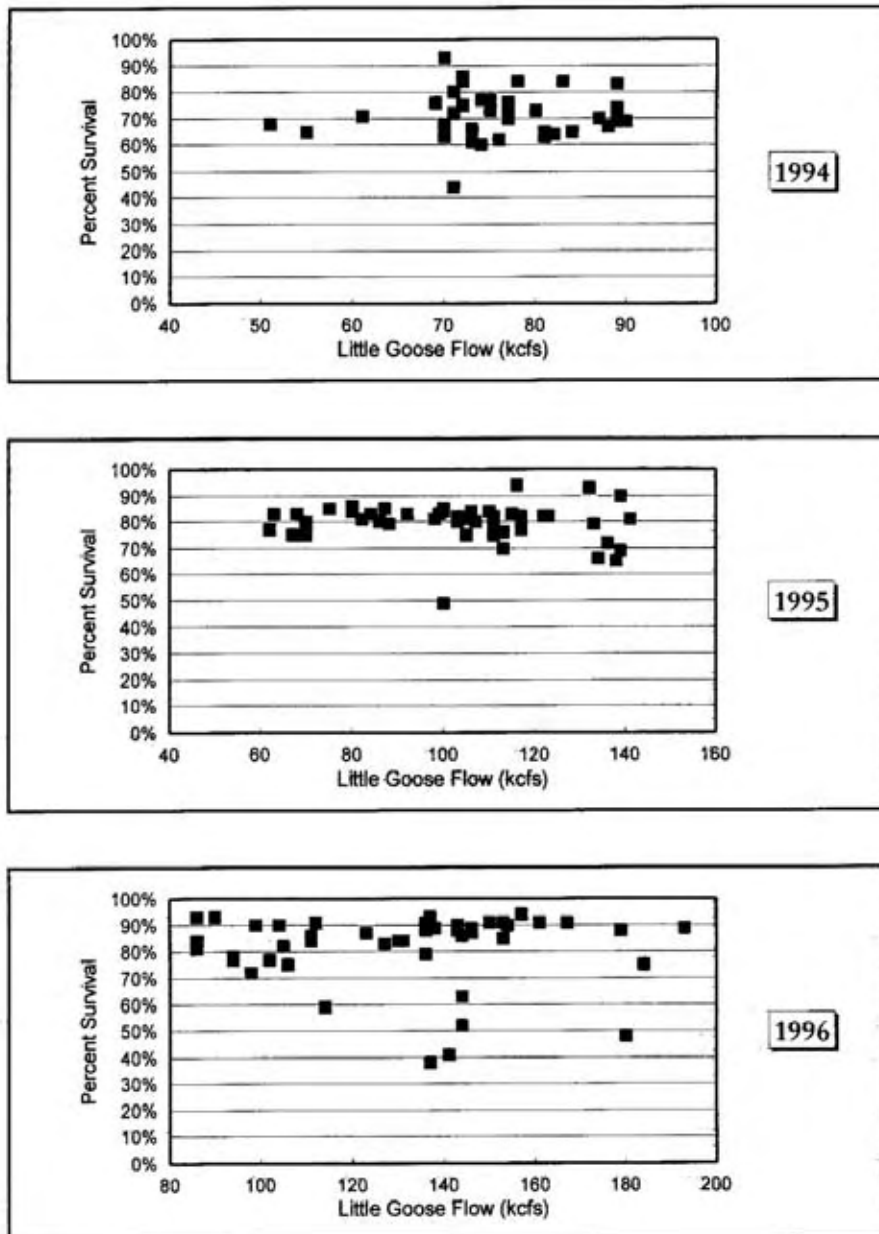
5.3. *Weak Flow-Survival Relationship.*

The first evidence for a weak flow-survival relationship evolved out of individual studies on specific species. The work all took place after preparation of the Cada, et al., (1994) report, and it represents a radical departure from the previously accepted belief system. The main evidence is based on new PIT-tag survival studies. This technique allowed tagging and non-invasive detection of individual fish and represented a breakthrough in survival studies by decreasing the error in the statistical estimates to only a few percent.

A prototype study was conducted in 1992, an extremely low flow year comparable to 1973, which had the second lowest smolt survival on record (Marsh and Anchord 1992). The results rattled the foundation of the old belief system. Estimates of survival were nowhere near the 1973 levels. Subsequent expanded studies conducted through 1997 have conclusively proven that a strong flow-survival relationship for spring chinook and steelhead smolts does not exist (Smith, et al., 1997a). A regression of the survival data for spring chinook migrating from Lower Granite tailrace to Lower Monumental tailrace from 1994 through 1996 resulted in a shallow slope with a relatively low statistical relationship.

More important for management, though, were the relationships between flow and survival *within years* (see Figure 10). Whereas a corollary to the strong hypothesis that within-year flows would benefit within-year survivals, the PIT tag analyses indicated no

Figure 10. NMFS/UW Survival Data, 1994-1996
 Survival Rates for Juvenile Spring Chinook Release Groups
 (L. Granite Tailrace to L. Monumental Tailrace)



relationship whatsoever (Smith, et al., 1997a). In essence, the PIT tag data and the subsequent analyses conclusively prove that the strong inseason flow-survival hypothesis for spring chinook and steelhead smolts--as was originally claimed from the Sims and Ossiander studies--is not supported.

The old data did have low survivals, and so these survival estimates also must be considered. Although it is often difficult to explain the past, Williams and Matthews (1995) added a key missing factor. They reviewed the hydro system records and data and showed that in the early survival studies, the hydro system was radically different than it is now. Significant accumulations of trash in the forebays of the Upper Snake River dams, intermittent turbine operations in low flow years, and large spills and gas supersaturation levels in high flow years (and in years with reduced dam hydro capacity) all contributed to the mortality reported in the Sims and Ossiander work. Improved dam operations have reduced mortality problems and have increased dam passage survival. As such, reconciliation of the Sims and Ossiander studies and the new PIT tag studies is straightforward.

Having addressed errors in the formulation of the spring chinook flow-survival relationship for smolts, the need also exists to address the relationship between travel time and adult returns presented by Petrosky (1992). The management action implied is that by decreasing water travel time by any means, there will be increases to adult fish returns. Again, the leap of faith to flow augmentation as a management action is wholly unsupported. Although the correlation between smolt-to-adult returns (SAR) and water travel time over 27 years of observations is visually evident, it is a misleading correlation, since flow had very little impact on either variable in the time series.

The main factor was simply the change in the number of dams over the 27 years. In the early part of the time series (1966-1969), smolts and adults passed three dams, while in the latter part of the series (after 1976), they passed eight. Dams increase water travel time and the cumulative mortality in dam passage, but increasing flow would only have a minor impact on travel time and would only improve dam passage survival as a consequence of spill, albeit in a minor but measurable way.

A second factor driving the correlation is the change in ocean/climate conditions over the analysis period. In the early part of the time series, climate was in a wet regime favorable to the survival of the Columbia River salmon and, in 1977, it shifted into a dry regime unfavorable to their survival (Anderson 1995; also see Olsen and Richards 1994).

The final issue relevant to the earlier data analyses is that after 1977, about 80% of the Snake River spring chinook spawners were barged through the river as smolts. Thus their passage through the hydro system was independent of water velocity, and so it is incorrect to identify a mechanistic relationship between the survival of transported fish and water travel time.

In their 1995 BIOP, the NMFS recognized that the data supporting the recommended flow augmentation program contained limitations, and the agency has continued to better define and understand the flow-survival hypothesis.

5.4. *Flow-Survival Factors Affecting Fall Chinook.*

The effect of flow on fall chinook is less defined and has been confounded because the fish feed and grow as they move slowly through the river system in the summer and late fall. And since temperature changes can have both a positive and potentially negative (thermal shock and changes to FGE) impacts on the fish, the implications of flow augmentation are very complex and are yet to be well understood.

Most studies on smolts have focused on the relationship of flow to travel time. Giorgi (1994) reevaluated an expanded data set, encompassing that used by Berggren and Filardo (1993), and found no significant flow-travel time relationship for fish in the Lower Columbia. Evaluating data from the Mid-Columbia above McNary Dam, Giorgi, et al., (1997) found similar results. Fish length was the major determinant of fall chinook travel time, and flow was of secondary importance. Flow, by itself, explained about 28% of the observed variation in migration rate.

The fall chinook flow-recruitment to age two relationship found by Hilborn, et al., (1993) was reanalyzed by Skalski, et al., (1996), who expanded the analysis to include more explanatory factors than just river flow and included more downstream comparison stocks. Skalski, et al., (1996) concluded that the 24 years of Priest Rapids hatchery returns yielded little insight into key in-river factors that may be influencing hatchery return rates. In fact, of all the variables analyzed, *flow provided the least amount of predictive capability*. Also, the choice of the downstream comparison stocks greatly influenced the outcome of the analysis.

The recent PIT tag data provides a better picture of the complexity of the within season (year) survival of fall chinook in the Snake River. Smith, et al., (1997b) observed a trend between flow and survival that was not statistically significant (.05 level) within years but held moderate correlation. But it is noteworthy that the survival relationship was better described by the date fish passed Lower Granite or Little Goose dams. In general though, the factors affecting fall chinook in-river survival are not fully understood. A prolonged migration with the tendency of later migrating fish to residualize (stop migration and over-winter in the reservoir) complicates the interpretation of the effect of flow, temperature, release date, or fish size on their survival while passing through the hydro system.

Another affect flow may have on overall survival can be seen by examining the preliminary fall chinook adult PIT tag returns from both the 1994 and 1995 migration years (PITAGIS data base, 1998). The adult PIT tag data indicate that fall chinook juveniles detected at collector facilities from October 1, to December 10, produce about as

many returning adults as juveniles detected during the peak migration period (July-September)—a period when flow augmentation was used to protect juvenile migrants (see Figure 11). These data indicate a survival advantage for juveniles that delay migration until late fall. As such, management actions that attempt "to force" juveniles to migrate during a certain time frame may actually be detrimental to the overall survival of a given year class.

Still, the relationship between year-to-year flows and Lower Granite PIT tag detection of Hells Canyon fall chinook has an apparent correlation over the years 1992 to 1997. But as with the PIT tag results reported by Smith, et al., (1997b), the year-to-year correlation is complicated by protracted migration, temperature, and environmental factors. For example, 1992 was identified as a low flow year with a low detection rate. Yet 1997, an extremely high flow year, experienced substantially lower detection probabilities than the two previous years. Detections are not a measure of survival, so the relationship is complicated by these year-to-year changes in dam operations.

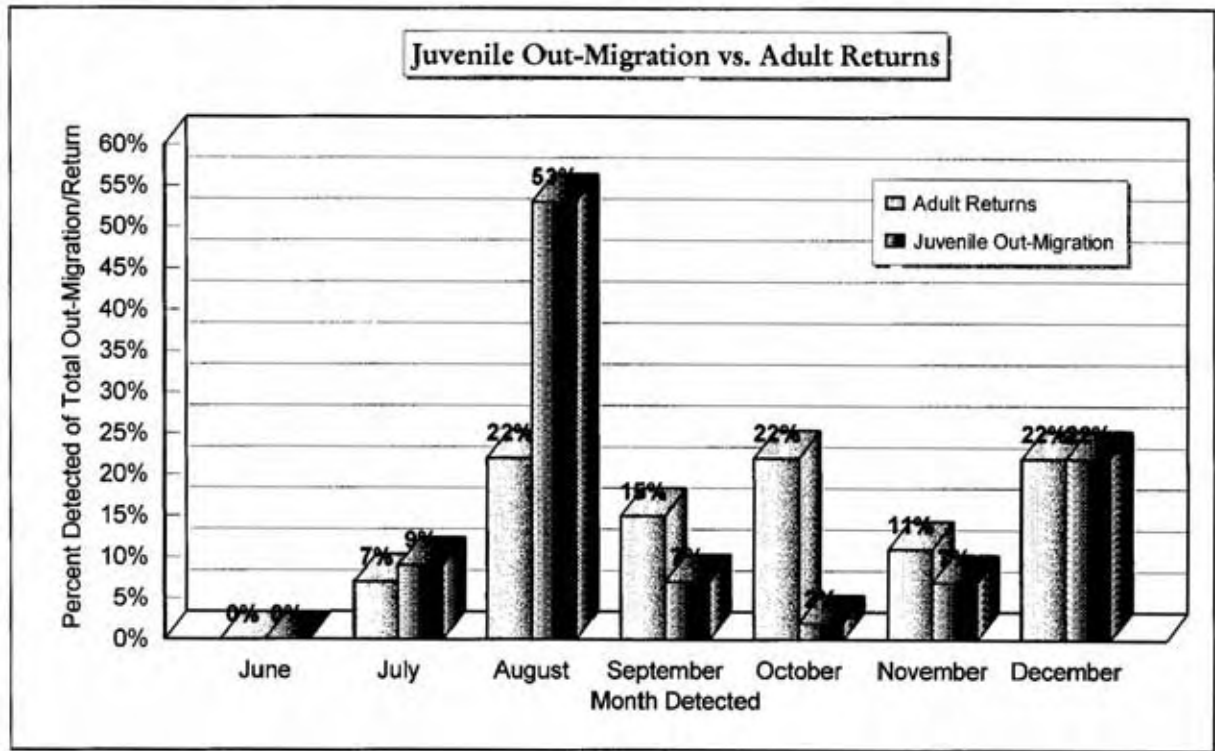
Further, the relationship between juvenile detection rate and survival from year-to-year is complicated by changes in project fish passage facilities. For example, from 1995 through 1997, extended-length screens were incorporated into both Lower Granite and Little Goose dams. These screens increase overall fish guidance efficiency which results in an increase in PIT tag detections. In addition, in 1996 and 1997, a prototype surface collector was installed at Lower Granite Dam. Because this system is not equipped with PIT tag readers, any tagged fish passing the project through this system would not be detected.

Even with these problems associated with the fall chinook detection results (only six average annual data points), the data present a story that is apparently being accepted by resource managers (Stelle 1997). This is cause for concern, given the region may fall into the same dilemma created by the seven data points representing the early Sims and Ossiander analysis.

Other patterns in the fall chinook data caution us about jumping to conclusions. A fundamental characteristic of mortality models is survival increases with decreasing travel time. This relationship exists for the within-year data evaluated by Smith (1997b), in which no flow-survival relationship could be identified, but is absent from the year-to-year data, which has a simple linear flow-survival relationship. In fact, if anything, the opposite pattern exists in the year-to-year data. The lowest detection rates (5%) correspond with the shortest travel time (25 days), while the highest detections (30%) correspond with the longest travel time (50 days).

A second germane outcome of the recent research is that summer flow augmentation may have a negative effect on juvenile fall chinook migrating from the Clearwater River below Dworshak Dam. Researchers indicate (Conner 1995) that reduced water temperatures in the Clearwater River reduced the growth rate and delayed migration

Figure 11. Juvenile Fall Chinook Run-Timing at McNary Dam Versus the Percent of the Corresponding Adult Returns Based on PIT Tag Detection History



timing of fall chinook juveniles. This change in migration timing may have contributed to reduced detection rates, and possibly survival, in 1994.

Still, under low flow conditions, summer water temperatures in the Lower Snake River can exceed 74 F. (Bennett, et al., 1997), a temperature level that can be lethal to chinook salmon survival. Researchers have documented that flows from Dworshak Reservoir can be used to lower water temperatures to levels more favorable (< 70 F.) for both juvenile and adult survival (Bennett, et al., 1997). But researchers have been unable to determine the change in juvenile survival resulting from decreased water temperatures or the amount of water needed to achieve survival changes.

The lack of precision in current fall chinook survival estimates is caused by many factors, including inadequate analysis tools, inadequate sample sizes, and the extended migration timing of the fish themselves. As research continues, future studies will provide data to judge more accurately the merits of flow augmentation.

To conclude, the results of recent PIT tag analyses, as well as other analyses surrounding the benefits of increased flows, serve as a warning to fish managers not to jump to expedient conclusions regarding flow impacts to fall chinook survival.

5.5. The Delayed Mortality Issue and Models.

Although the previous data supporting a strong flow-survival relationship has been largely discounted, the debate on the impacts of flow still remains and has been recast in terms of the impact of mortality in the hydro system, influencing mortality in the estuary and ocean. This mortality has been termed "delayed" mortality. Again, hypotheses on the effect of flow on this delayed mortality divide into two camps: one in which flow has a strong influence on delayed mortality (tribal-agency FLUSH/delta model analyses); and another in which flow has a weak influence on delayed mortality (University of Washington, CRISP/alpha model analyses).

The decades old argument on the value of flow may now depend on which model system is a better representation of the Columbia River and their salmon stocks. This evaluation is taking place through the regional PATH process, where arguments for and against each model system are being developed and will be reviewed by independent scientists. The merits of each model system will be judged on how well they fit the existing data and their ecological realism.

But the University of Washington analyses have identified technical issues within the FLUSH/delta model system, including: 1) a weak fit of FLUSH to in-river survival studies; 2) the lack of a well-defined biological basis for connecting hydro system mortality to delayed mortality; and 3) the use of historical data without accounting for the unique factors contributing to the historically poor passage conditions.

In general summary, flow augmentation is likely to have limited benefits as a tool for salmon recovery. Previous claims of large benefits for flow augmentation have been overestimated. What remains of the contention for a strong flow-survival relationship is now being addressed in the PATH process.

5.6. CRiSP Modeling Analyses Results.

To provide some additional insight into the flow-survival relationship, the results from CRiSP modeling analyses, surveying different flow augmentation levels, are presented within Tables 3-4 and Figures 12-13. These modeling analyses match closely the survival relationships within the mainstem Snake-Columbia River corridor exhibited by the NMFS spring/summer chinook data and the available fall chinook data sets.

In Table 3 and Figure 12, the modeling analyses suggest that spring migrant survival rate improvements—gained by incremental flow enhancement—are generally small. During a low water-year condition, the absolute change in Snake River fish survival would be about 2.3% (56.9% survival to 59.2%), with 6.5 MAF of flow augmentation (flow augmentation from both the Snake and Columbia river systems). During average water-year conditions, the absolute change in survival would be about 1.4% (59.2% survival to 60.6%).

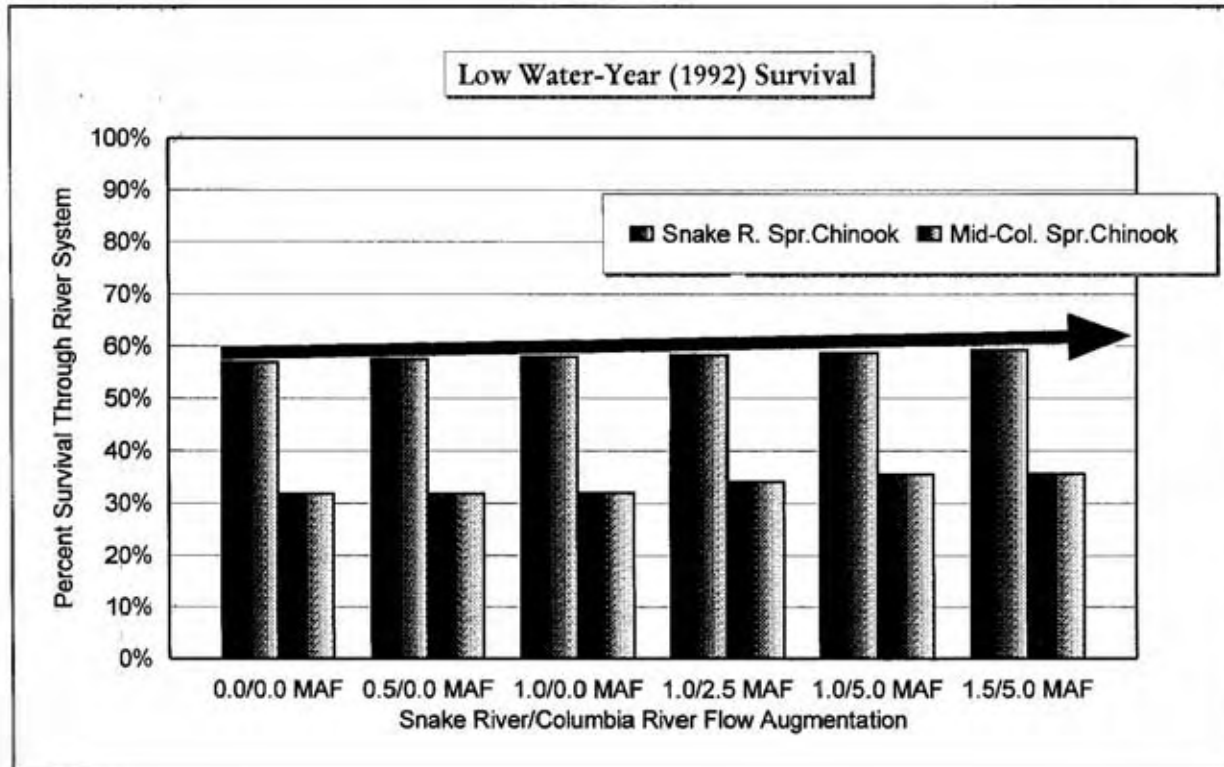
As portrayed within Table 4 and Figure 13, the fall chinook survival estimates, with flow augmentation, are higher than the estimates for spring chinook. This is true for both absolute survival improvements and for incremental percentage increases, because of the lower overall survival rates of the migrating fall chinook. The range of absolute change is about 2-4% for Snake River fall chinook and Mid-Columbia fall chinook. But the incremental percentage change in survival for the Mid-Columbia fall chinook is about 40%.

The fall chinook modeling analyses in Table 4 and Figure 13 are preliminary and are based on high range value estimates (data sets); but they are presented here with the recognition that work on the fall chinook is still incomplete. Other modeling analyses of the fall chinook data produces estimates of far less elasticity between incremental flow augmentation and survival increases, within years.

Also, it is important to note that these flow-based survival rate improvements are influenced by other recovery plan measures—most importantly being the juvenile transportation program. As higher percentages of fish are removed from the river system due to transportation program operational changes, the effectiveness of the flow augmentation program for mainstem survival diminishes.

Snake River summer flow augmentation is currently being used to enhance the transportation collection efficiency for fall chinook. But flow augmentation is not the only method available to increase collection efficiency. Structural changes at the projects, such

Figure 12. Spring Chinook Survival Estimates



**Table 3. Estimated Impacts to Mainstem Survival
University of Washington CRiSP 1.5 Analyses**

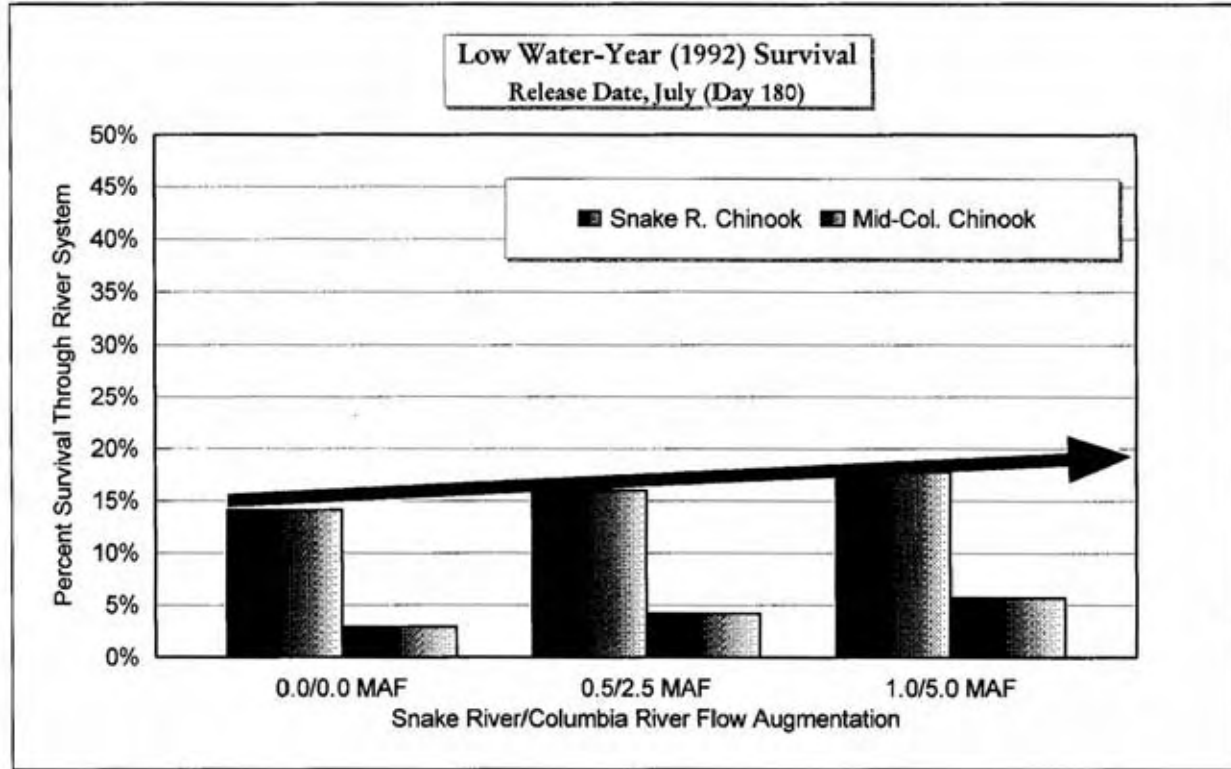
Flow Augmentation under 1995 BIOP Operations with Juvenile Salmon Transportation Survival From L. Granite Head-Water to the Estuary						
Estimated Survival:						
Flow Augmentation At:		Low Water Year (1992) Spring Chinook		Raw Score Percent Increase		
<u>Snake R.</u>	<u>Columbia R.</u>	<u>Snake</u>	<u>Mid-Columbia</u>	<u>Snake</u>	<u>Mid-Columbia</u>	
0.0 MAF	0.0 MAF	56.9%	31.7%	-----	-----	
0.5 MAF	0.0 MAF	57.4%	31.8%	0.5%	0.1%	
1.0 MAF	0.0 MAF	57.9%	31.9%	1.0%	0.2%	
1.5 MAF	0.0 MAF	58.5%	31.9%	1.6%	0.2%	
1.0 MAF	2.5 MAF	58.3%	34.0%	1.4%	2.3%	
1.0 MAF	5.0 MAF	58.6%	35.5%	1.7%	3.8%	
1.5 MAF	5.0 MAF	59.2%	35.5%	2.3%	3.8%	
No Transportation, In-River Survival Only						
0.0 MAF	0.0 MAF	35.8%	31.7%	-----	-----	
0.5 MAF	2.5 MAF	36.8%	33.9%	1.0%	2.2%	
1.0 MAF	5.0 MAF	37.7%	35.5%	1.9%	3.8%	
Estimated Survival:						
Flow Augmentation At:		Average Water Year (1995) Spring Chinook		Raw Score Percent Increase		
<u>Snake R.</u>	<u>Columbia R.</u>	<u>Snake</u>	<u>Mid-Columbia</u>	<u>Snake</u>	<u>Mid-Columbia</u>	
0.0 MAF	0.0 MAF	59.2%	36.3%	-----	-----	
0.5 MAF	0.0 MAF	59.7%	36.3%	0.5%	0.0%	
1.0 MAF	0.0 MAF	59.4%	36.3%	0.2%	0.0%	
1.5 MAF	0.0 MAF	59.9%	36.3%	0.7%	0.0%	
1.0 MAF	2.5 MAF	59.8%	38.3%	0.6%	2.0%	
1.0 MAF	5.0 MAF	60.1%	39.8%	0.9%	3.5%	
1.5 MAF	5.0 MAF	60.6%	39.8%	1.4%	3.5%	
No Transportation, In-River Survival Only						
0.0 MAF	0.0 MAF	37.8%	36.3%	-----	-----	
0.5 MAF	2.5 MAF	38.8%	38.3%	1.0%	2.0%	
1.0 MAF	5.0 MAF	39.8%	39.8%	2.0%	3.5%	

Data/Analyses Sources:

Columbia Basin Research Office, University of Washington, CRiSP 1.5 Analyses, August-December 1997.

Note: The flow augmentation scenarios are for water released into the Snake and Mid-Columbia headwaters over a 60-day period during the migratory season.

Figure 13. Fall Chinook Survival Estimates
High Range Survival Rate Values



**Table 4. Estimated Impacts to Mainstem Survival
University of Washington CRiSP 1.5 Analyses**

Flow Augmentation under 1995 BIOP Operations with Juvenile Salmon Transportation Survival from the Lower Granite Head-Water to the Estuary						
Estimated Survival:		Low Water Year (1992)		Raw Score		
Flow Augmentation At:		Fall Chinook		Percent Increase		
<u>Snake R.</u>	<u>Columbia R.</u>	<u>Snake</u>	<u>Mid-Columbia</u>	<u>Snake</u>	<u>Mid-Columbia</u>	
		High-Range	High-Range	High-Range	High-Range	
		<u>Value</u>	<u>Value</u>	<u>Value</u>	<u>Value</u>	
<u>Release Date: July (Day 180)</u>						
0.0 MAF	0.0 MAF	14.1%	2.9%	-----	-----	
0.5 MAF	2.5 MAF	16.0%	4.2%	1.9%	1.3%	
1.0 MAF	5.0 MAF	17.8%	5.7%	3.7%	2.8%	
<u>Release Date: Day 200</u>						
0.0 MAF	0.0 MAF	10.4%	2.3%	-----	-----	
0.5 MAF	2.5 MAF	12.2%	3.0%	1.8%	0.7%	
1.0 MAF	5.0 MAF	13.8%	3.9%	3.4%	1.6%	

Estimated Survival:						
Flow Augmentation At:		Average Water Year (1995)		Raw Score		
Flow Augmentation At:		Fall Chinook		Percent Increase		
<u>Snake R.</u>	<u>Columbia R.</u>	<u>Snake</u>	<u>Mid-Columbia</u>	<u>Snake</u>	<u>Mid-Columbia</u>	
		High-Range	High-Range	High-Range	High-Range	
		<u>Value</u>	<u>Value</u>	<u>Value</u>	<u>Value</u>	
<u>Release Date: July (Day 180)</u>						
0.0 MAF	0.0 MAF	26.4%	9.3%	-----	-----	
0.5 MAF	2.5 MAF	28.0%	11.5%	1.6%	2.2%	
1.0 MAF	5.0 MAF	29.4%	13.7%	3.0%	4.4%	
<u>Release Date: Day 200</u>						
0.0 MAF	0.0 MAF	23.1%	5.8%	-----	-----	
0.5 MAF	2.5 MAF	25.5%	7.2%	2.4%	1.4%	
1.0 MAF	5.0 MAF	27.2%	8.8%	4.1%	3.0%	

Data/Analyses Sources:

Columbia Basin Research Office, University of Washington, CRiSP 1.5 Analyses, August-December 1997.

Note: The flow augmentation scenarios are for water released into the Snake and Mid-Columbia headwaters over a 50-day period during the migratory season.

Data for fall chinook migrations is more limited than for spring chinook; as such, the above survival estimates reflect high range values--for flow augmentation response-- that are under continued review and evaluation.

as the current installation of double-length screens and/or surface collector technology, may be able to achieve the same goal, more cost-effectively, and provide benefits for spring migrants as well.

5.7. *Ecological Considerations Concerning Flow and Mainstem Passage.*

The scientific protocols used for determining a survival versus flow relationship are to mark juveniles during migration, recapture them as older juveniles or as adults, plot their survival rate against some estimator of flow they experienced during migration, and calculate a regression statistic. Since this has been done for many groups of fish over many years and by many scientists, the results, not surprisingly, are variable (see, for example, the Cada et al., 1994 review and the studies cited in Appendix A). But probably the best data we now have is the NMFS PIT tag data base (Smith, et al., 1997a).

Beginning in 1993, NMFS and University of Washington researchers combined state-of-the-art PIT tag technology with sound statistical study design to quantify the relationship between juvenile migration survival and flow discharge in the Snake River. These data are now being collected under improved in-river test conditions of high spill and flow, as prescribed by NMFS in the 1995 BIOP. Smith, et al., (1997a) have published NMFS findings to date, covering multiple-year flow conditions data.

The results of the multi-year juvenile survival data in the Snake River probably give us the most definitive picture of how flow affects spring chinook and steelhead migrating through the Lower Snake and Lower Columbia hydropower corridor. Key points from the NMFS data come readily to light.

When comparing juvenile survival between years, there is higher survival in years with higher flows. This parallels the findings of Sims and Ossiander (1981), a study whose data have been criticized as statistically inadequate (see Kreeger and McNeil, 1992; Steward, 1994). Among other considerations, the inter-annual relationship seems to depend on the fact that there are very large differences in seasonal discharge from year-to-year—larger than we observe in weekly or monthly variations within each year. Examination of the data tends to suggest that it may not be the provision of higher flows that elicits the survival benefit.

In reviewing these data, it appears that for years when the average spring discharge is below 80-90 kcfs in the Snake River, survival is much lower than when it is above this value. Smith, et al., (1997a) characterize this phenomena well. In particular, the *within year* survival data strongly suggest that there is no apparent relationship between survival and flow. The biological or physical cause of why there is a strong between-year survival relationship, but no within-year relationship, is speculative; it is likely based in ecological factors that are well beyond the effects of the single flow rate variable.

For example, an examination of week-to-week survival of migrating juveniles indicates that the specific weekly discharge does not seem to greatly influence survival. That is,

in examining the flow-survival relationship within a specific year, the same kind of strong relationship does not manifest, as noted between years. Is it possible that this situation exists because there is not a significant change in flows from week-to-week to elicit a survival response?

In answering this question, it can be observed that flows within a season can vary by as much as 50 to over 100 kcfs (see Figure 10). Thus, it can be said that fish are exposed to highly variable flows within a year. It is not unusual to see Snake River flows at the beginning of the season at 40-60 kcfs and reach 120-140 kcfs as run-off proceeds. Snake River discharge history from 1994-1997 illustrates this point well. In 1994, flows began near 30 kcfs but never exceeded 100 kcfs—a very low flow year. In 1996, by contrast, flows began around 90 kcfs and peaked near 200 kcfs. In both years, flows fluctuated greatly within the season (sometimes within a week), yet no survival relationship emerged. Both years presented natural experimental opportunities for survival to show weekly fluctuations, because flow conditions were often highly variable week-to-week. But the survival data do not correspond to the flow variations. This observation suggests that survival is not a function of week-to-week discharge; it is not the instantaneous flow condition that is providing a measurable survival benefit. Instead, it appears that it is the overall annual condition of low flow (drought) versus high-flow (flood) years. Seasonal, not daily or weekly, volume water discharge is a predictor (or a correlate) of annual in-river survival percentages—likely due to multiple variables stemming from wet seasons versus dry years.

Consider, as well, even if total seasonal discharge was the only variable driving survival—an unlikely assumption—is it possible to "turn a low-flow year into a high-flow year" by using reservoir storage and thereby increasing survival? If we compare the volume of water that passed Lower Granite Dam in the spring of 1994 and 1996, we find that total river flow in 1996 (14.6 MAF) was nearly twice that of 1994 (7.6 MAF). In order to make river conditions in 1994 resemble 1996, it would require an additional 7 MAF of flow augmentation. Currently, the total Snake River storage is about 12 MAF (System Operations Review estimate). Therefore, we would need to evacuate two-thirds of the entire storage in Idaho and release it in a two-month period. Even if this were hydrologically possible, it would leave negligible storage or available instream flows for other purposes; and the region would need to forego most uses for water later in the year, including fish and wildlife in the Middle and Upper Snake River.

It appears likely that the use of storage as a mitigation tool is relatively limited in how much increased in-river survival it can provide, within the hydropower corridor. A major objection to previous juvenile survival data has been inadequate in-river conditions to maximize in-river survival. NMFS has provided improved conditions to test this hypothesis since 1993, in the form of both higher spill and flow target levels.

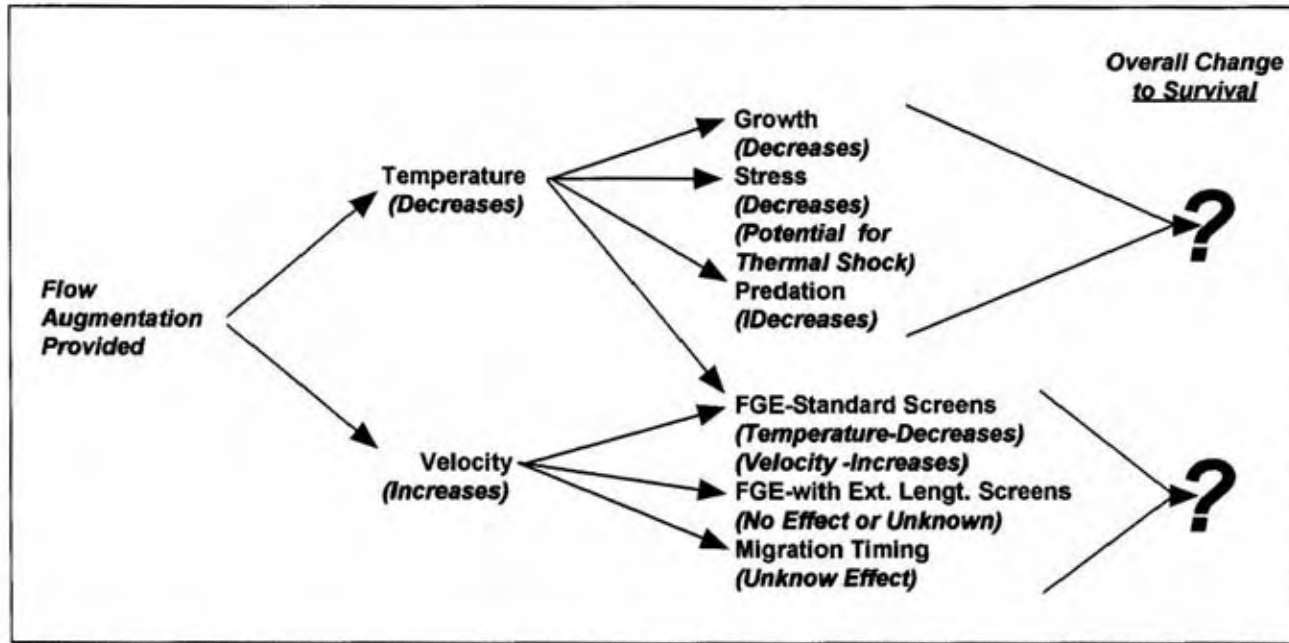
Based on their own data, the NMFS recovery strategy should anticipate that survival of juveniles will vary year-to-year, and survival appears to be contingent especially on whether we anticipate a drought year and therefore low survival in-river. For now, it appears that flow as a tool to enhance in-river survival of spring migrants, within seasons, has severe limitations in the Snake River; and that the survival benefits of simply drafting

storage will be small, first by storage limitations themselves, and second by the survival benefits—no matter what we may be willing to pay biologically or economically in the way of upstream costs. The benefits to fall chinook are less understood and flow may offer some benefits (undefined at the present time) during the summer migration season. This appears to be hydrologically possible and holds more promise than the current program of enhanced flows during the spring runoff. It also is recommended that appropriate monitoring and evaluation continue.

Summary Observations and Comments:

- Largely based on historical data depicting year-to-year flow and juvenile fish survival relationships, it has been assumed that flow augmentation could be used to increase flows during low water-year conditions, in an attempt to produce survival rates observed in high water years.
- Data collected for spring migrants since 1992 (NMFS 1993-1997 data sets) indicate that the *within year relationship* between different flow regimes and fish survival through the hydro system corridor is weak. This means that attempts to use flow augmentation to improve spring migrant survival will provide very little or limited benefits.
- The year-to-year correlations between flow and survival—reflecting vastly different flow levels between years—support the hypothesis that ecological factors associated with drought conditions are principally responsible for fish survival.
- The year-to-year observations move toward the conclusion that better water-year conditions, in general, provide for greater fish survival than drought conditions.
- The flow-survival data collected on fall chinook is more variable and less well defined than for spring migrants. Several variables and factors affect overall survival, including growth, stress, predation, migration timing and rearing, and changes to FGE at the Lower Snake River projects (see Figure 14).
- Given the existing data, flow is one variable correlated with survival in some cases, but it has less predictive capability than other variables (such as migration timing and fish size through the upper river system). Also, some relationships, such as observed numbers of marked fish detections between years, are inconsistent with the flow-survival hypothesis within years.
- During the summer period, Lower Snake River water temperatures can and do exceed levels that negatively affect migrating juveniles and adults. The use of some flow augmentation (from Dworshak Reservoir) to improve migration conditions should continue to be reviewed; and the biological benefits and costs should be better understood.

Figure 14. Factors Affecting Fall Chinook Survival and Flow Augmentation



-
- Snake River summer flow augmentation is being used to enhance the transportation collection efficiency for fall chinook. But it is yet to be verified by empirical data, beyond the detection rate data. Flow augmentation is not the only method available to increase collection efficiency. Structural changes at the projects, such as the current installation of double-length screens and/or surface collector technology, may be able to achieve the same goal, more cost-effectively, and provide ancillary benefits for spring migrants as well.
 - For the spring period (May-June), pulsed flows (small water volumes) should be reviewed for potential experimentation as a migratory stimulator, primarily to benefit fish leaving the Salmon River tributary and entering the mainstem Snake River system—as recommended jointly by federal and state fish and water resources managers.
 - Flow augmentation may hold some incremental benefits (undefined) for improving fall chinook survival. *However, resource managers should exercise great caution before increasing flow levels beyond the program levels employed in 1994 (summer flow augmentation) given existing uncertainties.*

6.0. *Economic Trade-Offs of Flow Augmentation.*

6.1. *Direct Net Value Measures of Economic Change.*

In evaluating actions affecting the hydro system and related operations, both net economic costs and benefits should be considered. If an action's net benefits exceed costs relative to other hydro system impacts, then society (the region) has received a monetary gain to overall net social welfare. The region is not being economically "penalized" by this allocation of resources—use of river water—but enjoys a net economic benefit.

Real changes to economic efficiency are measured in terms of direct net value. *Direct value* refers to the economic benefits derived from primary economic activities or sectors, such as: the crop value of irrigated agriculture; the marginal value (or opportunity costs) of electric power; or the ex-vessel or sport-effort value of commercial and sport salmon fishing. *Direct net value* represents the net benefits (monetary dollars) derived from primary activities, over and above the cost of providing or engaging in such activities.

For irrigated agriculture and commercial fisheries, direct net value (benefits) represents monetary returns above costs to proprietors and management. For sport fishermen, net value reflects willingness-to-pay to enjoy the sport activity above actual costs. For the hydro power sector, direct net value (costs) would be foregone electric power generation due to water reallocations (the loss of power revenues due to changes in hydro system operations).

Direct net value is recognized by the (National) Water Resources Council, the System Operation Review EIS (Corps 1995) economic workshop group, the NMFS Economics Technical Committee (Hubbert 1996), and the Corps Drawdown Review Economic Workshop group as an appropriate economic measure for assessing net economic impacts or changes to the region's (and nation's) social welfare. Direct net value is the best measure to use in understanding an activity's true economic benefits and costs; it can be used to assess and standardize the relative benefits and costs of different types of economic activities.

6.2. *Flow Augmentation Impacts.*

In the case of flow augmentation impacts, dedicated water volumes for flow augmentation reduce the amount of water available for system hydroelectric power production; and under some circumstances or scenarios, the fish flows could restrict the amount of water available for irrigated agriculture. For hydropower impacts, the economic value of this direct net cost can be measured in terms of dollars per acre-feet of water (dedicated for flows), taking into account average power generation losses throughout the system during the flow augmentation period. The direct net value of irrigation losses can be calculated on a dollars per acre-feet basis, as well, relying on a range of regional value estimates.

The Bonneville Power Administration has prepared power cost estimates associated with the flow augmentation program (BPA 1997), reflecting several variables affecting system-wide costs and changing power prices, during different types of water-year conditions. This estimate suggests a direct net cost of about \$8-10 million per one million acre-feet of flow augmentation (BPA system costs). For irrigated agriculture impacts, a net benefit range estimate of about \$40-70 million per one million acre-ft of water is available (NEA 1997; Olsen 1996a; Olsen 1996; and Hamilton and Whittlesey 1996).

The direct net economic benefit for fish flows can be calculated by using an estimated increase in survival due to flow augmentation, for all Columbia River stocks, and using sport and commercial fishing values as representing a realistic (or measurable) economic value for the runs. For a favorable baseline condition (average annual run size during the 1987-1991 period), the System Operation Review EIS (Corps 1995) provides a direct net value estimate of about \$25 million, for the sport and commercial value of all up-river origin (above Bonneville Dam) salmon and steelhead. If the average survival rate (incremental) effects from the multi-year flow augmentation program are assumed to be about 5%—based on CRISP modeling runs—and the effects are "compounded" for ten future life-cycles, then a direct net benefit estimate would be about \$2.25 million per one-million acre-feet of flow augmentation. This dollar value estimate represents a *future value estimate—as opposed to an annualized present value estimate—and should be considered as reflecting a high value perspective for comparison purposes here.*

The value estimates for comparing the direct net economic trade-offs of flow augmentation versus irrigation and hydro power operations are provided in Table 5. These estimates indicate that even when favorable assumptions are applied to the estimation of the flow program, the direct net fish benefits do not exceed the costs to hydro power production or irrigated agriculture. This would indicate that the region receives negative economic trade-offs when relying on flow augmentation.

Additional studies are being prepared to address other economic benefits and costs associated with the flow augmentation program—in addition to those identified in Table 5. For example, there are recreation sector costs at the Upper Columbia-Snake River Basin storage projects that are not included in Table 5; and potential recreation benefits or other environmental benefits are not included. As well, the values presented in Table 5 do not take into account any costs or benefits incurred between sectors—like irrigation and hydropower—that could occur through joint operations or increases to efficiency. For example, Hubbert and Fluharty (1996) estimated an average annual cost of 1 MAF of flow augmentation from Idaho (Snake Basin) at about \$49 million—with additional hydro power production benefits included (this cost is clarified in Hamilton and Whittlesey 1996). Also, the USBR has estimated that a permanent acquisition of .427 MAF from the Upper Snake Basin could remove 425,000 acres from production, with an acquisition cost of \$294 million (depending on reservoir refill requirements).

Still an initial review provided here suggests that it is ever-more-important to structure the flow augmentation program in a way that will prioritize or optimize program

**Table 5. Estimated Economic Benefits of Water Use
For Major Sectors and Types of Economic Sector Trade-Offs
(Direct Net Economic Value Estimates)**

<u>Economic Sector/Purpose</u>	<u>Estimated Benefits Annual \$/MAF</u>	<u>Economic Trade-Offs For Water Diversion</u>
Irrigated Agriculture*	\$40-70 Million	Reduces water for hydropower production and fish flow augmentation.
Hydroelectric Power**	\$8-10 Million (BPA System Costs)	Reduces water availability for fish flow augmentation; could conflict with irrigated agriculture.
Flow Augmentation--Fish Impacts Estimated Sport and Commercial+ Fisheries--Columbia Basin Origin (High Value Estimate)	\$2.25 Million	Flow augmentation reduces hydropower production and can affect irrigated agriculture under NMFS BIOP-Recovery Plan.
Flow Augmentation--Fish Impacts Estimated Use and Existence++ Values for Columbia River Basin Salmon and Steelhead	\$4.80 Million	Flow augmentation reduces hydropower production and can affect irrigated agriculture under NMFS BIOP-Recovery Plan.

* Assumes Direct Net Value of \$40-70/acre ft. of water.

** Estimated marginal power cost impacts to Bonneville Power Administration.

+ Assumes baseline economic value of \$25 million (1995\$), with compounding future value of 5% attributed to flow augmentation, for 10 migration periods (with average annual flow augmentation of about 7 MAF). The value represents a future value estimate and should be considered as presenting a high value perspective for comparison purposes here.

++ Assumes "total value" estimate (use, option and existence value) based on Columbia Basin Salmon and Steelhead study for use and non-use values; assumes that about 53% of the total value would reflect existence value (Olsen and Richards 1991). Use value based on future value estimate.

Data and Analyses Sources:

D. Huppert and D. Fluharty, Economics of Snake River Salmon Recovery: A Report to the National Marine Fisheries Service, School of Marine Affairs, University of Washington, Seattle, Washington, 1996 (and data/sources cited therein, SOR EIS).

Personal communications with Dittmer Operations staff, Bonneville Power Administration, Vancouver, Washington, August-September 1997.

D. Olsen, The Columbia Basin Project: Project Operations and Economic Benefits, A Regional Overview, The Pacific Northwest Project, Kennewick, Washington, 1996 (and Technical Memorandum Prepared for the Public Purposes Work Group of the Comprehensive Energy Review, 1996, Evaluating Irrigation, Power System, and Flow Augmentation Benefits and Costs).

J. Hamilton and N. Whittlesey, Cost of Using Water from the Snake River Basin to Augment Flows for Endangered Salmon, Paper Presented at the Annual Western Regional Sciences Association, Napa, California, February 1996.

implementation. The economic trade-offs (costs) of the program are, and could be, substantial. From an economic trade-off perspective, the program should be implemented to prioritize fish benefits, while acknowledging significant economic constraints and reducing costs to other sectors.

6.3. Cost-Effectiveness Analyses for Salmon Recovery Measures.

Another economic perspective that is being brought to bear on salmon recovery policy involves cost-effectiveness analysis. Flow augmentation is only one of several measures being pursued by the region to protect and enhance fish resources. And it is not unexpected to ask the question: how does flow augmentation compare to other recovery actions?

While detailed, quantitative cost-effectiveness reviews have been completed (Olsen and Anderson 1994) and are being undertaken to estimate the benefits of flow augmentation (and within the Corps' Lower Snake River Drawdown EIS), the subject can be investigated briefly within this paper using some basic qualitative and quantitative indicators. A framework for reviewing these indicators is presented in Table 6.

This framework assesses recovery measures according to six criteria or observations: 1) the measure is operational or currently being implemented; 2) empirical data is available to evaluate measure performance; 3) using empirical data, the measure is or can be confirmed as effective; 4) the measure's potential impact on survival is measured across one life-cycle; 5) the measure's estimated economic cost is identified; and 6) the maximum economic risk of pursuing the measure is considered.

With regard to the first three criteria, flow augmentation is operational, empirical data has been collected, but flow augmentation's range of effectiveness is uncertain. The NMFS within-year data and CRiSP modeling analyses discussed in previous sections would suggest limited to uncertain levels of effectiveness, particularly for spring migrants. With regard to cost, flow augmentation is similar to the incremental costs associated with a full transportation improvement scenario, with increased collection efficiency and direct loading facilities included within transport costs. It is more costly than measures like the law enforcement program or turbine improvements, but it is less costly than proposed Snake River reservoir drawdowns. These dollar costs also define the level of maximum economic risk, if the measures fail to perform.

In terms of dollar cost per unit of measured survival benefits, across one life-cycle, flow augmentation benefits could fall within the \$16-92 million dollar range per 1% increase in survival, for spring chinook. This range is based on CRiSP modeling analyses and the assumptions discussed in Table 6. For example, the dollar per survival improvement range for flow augmentation suggests that it is likely more cost-effective (and less risky) than a reservoir drawdown measure, but it would be less cost-effective than

**Table 6. Cost-Effectiveness Review
For Salmon Mitigation and Recovery Measures**

Measure	Measure is Operational	Empirical Data Exists for Review	Effectiveness Confirmed	Estimated Incremental Increased Survival+	Estimated Annual Cost+	Est. \$ per 1% Survival Improv.	Maximum Economic Risk
Flow Augmentation	Yes	Yes	Uncertain Results	1 to 4% (Snake Sp.Chin.)	\$56-70 Mil./Year (Ave. 7 MAF/Year)	\$14-70 Mil.	(>\$50 Mil. Loss)
Turbine Improvements	Being Installed or Reviewed	Yes	Generally Effective	1 to 3% (Snake Sp.Chin.)	\$10-20 Mil./Year	\$4-20 Mil.	(<\$25 Mil. Loss)
Snake R. DD 4-Pool Nat. R.	No (5 Years)	No	No, But Definite In-River Improv.	-28% to 72%** (Snake R. Fish)	\$150-250 Mil./Year***	>\$2 Mil.	(>\$100 Mil. Loss)
Surface Collectors	No* (Experimental)	Yes (Limited Data)	No* (Experimental)	0-9% (Snake Sp.Chin.)	\$32-40 Mil./Year 2 to 4 Projects	>\$4 Mil.	(<\$50 Mil. Loss)
Existing Project Spill	Yes	Yes	Uncertain Results At High Levels	0-8%++ (Snake Sp.Chin.)	\$40-60 Mil/Year	>\$5 Mil.	(>\$50 Mil. Loss)
Snake R. MOP DD	Yes	Yes (Flow-Surv. Data)	No	<1% or Not Measurable	\$20 Mil./Year	>\$20 Mil.	(<\$50 Mil. Loss)
Smolt Transport Improvements (Full Transport)	Yes	Yes	Empirical Data Suggests Yes	10%+++ Total Survival >60% (Snake Sp.Chin.)	\$90 Mil./Year All Improvement Features	\$9 Mil.	(>\$50 Mil. Loss)
Law Enforcement	Yes	Yes	Yes	>0% 319/104 (fish/nets)	\$3-4 Million/Year	<\$3-4 Mil.	(<\$25 Mil. Loss)

Notes:

- * Does not include Wells Dam structure on the Mid-Columbia River; refers to existing dam retrofits.
- ** Depends on assumptions concerning existing smolt transportation program. If program is not more effective than existing in-river conditions, then drawdown would likely produce about 72% gain. If existing program is 100% more effective than existing in-river conditions, then drawdown would reduce survival by about 28%.
- *** Cost depends on assumptions about flow augmentation and power/construction costs.
- + Based on data and analyses contained within the Harza, "Salmon Decision Analysis" (1996) Report, and University of Washington Analyses, Aug-Sept., 1997.
- ++ Depends on assumptions concerning transportation effectiveness.
- +++ Assumes that existing transportation program is effective (provides about 100% survival improvement above existing in-river conditions).

Data Sources and Estimates: Harza, "Salmon Decision Analysis" Report (1996); Corps System Operation Review EIS (1995); Corps System Configuration Study, Phase I (1994) and Interim Status Report (1996); BPA Loads and Resources (1995); Harza-BPA Technical Memorandum, July 1997; University of Washington CRISP 1.5 Model Analyses, Aug.-Sept., 1997; and Harza and Pacific Northwest Project (1997).

transportation program improvements, if the existing NMFS transportation benefit estimates are correct.

So in taking into account some fundamental cost-effectiveness criteria, given available data and assumptions, this economic perspective also would encourage resource managers to optimize the use of the flow augmentation program. Flow augmentation costs directed toward limited or undefined survival benefits detract from an ability to allocate finite dollars to more beneficial salmon benefit measures, or other types of mitigation and compensation strategies.

Summary Observations and Comments:

- Using sport and commercial fisheries value and fish abundance estimates for the 1987-1991 period, the annual direct net value of the upriver (above Bonneville Dam) salmon and steelhead contributions to ocean and in-river fisheries is about \$25 million.
- Applying some favorable economic and biological assumptions to the benefits of flow augmentation, the annual direct net economic value of the upriver contributions to commercial and sport fisheries is about \$2.25 million per one million acre-feet of water used for flow augmentation--representing a *future value* estimate over 10 life-cycles (1995\$).
- Flow augmentation does cause economic impacts to hydroelectric power operations and could create future economic impacts to irrigated agriculture. For one million acre-feet of flow augmentation, the cost to hydropower operations is estimated to be about \$8-10 million (BPA system costs). For irrigated agriculture across the Columbia Basin, the value of one million acre-feet of water is estimated to be about \$40-70 million; one estimate (Huppert and Fluharty 1996) for the Upper Snake River Basin suggests about \$49 million per one million acre-feet of water provided for flow augmentation (includes hydropower benefits).
- Both economic trade-off analyses and cost-effectiveness analyses strongly support the position that *any flow augmentation program should be optimized to maximize fish benefits relative to the costs incurred to other water resource sectors.*

7.0. *Recommendations for Decision Makers.*

7.1. *The NMFS Water Policy.*

The NMFS water policy--bred from the flow targets/augmentation program--directs that all future (new) water allocations from the Columbia River Basin drainage area should be used solely for fish protection.

The NMFS water policy is a single-purpose, resource use strategy that subjugates new water withdrawals for other types of social and economic activity or growth within the Basin. The policy is one-dimensional in nature, and it directly or indirectly challenges state legislative authority to govern water management.

The NMFS senior management, working with state water resource managers, should reevaluate and change this policy to better reach the needs of biological and economic optimization.

7.2. *Review and Restructure the Flow Targets/Augmentation Program.*

The river system benefits of flow augmentation are best estimated by relying on NMFS/UW data for flow-survival relationships (1993-1997 data), the CRiSP modeling analyses (which corroborate the NMFS/UW data), as well as other data and analyses being developed for fall chinook impacts. These data and analyses strongly suggest that the correlation between incremental flow changes and juvenile spring migrant survival is relatively inelastic, or that the survival benefits are small. *Flow benefits are best considered by examining the within year data relationships.*

To date given the data available, estimated river system flow benefits--though limited--appear to favor fall chinook. But the uncertainty surrounding the effects of flow augmentation on overall fall chinook survival is great. Several factors are unclear or unresolved concerning direct inriver survival benefits within years, migration timing and flow conditions, and the use of flow to improve transport collection efficiencies. It is more clear that flow augmentation is a measure providing marginal survival benefits, while factors independent from the mainstem river system, such as ocean/climatic conditions, will govern total productivity levels.

In contrast to some of the biological impacts, the economic trade-offs of flow augmentation are more predictable. Flow augmentation does increase costs to the hydropower system--one of the single largest costs of the salmon recovery program--and it could create significant costs to the irrigation (and other) sector, through either direct water curtailments or abrogating state water permits.

It should be further underscored that the flow augmentation program is directly affected by the collection efficiency of the smolt transportation program. Under a full or

"maximized" transport collection program, the flow augmentation benefits within the mainstem corridor become very limited. For example, in the case of Snake River spring chinook collection at Lower Granite and Little Goose dams, 80% collection efficiencies will leave less than 5% of the migrating fish within the river system (below Little Goose Dam). If transport collection efficiencies improve at the McNary Project, then the flow benefits for Mid-Columbia fall chinook will decrease as well. And as technical modifications are made at the collection facilities to improve fish guidance, the upriver effects of flow augmentation to improve fish guidance are diminished.

Given the data, analyses, and observations noted above and presented throughout this paper, the following review and changes are suggested for the flow augmentation program.

Optimization Review:

- > The existing flow augmentation program does not optimize water use for either survival benefits (benefit per unit of flow) or economic costs (benefit per dollar cost) to the river system. This optimization review should include changes to hydro system management, requiring new hydro regulation analyses.
- > The flow augmentation program would benefit from a detailed technical review that focuses on the *optimization of water use*. This would include applying principles of *cost-effectiveness, to compare the biological benefits gained for the costs incurred*.

A restructured flow augmentation program that better reflects a step toward optimization of the existing water resources is described below:

Low Water Conditions, Snake River System:

- > For the summer period (July-August), provide for experimentation a *maximum of 0.5 MAF* from the Brownlee Project and above consistent with state law and obtained from willing sellers or lessors; and a *maximum of 1.0 MAF* from Dworshak to be used for fall chinook migration and/or adult temperature control. Data to review this experimental regime would be collected through 1999, consistent with the existing NMFS decision-making process.

Low Water Conditions, Columbia River System:

- > Direct flow augmentation releases solely for the fall chinook migration. For the summer period (July-August), provide for experimentation *0-4.0 MAF, as recommended jointly by federal and state fish and water resources managers*.

Average Water Conditions, Snake River System:

- For the summer period (July-August), provide for experimentation a *maximum of 0.5 MAF* from Brownlee Project and above consistent with state law and obtained from willing sellers or lessors; and a *maximum of 1.0 MAF* from Dworshak to be used for fall chinook migration and/or adult temperature control. Data to review this experimental regime would be collected through 1999, consistent with the existing NMFS decision-making process.

Average Water Conditions for the Columbia River System:

- Direct flow augmentation releases solely for the fall chinook migration. For the summer period (July-August), provide for experimentation *0-4.0 MAF*, as recommended jointly by federal and state fish and water resources managers.

Such restructuring of the flow augmentation program would have the greatest deviation from the existing flow augmentation program by eliminating the current spring flow augmentation regime. But the limited benefits gained from the spring flow augmentation program could be off-set by a full transport regime, particularly during low water-year conditions.

During the summer period, the restructured program would limit flow augmentation in the Snake River Basin to a level not to exceed operations that occurred in the summer 1994 (drought conditions). Without a better technical justification for the summer flow augmentation, resource managers should refrain from attempts to increase this flow regime.

It is equally important that better data and analyses are provided in order to justify adequately the use of water currently being used for summer flow augmentation.

7.3. Future Considerations for Flow Augmentation Management and Evaluations.

It appears clear that using flow augmentation within a single season is not an effective recovery tool for spring chinook migration within the mainstem. What is less clear is whether mainstem flow augmentation is an effective management tool for fall chinook within the mainstem; or how flow augmentation can or should be used to improve survival within tributaries. Given these latter uncertainties and issues beyond the scope of this paper, the following recommendations are provided.

- In the case of Snake River fall chinook, the existing data on collection efficiency (FGE) and its relationship to flow is difficult to interpret. The need exists to establish data that verifies the interaction between flow augmentation and structural

improvements to FGE, and cost-effectiveness analysis should be used to assess risk and economic trade-offs.

- > Resource managers may want to give consideration to changing the focus of flow augmentation efforts away from mainstem actions to improving habitat conditions within some tributaries. Greater fish benefits may be obtained within tributaries, using less volumes of water. This factor has been generally ignored within the present flow augmentation program. Understanding and optimizing water use in tributary habitats may offer a more biologically productive, and cost-effective approach, to water management.
- > Low flow years exacerbate temperature stress to fish in both tributaries and the mainstem. The use of flow augmentation to minimize temperature stress may be beneficial in some habitat areas and applications, but it should be carefully modeled to determine benefits on a *site-specific basis*.
- > Drought years are especially difficult for both fishery resources and agricultural enterprises (as well as other economic and industrial water uses). This is particularly true for tributaries and their habitat conditions. The NMFS Recovery Plan should better recognize this factor, and take into account criteria for demonstrating real biological benefits, prioritizing major production tributaries, and measuring the cost-effectiveness and benefit-cost of tributary flow enhancement actions.
- > Water use efficiency is an important objective for many water withdrawal sectors within the Columbia River Basin. The use of efficiency measures to accomplish well evaluated flow augmentation actions within tributaries--and support economic activities--should be encouraged.
- > *Direct actions to implement flow augmentation measures should defer to the existing authority of state water rights and should allow for "locally developed" solutions within specific watersheds.* This could include an implementation of efficiency measures, water transfers, and the development of new water storage projects to benefit both fish and economic interests.

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APPENDIX A. ANNOTATED BIBLIOGRAPHY

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"There was no statistical evidence that to indicate that instream flows effected either the rate of movement or the residence time of 0-age chinook salmon in John Day Reservoir.

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In 1989, 1990, and 1991 flows at LGD differed substantially during spring salmonid out-migration, "...flow had little effect on the dynamics of the out-migration of hatchery or wild spring/summer chinook populations. There was virtually no difference in fish movement patterns for the three years in each of the three groups of chinook salmon. Since flow at Lower Granite Dam had little effect on the passage pattern of PIT-tagged fish, we believe that other environmental and physiological factors, in addition to flow, influenced the movement patterns of fish."

- 1992 Petrosky, C. E. Analysis of flow and velocity effects on smolt survival and adult returns of wild spring and summer chinook salmon. *In*: Passage and survival of juvenile chinook salmon migrating from the snake river basin. Proceedings of a technical workshop,, University of Idaho, February 26-28, 1992. Pp 107-120.

This paper presents an overview of the NMFS smolt survival data set and reports the following. "Yearling chinook smolt survival rates from NMFS studies in 1970-80 are significantly related to flow and water velocity for aggregate wild/natural and hatchery fish. Smolt-to-adult returns were significantly correlated with water particle travel times for wild spring chinook from Marsh Creek, Idaho, as well as for Snake River aggregate spring and summer chinook and steelhead of wild/natural origin."

- 1994 Cada, G. F., M. D. Deacon, S. V. Mitz, and M. S. Bevelhimer. 1994. Review of information pertaining to the effect of water velocity on the survival of juvenile salmon and steelhead in the Columbia River basin. Prepared for the U.S. Department of Energy, contract No. DE-AC05-84OR21400.

The authors reviewed over 130 references and concluded that. "Despite the problems with existing data sets, the general relationship of increasing flow in the Columbia River Basin still appears to be reasonable." Flow survival models tend to produce similar results at low flows, but diverge in their predicted survivals at higher flows, therefore the bounds for this relationship are presently undetermined.

- 1994 Steward, C. R. 1994. Assessment of the flow-survival relationship obtained by Sims and Ossiander (1981) for Snake River spring/summer chinook salmon smolts, final report. Prepared for Bonneville Power Administration, project number 93-013. Portland OR. 78 p.

The author questions the validity and usefulness of the Sims and Ossiander (1981) flow-survival relationship. "From my assessment of the methods and data used by Sims and Ossiander (1981), I recommend that the flow-survival relationships *not* be generalized to existing populations and passage conditions. Fisheries managers, the public, and the fish themselves would be better served by data collected under present conditions using current technological and analytical techniques."

- 1994 Bevan, D., J. Harville, P. Bergman, T. Bjornn, J. Cruchfield, P. Klingemen, and J. Litchfield. 1994. Snake River Salmon Recovery Team: Final Recommendations to National Marine Fisheries Service.

The authors state that "there is a lack of information on which to base a scientific decision on the size and timing of the water budget that will maximize smolt survival."

- 1995 National Marine Fisheries Service Biological Opinion 1995

This document provides recommended flows and spills during juvenile salmonid migrations. Endorses transportation as primary mitigation tool: "...it is appropriate to continue to rely on transportation as a major means to mitigate the adverse impacts of the FCRPS."(p.111). "Spill and transportation operations are intended to be interim. Ideally these interconnected programs would be based on a rule curve that establishes the relationship between flow conditions, in-river survivals, and the relative benefits of transportation." (p.112).

- 1995 National Marine Fisheries Service. 1995. Basis for minimum flow ranges for operation of the federal Columbia River power systems.

Cites several references that there is a significant relationship between flow and travel time, then states: "At least three mechanisms can be identified that link increased travel time resulting from lower flows to higher mortality". These are: 1) Increased exposure to predators, 2) Later arrival means higher temperatures which means increased predator

mortality, and 3) Later arrival means higher river temps which means decreased bypass efficiency.

1995 NMFS. 1995. Proposed recovery plan for Snake River salmon.

This document states that. "In general, there is a direct relationship between juvenile fish survival and flow..."it goes on to say "...it is difficult to determine the exact mechanism by which increased flow increases survival, and it is difficult to establish a particular level as being ideal or necessary. NMFS believes that changes in river management should be made, within the constraints of available water, to increase during the spring and summer salmon migration, restoring to some extent the natural hydrographic conditions under which listed salmon stocks evolved.

1997 Smith, S. G., W. D. Muir, E. E. Hockersmith, S. Achord, M. B. Eppard, T. E. Ruehle, J. G. Williams, and J. R. Skalski. Survival Estimates for the passage of salmonids through Snake River dams and reservoirs, 1996 annual report. Prepared for Bonneville Power Administration. Project 93-29. Portland, OR.

This study uses PIT tag data to reach the following conclusions. The relationship between flow exposure and travel time was relatively strong and consistent between years for both steelhead trout and yearling chinook salmon; higher flows were associated with shorter travel times. There was a decreasing trend in travel time throughout the season that could not be attributed to flow. Relationships between survival probabilities and flow volumes and other exposures were not consistent between years. There was no relationship between flow and survival within years.

Columbia-Snake River Irrigators Association Technical Memorandum

DATE: July 30, 2002

TO: CSRIA Board of Directors
Larry Cassidy, Chairman, Northwest Power Planning Council
Tom Karier, Ph.D., Eastern WA NPPC Member
And Interested Parties

FROM: Darryll Olsen, Ph.D., Resource Economist
CSRIA Board Representative

SUBJECT: Technical Analyses of Mainstem Water Withdrawals—
Salmon Survival Impacts on the Columbia River

UW Fish Survival Modeling—Background:

CSRIA technical representatives have been working with the Columbia Basin Research Center at University of Washington (UW) to review how new water withdrawal operations on the mainstem Columbia River would affect salmon survival. These analyses build upon previous work conducted with the UW.

As you may know, UW uses the CRiSP model to evaluate the impacts of juvenile salmon migration through the Columbia-Snake River mainstem. The model, in various editions, has been used to estimate fish survival since the late 1980s—the original model version was known as FISH-PASS, and it was used by Argonne National Laboratory (ANL) researchers to model the impacts of fish survival at the Mid-Columbia River dams (I used the original model output data while working at ANL to estimate impacts affecting Rock Island Dam operations).

Several models have been developed during the past 10-15 years, including PAM (Northwest Power Planning Council), FLUSH (ODFW and tribes), Idaho Fish Manager Model (Pacific Northwest Project), and SYMPASS-II (NMFS).

The CRiSP model has been periodically updated to incorporate new empirical research findings. In simple terms, the model is an "accounting model," estimating salmon/steelhead mortality/survival rates as the fish move through the Columbia River system.

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To date, the CRISP model has produced survival rate estimates that calibrate very closely to actual, measured empirical data for mainstem fish survival (NMFS data). The model provides highly accurate estimates of fish survival, when compared to the data analyses developed by NMFS.

Using the model, it is possible to estimate the effects of incremental changes to the river system, including the effects of water withdrawals—new water rights—at various points along the Columbia River.

Modeling Water Withdrawals from the Columbia River:

The effects of water withdrawals from the Columbia River can be readily analyzed by CRISP, using parameters specified by CSRIA. These parameters are:

- Average (2000) and low (2001) water-year conditions (model actual flow data conditions).
- Proportional, incremental water withdrawals behind mainstem project pools (Mid-Columbia to John Day projects), reaching 350 cfs, 500 cfs, 750 cfs, and 1,000 cfs at the John Day Pool; thus emulating the effects of new water rights along the Columbia River system.
- Remove new water withdrawals for the period July-August, affecting the lowest water conditions—and with existing water withdrawals in place.
- Measure survival estimate changes from baseline, with and without incremental water withdrawal reductions up to 1,000 cfs.

Model Analyses Estimates:

The model analyses indicate that:

- New water withdrawals at 350 cfs would reduce fish survival within the mainstem Columbia River by substantially less than 1%, under low water-year conditions.
- New water withdrawals at 1,000 cfs would reduce fish survival within the mainstem Columbia River by substantially less than 1%, under low water-year conditions.
- In effect, there exists no empirical impact to fish survival with an additional 350 to 1,000 cfs flow reduction in the mainstem Columbia River, even under low water-year conditions.

- Extrapolations from the model analyses suggest that several thousand cfs would have to be withdrawn from the river system in order to create a survival rate decrease of 1%—a level that would still be beyond empirical measurement (it could only be measured through the mathematical relationships incorporated within the model).
- By comparison, the Quad-Cities' new water right amounts to 15 cfs (estimated 8-year's incremental use). The effect on fish survival is not measurable on an empirical basis; virtually no impacts to fish survival would result from the new water right withdrawal.

Policy Implications for WA State (New Water Rights) and NPPC Decisions :

There are several key policy implications related to the above analyses:

Water Rights:

- The WA State Dept. of Ecology's use of the "no net loss" water policy as a justification not to issue new water rights, in order to "protect" migrating fish runs, is totally unfounded. Neither the UW modeling analyses, nor the empirical data or observations, support WADOE's policy action.
- The WA State Dept. of Ecology intends to issue a new water right to the Quad-Cities, purchasing water from other water rights to "mitigate" the effects of the new 15 cfs water withdrawal. Based on the UW analyses, the WADOE's use of state funds for such a "mitigation" measure represents an extraordinary waste of public money.
- The WADOE's failure to incorporate the past and ongoing work of the UW researchers—or to even address such analyses within the agency's recent record of examinations (ROEs) for new water rights—constitutes a clear failure to adhere to an objective, technical and scientific process. (As you will recall, Mr. Keith Phillips, WADOE manager, earlier stated to the CSRIA Board that the agency had deliberately excluded review of technical information counter to the flow targets from being used by WADOE in the ROEs).

Flow Targets:

- The UW analyses further suggest that the benefits of flow augmentation on the mainstem Columbia River are highly marginal at best, even under low water-year conditions.
- The mainstem flow targets are highly arbitrary in nature, established by NMFS policy decree rather than derived from well-developed scientific observations.

This summary file created: CRISP1.6 models pool migration rate dependent survival for Snake River and Lower Columbia reaches.
 Runs performed @ Columbia Basin Research by Jim Anderson and Chris Van Holmes (jim@cbcr.washington.edu, chv@u.washington.edu)

Flow Year (1)	Total withdrawal (KCF) (2)	Irrigation withdrawal per reservoir (KCF) (3)	Stock	Release Site	Release start day	In-River Survival Fraction (5)	Wich Alt IRR split Mortality (4)	Total System survival fraction	Change in Total Survival from baseline (0 withdrawal)	Fraction of Releases Transported
2000	0.00	0.000	Steelhead	Okanogan Confluence	110	0.34288	NA	0.33988	0.00000	0
2000	0.36	0.068	Steelhead	Okanogan Confluence	110	0.34288	NA	0.33988	0.00000	0
2000	0.80	0.083	Steelhead	Okanogan Confluence	110	0.34288	NA	0.33988	0.00000	0
2000	0.78	0.125	Steelhead	Okanogan Confluence	110	0.34288	NA	0.33988	0.00000	0
2000	1.00	0.187	Steelhead	Okanogan Confluence	110	0.34288	NA	0.33988	0.00000	0
2000	0.00	0.000	Steelhead	Snake River Trap	81	0.33987	NA	0.70427	0.00000	0.87847
2000	0.36	0.068	Steelhead	Snake River Trap	81	0.33987	NA	0.70427	0.00000	0.87847
2000	0.80	0.083	Steelhead	Snake River Trap	81	0.33987	NA	0.70427	0.00000	0.87847
2000	0.78	0.125	Steelhead	Snake River Trap	81	0.33988	NA	0.70427	0.00000	0.87847
2000	1.00	0.187	Steelhead	Snake River Trap	81	0.33988	NA	0.70427	0.00000	0.87847
2000	0.00	0.000	Subyearling Chinook	Okanogan Confluence	188	0.04887	NA	0.00311	-0.00012	0.08019
2000	0.36	0.068	Subyearling Chinook	Okanogan Confluence	188	0.04886	NA	0.00380	-0.00014	0.08007
2000	0.80	0.083	Subyearling Chinook	Okanogan Confluence	188	0.04885	NA	0.00337	-0.00029	0.08000
2000	0.78	0.125	Subyearling Chinook	Okanogan Confluence	188	0.04847	NA	0.00382	-0.00029	0.08079
2000	1.00	0.187	Subyearling Chinook	Okanogan Confluence	188	0.04843	NA	0.00373	-0.00028	0.08071
2000	0.00	0.000	Subyearling Chinook	Snake River Trap	137	0.12732	0.13888	0.43014	-0.00001	0.48185
2000	0.36	0.068	Subyearling Chinook	Snake River Trap	137	0.12732	0.13887	0.43013	-0.00001	0.48184
2000	0.80	0.083	Subyearling Chinook	Snake River Trap	137	0.12732	0.13887	0.43013	-0.00001	0.48184
2000	0.78	0.125	Subyearling Chinook	Snake River Trap	137	0.12731	0.13887	0.43013	-0.00001	0.48184
2000	1.00	0.187	Subyearling Chinook	Snake River Trap	137	0.12737	0.13882	0.43	-0.00014	0.48184
2000	0.00	0.000	Yearling Chinook	Okanogan Confluence	108	0.37739	NA	0.35445	0.00000	0
2000	0.36	0.068	Yearling Chinook	Okanogan Confluence	108	0.37739	NA	0.35445	0.00000	0
2000	0.80	0.083	Yearling Chinook	Okanogan Confluence	108	0.37739	NA	0.35445	0.00000	0
2000	0.78	0.125	Yearling Chinook	Okanogan Confluence	108	0.37739	NA	0.35445	0.00000	0
2000	1.00	0.187	Yearling Chinook	Okanogan Confluence	108	0.37739	NA	0.35445	0.00000	0
2000	0.00	0.000	Yearling Chinook	Snake River Trap	75	0.48882	NA	0.78888	0.00000	0.87737
2000	0.36	0.068	Yearling Chinook	Snake River Trap	75	0.48882	NA	0.78888	0.00000	0.87737
2000	0.80	0.083	Yearling Chinook	Snake River Trap	75	0.48882	NA	0.78888	0.00000	0.87737
2000	0.78	0.125	Yearling Chinook	Snake River Trap	75	0.48882	NA	0.78888	0.00000	0.87737
2000	1.00	0.187	Yearling Chinook	Snake River Trap	75	0.48882	NA	0.78888	0.00000	0.87737
2001	0.00	0.000	Steelhead	Okanogan Confluence	110	0.30082	NA	0.3878	0.00000	0.35229
2001	0.36	0.068	Steelhead	Okanogan Confluence	110	0.30082	NA	0.3878	0.00000	0.35229
2001	0.80	0.083	Steelhead	Okanogan Confluence	110	0.30082	NA	0.3878	0.00000	0.35229
2001	0.78	0.125	Steelhead	Okanogan Confluence	110	0.30082	NA	0.3878	0.00000	0.35229
2001	1.00	0.187	Steelhead	Okanogan Confluence	110	0.30082	NA	0.3878	0.00000	0.35229
2001	0.00	0.000	Steelhead	Snake River Trap	81	0.08841	NA	0.73616	0.00000	0.77323
2001	0.36	0.068	Steelhead	Snake River Trap	81	0.08821	NA	0.73615	0.00000	0.77323
2001	0.80	0.083	Steelhead	Snake River Trap	81	0.088	NA	0.73615	0.00000	0.77323
2001	0.78	0.125	Steelhead	Snake River Trap	81	0.0888	NA	0.73615	0.00000	0.77323
2001	1.00	0.187	Steelhead	Snake River Trap	81	0.08888	NA	0.73616	0.00000	0.77323
2001	0.00	0.000	Subyearling Chinook	Okanogan Confluence	188	0.02076	NA	0.03285	-0.00011	0.03003
2001	0.36	0.068	Subyearling Chinook	Okanogan Confluence	188	0.02011	NA	0.03244	-0.00018	0.03000
2001	0.80	0.083	Subyearling Chinook	Okanogan Confluence	188	0.02009	NA	0.0324	-0.00028	0.03000
2001	0.78	0.125	Subyearling Chinook	Okanogan Confluence	188	0.02033	NA	0.03225	-0.00028	0.03007
2001	1.00	0.187	Subyearling Chinook	Okanogan Confluence	188	0.02001	NA	0.03222	-0.00028	0.03008
2001	0.00	0.000	Subyearling Chinook	Snake River Trap	137	0.11889	0.12844	0.45008	0.00000	0.51838
2001	0.36	0.068	Subyearling Chinook	Snake River Trap	137	0.11882	0.12841	0.45008	0.00000	0.51838
2001	0.80	0.083	Subyearling Chinook	Snake River Trap	137	0.11882	0.12841	0.45008	0.00000	0.51838
2001	0.78	0.125	Subyearling Chinook	Snake River Trap	137	0.11887	0.12838	0.45008	0.00000	0.51838
2001	1.00	0.187	Subyearling Chinook	Snake River Trap	137	0.11887	0.12838	0.45008	0.00000	0.51838
2001	0.00	0.000	Yearling Chinook	Okanogan Confluence	108	0.22087	NA	0.38878	0.00000	0.3813
2001	0.36	0.068	Yearling Chinook	Okanogan Confluence	108	0.22087	NA	0.38878	0.00000	0.3813
2001	0.80	0.083	Yearling Chinook	Okanogan Confluence	108	0.22087	NA	0.38878	0.00000	0.3813
2001	0.78	0.125	Yearling Chinook	Okanogan Confluence	108	0.22087	NA	0.38878	0.00000	0.3813
2001	1.00	0.187	Yearling Chinook	Okanogan Confluence	108	0.22087	NA	0.38878	0.00000	0.3813
2001	0.00	0.000	Yearling Chinook	Snake River Trap	75	0.38078	NA	0.83187	0.00000	0.86732
2001	0.36	0.068	Yearling Chinook	Snake River Trap	75	0.38078	NA	0.83187	0.00000	0.86732
2001	0.80	0.083	Yearling Chinook	Snake River Trap	75	0.38078	NA	0.83187	0.00000	0.86732
2001	0.78	0.125	Yearling Chinook	Snake River Trap	75	0.38078	NA	0.83187	0.00000	0.86732
2001	1.00	0.187	Yearling Chinook	Snake River Trap	75	0.38078	NA	0.83187	0.00000	0.86732

NOTES

(1) CRISP1.6 Results for Normal Flow (2000) and Low Flow (2001) Irrigation scenarios

(2) Survival from release through the end of the Bonneville Tailrace.

The Alternative In-river Survival with the Alternative IRR split mortality applies to Snake Trap subyearling chinook. They are assigned a splitway mortality of 11.3% which is adjust to 80% the output to account for the latest alternative day and night mortality estimates. Steelhead and yearling chinook have In-R splitway mortality of 2%.

(4) Equal Irrigation withdrawals in KCFE from each of the following reservoirs: WEL, RRE, WAW,PRD, MCN, JDA

Response to the ISAB Review of Flow Augmentation: Update and Clarification Feb 10, 2003

By James Anderson
Columbia Basin Research
February 25 2003.

Introduction

I am responding to your request for comments on the ISAB review of flow augmentation update and clarification. I was asked by the ISAB to provide information to them on my research. I provided four reports:

1. The Flow Survival Relationship and Flow Augmentation Policy in the Columbia River Basin
2. Supplement to The Flow Survival Relationship and Flow Augmentation Policy in the Columbia River Basin
3. A collision theory based predator-prey model and application to juvenile salmonids in the Snake River Basin
4. An analysis of smolt survival with implications to flow management

These analyses are germane to the three questions the Council put forward to the ISAB on flow augmentation and smolt survival. In particular, documents 3 and 4 are relevant to the questions and the ISAB analysis. None of this work was noted by the ISAB.

My reply to the ISAB review is based on my work. I first present a brief overview of how I am evaluating the flow survival issues. Second, I consider the ISAB's responses to the Council questions in light of my analysis. My conclusions on the impacts of flow and survival and my responses to the Councils differ significantly from the ISAB's. I have intended my response to be respectful but candid with the belief that this is the best way to assist the Council in its difficult task.

The XT model

My analysis on the impacts of flow on smolt survival begins with a new theory I call the XT model because it describes survival in terms of both migration distance, X, and migration time T. The XT model represents a new approach to understanding smolt survival and predator prey interactions in general. It synthesizes in a single framework the CRISP, SIMPAS, and the ISAB's new fluctuating flow theories. Furthermore, the model provides an ecologically-based foundation that includes the effects of temperature and turbidity on smolt survival.

The number of salmon that predators eat depends largely upon three things: 1) the frequency of encounters with predators as the smolts swim downstream (primarily a function of distance traveled), 2) whether the predators can see them (primarily a function

of the turbidity of the water), and 3) how hungry the predators are (metabolism, largely a function of temperature).

The frequency of encounters depends on the balance of the smolts' directed downstream migration and their random movements relative to the predators. In this approach, the importance of smolt travel time depends on the fish behaviors. If smolts move directly down river in a steady flow and the predators sit-and-wait for the smolts to pass, then the smolts pass a gauntlet of predators and their survival is independent of the amount of time it takes to migrate, only the number of predators they encounter, which depends on migration distance. If smolts exhibit random movements in addition to their directed movements, then multiple encounters between predators and the smolts may occur, especially if the predators also move about searching for smolts. In this case migration time as well as distance traveled determine the amount of mortality. The balance of migration time and distance in determining smolt survival is characterized by a single variable, the random encounter velocity between predators and prey. This in turn can be estimated from survival, travel time, and travel distance.

Turbidity plays a role since the predators must see the smolts in order to capture them. The significance of visibility is characterized by a shape parameter, which can be estimated from survival and turbidity. Furthermore, the shape parameter is determined by the relationship between visibility and the reaction field of a predator and can be estimated independently from individual predator prey studies and ecological theory.

Temperature in the model affects the hunger of predators and is characterized by a factor that can be estimated from temperature and survival data and independently by the response of predators to temperature.

Thus, the XT model relates smolt survival to their travel time, their travel distance, water temperature and water turbidity. Put into a regression form, the values of the regression coefficients describe the contribution of each factor to smolt mortality.

My co-author and I are submitting a paper describing the basic XT model to the *American Naturalists*.

I applied the model to several thousand days of survival studies over the Snake and Columbia Rivers for spring, summer and fall chinook, and steelhead. This work was submitted to the NRC panel studying the impacts of flow on smolt survival in a study requested by the State of Washington. This document will be submitted to a journal soon. Enclosed is a draft manuscript. However, like the ISAB's hypothesis, mine is a work in progress.

The Council's Questions

Council Question 1. What is the evidence and to what extent will flow augmentation from storage reservoirs result in the same environmental attributes as higher flow under

natural conditions? In other words, how sound is the scientific approach of research that looks at correlations of fish movement and survival in relation to natural variations of environmental conditions such as flow, temperature, and turbidity, and then extrapolates to infer that man-made additions of flow will result in the same environmental attributes? Are there studies that more directly measure the effects of flow augmentation? If so what are the results of those studies?

ISAB Answer to Question 1:

The ISAB was unable to answer the question of whether the flow increments produced by flow augmentation will or will not induce conditions that enhance smolt survival. The ISAB could not answer this question because they viewed flow as the only variable affecting fish survival. The ISAB's approach cannot resolve the flow survival issue. Fish survival is not affected by a single variable and linear regressions of survival against a flow as constructed by NMFS and accepted by the ISAB are wholly inadequate to address the problem.

What the XT model reveals:

From my analysis of the data with the XT model, I conclude that temperature, migration distance and the amount of spill are the largest factors determining smolt survival. Smolt travel time is of minor importance. My work indicates that flow, through its effect on smolt travel time, is a minor variable. Furthermore, the effects of flow augmentation on smolt survival depend on the resulting impact of the augmentation on temperature and, secondarily, on turbidity. Therefore, I conclude that man-made additions of flow will not result in the same environmental attributes and effects on smolt survival as natural variations.

My paper "An analysis of smolt survival with implications to flow management" addresses these factors. To illustrate the basis of my conclusion, consider the relationship between flow and survival between Lower Granite and McNary Dam in 2001. In this data, survival continually decreases over the season as the water warms (Figure 1) but the flow follows a different pattern, increasing up to the spring maximum flow and then decreasing into the summer resulting in a > shape (Figure 2). This clearly demonstrates that survival is not monotonically related to flow as has been assumed in other studies. That is, the other studies all assume that survival increases with flow. The data shows survival can increase or decrease with flow. Note also that the figures show both the data (○) and the model (●) predictions of survivals of fish grouped according to their passage date at Lower Granite Dam. The model fits the flow survival and travel time survival relationships (Figure 3) but contains neither fish travel time nor flow. Furthermore, in both examples, the data and modeled relationships are highly nonlinear; that is survival both increases and decreases with travel time and flow. These facts alone should cast doubt on any analysis based exclusively on flow, whether flow is expressed as an average index as was done by NMFS, in terms of water particle travel time as was done by the Fish Passage Center, or in terms of fluctuating flows as was done by the ISAB.

What the XT analysis says about flow augmentation.

The effect of flow augmentation should be viewed in terms of its impacts on temperature, turbidity, and fish velocity. Thus, addressing how flow affects fish requires first addressing how flow affects temperature, turbidity, and velocity, and second, addressing how these variables affect smolt survival.

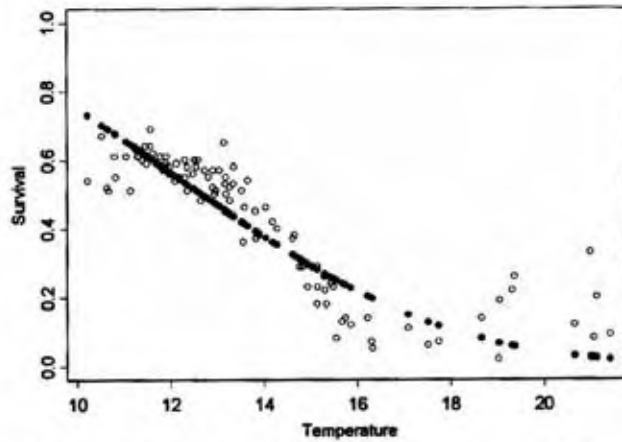


Figure 1. Modeled and observed chinook survival vs. temperature (°C) for migration between LGR and MCN in 2001. Survival estimated with PIT tags designated (○); survival estimated with the X-model designated (●).

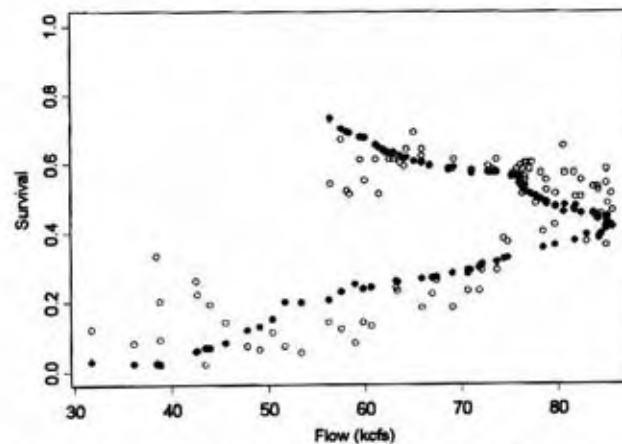


Figure 2. Modeled and observed chinook survival vs. flow for migration between LGR and MCN in 2001. Survival estimated with PIT tags designated (○); survival estimated with the X-model designated (●).

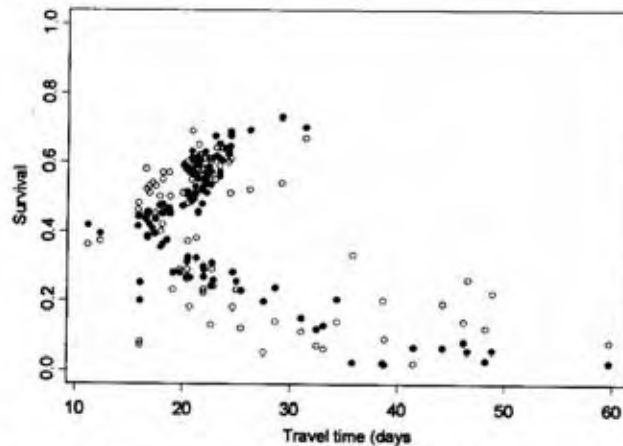


Figure 3. Modeled and observed chinook survival vs. travel time for migration between LGR and MCN in 2001. Survival estimated with PIT tags designated (○); survival estimated with the X-model designated (●).

Council Question 2. *To what extent will incremental flow augmentation within a year have the same effect on survival as the year-to-year changes in flow that are also accompanied by year to year changes in climate and ocean conditions?*

A. Relevant to the draft mainstem amendments, to what extent will changes in reservoir release strategies that could result in decreases in spring and summer flows of approximately 10% or less have a statistically significant effect on juvenile salmon and steelhead survival?

B. A linked question is what scientific evidence exists that decreased travel time as a result of flow augmentation will result in increased juvenile survival?

ISAB Answer to Question 2:

The ISAB concluded that incremental flow augmentation is not likely to have dramatic beneficial effects on in-river smolt survival. They also conclude that effects of flow augmentation on survival in the ocean and estuary is unknown.

My response:

In my analysis, I determined that both the year-to-year survival patterns and the within year survival patterns could be explained principally by temperature only. From this explanation, I conclude that we need to consider the impact of flow augmentation on river and ocean temperatures relative to the impacts of year-to-year variations in climate on river and ocean temperatures in order to address the Council's question. Flow augmentation from Dworshak, which is colder than the water body it enters, will improve survival slightly but flow augmentation from the Hells Canyon complex, which is warmer than the Snake River (Anderson 2001) will decrease survival. However, the

amount of temperature change in both cases is small and I expect that it will have unmeasurable impacts on fish survival through the river. However, this analysis has not been done. Furthermore, since the flow augmentation is small compared to the total river flow into the estuary and ocean, the impact of flow augmentation is insignificant irrespective of the basis of any relationship between flow and survival one assumes (Anderson, Hinrichsen and Van Holmes 2000).

ISAB Answer to Question 2A:

The ISAB believes a 10% decrease in augmentation would not affect survival for flows above 100 kcfs but could have an impact below that level. They based their conclusion on a breakpoint in the flow survival plot presented by NMFS on December 11, 2002 (Figure 4).

My response:

By plotting essentially the same data, grouped daily instead of weekly as was done by NMFS, I obtained a similar pattern (Figure 5). The ISAB interpreted the NMFS plot as evidence that survival decreases as a result of the lower flow below a flow of 100 kcfs. Note that the pattern was entirely generated by the low flow and survival in 2001. If the relationship were driven by flow then the ISAB's conclusion of a benefit of flow augmentation below 100 kcfs is reasonable. However, if the survival decline was not a result of flow but of another variable that exhibits a seasonal pattern with flow then we may not expect the same benefit of flow augmentation that is exhibited in the seasonal pattern. In fact, this is what I have found.

My analysis included water temperature, turbidity and fish travel time, which is linearly correlated with flow and therefore is a surrogate for flow for spring chinook. Using these variables in the XT model the regression determining the significance of each variable revealed that temperature was the only factor needed to fit the survival pattern within years and between years. Figure 1 illustrates the temperature survival pattern for 2001 and Figure 6 illustrates the pattern over the years 1995 through 2002. The patterns were the same across all years. However, even though the XT model contains only temperature it actually fits the flow vs. survival data better than the NMFS flow vs. survival curve. Compare the fits of the 2001 data with the NMFS flow line (Figure 4) and the temperature based prediction of flow vs. survival from the XT model (Figure 5). The NMFS prediction pass through the main scatter of points but for 2001, which is within the oval in Figure 4, the flow line is unable to track the > shaped pattern. In contrast, the XT temperature-based model fits both the general pattern and the within-season 2001 pattern.

Clearly, if temperature, not flow, is the operative variable, then the effect of flow augmentation depends on the temperature of the augmentation water compared to the temperature of the water body. Augmentation from Dworshak, which is cooler than the Snake River, would have a small benefit on survival while augmentation from Hells Canyon, which is warmer than the Snake River, would decrease survival.

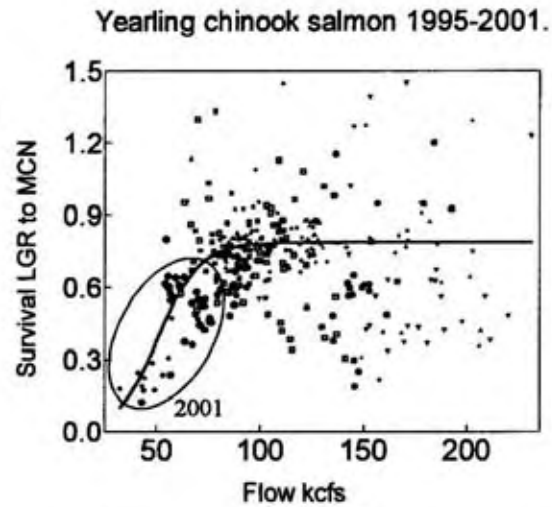


Figure 4. Relationship of flow and survival between LGR and MCN dams presented by NMFS December 11, 2002. The oval depicts the data from 2001.

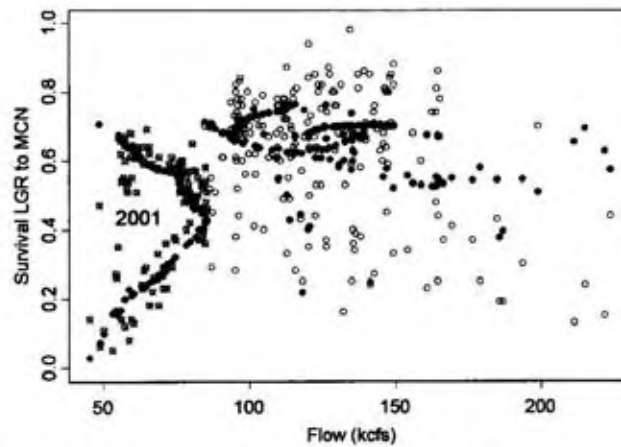


Figure 5. Modeled and observed chinook survival vs. flow for migration between LGR and MCN in over the years 1995 through 2002. Survival estimated with PIT tags designated (\circ) survival estimated with the X-model designated (\bullet). The 2001 data is designated by an x in the symbol \circ .

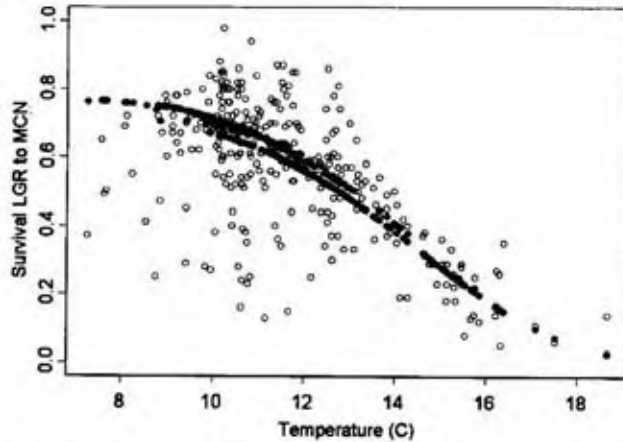


Figure 6. Modeled and observed chinook survival vs. temperature (°C) for migration between LGR and MCN between 1995 and 2002. Survival estimated with PIT tags designated (○); survival estimated with the X-model designated (●).

However, the breakpoint inferred by the ISAB must exist. When the flow goes to zero, the survival must also go to zero, and because flow and survival are unrelated over most of the observed range, we expect some breakpoint. The XT model establishes an ecological foundation for flow survival breakpoints and it is thus possible to estimate the breakpoint when temperatures are essentially uniform from year-to-year over a range of flows. Such conditions exist for migration of Dworshak hatchery fish to Lower Granite Dam. Data collected between a 1990 and 2001 (Figure 7) clearly show that survival is independent of flow over a range 38 to 133 kcfs. Fitting the XT data to this model indicates that the flow survival break point is on the order of 25 kcfs and is very sharp. Here again, the model and data both agree that flow is not a factor in determining smolt survival.

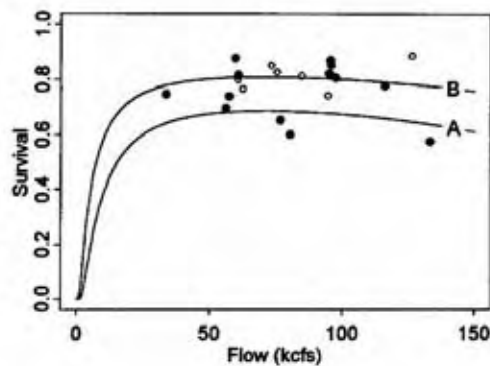


Figure 7. Relationship of flow to smolt survival from Dworshak Hatchery to Lower Granite Dam. Curve A uses travel distance $X = 116$ km and curve B uses $X = 64$ km. Open points are survivals for release dates greater than Julian Day 100. Solid points are survivals for release dates Julian Day 100 or less.

My analysis supports the ISAB statement that a 10% decrease in spring and summer flows will not have a deleterious effect on reach survival. In fact, my analysis allows a stronger statement. Because my analysis indicates temperature, not flow, controls survival over observed ranges of flow and the breakpoint is the below 33 kcfs a flow augmentation reduction should not impact reach survival unless it also impacts river temperature. In this case, the reduction could increase or decrease survival very slightly depending on the temperature differential of the river water and the augmentation water. However, I do not see changes in flow augmentation consigning "salmon to death by a thousand cuts" as suggested by the ISAB.

ISAB Answer to Question 2B:

The ISAB believes that the more time fish spend in a reach, the higher their mortality. They further believe that a more critical question involves the instantaneous mortality, which is the percent mortality per day. From their note on the mathematics of reach survival and flow, they conclude that the mortality rate may increase as a result of low flow or other factors such as temperature and turbidity.

My response:

Although I applaud the ISAB in considering the problem beyond simply regressions of flow against survival I suggest their analysis is insufficient. The manuscript "A prey survival model based on path length theory with application to juvenile salmonids in the Snake River Basin" presents a rigorous mathematical foundation for studying reach survival.

In contrast to the ISAB, I conclude from my work that the amount of time it takes smolts to migrate through the river does not have a significant impact on their survival through the river. The only clear exception I have found so far is for the survival of Snake River fall chinook to Lower Granite Dam. For these fish, survival depends on the velocity, travel time, water temperature, and turbidity. For the other stocks investigated to date, including spring chinook migrating through the hydrosystem, survival depends on distance traveled, which characterizes the number of predators encountered, temperature that affects the predator activity, and spill that affects the survival in dam passage.

Both NMFS and the ISAB have expressed concern for the effect of fish arrival time on their survival in the estuary. Whether or not this is a problem, it can be summarily disregarded in the context of flow augmentation. Simply stated, flow augmentation changes the water velocity too little to affect fish arrival time to the estuary. Analysis with the CRISP model indicates flow augmentation can only change arrival time by a few hours over a migration of several weeks. Furthermore, the impacts of the flow

augmentation on the estuary and freshwater plume dynamics can similarly be discounted because flow augmentation alters the total flow very little.

Council Question 3. *Are the statistical methods used in recent flow-survival analyses rigorous and technically sound? Did the analyses properly incorporate and treat 2001 low-water-year data?*

ISAB Answer to Question 3:

The ISAB considered the statistical methods sound but questioned whether they were appropriate, citing the Fish Passage Center flow survival review.

My response:

I disagree on the adequacy of the methods used to date. The flow survival analyses conducted by NMFS, FPC and the ISAB are all inadequate. In particular, with minor variations, they all consider only flow: NMFS used a flow index, the Fish Passage Center used water particle travel time, and the ISAB used flow fluctuations. All are incomplete. The NMFS analysis is correlative without causation. The FPC analysis is also correlative, and as my analysis and the ISAB's both noted, the flow survival relationship in the FPC analysis is driven by 2001 data.

Smolt migratory survival depends a number of factors so to try and understanding the impacts of flow on survival by considering only flow is simply wrong. However, the region has focused on flow and the brokenstick flow survival hypothesis for two decades. I applaud the Council for its efforts to review the problem and move forward with new information and ideas. I applaud ISAB for its efforts to think beyond linear regressions and encourage them to become further aware and involved in the work being conducted in the region.

Comments on the ISAB alternative hypothesis explaining data.

In seeking an explanation for the brokenstick in the flow survival pattern, the ISAB hypothesize that the fluctuating flows due to variable dam operations may be responsible. Variations in dam operations create seiches in the reservoirs and alter the forebay hydrodynamics with the effect being most pronounced under low flow conditions. The ISAB hypothesize these changes may disorient fish causing them to wandering through the reservoir. While the ISAB has not quantitatively linked flow variations to fish survival there are several analyses through which this can be done.

The XT model provides one approach. The model partitions smolt velocity into fluctuating and average parts and the relative magnitudes of the two determine the contributions of migration distance and time to smolt survival. Through this model we can, for example, evaluate the importance of seiches in producing a brokenstick flow survival relationship. Taking the elevation data presented by the ISAB the seiche wave velocity is about 30 mph, such that the Lower Monumental Reservoir elevation exhibits an oscillation on the order of an hour. Assuming an average reservoir depth of 100 ft,

and a seiche amplitude of 1 foot the root-mean squared horizontal velocity is $u = 4$ cm/s. In comparison the average migration velocity of the fish is about $U = 23$ cm/s. If the seiche is the only contributor to random movement in the smolt migration, then the survival equation would be expressed

$$(1) \quad S = \exp\left(-\frac{t}{\delta} \sqrt{23^2 + 4^2}\right)$$

where δ is the length scale of the ecological neighborhood in which the predator interacts with the prey. The equation factors in the contribution of the average downstream migration velocity, 23 cm/s, and the seiche induced random velocity 4.36 cm/s. With the seiche, the characteristic velocity is $\sqrt{23^2 + 4.36^2} = 23.41$ cm/s, which increases the rate by 1.7% when the average migration velocity is 23 cm/s. Thus, at typical migration velocities a seiche would have no significant effect of the rate or mortality. However, at some point the average migration velocity becomes sufficiently low such that the seiche does become significant. This is illustrated in the Figure 8 below where the average velocity is in terms of multiples of the seiche velocity, which is normalized to 1. The figure demonstrates the breakpoint in the flow survival curve occurs when the average migration velocity is equal to 1.8 times the random velocity. Thus, the XT model predicts that for a seiche with a 4.3 cm/s rms velocity to produce the flow survival breakpoint the average fish migration velocity is 7 cm/s. If fish velocity decreases linearly with flow and the average flow is 100 kcfs then the flow induced breakpoint is on the order of 30 kcfs. From this cursory example I conclude that a 1 foot seiche is not responsible for the breakpoint in the flow survival plots. More important though, the example illustrates that theory is available to evaluate the ISAB's fluctuating flow hypothesis.

Other work in progress will contribute to evaluating the effects of flow on survival. In particular, Andy Goodwin and John Nestler of the Army Corps have made significant progress in modeling the response of salmon smolts to river flows and the hydraulic conditions at the forebay of dams. The work, which is part of Goodwin Ph.D dissertation from Cornell University, has combined a computational fluid dynamics model with a behavior model to predict the detailed movement of fish in the forebay of Lower Granite Dam. The model was calibrated with detailed movements of radio and hydroacoustic tagged fish. Goodwin reports "I've been able to match the percentages with which juvenile steelhead use each of the passage routes through the dam (+/- 10%), which Gary Johnson said was within the error of the data. I can capture behaviors in the forebay such as shadowing of the BGS, tracing of the trash boom, (more or less) the proper holding & milling locations, and (within an order-of-magnitude) the residence time (A. Goodwin Personal communication)." This work and the XT model are important because they illustrate that other ongoing research is advancing the quantitative approaches hypotheses proposed in the ISAB review.

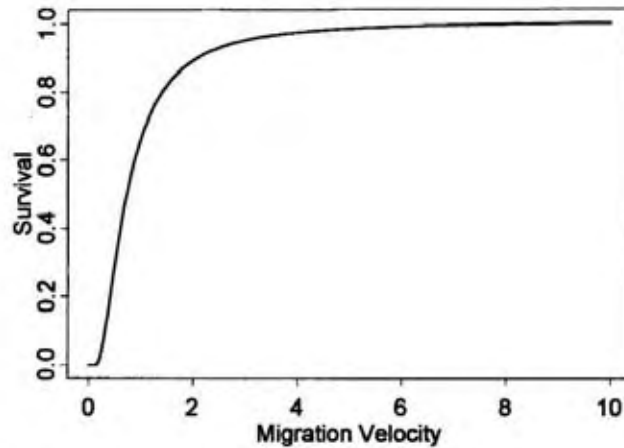


Figure 8. The XT model survival vs. average migration velocity expressed as multiples of the smolts random component of their migration velocity

Summary

NMFS and FPC used linear and multiple-linear regression techniques to analyze factors affecting flow. These approaches have no ecological basis and are incapable of explaining flow breakpoints or the differences in survival patterns within a year and between years. NMFS concluded that within-year patterns are not statistically significant and have generally ignored them. However my analysis clearly shows there are within-year patterns, which must be explained along with the between-year patterns in any coherent robust analysis. The NMFS and FPC analyses are unsatisfactory because they are devoid of ecological foundations. The ISAB moved closer to an ecological basis by approaching the problem with their fluctuating flow hypothesis. However, their work to date is speculative, qualitative, and is not based on solid first principles of ecology. NMFS, FPC, and the ISAB are all too flow centric in their approach. In fact, for over two decades the region has attempted to explain the effects of flow on fish survival without consideration of other environmental factors. This approach has yielded little to an understanding of smolt survival.

Whereas the flow centric models assume flow is the operative variable controlling survival, the XT model, offers an ecologically-based approach to study the effect of environmental properties on smolt survival and allows the data to indicate the significance of each variable. The model addresses the fluctuating flow hypothesis proposed by the ISAB, explains and quantifies flow-induced breakpoints, and fits both the between- and within-year patterns of survival. Additionally, because the model coefficients have ecological meaning, coefficient values derived by fitting survival data can be tested against values determined independently. For example, the model's coefficient predicting how predator activity increases with temperature compares favorably with laboratory estimates of predator feeding activity changes with temperature.

The conclusions that I reach from with the XT model disagree with the findings of the ISAB.

- I find the break in the flow survival curve is not due to flow, but to differences in temperature in 2001 compared to other years.
- My initial analysis indicates that seiches of the intensity identified by the ISAB are not response for the breakpoint at 100 kcfs. I estimate a flow induced flow survival breakpoint would occur at about 25 to 30 kcfs.
- My analysis does not support the ISAB hypothesis that regulating river flows will significantly affect fish survival unless river flow drops below 30 kcfs.
- My analysis does not support the ISAB belief that changes in estuary conditions and smolt arrival time to the estuary resulting from flow augmentation are significant. The contribution of flow augmentation to estuary processes is simply too small to be significant.
- I disagree with the ISAB's statement that the within year survival data does not show a pattern. There are patterns, especially in 2001, and any model used to evaluate the flow augmentation program must be able to explain and fit both the within year and the between year patterns.

I do reach several conclusions that agree with the ISAB's review:

- The prevailing flow-augmentation paradigm is no longer supportable by the data.
- Valid approaches must be based on ecological mechanisms for explaining smolt survival.
- Interpretation of flow requires an understanding of the relation between reach survival, instantaneous mortality, migration speed, and flow. I add to this list the need to understand the contributions of environmental factors including temperature and turbidity. Also, the understanding must have a theoretical basis that is mathematically rigorous and based on first principles of ecology.

Final thoughts

The XT model and resulting analysis are new and important to the understanding the impacts of flow on survival. However, the ISAB's review contains no reference to the work, which admittedly is in progress, but was available to the ISAB. Furthermore, I realize that the work must be completed and reviewed before it factored into the Council's decision. However, even though it is work in progress, it illustrates that the ISAB review was significantly incomplete and conclusions reach by the ISAB may be open to challenge on a solid scientific foundation.

**Supplement to
“The Flow Survival Relationship and Flow Augmentation Policy in the
Columbia River Basin”
Analysis of New Results**

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November 11, 2002

Analysis of flow and survival in the year 2001

Smolt data from 2001, an extremely low flow year, overwhelmingly shows that the effect of incremental within-year changes in flow on juvenile fish survival are not significant. Even using between-year flow data, which is not appropriate to evaluate the effects of a within-year change in flow, a one kcfs withdrawal changes fish travel time by less than 3 hours over a two to three week migration and changes survival by no more than a few hundredths of a percent on a base survival of 20% to 50%.

Because 2001 had some of the lowest flows on record, it is valuable to compare it to other years to evaluate the effects of very low flow on fish survival and travel time. The flow in 2001 was about half a normal year. Using McNary Dam as a reference point, the average flow during wild spring chinook passage was 135 kcfs. The survival between Lower Granite and Bonneville dams was 26.7% for spring chinook smolts and 3.8% for

steelhead smolts. In comparison, average 2002 flow experienced by these stocks was about 238 kcfs and their survivals were 50.4% and 26.7% respectively. The spring chinook travel time between Lower Granite Dam and Bonneville Dam in 2001 was corresponding slow at 34 days, while in 2002 the fish migration took 18.7 days, which is typical of years with average flows. The 2001 data is especially valuable because it provides a low flow data point, which clarifies the between-year flow-survival relationship. Including other years in a linear regression shows that each one kcfs change in flow increases the travel time between Lower Granite Dam and Bonneville Dam by less than 3 hours. This travel time change should also occur for a one kcfs withdrawal. Taking a linear regression of flow and survival between years, we find a one kcfs reduction in flow between two years is associated with changes in survival of about 0.14% for spring chinook and 0.2% for steelhead. Thus, if the flow index is 200 kcfs in one year and 199 kcfs in the next year, the spring chinook survival would change from 38.98 % to 38.84% and the steelhead survival would change from 17.79% to 17.57%.

However, these changes in survival between years, although small, also correlated with differences in environmental conditions including temperature, turbidity and fish condition. For example, in 2001 the average temperature during wild spring chinook passage was 14.7 °C while in 2002 the average temperature during passage was 11.8 °C. Because water withdrawals affect flow without measurably affecting temperature, turbidity and fish condition, the in-season relationship between flow and survival is the rational measure to use for predicting changes in fish survival associated with water withdrawals. Analyses of flow and survival for spring chinook and steelhead within the 2001 migration season are valuable for determining if flow-survival relationships exists. Zabel et al (2002) conducting such analyses concluded "Substantial increases in flow exposure in the middle of the season, for example, did not increase survival for either Snake River spring chinook or steelhead." In Figure 1, the closed points represent survivals for the middle 99% of the total fish migration between Lower Granite Dam and McNary Dam in 2001. The lower ellipse of points represents 1% of the smolts, which passed after June 20 when the Snake River temperatures were above 15°C. In comparison, the Lower Granite Dam average temperature experienced by the fish was 11.3 °C. For survivals calculated from daily Lower Granite Dam passage of spring

chinook in 2001, again there is no survival relationship with flow index (Figure 2). For steelhead, there is no in-season flow-survival relationship (Figure 3). Assuming the regression in Figure 2 represents a flow survival relationship if one did exist, then a one kcfs water withdrawal would change survival a few hundredths of a percent at most. As a practical matter, given the greater importance of other variables, it is not reasonable, even in a low flow year like 2001, to ascribe any measurable adverse effect on fish survival to water withdrawals on the order of 1,000 cfs.

Indeed, even larger withdrawals have should have no impact on fish survival. Since much of the water withdrawn eventually returns to the river as ground water an actual one kcfs loss to the system requires a larger withdrawal. Nearly all municipal water returns to the river as treated water and many irrigation withdrawals return most water back to the river. Finally, the impact of Columbia withdrawals on Snake River salmon and steelhead is reduced further because 50% to 95% of these fish are transported in barges and so they are not affected by river flow or water withdrawals in the Columbia. The net result is that withdrawals from the McNary and John Day reservoirs of any magnitude less than 1,000 cfs, and probably rather more than that have no impact on juvenile salmon and steelhead survival.

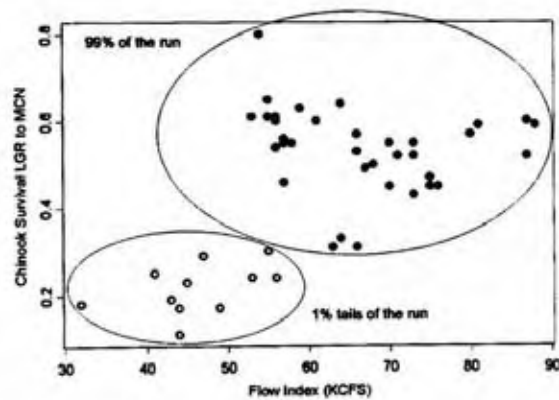


Figure 1. A plot of daily flow and daily survival for Snake River spring chinook in 2001. Data from Figure A.3.1 of Zabel et al (2002). Upper ellipse represents survivals that occurred during 99% of the fish run; the lower ellipse represents survivals that occurred during the tail 1% of the fish run

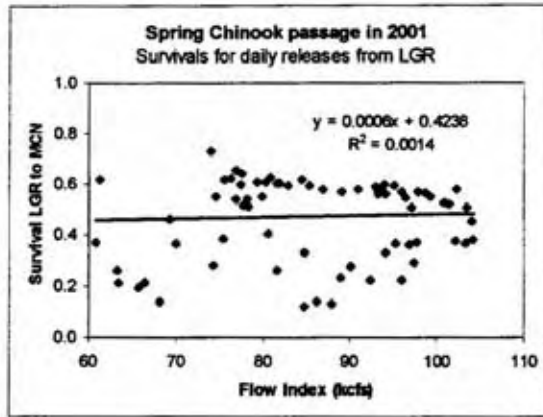


Figure 2. Flow index vs. survival for spring chinook grouped according to day of Lower Granite Dam passage. Data from DART.

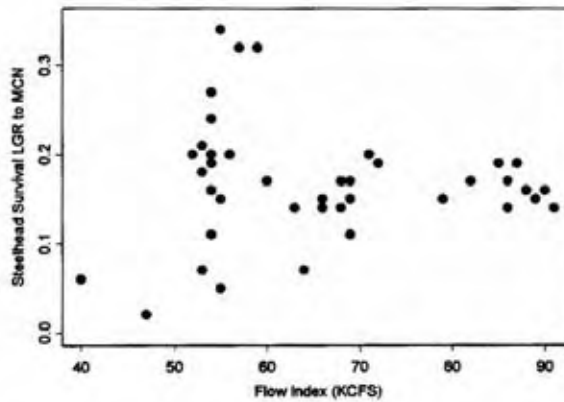


Figure 3. Relationship between daily flow and daily survival for Snake River steelhead in 2001. Data from Figure A.3.1 of Zabel et al (2002).

Analysis of summer flow on survival in John Day Reservoir

Analysis of flows and smolt survival through John Day reservoir in July and August shows no relationship between flow and survival.

Since summer flows are low, there is special concern for the impact of flow on survival of fish passing through system this time of year. The potential impact is illustrated in Figure 4, which plots a John Day Reservoir flow index against the survival of 163 groups of PIT tagged chinook smolts that passed through John Day Reservoir between June 21 and August 8 over the years 1999-2002. Individual and combined year regressions of flow against survival showed no significant relationship with p-values ranging between 0.69 to 0.345 and r-squares from 0.018 to 0.075. The survival vs. flow slopes of the regressions ranged between -0.002 to 0.0019 for individual years and was 0.0004 for the combined year data. Using this latter estimate as the typical flow survival relationship, a one kcfs water withdrawal would decrease survival through John Day Reservoir from 52.60% to 50.56%, which is a change of a few hundredths of a percent.

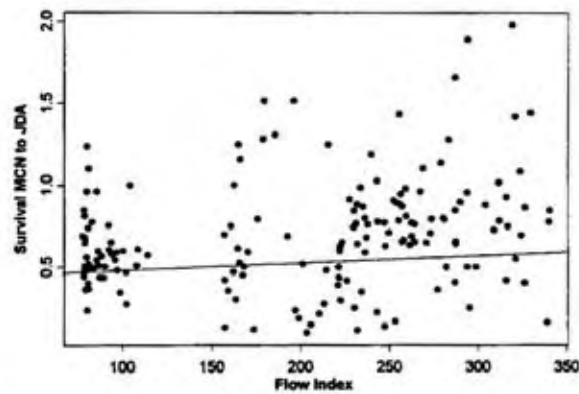


Figure 4. Flow and survival of chinook passing through John Day Reservoir between June 21 and August 8 over the years 1999 – 2002. Weighted regression lines is through all data.

Analysis of the effect of flow on ocean survival in 2001

Comparing jack chinook returns from 2001 to earlier years indicates the low flow had no discernable impact on early ocean survival.

Concern has been expressed that low flow affects the survival of smolts as they enter the ocean. The hypothesis is that the freshwater plume provides habitat in which the smolts feed and avoid predators. Although qualitatively this is a plausible hypothesis, again the evidence suggests that the effect does not exist in any measurable sense, if it exists at all. Simply on the basis of the impact of withdrawals relative to the base flow, it is straightforward to discount the effect of withdrawals on the Columbia River freshwater plume in the ocean. A withdrawal of one kcfs on base flow of 300 kcfs entering the ocean represents a change of 0.3% of the flow into the plume.

The biological response to such a small change cannot be measured, but if river flow did have a measurable affect on ocean survival, it should be evident by comparing data from 2001, which had half the flow of a normal year, to another year with a normal flow. We can infer the level of impact by comparing jack returns in 2001 to returns from 1999 and 2000, which were years with higher flow but similar ocean conditions. Jack salmon are the precocious males that migrate out in the spring of one year and return in the spring of the next. They represent a small fraction of the total run but they are a measure of the success of the year class. For the 2001 smolt out migration, 0.2% returned in 2002 as jacks. In comparison, the jack returns for the 1999 and 2000 out migrations were 0.2% and 0.4% respectively. Furthermore, jack returns in the early 1990s were on the order of 0.05% under normal flow levels.

References

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**The Flow Survival Relationship and Flow Augmentation Policy in the
Columbia River Basin**

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Corrected 9/9/2002

Flow augmentation and flow targets have been central programs in Columbia River salmon management for more than twenty years. Over this time, water requests have increased from 3.75 MAF in 1983 when the Water Budget was established (NPPC 1983) to between 13 and 16 MAF in the 1995 and 2000 NMFS Biological Opinions (NMFS 1995a; NMFS 2000a). Over the same period, the body of science on the effects of flow grew from a single graph between smolt survival and Snake River flow, to a body of information involving the tagging of a million smolts with survivals measured over the entire salmon life cycle. Whereas the growing body of scientific evidence indicates that variations in flow have no measurable effect on survival of juvenile salmon and steelhead

through the mainstem of the Columbia and Snake, the fish managers continue with their policy of augmenting these flows and have effectively halted further withdrawals of water from the mainstem of the system. In this paper I explore the history of the flow survival research and how political objectives produced a growing disconnect between the research and the water policy.

The development of flow policy

The flow augmentation policy established two decades ago is based on the initial research suggesting small changes in flow are correlated with large changes in fish survival. However, the policy is based on two assumptions 1) a flow survival relationship actually exists and 2) the effect natural flow variations have on survival can be achieved with flow augmentation.

Even prior to the completion of the hydrosystem National Marine Fisheries Service researchers (NMFS) documented the detrimental effect of dams on the survival and travel time of fish during their migration to the ocean. Prior to the construction of the Snake River dams (1964-1974), smolt traveled from the Snake River to the ocean in a matter of days and with the construction of the dams (1974-1994), the travel time extended to several weeks (Figure 1). Concomitant with the increasing travel time the percent of adults returning, designated the smolt-to-adult ratio (SAR) declined. While it was clear that fish suffered mortality as they passed the dams, there was also a concern that the extended travel time contributed to the fish mortality. The hypothesis was that extended travel times increased the exposure of fish to predators and disease and delayed their entrance into saltwater, resulting in additional stress and mortality both in the river migration and in the estuary. Researchers studied survival of smolts from the Snake River to John Day Dam over seven years. Based on two low survivals in years with very low flows they hypothesized that more flow produced higher smolt survival (Figure 2). The hypothesis became known as the Sims and Ossiander flow survival relationship after the NMFS scientists that published the finding in an annual research report (Sims and Ossiander 1981).

At the same time as with the construction of the hydrosystem, the Columbia and Snake River salmon stocks declined and so fish managers sought a number of partial solutions

to restore the runs. The two main actions were limiting harvest and increasing the production of hatchery fish to compensate for habitat lost by the dams. In addition, fisheries managers sought to increase survival by bypassing smolts around the turbines and by speeding their seaward migration by flushing additional water through the river during the spring migration. The initial flow augmentation occurred in 1983, and was based on two premises. One was intuitive. Because smolts migrated during the spring flush and the dams diminished the spring flows, augmentation of the spring flows with water from the storage reservoirs would partially mimic the natural conditions and therefore increase smolt survival. The second premise was quantitative. The Sims and Ossiander flow survival hypothesis suggested great benefits from modest increases in flow. For example, fish managers predicted spring chinook survival would increase 180% with a 47 kcfs increase in flow at Ice Harbor Dam (CBFWA 1990). However, applying the Sims and Ossiander curve to predict the benefits of flow augmentation involved a very important, but unstated, assumption. The Sims and Ossiander curve was derived by plotting yearly averaged flow against yearly average survival and thus represented a relationship between years. Flows between years depend on the amount of rainfall, snow, and the temperature patterns, which together control environmental conditions prior to and during the smolt migration. Thus, a yearly average flow survival relationship involves many factors other than just the flow that the fish experience while migrating through the river. Flow augmentation, however, is produced by shaping the available flow within the season. Thus, by applying the Sims and Ossiander curve to flow augmentation fish managers assumed that the benefits of a wet year could be achieved in a dry year by simply reshaping the timing of the spring runoff.

Two decades ago when the Water Budget began, neither the flow survival hypothesis nor the hypothesis on the equivalence of natural and augmented flows were challenged and in fact they were simply not discussed. However, these assumptions were central to the Water Budget in 1983. Thus, the fish water policies today have a direct lineage to the curve Sims and Ossiander drew through seven data points representing observations of (1973-1979) yearly averaged flows at Ice Harbor Dam against the per project survival of spring chinook and steelhead smolts from the Snake River to John Day Dam.

Testing the hypothesis that survival increases as flow increases

Over the past two decades, flow was hypothesized to affect survival via the effect of flow on travel time, altering the exposure of fish to predators and deleterious river conditions. While studies establish that flow was related to travel time, the Sims and Ossiander flow survival hypothesis could not be reproduced. A weaker relationship between flow measures and SARs was identified but the underlying factors could not clearly be identified which prompted a revision of the flow survival mechanism to include other factors such as estuary arrival timing. Even though the research has not supported the hypothesis, fish managers have not abandoned the flow policy based on the hypothesis but instead increased flows even more based on the hypothesis.

Although the Sims and Ossiander flow survival hypothesis is critical to fish water policy, it has never been precisely formulated, and the hypothesized underlying mechanism has changed over time in response to findings of the flow survival research. In the initial mechanism, it was hypothesized that flow affected survival via its effect on fish travel time: Increased flow decreased fish travel time, which increased fish survival. Petrosky (1992) demonstrated an inverse correlation between travel time of Snake River water and the survival of smolts to adult (SAR) (Figure 1). A paper by Berggren and Filardo (1993) provided support for the travel time mechanism by showing flow and smolt travel time were significantly related for Snake River spring chinook. Hilborn (1993) compared SARs of spring chinook from the Upper and Lower Columbia and concluded the SAR difference between the two reaches was greater for years with lower flows. Cada et al. (1994) reviewed a range of studies and suggested other factors were also of importance, especially temperature. With these reports, NMFS established a flow augmentation policy in the 1995 Biological Opinion (NMFS 1995a, b). The dominant justification was in terms of the flow-travel time link. NMFS used travel time as one of the main performance measures in setting the spring and summer flow targets the hydrosystem required to insure safe passage of smolts. The flow target justification also involved temperature: fish arriving at projects later with higher temperatures would encounter more active predators and could have lower bypass efficiency causing more fish to pass through turbines. Thus, the water policy, up through the 1995 Biological Opinion, was based on a handful of studies that appeared to support the Sims and Ossiander assumption

that increases in flow increase salmon survival. There was no test and little discussion of the second assumption that the benefit assumed from natural year-to-year flow variations could be achieved by reshaping flows within a year.

However, with the development of the PIT-tag marking system, which allowed greater precision in estimating smolt survival, scientists were able to fully test the first hypothesis and partially test the second hypothesis. The first test of the Sims and Ossiander flow survival hypothesis was obtained in Little Goose Reservoir in 1992. It was a low flow year similar to 1973 and NMFS researchers expected survival to be low, but surprisingly, the PIT-tag measured survival was higher than the highest survival obtained in the highest flow year of the Sims and Ossiander study. Results from 1994 also showed very high survival. It is noteworthy that in developing the flow targets for the 1995 Biological Opinion, NMFS rejected the 1993 and 1994 PIT tag studies (NMFS 1995b). However, with each additional year of data, the rejection of the flow-survival hypothesis became stronger: It is now clear that survival of spring chinook and steelhead through the hydrosystem is not related to variations in flow (NMFS 2000b; Bickford and Skalski 2000, Muir et al. 2001).

Researchers have reviewed the early studies and found flaws. The strong flow survival relationship in the Sims and Ossiander data (Figure 2) depended entirely on low survivals in the two drought years, 1973 and 1977. A closer look at the historical records revealed these low survivals were likely caused by poor dam passage conditions, not the low flows. Because the dam intakes were not regularly cleaned, larger numbers of tree, branches and other trash, accumulated at the face of the upper most dam on the Snake River (Williams and Matthews 1995). A review of the Petrosky's (1992) travel time and SAR relationship also revealed flaws with the analysis. NMFS used data representative of the current fish passage environment and found a weaker relationship between smolt to adult ratio (SAR) and water travel time (Figure 2) (NMFS 2000b). For the first time NMFS articulated the previously unquestioned second hypothesis stating, "Correlation does not necessarily imply causation (Sokal and Rohlf 1981), and higher SARs associated with higher flows does not necessarily indicate the SARs can be increased by adding more flow to the river" (NMFS 2000b, 53). Skalski, *et al.* (1996) reevaluated the Hilborn *et al.* study (1993) and found that the relationship between SARs and flow

depended wholly on the choice of reference sites. Finally, Giorgi *et al.* (1997) found flow and travel time were not correlated for mid-Columbia fish. Thus, the flow travel time relationship Berggren and Filardo (1993) found for Snake River fish could not be universally applied.

Notwithstanding the plethora of information seriously challenging the data and the theory on which the 1995 Biological Opinion was based, NMFS sustained its policy by concluding “that although a direct flow survival relationship cannot be established by data, it does not preclude benefits of flow augmentation because increased flows may improve survival outside the hydrosystem as a result of earlier arrival to the estuary, improved estuary conditions and reduced delayed mortality (NMFS 2000b, 58).” For the 2000 Biological Opinion NMFS continued to call for flow targets: “These results support management actions to provide flows of at least 85 kcfs in the Snake River and 135 kcfs in the upper (mid-) Columbia River during spring and 200 kcfs in the lower Columbia River during the summer (NMFS 2000b, 57).” Furthermore, NMFS implemented the “no net withdrawal” policy to preclude additional withdrawals of water from Columbia and Snake River Basins.

Newer research shows no flow survival relationship

The newest studies firmly rejected the flow-survival hypothesis. For yearly averaged data, which tests for a relationship between years, both in-river and SAR measures of survival were either independent of flow or exhibited statistically weak increases with flow. However, when comparing weekly or daily averaged data within each year, which tests for a flow survival trend within a season, no relationships were evident whatsoever.

Research published after the 2000 Biological Opinion strengthens the conclusion that flow is not related to survival. NMFS’s scientists (Smith *et al.* 2002) wrote, “Correlations between river discharge and survival between Lower Granite Dam and McNary Dam and between travel time and survival were neither strong (within or between years) nor consistent from year to year.” However, the paper took particular care to offer alternative theories under which the agency’s policy might still make sense: “Thus, survival benefits to the stocks from increased flow in this stretch of the river were at best minimal; any measurable benefits occurred downstream from the Snake River.

(Smith et al 2002)". Going further, the publication speculated that flow augmentation during smolt migration might provide survival benefits in other portions of the salmonid life cycle and in free-flowing sections of the river both upstream and downstream from the hydrosystem. They suggested flow augmentation may improve the arrival timing of fish to the estuary citing a paper by Zabel and Williams (2002) that found the date of fish arrival to Lower Granite Dam in 1995 correlated with rate of return of adults. However, the example is not convincing. Zabel and Williams (2002) also found that arrival date only correlated with survival for in-river passing smolts in one year. For smolts transported through the river the opposite trend existed, the later arriving fish survived better and in 1996, no significant difference was found between release date and returning adults for either transport or in-river groups.

The question remains, then, does flow augmentation directed at fish migrating through the hydrosystem improve survival of fish in the tributaries above hydrosystem, in the estuary, or in the Columbia River plume below the hydrosystem? It is noteworthy that to the present time little research has been conducted to test the hypothesis that flow affects fish outside the hydrosystem (Giorgio *et al.* 2002). However, data does exist to address this issue. First, consider the evidence for a flow-survival relationship above the hydrosystem. Six years of NMFS studies (Muir *et al.* 2001) demonstrated that hatchery spring chinook survival from Snake River tributaries to Lower Granite Dam was significantly related to distance traveled, but not travel time. Since fish survival was not related to fish velocity, the data contradicts the flow/travel time survival hypothesis. Moreover, plotting over ten years spring chinook survival traveling the 116 km distance between Dworshak Fish Hatchery on the Clearwater River to Lower Granite Dam clarifies the picture (Figure 4). The flow survival relationship was flat over the very large flow range of 20 to 140 kcfs. Snake River fall chinook is the only stock exhibiting a correlation between flow and survival to Lower Granite Dam. However, the studies also demonstrated that survival was strongly correlated with release date, temperature, and turbidity (Anderson *et al.* 2000; Dreher *et al.* 2000; NMFS 2000b). These analyses all conclude that with the existing data, flow cannot be identified as the operative variable affecting survival. Furthermore, travel time is not correlated with flow or survival in these data, so if flow were the operative variable it does not act through the

previously assumed mechanism involving exposure time. If flow affects survival, it would most likely work indirectly through the effect of temperature on smolts and their predators and through the effect of turbidity on the water clarity of the habitat. However, flow augmentation from the Hells Canyon Reservoir complex warms the Snake River, which would presumably increase predator activity and therefore decrease smolt survival (Anderson 2000b). The NMFS (2000b) report also noted that the relationship of flow and survival was variable and less pronounced within the hydrosystem between Lower Granite and Lower Monumental dams.

The information available to address the impact of flow augmentation on salmon survival below the hydrosystem is more problematic. For this assessment, several studies have compared the SARs or the log of the ratio of the recruits to spawners ($\ln(R/S)$) with flow measures. However, if such correlations exist flow is not necessarily the causative factor. Changes in the hydrosystem over the years of observation and the natural variability in the ocean conditions that may correlate with the wet and dry years, and therefore, make it impossible to establish a clear cause and effect relationship between the natural year-to-year variations in flow and these indicators of survival (NMFS 2000b). Confining the analysis to years representative of the current hydrosystem, several studies show a relationship between SAR or $\ln(R/S)$ and a measure of flow during the migratory season. However, as noted a number of factors preclude associating the relationship with in river flows. NMFS (2000b) found over the years 1974-1994 a weak statistical relationship between water travel time and SAR for spring chinook but not for steelhead. Snake River fall chinook survival, expressed as the residuals of the spawner recruit curve, was uncorrelated with the flow during smolt migration (Anderson Hinrichsen and Van Holmes 2000), while for Marsh Creek spring chinook a relationship was found (Petrosky 1991). With selected data, yearly averaged relationships between flow and adult survival measures may or may not be found, but since about 90% of the Snake River smolts were transported, their exposure to the river environment was very limited. In contrast, Mid-Columbia stocks are not transported and they have flow-survival correlations. However, in the years of these studies the low flows correspond to warm ocean conditions, which produce poor salmon survival in the ocean (Mantua and Hare 1997, Anderson 2000). Therefore, survivals that correlate with high flows also correlate

with years of better ocean survival. NMFS sums up the SAR flow information up through 2000 as follows, "While it is not possible to establish a clear cause and effect relationship with these [SAR and $\ln(R/S)$] data, it is not possible to rule one out" (NMFS 2000b p 54).

However, the real question is not whether SAR is related to the natural year-to-year variations in flow, but whether SAR is related to flow augmentation. Germane to this question is the recent data on in-season flow and SAR, which was not available when NMFS prepared the white paper (NMFS 2000b). With nearly 700,000 run of the river PIT tagged salmon and steelhead smolts and 5000 adult returns it is now possible to explore whether an in-season flow SAR relationship exists for Snake River fish. Figure 5 shows the results for in-river passing wild spring chinook over the years 1995 to 2000. The data represent averages of groups of fish that passed Lower Granite Dam weekly. Regression lines of weekly averaged SAR vs. weekly averaged flow for each year reveal no flow survival pattern within a year or between years for Lower Granite Dam flows ranging between 50 and 200 kcfs.

Models and the flow augmentation hypothesis

Since the flow-survival studies conclusively demonstrate that the effect of flow augmentation on fish survival above, below, or within the hydrosystem is so small, if it exists at all, as to be unmeasurable, models must be used to assess the incremental and cumulative impact of flow augmentation. Since models are simplified, but quantitative, representations of our understanding, as the data improves, the models are updated and revised. The first models developed by NMFS twenty years ago reflected the extremely limited data available and predicted a strong flow-survival relationship. The models now used by NMFS and the Region, which are based on an additional decade of high quality data, contain no flow-survival relationship whatsoever. Analysis also indicate even moderate water withdrawals should have virtually no impact on fish survival.

It is important to realize that the flow augmentation volumes released from upstream reservoirs are extremely small compared to the natural variations in flow, and the irrigation withdrawals at issue in this action are smaller still. Consequentially, since the relationship of survival and flow is inconclusive over the scale of year-to-year variations

and flow and survival are uncorrelated over the seasonal scale, it is virtually impossible to measure the impacts of flow augmentation on fish survival. Therefore, with present technology the second assumption that varying flow through augmentation produces the same effect as natural variations in flow is untestable. Thus, to extrapolate information derived from natural variations to flow augmentation we must use models. NMFS developed the first model of flow augmentation, which was no more than a fit of a two-parameter equation through seven data points (Figure 2) (Sims and Ossiander 1982). The equation is empirical, it has no basis in fish ecology, but fish managers readily accepted it as a valid description of the impacts of flow on smolt survival through the hydrosystem.

In the 1990s, two juvenile passage models, FLUSH and CRiSP, were developed or revised for use in the PATH process, a regional workgroup charged with evaluating the impacts of dam removal on the recovery of Snake River salmon (Marmorek 1998). The FLUSH model assumed that the fish mortality rate, the percent of the remaining population that dies each day, increases the longer fish are in the hydrosystem. The CRiSP model assumed mortality rate is constant over the migration. The FLUSH model, like the early Sims and Ossiander empirical model, produces a strong flow-survival relationship while the CRiSP model has a relatively weak flow-survival relationship. Because at the time of PATH there were no measurements of fish through the entire extent of hydrosystem, scientists calibrated the two models with the available data, which extended halfway through the hydrosystem. Due to the nature of the models, they produced essentially the same survivals to the midway point, but because the mortality rate in the FLUSH model strongly increases with fish travel time the predicted survival through the entire hydrosystem was less than half the CRiSP model prediction (~ 20% survival for FLUSH and ~40% survival for CRiSP). A panel charged with reviewing the two models believed that smolt mortality should increase strongly with travel time through the hydrosystem and weighted the FLUSH model over the CRiSP model.

After the PATH review, survival estimates over the entire hydrosystem were finally available to test the two models. NMFS estimated juvenile spring chinook survival from the tailrace of Lower Granite Dam to the tailrace of Bonneville Dam was 48% for the 1997 migration. The two model teams then provided their prediction. CRiSP model

developers estimated survival was 59% and the FLUSH model developers estimate survival was 24%. In the next two years, NMFS provided additional hydrosystem survivals, which the CRiSP model team compared to their model predictions. For the 1998 smolt passage, the NMFS estimate was 63% and the CRiSP prediction was 49%. For 1999, the NMFS estimate was 56% and the CRiSP prediction was 54% (CBR 2000). The FLUSH modelers did not provide model either year, but by reverse engineering the FLUSH model (the actual model was never released to the scientific community), the estimated survivals for the two years would be below 15%. The results are clear, the FLUSH model and PATH scientific review panel's weightings are not supported by the survival studies.

NMFS was well aware of the failure of the FLUSH model and the difficulties of the PATH process so they develop an alternative model, SIMPAS, which is based on PIT tag survival studies between 1992 and 1999 (NMFS 2000c). Most significant, the SIMPAS model describes survival through the hydrosystem on a per kilometer basis. That is, the new NMFS model contains no flow survival relationship whatsoever. Furthermore, NMFS used SIMPAS in developing the 2000 Biological Opinion.

Thus, over two decades of modeling the impacts of the hydrosystem on juvenile salmon migration NMFS has progressed from a model with a very strong flow-survival relationship to a model with no flow-survival relationship. This surprising result may seem at first counterintuitive. NMFS in 1980, and the PATH review panel in 1997, both believed that fish mortality through the hydrosystem depends on how long it takes smolts to migrate through the system. In addition, both groups of researchers believed that the rate of mortality strongly increased over time so that the majority of the fish must die at the bottom of the hydrosystem. How then can survival be independent of the migration time? Anderson and Zabel (in review) developed a mathematically rigorous and intuitive explanation. Simply put, they showed that smolt survival is independent of travel time if the predators are essentially stationary. In this case, the smolts must pass a gauntlet of predators and the total mortality does not depend on how fast the smolts migrate but on how many predators they encounter while passing through the hydrosystem gauntlet. (It should be noted that predator densities are in fact higher below the dams than within the hydrosystem; migrating salmon experience a gauntlet nearly everywhere they go.)

Against the gauntlet description, flow proponents have suggested that fish mortality increases with passage time as a result of cumulative stress experienced by the migrating fish (Budy et al. 2002). Although questions on the significance of stress are yet to be resolved we can summarily disregard the contribution of flow augmentation and water withdrawals to the fish stress levels because these actions only change the total travel time of the fish by minutes over a total migration of weeks.

Over the last few years, the CRiSP model has been used to estimate the impacts of flow augmentation and water withdrawals on smolt survival and in each case, the impacts are insignificant (Anderson 1999). For example, a 147 cfs withdrawal from the mid-Columbia was estimated to reduce adult returns by less than 9 fish out of a population of a half million and the travel time would be increased by minutes.

The new data and model trim even these estimates. From our recent studies, smolt mortality depends more on distance traveled than travel time, and the predicted impacts of flow augmentation in the updated model will be about 75% less than the impacts predicted in the previous model. Thus, where the CRiSP 1.6 model predicted a 9 fish loss the updated model, CRiSP 1.7, will predict about a two fish loss. However, even this miniscule modeled loss is higher than what is expected to happen in the real world. In previous evaluations of the impact of flow augmentation, we assumed that water withdrawn for municipal or agricultural uses is lost to the system. In fact, the majority of water pumped from the mainstem of the Columbia River system returns to the system, either as treated water or as ground water recharge. Thus, the impact need to be lowered in proportion to water actually lost relative to the amount withdrawn. In the above example, the predicted impact of a 147 cfs withdrawal is expected to be less than one adult salmon. Alternatively, using the new NMFS SIMPAS model the impact is zero fish lost.

Is the addition or loss of one or even a hundred adult salmon out of a population of a half million significant to the salmon populations? On an intuitive level, the answer is clearly no. Using models, NMFS recently concluded that recovery of Snake River salmon was not dependent on further improvements in hydrosystem survival (Kareiva *et al.* 2000). Moreover, NMFS has also concluded that even large reductions in adult returns are not

significant to recovery, as evidenced by the fact NMFS allows the in-river harvest of thousands of salmon in the mainstem of the Columbia River that would otherwise reach their final destination in a few weeks.

The disconnect between policy and science

While the cumulative body of scientific information all points to flow not affecting survival in any meaningful context, the policy of reducing water withdrawals and augmenting river flow has continued to expand. Furthermore, fish and water managers have consistently acted to discredit or ignore the information against their policies

The hypothesis that higher flow will improve fish survival was first proposed in 1981 which led to the establishment of the Water Budget in 1983. Over the next two decades, only five additional studies and reports provided any indirect support for the hypothesis while more than twenty studies have directly refuted the hypothesis (Table 1). The evidence is now overwhelming to reject the hypothesis and the contention that flow augmentation and water withdrawals in the mainstem of the river system have any impact on salmon. However, over this same period the fish and water managers have increased the flow augmentation and implemented stringent regulations stopping water withdrawals (Table 1). Furthermore, as the research has serially addressed and rejected the hypothesis on which the water policy was based the managers have reformulated the hypothesis into more nebulous forms.

In 1983, the justification for the water budget was to speed fish down the river to increase survival. When this was shown to be false, the justification was switched to an impact on adult returns (SARs). When it became clear that the benefits of water policy could not be demonstrated in terms of adults returns the managers shifted justification saying that the research could not rule out benefits (“While it is not possible to establish a clear cause and effect relationship with these [SAR and ln(R/S)] data, it is not possible to rule one out” (NMFS 2000b p 54)). When models demonstrated that the benefits of water policy were insignificant managers rejected the model (in the case of CRiSP) [Barwin transcript] or simply ignored the model (in the case of SIMPAS). When models predicted miniscule impacts managers challenged the conclusions applying a *reduction ad absurdum* proof, noting that a miniscule impact is significant if the entire river is withdrawn. In the face of

the accumulating evidence *against* the benefits of flow, managers continue to rely on non-deductive logic, statements of belief, and qualitative extrapolations: “Additional water withdrawals have the probable affect of exacerbating the situation thus delayed or prevent recovery of listed fish” [Barwin transcript]. Consistently, as new information emerges refuting the flow-survival hypothesis, the fish managers mount attacks on the data and its analysis in hopeless attempts to defend what has become the unsupportable foundation of their policies.

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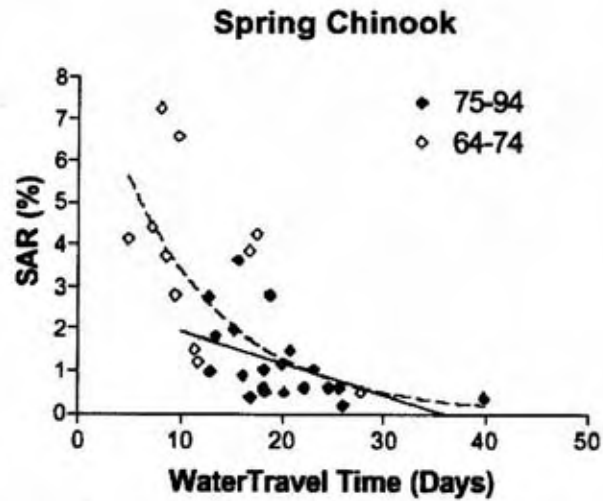


Figure 1. Regressions of smolt-to-adult returns versus water travel time for Snake River spring/summer chinook salmon for the 1964-1994 smolt migration (after Petrosky and Schaller 1998). The dashed line represents the regression line for the entire period; the solid line is for the years 1975-1994. From NMFS (2000b).

Table 1. History of Flow-Survival Relationship Key Studies and Program/Plans

Year	Evidence for flow-survival hypothesis and policy	Evidence against flow survival hypothesis and policy
1981	Sims and Oslander 1981 (73-79 Spring Chinook Studies)	
1983	NPPC 1983 Fish & Wildlife Program* (Policy)	
1990	CBFWA 1990 Integrated System Plan	
1992	Petrosky 1992 (Adult Returns Rates Correlated with water Travel Time in Snake River)	Marsh and Achord 1992 (First PIT-tag Study Shows High Survival with Low Flow)
1993	Hilborn et al. 1993 ; (Fall Chinook Flow-Travel Time Relationship) Berggren and Filardo 1993 Snake River spring chinook travel time decreases with flow	
1994	Cada et al. 1994 (Review from Several Systems Conclude Flow and Other Factors Affect Survival)	Giorgi et al. 1994 (No Flow-Travel Time Relationship in mid-Columbia) Olsen and Richards 1994 (Ocean Conditions affect West Coast Chinook)
1995	NMFS 1995 BiOp* (Proposed Flow Targets) (Policy)	Williams and Matthews 1995 (1970s, Low survival from Trash at Dams) Skatski et al. 1996 (Fall Chinook Survival Depends on Comparison Stock)
1997		Smith et al. 1997a (1993-1997 Data Shows No Within-Year Flow Survival Relationship for Spring Chinook) Giorgi et al. 1997 ; Smith et al. 1997b (No Within-Year Flow Survival Relationship in Fall Chinook) Mantua et al. 1997 (Ocean Regime Shifts Alter Salmon Production is an Alternative Reason for Stock Decline)
1998	Marmorek et al. 1988 (FLUSH Passage Model Predicts Strong Flow Survival Relationship)	Marmorek et al. 1988 (CRISP Passage Model Predicts Weak Flow Survival Relationship) Olsen et al. 1998 (Comprehensive Review of the Flow Program Questioning Policy, Hydrology, Biology, and Economics)
1999		NMFS obtains first estimate of smolt survival through the entire hydrosystem and requests FLUSH and CRISP project survivals for model tests. FLUSH error is 3 times greater than CRISP error.
2000	NMFS 2000a BiOp* (Continues with Flow Targets and Flow Augmentation Proposed in 1995 BiOP plus established a no net withdrawal policy) (Policy)	NMFS 2000b (No Flow Survival Relationship for Snake River Spring Migrants for 1995-1999) NMFS 2000a (NMFS Adapts SIMPAS Model in which Smolt Survival Depends on Distance, Not Travel Time) Anderson et al. 2000; NMFS 2000b (Snake River Fall Chinook Survival to LGR Dam Not Related to Travel Time, Survival has Highest Correlation with Release Date and Water Quality Parameters, which covary)
2001		Muir et al. 2001 (Hatchery Chinook Survival Varied Inversely with Distance to LGR Dam. Hydrosystem Survivals in 1990S Equal Survivals in the 1960s and Little Mortality Occurs in Reservoirs) Williams et al. 2001 (Survival Increases from 1970s to 1990s not Accompanied by Change in Flow)

2002	Fisheries Agencies challenge the Giorgi 2002 report	Giorgi et al. 2002 (Review of Data determined that little evidence for supporting flow survival relationship across water years 1993-2002 for yearling chinook and steelhead) Smith et al. 2002 (Between Lower Granite and McNary Dam flow survival relationship with the in season or between years) Anderson and Zabel <i>In review</i> (Smolts pass a gauntlet of predators making survival dependent on distance not travel time)
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* Fish migration and recovery programs.

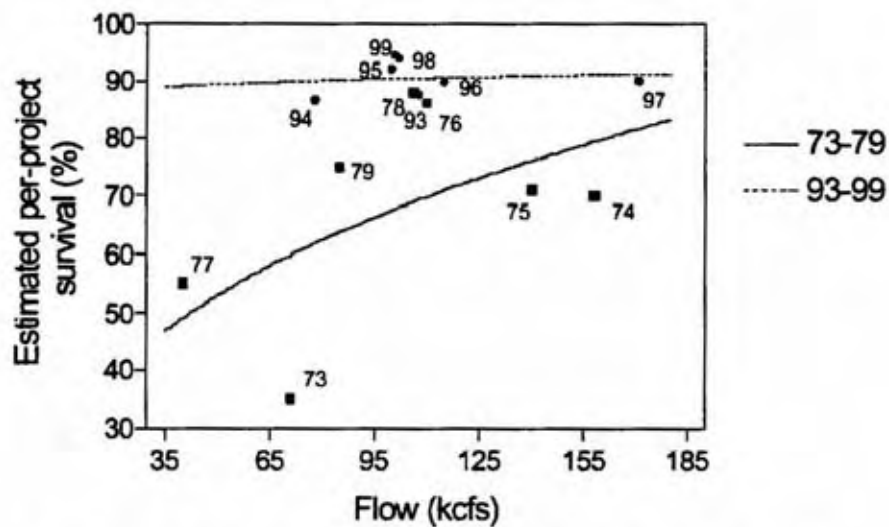


Figure 2. Historical and recent estimates of per-project survival (%) for yearling chinook salmon vs. index of Snake River flow (kcfs). Curves depict fitted nonlinear regression equations describing relationship between flow and survival in the two time-periods. Early period data from Raymond (1979) and Sims and Ossiander (1981). Graph from NMFS (2000b).

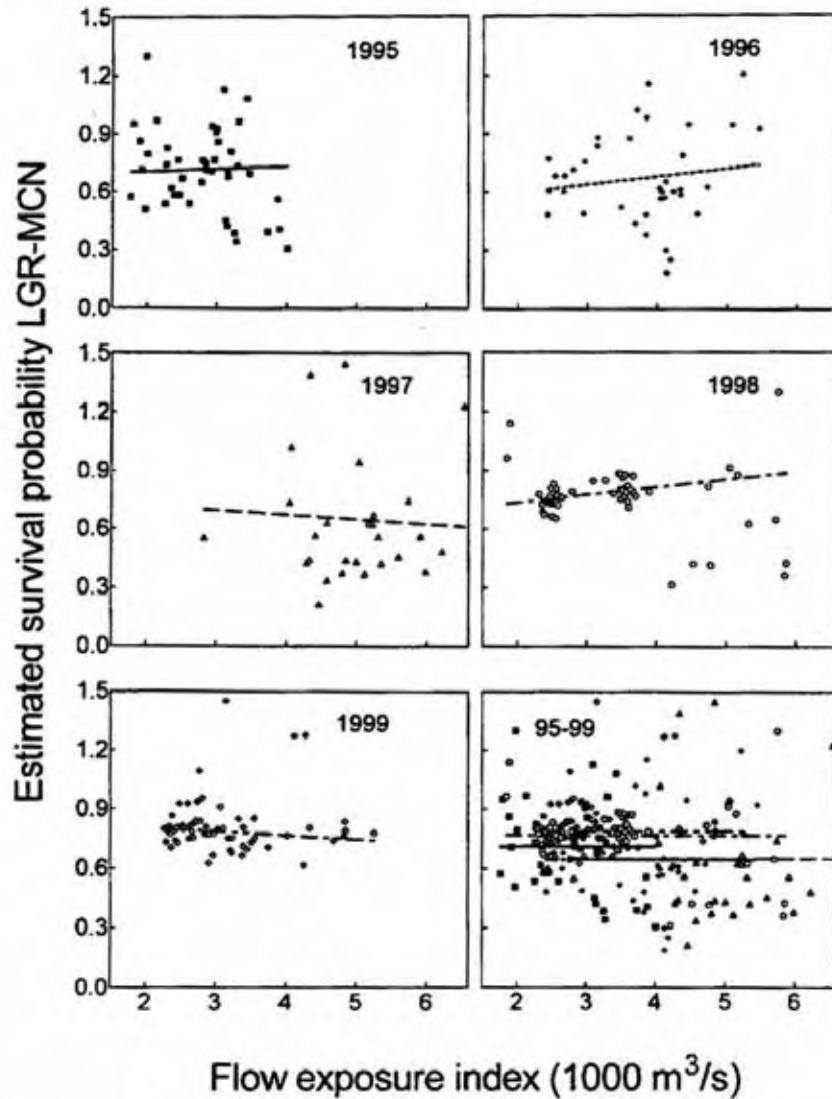


Figure 3. Relation between estimated survival from Lower Granite (LGR) Dam to McNary (MCN) Dam (d) and flow exposure index measured at Lower Monumental Dam for yearling chinook salmon, 1995–1999. Lines in the lower right panel depict the linear regression model identified in the model selection sequence. Regression lines are from weighted analysis (Figure from Smith et al 2002)

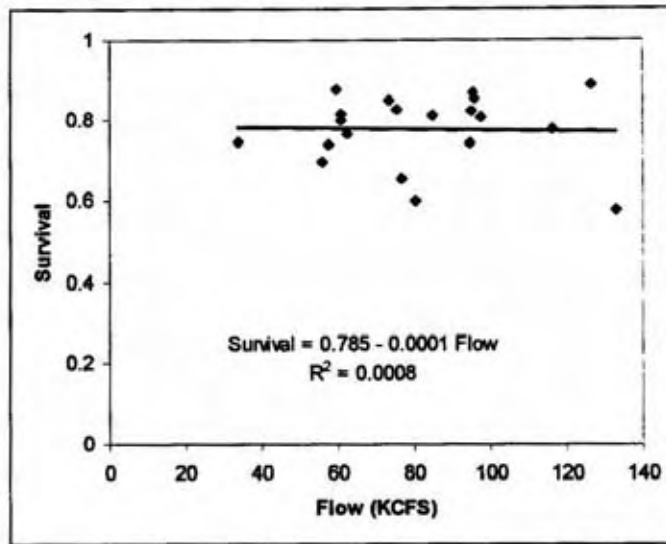


Figure 4. Relationship of flow to spring chinook smolt survival from Dworshak Hatchery to Lower Granite Dam for 10 years of PIT tag data from 1990-2001.

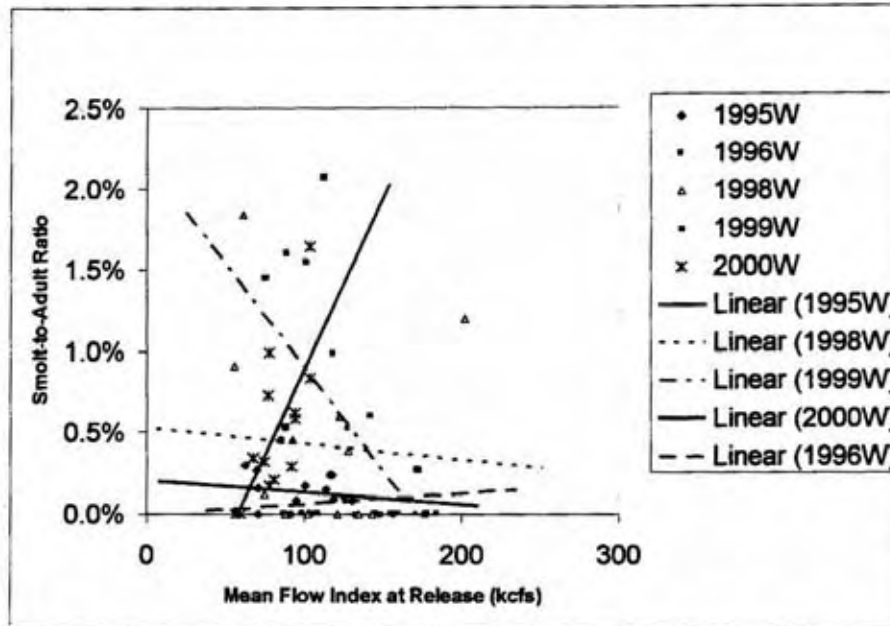


Figure 5. SAR vs. LGR flow index for PIT tagged spring chinook salmon tagged at Lower Granite Dam for between 1995 and 2000.

COMMENT SL 04



Ferry County Natural Resource Board

350 East Deleware

P.O. Box 115

Republic, WA 99166

April 9, 2003

Bureau of Reclamation
P.O. Box 815
Ephrata, WA 98823

RE: Flow Augmentation of Banks Lake

Whereas: A Memorandum of Understanding exists between Environmental Protection Agency, DOC (NOAA) National Marine Fisheries Service, USDI Fish & Wildlife Service, USDA Forest Service and USDI Bureau of Land Management, to cooperatively implement "*The Interior Columbia Basin Strategy*" and;

Whereas: This *Strategy* complements other efforts that address natural resource issues within the Columbian Basin, e.g., Federal Caucus All-H Paper, Northwest Power Planning Council, PACFISH/INFISH Biological Opinions, State Recovery Plans and;

Whereas: The planning principles and guidance contained in "*The Interior Columbia Basin Strategy*" are based on *Integrated Scientific Assessment for Ecosystem Management (PNW-GTR-382, 9/1996)*, of the *Klamath and Great Basins (Volumes 1 through IV, 1997)*, and all reports generated by the Interior Columbia Basin Ecosystem Management Project; are hereinafter referred to as the **ICBEMP Science** which includes Basin Wide Salmon Recovery and flow augmentation of 29 federal dam reservoirs, and;

Whereas: Actions implementing the ICBEMP Science of Flow Augmentation affects Five States with a landmass of 144 million acres of private and public lands and is proposed to extend to the year 2012 and;

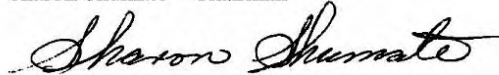
Whereas: National Marine Fisheries Service "Biological Opinion" for Basinwide Salmon Recovery Strategy of the Multi-Species Framework Project of 1999 – US Bureau of Reclamation states: Annual Estimated Costs; Agricultural Losses - \$100-\$200 Million **annually**, Recreation Losses - \$5-\$15 Million **annually**, Employment Loss – 2,000-4,000 jobs **annually**, Navigation Losses - \$25-75 Million **annually**, Lost Electricity Generation - \$0.5 **Billion** to \$1 **Billion annually**,

01

Therefore: For the economic stability of the Pacific Northwest and the NATION, based upon the preceding facts presented, we urge you to **refuse** the *recommendation* of the North West Power Planning Council to release 130,000 acre feet of water from Banks Lake into the Columbia River late this summer as this action will contribute to agricultural, recreation and employment losses for the entire Columbia River Basin

01

Sharon Shumate – Chairman



Ferry County Natural Resource Board

cc: State Senator Bob Morton
State Representative Bob sump
State Representative Cathy McMorris

U.S. Congressman George Nethercutt
U.S. Congressman Richard "Doc" Hastings
U.S. Senator Patty Murray
U.S. Senator Maria Cantwell

NATIONAL MARINE FISHERIES SERVICE**"Biological Opinion"****BASINWIDE SALMON RECOVERY STRATEGY**

Area Affected – 144 Million Acres

**Five States, Eight Groups of Counties,
Tribal Reservations**

**"ANNUAL" ESTIMATED COSTS
BUREAU OF RECLAMATION 1999**

Draw Down 29 Federal Dam Reservoirs on Columbia River and All Tributaries – Flow Augmentation

- AGRICULTURAL PRODUCTION LOSSES - \$100 Million - \$200 Million
- LOSS TO RECREATION - \$5 Million - \$15 Million
- EMPLOYMENT LOSS – 2,000 TO 4,000 JOBS
- NAVIGATION LOSSES - \$25 MILLION TO \$75 MILLION
- LOST ELECTRICITY GENERATION - \$0.5 Billion to \$1 Billion

Document Quoted – US Bureau of Reclamation – Multi-Species Framework Project – 1999

COMMENT SL 05

From: Patricia Shults <pshults@co.franklin.wa.us>
To: 'Bureau of Reclamation' <jblanchard@pn.usbr.gov>
Date: Fri, Apr 11, 2003 12:45PM
Subject: BANKS LAKE DRAWDOWN

The Franklin County Commissioners strongly concur with the Grant County Commissioners position. Please read the following letter.

Signed:

Sue Miller, Chairman
Neva J. Corkrum, Chairman Pro-Tem
Frank H. Brock, Member

Wildlife

The drawdown occurs at peak fishing/tourism season and would devastate the local communities along the lake, on the major Highway Routes of Highways 2, 17, and 155. Without the ability to generate revenue and taxes, these communities lose their tax base and the ability to survive. The Action Alternative will create a large shoreline of mud and stagnant water pools, the breeding grounds for mosquitoes. Nowhere in the EIS does it address the issue of mosquitoes, the mosquito born disease West Nile Virus. This virus has reached Washington and documented cases of infected horses and crows have occurred. Experts expect to document human cases and other bird cases in 2003. The EIS makes no attempt to document any impacts, or casual effects of this mosquito borne virus on humans, animals, or birds. No strategy of the use of pesticides, or the impacts is given. Alternative supplies of water to enhance flow augmentation are available from dam and reservoir release in Canada. Needlessly threatening the health of humans, animals, and birds makes no sense.

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Banks Lake is a known habitat for the endangered specie, the Bald Eagle. Northrup Canyon, near the north end of Banks Lake supports a small but surviving population of our country's national bird, the Bald Eagle. Impacts to the Bald Eagle as a listed endangered species and potential negative ramifications must be researched. Prior to the arbitrary choice of any one of the Action Alternatives, it would be prudent to determine the impact any Action Alternative may have on currently listed, dependant species. This may include the recently listed pygmy rabbit populations in neighboring Douglas County. Will decreasing the level of Banks Lake effect down gradient, dependant watering sources during the hottest driest time of the year? Hydraulic continuity of underground aquifers is not addressed in any of the Action Alternatives. There are a number of similar questions left unanswered or omitted in this draft EIS. The Action Alternative could have a negative impact to not only animals but also the Bald Eagle.

03

Social Environment

While recreation opportunities will decline at Banks Lake during the period of drawdown, especially the Coulee Community, other opportunities for water-based recreation are nearby. The problem with the nearby opportunities is they are already heavily used. It is a fallacy to believe there is other nearby recreational opportunities that Bank Lake has to offer. Overall impact to the Northern Region of Grant County economy will be great. This area depends on tourism/recreation. While lost income for the businesses will negatively affect their financial viability; the degree of impact will depend in part upon their ability to adapt their facilities to the lower lake levels in August. It will be extremely difficult to adapt their facilities with a drop in income. Grand County, the City of Coulee City and the Port of Coulee have invested a large amount of money in infrastructure in the park, camping area, boat facilities and the swimming area. This was to attract tourism/recreation and create jobs for the Coulee Community. The Action Alternative will adversely affect this investment. It will also adversely affect the low-income in the Coulee Community as explained in the environmental justice section and economic section. The social value of those who desire increased water for endangered salmon will have a minimal effect. The additional drawdown in the Action Alternative will only supply an additional one to two percent flows at McNary Dam. The Snake River fall Chinook juvenile migration tends to peak in mid-July with numbers tapering off into mid-August. Nearly half of the Snake River fall Chinook can be transported from the Snake River collector dams and will not benefit from flow augmentation from the Columbia River. In addition, there is uncertainty surrounding flow augmentation benefits for fish survival. Therefore, the social value of the Action Alternative will be nil.

The Action Alternative will negatively impact the recreational opportunities and economy of the Northern Region of Grant County. The local governments have made large investments in infrastructure to increase tourism thereby creating jobs. Again the Action Alternative will negatively impact this. The drawdown in August and part of September to increase flows of one to two percent to help salmon when their peak migration is mid-July has no social value, especially when you can barge them and there is uncertainty surrounding flow augmentation as a benefit.

Grant County government, which is responsible for our public's health, safety and general welfare, is very, very concerned over the potential negative impacts the Action Alternatives hold for our citizens!

We are also doing our best to understand the process we and our citizens are being forced to endure.

First, a biological opinion was produced which included a theory or hypothesis that increasing the river flow would support more fish.

Second, action plans are developed to support the theory presented in the biological opinion.

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Third, the public, dependent on the river’s water, is put through numerous processes to defend their uses of this water.

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Fourth, studies designed to support and reinforce the biological opinion theory have repeatedly missed the mark and are non-conclusive and are generally questioned by the scientific community.

Common sense must prevail in this process.

1. Put this draft EIS on hold;
2. Prove or disprove the biological opinion theory;
3. Then study the impacts of all Action Alternatives; and
4. Address and mitigate all impacts raised during the EIS process, including our populations, customs and culture.

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In conclusion, in 1998 the legislature passed, and Governor Lock signed, ESHB 2496, an act relating to salmon recovery. In passing the Salmon Recovery Act, the legislature declared that the state should “retain primary responsibility for managing the natural resources of the state, rather than to abdicate those responsibilities to the federal government.” This law set up a voluntary and locally-based salmon habitat restoration process, led by lead entities consisting of counties, cities, and tribal governments. The function of the entities is to develop a list of projects that help restore and protect habitat for fish within a Water Resource Inventory Area. The Act also created our state’s Independent Science Panel to “help ensure that sound science is used in salmon recovery efforts.”

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Independent scientific review provides decision makers with technical feedback and perspectives that do not reflect a particular vested interest or point of view. The Independent Science Panel was established under the Salmon Recovery Act of 1998; its purpose is to provide scientific review and oversight of the state’s salmon recovery efforts and to review the adequacy of the salmon recovery plans developed by the state. Other independent science bodies have been established and are operating in the Columbia River Basin; they were established under the Northwest Power Planning Act to advise the Power Council and its fish and wildlife program, and to review projects proposed for funding. The Governor’s Salmon Recovery Office will review the role of the Independent Science Panel to ensure their work is aligned with the most pressing needs facing the state and report to the Governor by April 15, 2003. It seems premature to implement the Action Alternative prior to the Independent Science Panel report to the Governor. The Action Alternative will negatively impact the Coulee community customs and culture. Grant County is demanding that those customs and culture be preserved under NEPA.

The Action Alternative is contrary to elements of our Comprehensive Plan. It is in conflict with our policies and goals of our Policy Plan. It is in conflict with our policies and goals of the Economic Development element. It is also in conflict with our policies and goals of our natural settings. The Action Alternative will negatively impact the visual quality, environmental justice, social environment, wildlife and the local economy of the Coulee Community. The negative impact of the Action Alternative far out weighs the minimal, uncertain benefits to salmon.

CC: "ofields@grantcounty-wa.com" <ofields@grantcounty-wa.com>

COMMENT SL 06

Commissioners:
MICHAEL DONEEN
T. JAMES DAVIS
LYNN M. HEMINGER

Chief Executive Officer/Manager:
WILLIAM C. DOBBINS



Public Utility District No. 1 of Douglas County

1151 Valley Mall Parkway East Wenatchee, Washington 98802-4497 509/884-7191 FAX 509/884-0553

April 1, 2003

Mr. Jim Blanchard
Special Projects Officer
Bureau of Reclamation
P.O. Box 815
Ephrata, WA 98823-0815

Dear Mr. Blanchard:

Public Utility District No. 1 of Douglas County provides electric service to the residents and businesses of Douglas County Washington. A number of our customers in eastern Douglas County rely on the services available at Coulee City. The economy in this area is based on dry land wheat and cattle operations. The agricultural economy has been depressed for several years with no relief in sight. While these farmers do not rely on the Columbia Basin Project for irrigation purposes, recreational traffic related to Banks Lake has helped to make support service businesses in Coulee City economically viable. The summer months are the most active tourist season. The proposed 10-foot drawdown during these months will jeopardize the employment and availability of services for many of our rural customers.

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Douglas PUD respectfully requests that the drawdown proposal be modified to assure continued viable operation of all recreational facilities on Banks Lake. Thank you for consideration of our concerns.

02

Sincerely,

William C. Dobbins
CEO/Manager

Ped 17691

COMMENT SL 07



GRANT COUNTY
OFFICE OF
BOARD OF COUNTY COMMISSIONERS
POST OFFICE BOX 37
EPHRATA, WASHINGTON 98823
(509) 754-2011

April 10, 2003

Jim Blanchard
Special Projects Officer
Bureau of Reclamation
32 C Street
P O Box 815
Ephrata WA 98823-0815

Hand Delivered

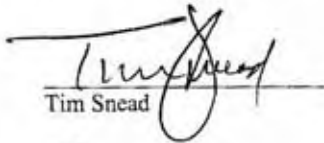
RE: *Grant County's Comments on Banks Lake Drawdown*

Dear Mr. Blanchard:

Enclosed you will find Grant County's Comments on the Bank Lake Drawdown for your consideration. Please feel free to contact me if you have any questions.

Sincerely,

BOARD OF COUNTY COMMISSIONERS


Tim Snead

for

Enclosure

TIM SNEAD
DISTRICT 1

DEBORAH MOORE
DISTRICT 3

LEROY ALLISON
DISTRICT 2

"PROVIDING THE PUBLIC SAFE, RELIABLE, RESOURCE EFFECTIVE LOCAL GOVERNMENT SERVICES WITH INTEGRITY."

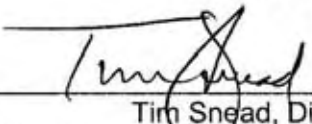
Grant County's

Comments on

Banks Lake Drawdown



Prepared by:



Tim Snead, District 1
Member, Board of County Commissioners

4/9/2003

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Attachments:

1. May 31, 2001, letter to Jim Blanchard, Bureau of Reclamation, regarding *Request to participate in NEPA Process as a Cooperating Agency*
2. Grant County Board of Commissioners Resolution/Ordinance No. 01-172-CC

Customs and Culture

Grant County customs and culture, as defined in our Comprehensive Plan:

The land and water are the lifeblood of Grant County. Our culture, customs, history, future, way of life and economy are dependent upon the land, the natural resources and an effective partnership empowering local stewardship of the land and its resources.

Much of what is best about our county is rooted in rural community life and the never-ending quest for fulfillment of the “American Dream.” The history and culture of Grant County exhibits traditional conservative values and attitudes, emphasizing courage, independence and individual freedom, initiative, hard work, stamina, perseverance, endurance, resourcefulness, patriotism and spirituality. The culture of Grant County and Central Washington reflect the original pioneer spirit of the early settlers, which continue to present day. The wilderness and desert were claimed by people as rugged as the land itself. Our heritage, our customs and culture is the legacy of their struggles, disappointments and triumphs.

The People of Grant County believe in:

1. Traditional American values;
2. Family;
3. Government serving the people;
4. Strong rural communities;
5. service to the community;
6. Preservation of our way of life;
7. Democracy and individual freedom.

We value:

1. Human dignity;
2. Our quality of life;
3. Our history, customs and traditions;
4. Equity, honesty and integrity;
5. Education;
6. spirituality;
7. The land, environment, and natural resources;
8. Law, justice and order.

We encourage:

1. Respect for human dignity and equal opportunity;
2. Balanced growth and development in harmony with the environment;
3. Balance between too little and too much government;
4. Preservation and the protection of the environment;
5. Protection of private property rights;
6. Economic development and prosperous communities, cities and towns;
7. Best use of the land.

Coulee City, the oldest town in Grant County, is situated at the middle crossing of the Grand Coulee, the only place within 60 miles where the Coulee can be crossed easily. An artesian spring lured the first Indian people. Later the settlement became a trading center for cattlemen, a construction camp for two competing railroads and then a stop-over for settlers making their way west. The winter of 1889-90 marked the transition

from cattle raising to grain, fruit and a more diversified agriculture base. Upon completion of the Grand Coulee Dam, Banks Lake Reservoir was filled in the 1950's.

The head gates at Coulee City supply irrigation water to the Columbia Basin Reclamation Project.

The Coulee City community has changed over the years from a cross-roads settlement, to cattle raising ranches to wheat products, to a community that has come to rely on Banks Lake. It is still a farming community, but tourism and recreation is just as important to this community. A survey was sent out to the people that live in the community and 110 people responded.

1. How many times each week do you and your family use Banks Lake during the months of August and September: *People use it an average of 27.5 times.*
2. How many times each week do you and your family use the swimming area at the Coulee City Park during the months of August and September? *People use it an average of 17.7 times.*
3. How many times a week do you launch your boat at the Coulee City Park during the months of August and September: *People launch an average of 16 times.*
4. How many times a week do you and your family use the Coulee City Park for water skiing or other related water sports: *The people use it an average of 13 times.*
5. How many times a week do you and your family go fishing in Bank Lake during the months of August and September: *The people fish an average of 20.4 times.*

Here are a few things that people in the community had to say about Banks Lake:

- It is very important to me and my family for gatherings of old friends and reunions of old classmates.
- Extremely important. We use the lake often, our visitors use the lake and we are having a large family reunion this summer at the City Park.
- Our family uses the lake for recreation just about every day with friends and grandchildren, fishing, swimming, family get-togethers and boating.
- Very important. There isn't much to do around Coulee that the whole family can do together like swimming, boating and fishing. Without use of the lake there would be no way to get in family time.
- The customs have changed since Banks Lake was created. It now is directed towards recreation. Drawing Banks Lake down ten feet would drastically change our customs during the two months.
- The Coulee City Park is where I taught my kids to swim and fish.

- It is very relaxing to go out to the shores of Banks Lake and just have a good time with friends, family, and also to meet new people. Personally, I would rather relax on the shore where the water hits my feet, rather than wading in mud.
- Banks Lake is our place, the “get away” each week during these months. It is our family time on the boat.
- Very. Our small community relies on the lake to bring extra revenue to our community.
- Business in our city depends greatly on the summer tourism with many jobs depending on this. This proposal would only exacerbate an already serious problem for jobs.
- Tourism keeps this town alive in the summer. Without water recreation and fishing on Bank Lake during the warmest summer months, there would be no reason for the tourists to visit our town.
- If they pull the lake down, I will lose about one third of my business at the motel.
- It is a snowball effect: if we lose the business and services in this area, people will leave and not move here. If the population declines, the school enrollment goes down. If enrollment declines, education suffers. It is never ending. If the lake is made unusable (and the drawdown will render it unusable) the economy, education, and way of life will have to change for the worst. If that is the goal of the drawdown, so be it. That is the only effect it will have (not good). Raising the Columbia River water by 1/32 of an inch really does not seem like the right solution for anything.
- This will create an odor problem as well as add to a mosquito population.
- It is a beautiful view from our house. When the lake is lowered, it will become a breeding ground for mosquitoes, which could harbor West Nile virus.
- The environmental impact of a drawdown would be huge. I remember the last drawdown – fish dying in muddy ponds along Highway 155, freshwater clams laying dead on exposed mud flats, muddy water halfway across the lake, and huge dust storms as mud flats dried. It seems crazy to create this kind of a problem for such a minimal potential effect on another.

The Action Alternative will not preserve the Coulee Community customs and culture. First, people in the community use the lake as an important part of their family activities. Making the lake unusable during the warmest and busiest summer days for over a month is contrary to what the people in the county believe in, family. This will negatively impact the custom and culture of families in the community.

Second, the people in Grant County believe in government serving the people as part of their culture. The Action Alternative is contrary to this belief. This will not serve anybody in the community of Coulee City or Grant County and I don't think it will do

01

anything for salmon. Just because National Marine Fisheries Service has negatively impacted many communities and because of that they want to negatively impact everyone to spread out the grief in a travesty. This is not government serving the people.

Third, the people of Grant County believe in a strong rural community as part of their culture. The Action Alternative again is contrary to this belief.

Drawing the lake down during the busiest time of the year will have a negative economic impact on this community both long and short term. People that visit will leave and not come back because of the uncertainty. This will cause business to lay off people, other people will leave because of the odor from the mud bogs and, the threat of the West Nile virus. The drawdown will weaken the community.

02

Fourth, the people of Grant County believe in the preservation of our way of life as part of their culture. The Action Alternative is contrary to their belief. Because the community will lose the use of the lake when it is the most heavily used by the community thereby affecting their way of life.

The people in Grant County value our quality of life as a custom. The Action Alternative will have a negative impact on the quality of life. We also value education as a custom. As stated earlier, as business drops, due to a loss of tourism and recreation, people will leave. School enrollment will drop and the education of the youth in the Coulee Community will decline. We encourage economic development and prosperous communities, cities and towns as our custom and culture. Again, the Action Alternative is contrary to what we encourage as our custom and culture.

03

The National Environmental Policy Act (NEPA) not only requires the federal government to consider the impact of its actions on the environment, but also to preserve culture, heritage and custom.

NEPA states:

It is the continuing responsibility of the Federal Government to use all practicable means, consistent with other essential considerations of national policy to:

Preserve important historic, cultural and natural aspects of our national heritage¹.

It is up to the local government to determine the custom and culture of the community.

Grant County has positively identified its custom and culture of the Coulee Community and Grant County. The County is informing the federal agencies of those customs and request/demand that those customs be preserved under NEPA.

Local Economy

Grant County is split up in three (3) economic regions. In all three regions, agriculture is important to the economy.

In the southern region, the towns of Royal City, Warden and Mattawa economy relies heavily on agriculture. The central region, Moses Lake, Ephrata and Quincy are more diversified. They rely on industrial, agriculture and tourists/recreation for their economic base. The northern region, the cities of Soap Lake, Coulee City, Electric City and Grand Coulee, economic base rely heavily on tourists/recreation and less on agriculture.

¹ 16 U.S.C. §4331 (a)(4)

03

04

The drawdown of Banks Lake to the 1,560 foot level will have a major negative economic impact on the northern region of Grant County.

There will be absolutely no net benefit for recreational opportunities at Bank Lake. People come to Banks Lake because of what it offers. If they come and all they see is mud for a swimming beach and the boat launch high and dry, they will leave and not come back. The other lakes in the county are already heavily used, especially the facilities. This not only will have a short term negative impact, but also a long term impact because of uncertainty.

The Grand Coulee, Banks Lake area has continually seen a steady growth in tourism. First it was Grand Coulee Dam, then the laser light show, which brought millions of visitors to the area. Over a period of time, these visitors also discovered the great recreational opportunities to be found in the area. Boating on Banks Lake has become more and more popular every year as long as lake levels remain relatively stable.

Dropping the lake level of Bank Lake below ten (10) feet will have an economic impact on the communities of this area. Coulee City operates a park, swimming beach, boat launch and camping sites. Coulee City, Grant County and the Port of Coulee City have invested nearly \$500,000 in this entire park. In 1994 (Figure 1) Banks Lake was drawn down more than five (5) feet. This drawdown resulting in no water in the swimming area and an unusable boat launch for access to the lake. Loss of revenue alone from the Coulee City Community Park resulted in a five year recuperation from just one year of drawing down Banks Lake.

When Grand Coulee Dam had the fire in the year 2000, the Bureau was unable to pump water into Bank Lake, which in July caused it to drop 7 ½ feet. As soon as word

05

06

got out, Sun Banks Resort began to get cancellations. They had a 21 percent drop in business for August of that year. A ten foot drawdown would make the boat launch totally useless at their resort.

It would also make ingress and egress to and from Osborne Bay, where the boat launch is located, prohibitive. In reality the biggest negative impact that a ten foot drawdown will have on Banks Lake and the tourist trade will be in the image that the tourists have of an empty lake. Sun Banks Resort has already experienced that effect in 2001 by the foolishness of the Seattle and Spokane media creating an image that Lake Roosevelt was in dire straights with little water. Sun Banks Resorts had people calling with the intention of canceling their reservations because of the media showing pictures of the lake with little water.

Fig. 1

COULEE CITY COMMUNITY PARK
CAMPING RECEIPTS

	1993	1994	1995	1996	1997	1998	1999	2000
JANUARY								
FEBRUARY								
MARCH								
APRIL	\$ 1,138.00	\$ 2,429.00	\$ 792.00	\$ 527.00	\$ 1,082.00	3,150.00	3,157.00	\$ 3,000.00 Memorial Weekend
MAY	\$ 2,505.00	\$ 10,321.00	\$ 8,568.00	\$ 9,773.00	\$ 11,000.00	10,749.00	9,240.00	\$ 15,194.00 4,645.00
JUNE	\$ 14,773.00	\$ 6,903.00	\$ 7,321.00	\$ 7,012.00	\$ 7,074.00	8,827.00	14,386.00	\$ 10,597.00
JULY	\$ 12,258.00	\$ 9,901.00	\$ 11,822.00	\$ 12,375.00	\$ 14,388.00	13,421.00	18,065.00	\$ 20,038.00
AUGUST	\$ 10,942.00	\$ 5,462.00	\$ 11,241.00	\$ 9,388.00	\$ 11,157.00	9,055.00	16,127.00	\$ 14,088.00
SEPTEMBER	\$ 8,029.00	\$ 4,129.00	\$ 5,497.00	\$ 5,086.00	\$ 5,164.00	5,821.00	6,579.00	\$ 7,464.00
OCTOBER	\$ 2,153.00	\$ 1,580.00	\$ 2,726.00	\$ 2,213.00	\$ 680.00	2,304.00	2,732.00	\$ 2,210.00
NOVEMBER	\$ 20.00							
DECEMBER								
TOTAL	\$ 51,818.00	\$ 40,725.00	\$ 47,965.00	\$ 46,354.00	\$ 50,545.00	53,327.00	70,886.00	\$ 72,569.00

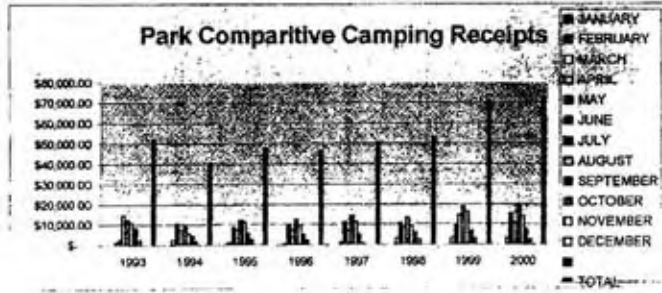


Figure 1

Using OTED statistics County Travel Impacts (Figure 2) destination spending in 1993 was 104.1 million. In 1994 it dropped to 98.6 million. Destination spending did not recover until 1998 level of 1993. This is very similar to the Coulee City Community parks revenue. The northern portion of Grant County is the main attraction for tourism and recreation in the County. Seventy percent of the businesses in the cities Soap Lake, Coulee City, Electric City and Grand Coulee are tourist and recreational based. This is a much higher ratio of tourist related business than any of the other cities in the County.

Grant County is an economically distressed County as designated by the State. Grant County receives sale tax money specifically for investments in infrastructure that creates economic development and jobs for the Cities of Grand Coulee, Electric City and Coulee City, all funds (\$195,000) has gone to tourist related infrastructure. There will be no industrial development in the northern area. The only industry is tourism.

WASHINGTON STATE
County Travel Impact
1991-2001

Prepared:

October 2002



Figure 2

Washington State Destination Spending by County, 1991-2000

Air transportation not included

(\$Millions)

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	*Annual Change
Adams	12.4	13.0	13.3	13.7	13.1	13.7	14.0	14.4	15.0	16.9	3.6
Asotin	13.6	14.1	14.3	16.3	16.9	16.9	17.4	17.4	19.4	21.0	5.0
Benton	87.0	94.2	102.6	125.4	119.6	120.6	129.1	131.3	139.2	154.0	6.5
Chelan	136.3	139.7	143.6	137.3	161.4	160.6	174.0	182.1	203.9	216.0	5.3
Clallam	90.3	98.2	100.4	98.7	104.7	108.1	113.7	116.6	119.8	124.9	3.7
Clark	144.8	151.4	157.6	165.6	177.4	189.9	202.4	223.3	231.3	253.1	6.4
Columbia	3.3	3.4	3.7	4.6	5.0	4.5	4.9	4.8	5.2	5.4	5.8
Cowlitz	71.0	70.8	72.1	72.6	77.8	80.2	86.3	85.9	91.2	93.8	3.1
Douglas	17.5	18.6	18.1	18.2	19.2	19.8	21.0	20.0	21.7	23.9	3.5
Ferry	11.2	11.6	11.4	11.1	12.0	11.8	11.7	11.2	12.5	14.1	2.6
Franklin	48.3	50.6	53.9	56.0	58.4	58.5	59.7	60.8	61.7	66.0	3.5
Garfield	1.1	1.2	1.2	1.2	1.3	1.3	1.3	1.3	1.4	1.5	2.9
Grant	101.9	102.0	104.1	98.6	95.6	98.5	101.7	104.7	110.7	128.9	2.7
Grays Harbor	122.9	129.5	130.7	131.5	140.7	147.7	152.9	167.2	173.6	186.1	4.7
Island	76.1	79.9	83.5	83.8	85.0	88.4	92.0	91.4	97.8	103.8	3.5
Jefferson	56.3	57.3	62.3	60.3	64.2	69.8	67.8	71.5	73.2	77.2	3.6
King	2,063.7	2,125.6	2,186.9	2,316.4	2,524.6	2,770.3	3,015.0	3,179.4	3,454.0	3,744.8	6.8
Kitsap	126.9	129.5	127.5	130.1	135.6	141.1	145.4	152.1	160.3	171.6	3.4
Kittitas	52.2	55.0	56.2	57.9	59.5	64.1	64.3	61.8	70.9	74.1	4.0
Klickitat	16.3	16.7	17.4	16.7	18.3	18.0	18.7	19.1	21.2	21.7	3.2
Lewis	87.4	90.4	89.0	87.4	92.2	93.4	99.9	104.2	110.5	121.9	3.8
Lincoln	9.9	10.1	10.2	10.2	9.4	9.5	10.1	10.1	11.1	12.6	2.7
Mason	51.9	53.3	55.0	54.5	56.6	58.0	60.1	59.8	62.9	65.9	2.7
Okanogan	62.9	65.4	67.3	64.0	70.9	71.7	78.7	82.2	90.0	97.3	5.0
Pacific	62.5	66.5	67.3	68.1	71.7	73.7	77.5	80.3	82.6	90.9	4.2
Pend Oreille	15.7	16.2	15.8	15.9	18.3	18.7	18.7	18.4	20.8	22.1	3.8
Pierce	390.3	406.2	418.9	429.0	448.1	469.4	501.2	507.7	539.8	605.6	5.0
San Juan	50.7	58.3	63.4	65.4	75.8	83.6	82.2	91.7	94.5	105.0	8.4
Skagit	113.9	116.5	114.1	118.1	121.3	124.7	136.1	139.2	153.8	168.2	4.4
Skamania	13.6	14.4	34.5	39.2	33.0	33.9	35.9	34.7	37.9	42.9	13.6
Snohomish	335.6	351.2	365.6	370.6	395.5	426.6	462.2	473.5	509.3	571.9	6.1
Spokane	342.0	356.4	363.0	373.8	387.7	412.1	423.8	437.4	456.3	499.3	4.3
Stevens	34.0	34.9	34.5	35.7	36.1	37.1	37.3	36.6	40.5	43.0	2.6
Thurston	104.7	111.8	116.4	125.1	129.9	142.9	145.5	149.5	158.5	176.0	5.9
Wahkiakum	1.5	1.6	1.6	1.7	2.0	2.0	2.1	2.1	2.4	2.5	5.9
Walla Walla	30.9	32.9	32.2	35.0	37.1	37.4	38.3	38.2	40.7	45.1	4.3
Whatcom	221.2	232.0	227.6	227.6	233.0	244.7	259.7	260.3	277.4	302.0	3.5
Whitman	20.6	19.7	21.1	22.3	26.0	27.0	26.8	32.4	29.8	35.6	6.3
Yakima	187.0	174.0	194.1	201.5	204.8	208.7	213.8	214.5	230.4	246.9	3.1
State Total	5,389	5,574	5,752	5,961	6,339	6,759	7,203	7,491	8,033	8,754	5.5

*Annual Change is the average annual percentage change.

Figure 2

Visitation to Banks Lake (Figure 3) shows a drop in from 1993 to 1994. Then a rise in 1995 and drop in 1996, same in 1997. When you compare spending with visits, it shows in 1994 a drop in spending and visits that was due to the drawdown. In 1995 there was an increase in visits but even a larger drop in spending. This clearly shows people visited but did not stay and spend money. Because of the uncertainty of the lake level, people made no plans to stay. From 1996 on, visitation dropped and remained steady but spending gradually increased. As with the Coulee City Park revenue, the destination spending both showed it took until 1998 before spending actually caught up to 1993 levels. This clearly shows a drawdown in the month of August for one month will have a long-term negative economic impact to the northern region of Grant County with over 70 percent of the businesses tourist related.

The cities that rely on tourism and recreation, Coulee City, Electric City and Grand Coulee have the least population growth in Grant County (Figure 4) from 1990 – 2000. Tourism and recreation are so important to this region, any negative impacts slows growth as one can see in this area of the County.

In closing the Action Alternative will have a long term economic impact to the region. We can clearly see the impact in 1994 with spending revenues down, taking over five years to reverse. The northern towns majority of businesses are tourist related. The drawdown had an impact on growth as compared to the rest of the cities in Grant County. Grant County will only invest in tourist related infrastructure in the region. Clearly the Bureau of Reclamation MUST NOT select the Action Alternative.

Table 2.4
Visitation to Grand Coulee/Banks Lake Area, FY 1997

Facility	Visitors
Grand Coulee Dam Visitor Arrival Center	467,347
Lake Roosevelt-National Recreation Area	1,462,820
Steamboat Rock State Park	583,496
Crown Point Vista	45,715
Roosevelt Recreation Enterprises Houseboat Rentals	13,559
Coulee Playland Resort	20,000
Colville Tribal Museum	12,179
GCDAC Chamber of Commerce	13,231
Coulee Dam Visitors Center	7,850
Dry Falls Interpretive Center	17,542
Total	2,643,539

Source: GCDACC, 1998.

Grand Coulee/Banks Lake Visitation
1986-1997

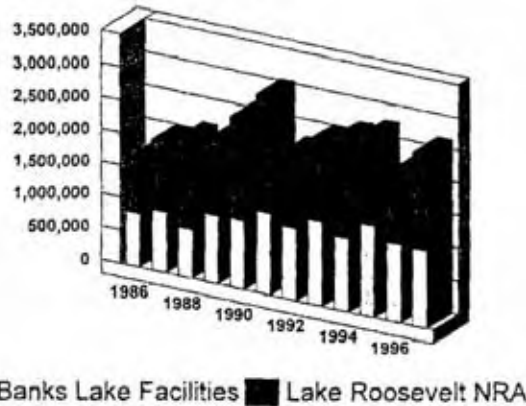
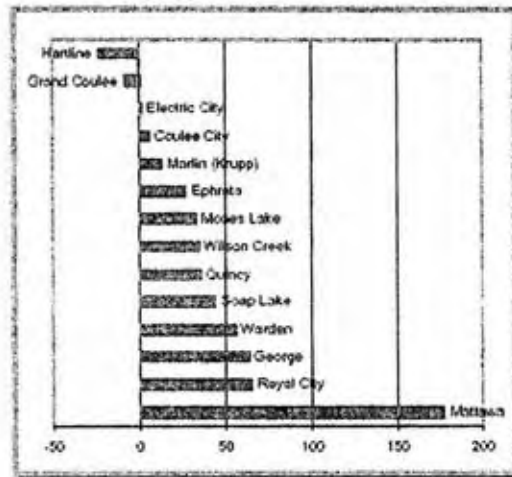


Figure 3

Approximately half, 52%, of Grant County's population lived within an incorporated area in 1990 and 2000. The remainder, 48% of the population lived in an unincorporated area of the county. Mattawa was the fastest growing incorporated area within the county over the 1990-2000 time period. (9)

Graph 4.
Percent Change by Incorporated Area, Grant County 1990-2000



Data Source: Office of Financial Management, State of Washington

Four incorporated areas of the county increased in total population by 50% or more over the 1990-2000 time period. They were Warden - 55%, George - 65%, Royal City - 65%, and Mattawa - 177%. All of these incorporated areas are located in the southern region of Grant County.

Two incorporated areas, Grand Coulee and Hartline, declined in total population between 1990-2000. Both of these areas are located in northern Grant County.

Data Notes
Graph 4 corresponds with data presented in Table 4.

Graph 5.
Location of Incorporated Areas, Grant County 2000

Data Tidbit
The railroad is credited with establishing and changing many towns including Quincy, Ephrata, Coulee City, and Wilson Creek.

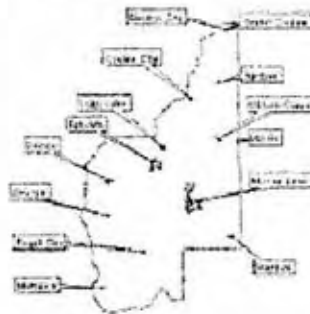


Figure 4

GRANT COUNTY COMPREHENSIVE PLAN

Chapter 4 – Policy Plan

Overview

The Grant County Comprehensive Plan provides a legally recognized framework for making decisions about land use in Grant County. Grant County's comprehensive plan directs the County's future physical growth through several mechanisms. It provides guidance for development regulations, such as the zoning ordinance, and for other county-wide plans such as solid waste, sewer, or capital facilities. Such plans must include the public facilities needed to accommodate the population growth anticipated in the comprehensive plan. They also must ensure that levels of service adopted within the plan can be maintained.

The comprehensive plan will also be useful when reviewing development applications and interlocal agreements or various County programs. Interlocal agreements are voluntary agreements entered into for various purposes; such as to coordinate policies of mutual interest, the use of shared facilities, and the accomplishment of mutual goals. County programs may be developed to fulfill the goals and policies of this Comprehensive Plan.

During the planning effort, scores of people were asked to provide input toward developing goals and policies that will address the many choices the next twenty years will pose, including:

"How should Grant County grow and develop?"

"What services and facilities will be needed to support growth?"

"How will the community pay for public improvements and services needed to support growth?"

"What kind of public/private partnerships and intergovernmental relationships can be forged to meet the challenges of growth?"

Answers to these kinds of questions will shape key public and private sector decisions well into the next century.

Purpose Of Policy Plan

General

This policy plan serves as a framework for County decision-makers, the development industry, and the public covering a broad array of issues of both short- and long-term

importance. The Policy Plan establishes an agenda for future work toward achieving the broader vision for the County. The Policy Plan ensures that Grant County complies with Washington's thirteen planning goals contained in a complex array of statutes and administrative codes known as the Growth Management Act or GMA.

Grant County and its cities and towns are among many jurisdictions required to conduct planning and development decisions according to the GMA. This Policy Plan represents Grant County's means for achieving compliance with the GMA while remaining true to our historical values, customs and culture.

The Plan manages growth by directing urban development to designated areas, including urban growth areas and rural areas of more intensive development, while protecting and conserving natural resource areas and retaining rural landscape features and lifestyles. The plan is also intended to guide planning for a broad range of public and private users, including County officials, community groups, other government agencies and even land developers.

The Plan:

- Guides the development of additional community plans and implementing regulations through its policy statement;
- Guides the provision of public facilities and services by integrating land use, infrastructure, and human service delivery;
- Provides regional coordination and consistency with other jurisdictional planning efforts; and
- Allows for citizen participation and involvement.

Planning Concepts and Principles

Several concepts, and their underlying principles, are basic to the planning approach embodied in this Comprehensive Plan. The Plan has these characteristics:

1. **Long Range.** The Plan is based on a 20-year vision of the County, as defined by the community through an extensive public participation process.
2. **Predictability.** Citizens, interest groups, agencies, and decision-makers planning for the use of land, making financial decisions, or trying to influence the course of a land use decision need to understand the Plan and the standards for its application and review.
3. **Consistency.** The Plan is internally consistent and coordinated with neighboring jurisdictions in an attempt to be externally consistent.

4. **Comprehensiveness.** The Plan interrelates people, land, resources, natural environmental systems, and public facilities in such a way as to protect the future health, safety and welfare of our citizens.
5. **Flexibility.** After its adoption, the Plan will continue to evolve to reflect our actual experience of growth and citizen concerns over that growth. Through annual updates and major, periodic reviews, the Plan will be adjusted to changing needs, unforeseen circumstances, or new local and regional trends.
6. **Goal-oriented.** Goals and policies of the Plan will trace the vision for the future for sustaining and improving the quality of life advocated by our citizens. Goals and policies will also be consistent with and balance the planning goals of the GMA.
7. **Financially Feasible.** The Plan is financially feasible and generally capable of implementation.

Underlying principles include:

1. Population growth should be focused toward urban centers where public services and facilities are present.
2. Future land use within Urban Growth Areas (UGAs) should be designated jointly by the cities and Grant County. Land use planning is a shared responsibility within the unincorporated portions of the UGA, although the County retains land use jurisdiction. The County's objective for land within the UGA should be to manage the transition from rural to urban use, minimizing public costs and uses that could prevent development consistent with the adopted future land use plans.
3. Development choices consistent with rural character should be provided for in rural areas.
4. To protect the long-term viability of the County's agricultural-based economy, residential development unrelated to agriculture should be discouraged on lands designated as agricultural.
5. Implementation of the Plan will be carried out in various ways, including through the goals and policies included in the Plan itself, action items or strategies identified in the Plan, and measures consistent with the Plan goals and policies. Implementation will be guided by the following principles:
 - Reduce the cost of public services by focusing development in areas where services, utilities and access are provided in adequate capacity, or can reasonably be upgraded to provide necessary capacity;

- Maintain flexibility, locational choice and preferences while explicitly specifying service expectations and limitations for each of the development areas;
- Streamline and integrate the regulatory review process for land use decisions to achieve more predictable process and time frames; and
- Emphasize a coordinated partnership approach to funding and providing service and financing development between the public and private sectors as well as across jurisdictional boundaries.

GMA Goals

The GMA requires Washington's fastest growing counties, the cities within them, and other jurisdictions opting in to the process to plan extensively in accordance with the following goals:

- **Urban Growth.** Encourage development in urban growth areas where adequate public facilities and services exist or can be provided in an efficient manner.
- **Sprawl.** Reduce the inappropriate conversion of undeveloped land into sprawling, low-density development.
- **Transportation.** Encourage efficient multi-modal transportation systems that are based on regional priorities and coordinated with county and city comprehensive plans.
- **Housing.** Encourage the availability of affordable housing to all economic segments of the population of this state, promote a variety of residential densities and housing types, and encourage preservation of existing housing.
- **Economic Development.** Encourage economic development throughout the state that is consistent with adopted comprehensive plans, promote economic opportunity for all citizens of this state, especially for unemployed and for disadvantaged persons, and encourage growth, all within the capacities of the state's natural resources, public services, and public facilities.
- **Property Rights.** Private property shall not be taken for public use without just compensation having been made. The property rights of landowners shall be protected from arbitrary and discriminatory actions.
- **Permits.** Applications for both state and local government permits should be processed in a timely and fair manner to ensure predictability.
- **Natural Resource Industries.** Maintain and enhance natural resource-based industries, including productive timber, agricultural and fisheries industries.

- **Open Space and Recreation.** Encourage the retention of open space and development of recreational opportunities, conserve fish and wildlife habitat, increase access to natural resource lands and water, and develop parks.
- **Environment.** Protect the environment and enhance the state's high quality of life, including air, water quality, and the availability of water.
- **Citizen Participation and Coordination.** Encourage the involvement of citizens in the planning process and ensure coordination between communities and jurisdictions to reconcile conflicts.
- **Public Facilities and Services.** Ensure that those public facilities and services necessary to support development shall be adequate to serve the development at the time the development is available for occupancy and use without decreasing current service levels below locally established minimum standards.
- **Historic Preservation.** Identify and encourage the preservation of lands, sites, and structures that have historical or archaeological significance.

A Vision For The Future

Visioning Survey

People choose to live and work in Grant County for many reasons. The County provides a diversity of environments and lifestyle choices such as urban, rural, and small town. The wholesome quality of life offered by Grant County includes a clean environment, job opportunities, easy access to work and recreation, quality health facilities, education and cultural activities, a variety of human services and a peaceful, uncrowded atmosphere.

In 1992, Grant County conducted a survey of nearly 2,500 residents to learn about their attitudes regarding a variety of topics related to growth. The results of that survey are summarized below.

Grant County residents:

- Like the rural lifestyle, friendly people and recreational opportunities, and strongly desire to preserve the rural lifestyle;
- Desire to preserve agriculture and agricultural lands;
- Wish there were more job opportunities for their children so that they could stay in the community;
- Wish there were more cultural activities;

- Desire to see economic growth in industry, recreation and tourism, and commercial development;
- Desire to identify and protect environmentally-sensitive areas and wildlife habitat, such as the Columbia, wetlands, Potholes Reservoir, and Moses Lake;
- Believe that land use regulations and permit processing is too cumbersome, and that more enforcement of regulations is needed; and
- Believe that a Comprehensive Plan should be prepared to guide elected and appointed officials toward orderly growth and development.

Visioning Survey Comment

In the Visioning Survey sent out to county residents, like the rural lifestyle, friendly people and recreational opportunities, and strongly desire to preserve the rural lifestyle; wish there were more job opportunities for their children so that they could stay in the community; desire to see economic growth in industry, recreation and tourism, and commercial development. The Action Alternative is contrary with these visions. The drawdown will have a negative impact on the lifestyle of the people in the Coulee Community, also with the desire to see economic growth in recreation and tourism. With the negative impact to the community, the economy will falter, jobs will be lost and the wish for more job opportunities for their children will not happen.

08

Vision Statement

Grant County seeks to maintain and enhance its quality of life while achieving benefits of growth and minimizing any negative impacts. Our vision defines our future and how we will respond to growth and change. Our vision is comprised of the following basic values:

- Promote a healthy, diversified, and sustainable local and regional economy by supporting existing local businesses, making prudent infrastructure investments, and encouraging new business that is compatible with and complementary to the community.
- Protect and preserve the natural beauty, rural character, and variety of lifestyles that define our community.
- Protect and conserve our agricultural resources, and prevent inappropriate conversion of prime agricultural lands.

- Manage growth effectively to prevent inappropriate or premature conversion of undeveloped land and to minimize incompatible land uses and the cost of public and private services.
- Encourage infill development within urban growth areas and enhance the sense of “community” around traditional population centers.
- Provide a variety of residential living opportunities, ranging from urban to rural, small town, rural settlement, shoreline, and agricultural.
- Promote healthy, safe, and productive communities with a variety of housing for all economic levels.
- Encourage opportunities for quality community education and technology to meet the educational and training needs of all residents.
- Promote open, responsive and accountable local government that works to create a true sense of community and to create democratic processes on all levels.

Vision Statement Comment

In the Vision Statement, Grant County seeks to maintain and enhance its quality of life while achieving benefits of growth and minimizing any negative impacts by promoting a healthy, diversified, and sustainable local and regional economy by supporting existing local businesses, making prudent infrastructure investments, and encouraging new business that is compatible with and complimentary to the community. Also protect and preserve the natural beauty, rural character, and variety of lifestyles that define our community. The Action Alternative will have negative impact on the local economy; local governments have made large investments in infrastructure. This investment was to promote recreation and tourism, in hopes of creating new business that are compatible with the Coulee Community. The drawdown is contrary to this vision.

Goal LU-5: *The County should conserve or enhance important natural, cultural, and scenic resources.*

Policies

LU-5.1: The Open Space land use designations should:

- Protect streams, stream corridors, wetlands, natural shorelines, and aquifers;
- Protect soil resources;

- Protect unique, diverse or critical wildlife and native plant habitat;
- Promote conservation principles by example or by offering educational opportunities;
- Enhance the values and functions of parks, wildlife preserves, nature conservancies or sanctuaries, or other open space lands;
- Enhance recreational opportunities and public access to open spaces; and
- Preserve scenic vistas, historic, cultural and archaeological sites.

LU-5.2: The County should inventory open space lands and define those to conserve. The County should consider development of a comprehensive parks, open space and recreation plan to identify, evaluate and designate additional appropriate open space.

Action Alternative Comment

The Action Alternative is in conflict with County Goal LU-5. The drawdown will negatively impact wetlands and the natural shorelines creating large mud flats; negatively impact wildlife and native plant habitat. It will also negatively impact parks and recreational opportunities. Grant County has zoned 95 percent of Bank Lake open space in recognition of the importance of wetlands, natural shorelines, wildlife, parks, recreational opportunities, and public access.

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Economic Development

Goal ED-1: *Encourage diverse employment opportunities that satisfy the socioeconomic needs of Grant County residents.*

Policies

ED-1.1: Facilitate the creation and retention of family wage jobs that meet the needs and demands of Grant County residents.

Actions: *The County may consider implementing the following actions under this policy:*

1. *Streamline zoning, subdivision and other planning and permitting regulations.*

2. *Maintain an operational computerized database (in GIS format) of industrial properties for planning purposes.*
3. *Expedite planning and permitting actions to take advantage of appropriate industrial development opportunities.*
4. *Seek high level of cooperation with other local governments and federal and state agencies in areas that affect issues of mutual concern and that could impact continued countywide economic development.*
5. *Support local economic development agencies and industry groups in market research efforts.*
6. *Seek ways to enhance utility and transportation infrastructure needed by industry within county.*
7. *Seek ways to promote flexibility and deregulation of markets for products sold by or used by industries in county.*

ED-1.2: Encourage business investment as a means to provide job opportunities for Grant County residents.

Actions: The County may consider implementing the following actions under this policy:

1. *Make necessary public infrastructure investments in transportation, water & sewer, telecommunications, and other utilities to leverage private investments that ultimately create jobs.*
2. *Provide adequate, serviced and environmentally acceptable sites that would meet the full range of industrial and business needs and opportunities.*
3. *Identify and organize financial capital resources to assist in attracting new businesses.*

ED-1.3: Encourage diverse job options and entrepreneurial opportunities for persons interested in full-time or part-time employment or desiring to own their own businesses.

Actions: The County may consider implementing the following actions under this policy:

1. *Participate in job fairs, information outreach sponsored by local development agencies, job training centers, and industry.*

2. *Encourage entrepreneurship by removing barriers to new business development and promoting efficiency in government.*
3. *Identify local and non-local financial capital sources to assist new business formation.*
4. *Establish a mentoring program for first-time entrepreneurs by matching individuals with business ideas with those able and willing to help develop their ideas.*
5. *Conduct local area studies of market potential for new retail, wholesale, service or industry input-providing businesses to identify opportunities for new local establishments.*
6. *Assess the feasibility in providing a small business incubator to nurture new local businesses.*

ED-1.4: Encourage educational opportunities for residents of all ages to develop and upgrade skills required for employment, advancement and entrepreneurship.

Actions: The County may consider implementing the following actions under this policy:

1. *Use development funds to provide education infrastructure and training for existing and prospective workers of local industries.*
2. *Support job training programs and skill enrichment programs.*
3. *Encourage local school districts to establish entrepreneurial program for students.*

ED-1.5: Work cooperatively with the Grant County Economic Development Council, Big Bend Community College, and other local jurisdictions to address employment needs consistent with county-wide regional policies.

ED-1.6: Encourage and accommodate home-based businesses and cottage industries that are consistent with the character of adjoining properties and neighborhoods.

Actions: The County may consider implementing the following actions under this policy:

1. *Promulgate special land use classifications and designate areas of the county as needed for small industry neighborhood zoning. This*

would enable for so-called "lone eagles" and cottage-based industries to pursue economic activity.

2. Support development of telecommunications infrastructure and transportation services (including scheduled air service) required by home-based businesses and cottage industries.

ED-1.7: Cooperate with education providers and employers in developing facilities and programs meeting a continuum of educational needs at the K-12, college, and continuing education levels.

Goal ED-2: *Encourage economic growth through planning and development of the region's public services and facilities' capacity.*

Policies

ED-2.1: Public service providers in Grant County should provide those services and facilities necessary to support a high quality of life and attract business investment.

ED-2.2: Review land use and permitting procedures to assure that regulatory processes are understandable, predictable, and can be accomplished within reasonable time periods in a manner that meets or exceeds state statutory requirements.

Actions *The County may consider implementing the following actions under this policy:*

1. Undertake comprehensive utility and other public service planning in order to take advantage of development opportunities, while addressing potential capacity shortfalls in given industrially-zoned locations within the county.
2. Provide planning flexibility that will be responsive to unforeseen or changing economic conditions and community desires.
3. Encourage long-term programs that effectively build local capacity for sustained economic development.
4. Support the development of transportation, and public water, sewer and utility systems that enhance economic growth.
5. Seek ways of cooperating with local governments and federal and state agencies to expedite land use and permitting procedures.

6. *Evaluate issues that impinge upon permitting of natural resources and land uses.*

Goal ED-3: *Ensure an adequate supply of commercial and industrial sites to provide opportunity for new and expanding businesses to locate or remain in Grant County.*

Policies

ED-3.1: Encourage a range of commercial retail and service businesses to meet local resident needs and serve visitors to Grant County.

Actions: *The County may consider implementing the following actions under this policy:*

1. *Encourage convenience-oriented retail within Rural Villages, UGAs, and Rural Communities that are convenient to residential neighborhoods and major employment centers.*
2. *In cooperation with local jurisdictions, identify an inventory of suitable commercial sites adequate to meet anticipated demand during the planning period.*

ED-3.2: Plan for a diversity of ready-to-build sites with sufficient support infrastructure and services needed to meet the demand for industrial land for the duration of the planning period.

Actions: *The County may consider implementing the following actions under this policy:*

1. *Undertake periodic studies of industrial growth in order to set planning targets for industrial sites and adjust long-term forecasts accordingly.*
2. *Undertake evaluations of industrial siting in regard to land use requirements and infrastructure needs.*
3. *Encourage the re-use and redevelopment of existing industrial sites that are no longer viable for their original or previous use.*

ED-3.3: Encourage low-cost, easily accessible, state-of-the-art telecommunications services throughout the County.

Actions: *The County may consider implementing the following actions under this policy:*

1. *Undertake evaluations of market conditions, regulatory policies, and franchising requirements pursuant to the permitting and/or licensing of telecommunications services.*
2. *Encourage development of state-of-the-art cable interties that meet band-width requirements for high-speed signal transmission.*

ED-3.4: Facilitate the retention and expansion of existing local businesses and start-up of new businesses particularly those that provide family wage job opportunities and operate in compliance with applicable regulatory requirements.

Actions: The County may consider implementing the following actions under this policy:

1. *Undertake prospective (and periodic) analyses of market conditions and land use needs of existing key industries.*
2. *Establish policies and programs in cooperation with local governments and state agencies to ensure business retention within the county.*

ED-3.5: Industrial sites designated under this Plan should be protected from encroaching incompatible uses.

Actions: The County may consider implementing the following actions under this policy:

1. *1. Develop performance and/or site design standards on non-industrial lands adjacent to designated industrial lands.*
2. *2. Lands designated as "Heavy Industrial" should be governed by performance standards set forth in the zoning ordinance. Such performance standards should include, but shall not be limited to:*
 - *Compliance with pertinent regulations regarding discharge of pollutants;*
 - *A maximum noise level standard;*
 - *Stream and watercourse protection;*
 - *Odor, glare, smoke, traffic and other nuisance standards.*

ED-3.6: Jurisdictions in Grant County shall regularly update inventories of land utilization, land demand, and suitable available properties for residential, industrial, commercial, public facility, and agricultural uses.

Goal ED-4: *Preserve the strength of the existing agricultural industry while diversifying the local economy by strengthening manufacturing and promoting producer services and other basic industries.*

Policies

ED-4.1: Focus business recruitment and development on firms that will diversify the local economy and can effectively serve state, national, Pacific Rim and other global markets from a Grant County location.

Actions: *The County may consider implementing the following actions under this policy:*

1. *Develop target industry profiles and analysis screens.*
2. *Conduct detailed analyses of prospective needs of candidate industries.*
3. *Conduct formal pro forma, market and regulatory analyses, and siting studies as needed.*

ED-4.2: Encourage high value-added resource based products and businesses.

ED-4.3 Encourage the establishment of industrial parks and other light manufacturing facilities and provide zoning of facilities engaged in producer services, including computer, health services, and telecommunications.

Goal ED-5: *Maximize the positive economic impact of tourism and recreational development.*

Policies

ED-5.1: Promote visitor opportunities that are compatible with or complement the character and existing uses of natural resource lands and critical areas or the rural lifestyles of Grant County.

Actions: *The County may consider implementing the following actions under this policy:*

1. *Encourage lodging, retail and transportation services to accommodate enhanced visitor opportunities.*

2. *2. Support efforts to develop, refurbish and maintain scenic open space, cultural and heritage resources that are attractive to both local residents and visitors.*

- ED-5.2: Support local jurisdiction efforts to improve and market visitor services.
- ED-5.3: Visitor facilities should be sited at locations that can be served with necessary public infrastructure and that are compatible with neighboring uses.
- ED-5.4: Provide for siting and development of Master Planned Resorts.

Action Alternative Comment

The Action Alternative will have a direct impact on County Goal ED-5 because of lost boating and swimming opportunities during the busiest time of the year. It is in conflict with policy ED-5.1 because it is contrary to the compatibility character and existing uses of our natural resource land and critical areas and the rural lifestyle of the Coulee Community. It conflicts with ED-5.2 because we lose the effort to improve and market visitor services.

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Goal ED-6: *Improve Grant County's economy by supporting efforts to improve human and social services.*

Policies

- ED-6.1: Encourage development of human and social service facilities that create job opportunities, meet community needs, and maintain Grant County's quality of life.

Actions: *The County may consider implementing the following actions under this policy:*

1. *Cooperate with other private and public agencies to promote the establishment of adequate housing and health care to low- and moderate-income workers and their families.*
2. *Expedite permitting of temporary housing, including group quarters.*
3. *Promote alternative financing and development initiatives for permanent housing for low- and moderate-income workers and their families.*

ED-6.2: Support development and maintenance of human and social service facilities including, but not limited to, health care, education, transportation and other services for persons with special needs.

Goal ED-7: *Promote economic growth that conserves natural resources and open spaces, maintains environmental quality and rural character, and enhances the overall quality of life.*

Policies

ED-7.1: Encourage commercial and industrial developments that incorporate innovative and/or experimental applications and demonstrate an ability to conserve natural resources and/or protect or enhance environmental quality.

Actions: *The County may consider implementing the following actions under this policy:*

1. *Establish incentive programs oriented to developments using best-practice technologies (e.g., use of renewable natural resources).*
2. *Establish program that rewards developers through expedited processes and site capacity incentives for siting or relocating facilities to areas that are compatible with surrounding land uses or critical natural resource areas.*

ED-7.2: Long-term commercially significant natural resource lands or lands in urban settlements shall be protected from encroachment from conflicting uses.

Goal ED-8: *Coordinate economic development efforts so that a clear and consistent economic policy is followed.*

Policies

ED-8.1: Work cooperatively with the Grant County Economic Development Council, Big Bend Community College, Port Districts, and other local jurisdictions to address economic development issues and make policies that are consistent with this Plan.

Actions: *The County may consider implementing the following actions under this policy:*

1. *1. Build support for this economic development element by presenting its recommended policies and actions from the County's public and private partners.*

2. *2. Place Grant County Economic Development Council and Grant County Long Range Planning in joint-charge of the implementation of this element.*

Critical Areas

Goal NS-2: *Wetlands should be protected because they provide important functions that add to the quality of life.*

Policies

- NS-2.1: Wetland areas should be identified by the development applicant and reviewed by the County prior to development. If a wetland is determined to exist on a parcel subject to a non-exempt development activity, a written delineation should be required of the applicant.
- NS-2.2: The County should consider accepting written determinations, delineations and mitigation plans only from the U.S. Army Corps of Engineers, the Department of Ecology, the Natural Resources Conservation Service, or a qualified critical areas professional. The County should consider requiring that mitigation plans for unavoidable wetland impacts to be based on a wetland functional assessment.
- NS-2.3: Based on their quality demonstrated by the classification system defined in the Resource Lands and Critical Areas Ordinance, wetlands should be protected from alterations due to land use changes that may create adverse impacts to the wetland.
- NS-2.4: The County should consider incorporation of the Washington State Wetlands Rating system for Eastern Washington (Ecology Publication #91-58) into the classifications system adopted in the Resource Lands and Critical Areas Ordinance.
- NS-2.5: The County should consider incorporation of the Washington State Department of Ecology Manual titled "Washington State Wetlands Identification and Delineation Manual, March 1997" into the classifications system adopted in the Resource Lands and Critical Areas Ordinance.
- NS-2.6: Whenever feasible, innovative techniques that enhance a wetland and promote it as a useful, functioning part of the development will be encouraged.
- NS-2.7: Wetland preservation strategies and efforts, including wetland banking, should be coordinated with appropriate local, state and federal agencies

and private conservation organizations to take advantage of both technical and financial assistance and to avoid duplication of efforts.

Action Alternative Comment

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The Action Alternative will be in conflict with County goal NS-2 drawing the lake down for over a month during the hottest time of the year will adversely impact the large wetlands on Banks Lake.

The Action Alternative will be in conflict with Goal NS-6 because of the negative impact to fish and wildlife around and in Banks Lake.

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Protecting Grant County's shoreline environment is of importance to preserving the economic, environmental and cultural resources of the Coulee Community.

Goal NS-6: *Fish and wildlife habitat areas should be protected as an important natural resource, particularly in regard to their functions and economic, aesthetic and quality of life values.*

Policies

- NS-6.1: Critical fish and wildlife habitat conservation areas within the County should be identified as such.
- NS-6.2: The impacts of new development on the quality of land, wildlife and vegetative resources should be considered as part of the environmental review process. Any appropriate mitigating measures should be required. Such mitigation may involve the retention and/or enhancement of habitats.
- NS-6.3: The preservation of blocks of habitat and the connections between them, as well as the restoration of lost and damaged fish habitat, should be encouraged.
- NS-6.4: Proper riparian management that maintains existing riparian habitat and is consistent with best agricultural management practices should be encouraged.
- NS-6.5: Land uses adjacent to naturally occurring water bodies and other fish and wildlife habitat areas should not negatively impact the habitat areas. If a change in land use occurs, adequate buffers should be provided to the habitat areas.
- NS-6.6: Activities allowed in fish and wildlife habitat conservation areas and open space should be consistent with the species located there, and in accordance with all applicable state and federal regulations and/or best management practices for the activity regarding that species.

Shoreline Management

Protecting Grant County's shoreline environment is of importance to preserving the economic, environmental and cultural resources of our community. The shoreline policies that follow have been crafted to recognize these unique and valuable shoreline resources and to protect them for the benefit of future generations. These policies are intended to be consistent with the Shoreline Management Act, Chapter 90.58 RCW.

Goal NS-9: The County should recognize and protect the functions and values of the shoreline environments of statewide and local significance. For shorelines of state-wide significance (SSWS), protection and management priorities are to:

- a. Recognize and protect the state-wide interest over local interest;
- b. Preserve the natural character of the shoreline;
- c. Provide long-term over short-term benefit;
- d. Protect the resources and ecology of shorelines;
- e. Increase public access to publicly owned areas of shorelines; and
- f. Increase recreational opportunities for the public in shoreline areas.

Policies

NS-9.1: General Shoreline Use:

1. Maintain areas within the shoreline jurisdiction with unique attributes for specific long-term uses, including agricultural, commercial, industrial, residential, recreational and open space uses.
2. Ensure that proposed shoreline uses are distributed, located and developed in a manner that will maintain or improve the health, safety and welfare of the public when such uses occupy shoreline areas.
3. Ensure that activities and facilities are located on the shorelines in such a manner as to retain or improve the quality of the environment.
4. Ensure that proposed shoreline uses do not infringe upon the rights of others, upon the rights of private ownership, upon the rights of the public under the Public Trust Doctrine or federal navigational servitude, and treaty rights of Indian tribes.

5. Minimize the adverse impacts of shoreline uses and activities on the environment during all phases of development (c.g. design, construction, management and use).

Shoreline Comment

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Protecting Grant County's shoreline environment is of importance to preserving the economic, environmental and cultural resources of the Coulee Community. The Action Alternative will be in conflict with the County's goal NS-9. Banks Lake is a lake of state-wide significance, along with the shoreline. The drawdown will be in conflict with A through F of the State and County's priorities in protection and management of our shoreline.

The Action Alternative will be contrary to the County's policies of shoreline management NS-9.2 Economic Development, NS-9.5 Public Access, NS-9.6 Recreation Development, NS-9.5 Public Access, NS-9.5 Recreation, NO-9.8 Wetlands, NS-9.15 Natural Environment, NS-9.18 Boating, NS-9.19 Commercial Development and NS-9.23 Recreational Development. The drawdown will have a negative impact on economic development, reduce public access, damage recreation, adversely impact wetlands, degrade the natural environment, limit boating, negatively impact commercial development and damage long-term recreation development because of uncertainty, unpredictability and consistency with the lake level.

NS-9.2: Economic Development:

1. Ensure healthy, orderly economic growth by allowing those economic activities which will be an asset to the local economy, and for which the adverse effects on the quality of the shoreline and surrounding environment can be mitigated.
2. Protect current economic activity (e.g. shipping, marinas, agriculture, etc.) that is consistent with the policies of the SMP.
3. Develop, as an economic asset, the recreation industry along shorelines in a manner that will enhance public enjoyment.
4. Ensure that any economic activity taking place along the shorelines operates without causing irreparable harm to the quantity of the site's environment or adjacent shorelands.
5. Protect current agricultural land uses of long-term commercial significance and provide for development of new agricultural uses for which adverse environmental effects can be mitigated.

NS-9.3: *Circulation:*

1. Provide safe, reasonable, and adequate circulation systems to shorelines where routes will minimize adverse effects on unique or fragile shoreline features and existing ecological systems, while contributing to the functional and visual enhancement of the shoreline.
2. Within the shoreline jurisdiction, locate land circulation systems that are not shoreline dependent as far from the land-water interface as practicable to reduce interference with either natural shoreline resources or other appropriate shoreline uses.

NS-9.4: *Conservation:*

1. Develop and implement management practices that will ensure a sustained yield of renewable resources of the shorelines while preserving, protecting, enhancing and restoring unique and nonrenewable shoreline resources, environments, or features.
2. Reclaim and restore areas that are biologically and aesthetically degraded to the greatest extent feasible.
3. Preserve scenic vistas, aesthetics, and vital estuarine areas for fisheries and wildlife protection.

NS-9.5: *Public Access:*

1. Ensure that developments, uses, and activities on or near the shoreline do not impair or detract from the public's access to the water. Where practicable, public access to the shoreline should be enhanced.
2. Design public access projects such that they provide for public safety and minimize potential impacts to private property and individual privacy.

NS-9.6: *Recreation:*

1. Optimize recreational opportunities now and in the future in shoreline areas.
2. Encourage federal, state and local governments to acquire additional shoreline properties in Grant County for public recreational uses.

NS-9.7: Historic/Cultural/Scientific:

1. Identify, protect, preserve, and restore important archeological, historical, and cultural sites located in shorelands.
2. Encourage educational projects and programs that foster a greater appreciation of the importance of shoreline management, maritime activities, environmental conservation, and maritime history.
3. Prevent public or private uses and activities from destroying or damaging any site having historic, cultural, scientific or educational value without appropriate analysis and mitigation.

NS-9.8: Wetlands:

1. Preserve and protect natural (non-exempt) wetlands to prevent their loss and degradation.
2. Identify natural (non-exempt) wetlands areas and boundaries according to established identification and delineation procedures.
3. Provide adequate mitigation for disturbance of natural (non-exempt) wetlands and buffers in the shoreline environment.
4. Maintain a wetland buffer zone of adequate width between a natural (non-exempt) wetland and adjacent development to protect the functions and values of the wetland.
5. Base the width of the established buffer zone upon the functions and values of the natural (non-exempt) wetlands.
6. Natural (non-exempt) wetlands that are impacted by activities of a temporary nature should be restored upon project completion.
7. Give preference to in-kind and on-site replacement of wetland functions and values. Where in-kind and/or on-site replacement is not feasible or practical due to the characteristics of the existing wetland or property, mitigation of equal or greater ecological value should be provided off site.
8. Require an applicant to monitor mitigation plans, and to take corrective action if necessary, in order to ensure long-term success of mitigation projects.

9. Develop standards and procedures for wetland banking allowing for approval of wetland mitigation banks on a case by case basis until such standards and procedures are adopted.

NS-9.9: Utilities:

1. Require utilities to utilize existing transportation and utility sites, rights-of-way and corridors whenever practicable, rather than creating new corridors in the shoreline environment. Joint use of rights-of-way and corridors in shoreline areas should be encouraged.
2. Locate utility facilities and corridors so as to protect scenic views. Whenever practicable, such facilities should be placed underground or alongside or under bridges.
3. Design utility facilities and rights-of-way to preserve the natural landscape and to minimize conflicts with present and planned land uses.
4. Prohibit solid waste disposal activities and facilities in certain sensitive shoreline areas.
5. Ensure that utilities that are necessary to serve shoreline uses are properly installed so as to protect the shoreline environment and water from contamination.
6. Locate and design utility facilities in a manner that preserves the natural landscape and shoreline ecology, and minimizes conflicts with present and planned land uses.
7. Locate utility features for adequate setback at river crossings so as to allow for natural river meander.

NS-9.10: Vegetation Management:

1. Stress prevention of aquatic weed problems. Where active removal or destruction is necessary, it should be the minimum necessary to allow water-dependent activities to continue. Control activities should minimize negative impacts to native plant communities, and include appropriate disposal of weed materials.
2. Invasive, noxious weeds causing irreparable damage to the shoreline environment should be removed with all due diligence.

NS-9.11: Water Quality:

1. Require developers to locate, design, construct, and maintain shoreline uses and activities to minimize adverse impacts to water quality and fish and wildlife resources.
2. Minimize or mitigate for impacts from agricultural activities such as animal feeding operations, feed lot wastes, retention and storage ponds, manure storage, use of fertilizers and pesticides and other like activities by implementing best management practices.

NS-9.12: Urban Environment:

1. Prioritize the preservation or expansion of existing high-intensity commercial or industrial waterfront centers over the creation of new high intensity industrial or commercial sites.
2. Site industrial or urban development in areas without severe biophysical limitations.
3. Prioritize “water-dependent”, “water-related” and “water-enjoyment” uses over other waterfront uses.
4. Ensure that developments within the Urban environment are compatible with uses and activities in adjacent (including aquatic) environments.

NS-9.13: Rural Environment:

1. Protect areas with a high capacity of supporting agricultural or forestry uses from incompatible development.
2. Encourage public and private recreational facilities that are compatible with agriculture and forestry industry.
3. Discourage urban density development.
4. Promote low-density residential development.
5. Allow mineral extraction with sufficient buffers.
6. Require development within the Rural environment to be compatible with uses and activities in adjacent (including aquatic) environments.

NS-9.14: Conservancy Environment:

1. Prohibit or restrict activities and uses that would substantially degrade or permanently deplete the physical or biological resources of the area.
2. Restrict new development to that which is compatible with the natural or biological limitations of the land and water.
3. Prohibit activities or uses that would strip the shoreline of vegetative cover, cause substantial erosion or sedimentation, or adversely affect wildlife or aquatic life.
4. Encourage agricultural and recreational activities that will not be detrimental to the natural shoreline character.
5. Allow single family residential development as a principal use in the Conservancy environment.
6. Ensure that developments within the conservancy environment are compatible with uses and activities in adjacent (including aquatic) environments.

NS-9.15: Natural Environment:

1. Restrict or prohibit uses or developments that would significantly degrade the natural value or alter the natural character of the shoreline area.
2. Permit access for scientific, historical, educational and low-intensity recreational purposes, provided that no significant adverse impact on the area will result.
3. Ensure that uses and activities permitted in locations adjacent to shorelines designated Natural are compatible and will not compromise the integrity of the natural environment.
4. Ensure that developments within the Natural environment are compatible with uses and activities in adjacent (including aquatic) environments.
5. Prohibit commercial and industrial uses other than low-intensity agricultural practices, low-intensity mineral extraction, and commercial forestry.
6. Prioritize preservation of resources over public access, recreation and development whenever a conflict exists.

NS-9.16: Aquatic Environment:

1. Prohibit structures that are not water-dependent and uses that will substantially degrade the existing character of the area.
2. Ensure that developments within the aquatic environment are compatible with the adjoining upland environment.
3. Encourage diverse public access opportunities to water bodies that are compatible with the existing shoreline environment.

NS-9.17: Agriculture:

1. Protect agricultural land of long-term commercial significance from incompatible and preemptive patterns of development.
2. Protect the productivity of the land base by using best management practices to control soil erosion.
3. Maintain a vegetative buffer between agricultural lands and water bodies or wetlands.

NS-9.18: Boating:

1. Locate and design boating facilities so that their structures and operations will be compatible with the area affected.
2. Discourage the use of floating homes and houseboats. They should be allowed only in limited circumstances where their negative environmental impacts can be substantially avoided.

NS-9.19: Commercial Development:

1. Encourage new commercial development on shorelines to locate in those areas with existing, consistent commercial and/or industrial uses and in a manner that will minimize sprawl and the inefficient use of shoreline areas.
2. Encourage commercial development to utilize existing transportation corridors and to minimize the number of ingress/egress points. Ingress/egress should be designed to minimize potential conflicts with, and impact on, regular corridor traffic.

NS-9.20: Flood Hazard:

1. Restrict or prohibit development uses in flood plains that will be dangerous to health, safety or property during flood events.
2. Require enhanced construction standards in areas that are vulnerable to flooding.

NS-9.21 Industrial:

1. Restrict new industrial lands from being sited on sensitive and ecologically valuable shorelines.
2. Encourage new industrial development to provide physical and/or visual access to shorelines.
3. Encourage Industrial and Commercial Development within incorporated Urban Growth Areas, Rural Areas of More Intense Development, Major Industrial Developments, lands designated as Commercial and Industrial, and on existing Port-owned and/or operated parcels.

NS-9.22: Mining:

1. Protect water bodies from sources of pollution, including but not limited to, sedimentation and siltation, chemical and petrochemical use, and spillage and storage/disposal of mining wastes and spoils.
2. Minimize the disruption caused by mining activities so that the natural shoreline systems can function.
3. Minimize adverse visual and noise impacts of mining on surrounding shoreline areas.
4. Return closed mining sites to as near a natural state as feasible upon closure.

NS-9.23: Recreational Development:

1. Locate and design shoreline recreational developments to reflect population characteristics, density and special activity demands.
2. Design recreational developments to minimize adverse impacts on the environment.
3. Encourage a variety of compatible recreational experiences and activities to satisfy diverse recreational needs.

4. Encourage the linkage of shoreline parks, recreation areas, and public access points with linear systems, such as hiking paths, bicycle paths, easements and/or scenic drives.
5. Locate and design recreational developments to preserve, enhance, or create scenic views and vistas.
6. Locate, design and maintain trails and pathways to protect bank stability.

Chapter 6 – Economic Development Element

Introduction

Purpose of the Chapter

A healthy economy is essential to the vitality and quality of life in Grant County. While the natural setting of the County largely determines the parameters within which economic development may occur, virtually every other feature of community life is dependent on the area's economy.

This Element places economic development within the context of the County's other goals and policies. To be able to provide adequate employment opportunities for the projected population growth during the planning period, the economy must grow. Growth, however, is subject to the constraints of the natural setting and the vision of our citizens. Gaining consensus for the direction economic development should take enhances economic development efforts.

Economic growth also requires investment in the infrastructure of the County, including transportation facilities, water and sewer systems, and private utilities. Having industrial and commercial sites available, ready-to-develop at an affordable price is a prerequisite to effectively participating in the competition of new companies. Changes in the economic development of the County also may impact its demographic composition and affect both the type and location of needed housing. Because economic development can have system-wide impacts, proposed economic policies must be addressed. Those policies or activities that are not sustainable within the constraints of the County do not contribute to the overall well-being of the County.

This Element is related to many other elements of this Plan. The Natural Setting, Land Use, Capital Facilities, Utilities, and Housing Elements describe plans and policies for infrastructure development and land use. These elements lay the groundwork and form the "building blocks" for economic development.

Grant County's Vision for the 21st Century

Grant County seeks to maintain and enhance its quality of life while achieving benefits of growth and minimizing any negative effects. Our vision defines our future and how we will respond to growth and change. Our vision centers on the following basic economic value:

“Promote a healthy, diversified and sustainable local and regional economy by supporting existing local businesses, making prudent infrastructure investments, and encouraging new business that is compatible with and complementary to the community.”

Overview

Grant County is part of what many have called the “other Washington,” composed of a struggling rural economy outside of the dynamic, healthy urban economy found in many Washington metropolitan areas. In recent decades, employment growth has faltered in resource-based industries, such as farming and forest products, which has provided the economic foundations for many of these rural areas in the state. Of particular concern is a group of rural counties, many of whom have not shared in the state’s recent economic prosperity. With double-digit unemployment rates, depressed per capita incomes, and low rates of employment growth, these “distressed” counties indicate they have been left behind economically.

Although Grant County has been designated as a “distressed” county, some aspects of the county’s economy stand in sharp contrast to a number of other counties that comprise the “other Washington.” While high unemployment rates continue to persist, Grant County is among the state’s leading counties in population growth and employment gains during the 1990s.

Grant County’s vision for its economic future focuses on such key words/phrases as vitality, diversity, quality-of-life, sustainability and growth. As Grant County moves into the twenty-first century, it has the opportunity to excel and enjoy the benefits of balanced economic growth without compromising its quality-of-life. Effective local economic development planning and well-informed decision-making and action are needed to achieve these goals.

Overview Comment

The Action Alternative again is in conflict with the state’s goal to promote economic opportunity for all citizens of this state, especially for unemployed and for disadvantaged persons. The US Census Bureau shows the Coulee Community with families below the poverty level for higher than the state. The drawdown will cause a drop in tourism, which in turn will cause an economic downturn in their economy, impacting an already disadvantaged community

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Economic Development Comment

The Economic Development element of the County's comprehensive plan for the vision for the 21st century is in conflict with the Action Alternative. The city, County, and port have invested in infrastructure to promote recreation and tourism, to encourage new business is compatible with and complimentary to the community. Drawing the lake down during the busiest time of the year leaving no swimming beach or boating facilities will severely impact that vision. This will adversely impact a healthy, sustainable local economy, limiting infrastructure, investment and discouraging new business.

Relationship To Other Plans

Growth Management Act Requirements

The Growth Management Act (GMA) essentially creates a framework to plan for economic development through the Act's thirteen goals, requirements for countywide planning policies, mandatory plan elements, and other planning requirements. Economic development is one of these core goals of the Act. Furthermore, integration of economic development into this GMA framework helps to ensure that policies, regulations, and procedures produced are consistent with the broad community vision, reflect the preferred local economic strategies, and support sustainable and vital local economies.

Operationally, the GMA states this economic development goal is to:

Encourage economic development throughout the state that is consistent with adopted comprehensive plans, promote economic opportunity for all citizens of this state, especially for unemployed and for disadvantaged persons, and encourage growth, all within the capacities of the state's natural resources, public facilities, and public services.

GMA recognizes that economic development planning no longer stands alone as an isolated activity, but is an integral part of comprehensive planning and community development. Furthermore, economic development has evolved from its perceived singular focus on commercial and industrial development to a broader emphasis on the role the economy plays in implementing the county's vision. Not only does the local economy provide jobs and income for its residents; it creates the tax base to support education, public safety, infrastructure, environmental management, and other public services and programs.

County-Wide Economic Development Planning

Although this effort represents the first county-wide economic development plan, various Grant County entities have been engaged in economic development planning activities. In October 1997, Grant County Economic Development Council (EDC) developed a

consensus mission statement for Grant County. This mission statement also included the stated goals and priorities of the EDC. The mission statement of the Grant County Economic Development Council is:

To work for the continued, orderly growth of the Grant County economy through coordinated marketing and planning activities while maintaining a favorable quality of life for its residents.

The stated goals and priorities of the Grant County EDC are:

- To promote and attract new business to Grant County;
- To assist retention and expansion of existing business;
- To serve as a facilitator for public forums on vital issues affecting economic growth in Grant County; and
- To increase the coordination of, and support for, community and economic development services in Grant County.

In many ways, the stated mission and goals of the Grant County EDC is similar to the articulated vision of the residents of Grant County.

Objectives of Economic Development Policies

Economic development planning is difficult, complicated by interrelationships among markets and between markets and policies in the real world. In addition, the context of economic development planning is important—planning within rural areas is vastly different from planning in metropolitan areas. Complications begin with definitions: what is economic development? How does it differ from economic growth?

Although economic development has been defined differently over the years, it has become increasingly synonymous with “jobs,” signaling various economic and social issues. In practice, economic development is essentially the process by which individuals and organizations make decisions to invest in an area. Through innovations and adaptations, these investors increase their capacity to create wealth. The results are new, expanded, or retained, industrial, commercial, or service enterprises and new or retained jobs.

Local economic development is a process requiring both the efforts of private and public sectors to achieve its potential. While the basic elements of economic development—such as availability of labor, capital, appropriate technology, infrastructure, and support services—are the same regardless of the area, the basic characteristics of rural and urban areas differ. Several important variations influence what development strategy is adopted and the nature of effective public-private partnerships.

- First, the growth or decline of business and population has a greater relative impact in smaller, rural areas. For example, the expansion of a manufacturing industry leading to the addition of 100 new jobs would have little impact on day-to-day service demands in a metropolitan area. Such an investment, however, would add several percentage points to the employed workforce and associated population within a rural area. The resulting growth could strain the ability of the town to provide utility hook-ups, fire protection, and other community services. Conversely, the loss of a 100-employee plant has a much more severe impact on the economic well-being of a rural area than a metropolitan city. The job losses may result in outmigration, a lower tax base, underutilized public facilities, and municipal fiscal deficits.
- Second, many rural areas are dominated by one or two industries, whether agriculture, forestry, mining, or manufacturing. Such dependence makes them especially vulnerable to downturns caused by factors ranging from changing global markets to bad weather. Unlike their metropolitan counterparts, rural areas often do not have the breadth in their economic bases to help cushion the effect of problems confronting specific industries. Consequently, development policies aimed at technological modernization and competitiveness often take on greater importance in rural areas.
- Third, the smaller and less dense population base in rural areas make delivery of basic services more difficult. The logistics and mechanisms for providing public services in urban areas produce economies of scale impossible for rural areas to duplicate.
- Fourth, rural areas often lack the capacity—enough trained staff, locally generated development capital and technical resources, and sufficient access to outside resources—to take advantage of public assistance programs and private development opportunities. Indeed, the need to build local capacity is the most pressing development issue for many rural areas.

Economic development is fundamentally linked with economic welfare and social well-being or quality of life, both now and in the future. Indeed, this linkage between economic welfare or quality of life and economic development policies has become so important; it has been called the “second paycheck.” An area’s net quality of life benefits are analogous to a second paycheck that each resident of the region receives, supplementing the first paycheck received from an employer or other source of income. Some economists argue that the sum of these two “paychecks” determines the overall well-being of the area’s residents.

In contrast to economic development, economic growth is more a quantitative measure—more investment, income, jobs, output, and consumption—within the local economy. Economic growth essentially means more economic activity, and generally results from economic development.

When government pursues economic development and achieves economic growth, there will likely be debate about the merits of that growth. On the positive side are the benefits to the local area including increased jobs and income, growth of services, and developed space; on the negative side are the inconveniences that accompany growth such as congestion, pollution, and the loss of open space.

Most citizens recognize the inherent tradeoffs—some favor growth while others fear the negatives. The diversity of interests requires government to pursue a broad range of objectives, many of which may conflict. The challenge for governments undertaking economic development is to recognize these potential conflicts and make sound decisions about the inherent conflicts among various objectives.

Public policy should not try to maximize a single objective because the result would most certainly be a reduction in the overall welfare of the local area. For instance, maximizing employment or income might result in severe reductions in local environmental quality. Conversely, maximizing environmental quality might mean stopping most development. Instead, the public sector should pursue an overall strategy that optimizes multiple objectives.

Even if government could maximize economic outcomes in the aggregate (i.e., Grant County taken as a whole), many decisions turn on what happens at the disaggregated level (impacts on specific industries, locations, or groups). Economists see this distinction as essentially a tradeoff between efficiency and equity: policies that may generate the most benefits in the aggregate may in turn distribute those benefits and costs so poorly that they will be rejected by citizens and policymakers. Other policy issues abound. For instance, who should County economic development programs be assisting—businesses or workers, existing firms or new firms? Where should jobs and employees be located?

Residents in Grant County would agree that the outcome of economic development planning should be to make them better off. Unfortunately, there is no practical way to maximize a single objective at the exclusion of others. Thus, government needs to be recognize that: (1) they will pursue multiple economic development objectives; and (2) they must have the public support for these objectives.

Planning processes in economic development spend a great deal of time at the front end discussing and debating broad goals and objectives to achieve this level of support. The citizen's advisory committee did not spend much time on this discussion since the framework had already been adopted through the 1997 mission statement of the Grant County Economic Development Council.

Economic Development Comment

In the objective of Economic Development policies, first the growth or decline of business and population has a greater relative impact in smaller, rural areas. Second, many rural areas are dominated by one or two industries, to tourism and agriculture in the Coulee Community, such

dependence makes them especially vulnerable to downturns. Third, the smaller and less dense population base in rural areas make delivery of basic services more difficult.

Economic development is fundamentally linked with economic welfare and social well-being or quality of life, both now and in the future. This linkage between economic welfare or quality of life and economic development policies has become so important; it has been called the "second paycheck."

The Action Alternative is contrary to our objectives of economic development. The decline of business and population due to the lack of facilities during the busiest time of the year, causing a drop in visitors, will have a greater negative impact because this is a small rural area.

The Coulee Community relies on tourism and agriculture as its economic base. Because the community relies heavily on tourism, the Action Alternative will make them very vulnerable to a downturn. Because economic development is lumped with economic welfare and social well-being or quality of life, the Action Alternative will have a negative affect on the quality of life for the Coulee Community.

Needs Assessment

This section presents five realistic economic development options for Grant County based on the County economic SWOT assessment and discussion with county officials and civic leaders. These options will help serve as guides for the county to develop and implement a formal economic development action plan.

Option 1: Attract New Employers

Attracting new basic employers for whom there is a comparative advantage to the county will add employment and income directly. Through the economic multiplier effect, other jobs and income will also be added within the county. Basic employers can include (a) manufacturing; (b) nonmanufacturing, such as tourist attractions, computer services, and wholesale warehouses; or (c) non-local government. Action steps/policies to meet this goal include:

- Identification through targeted research of basic employer(s) with greatest potential;
- Encourage value-added agricultural production and processing;
- Provision of adequate, serviced and environmentally acceptable sites that would meet the full range of industrial/business needs and opportunities;

- Make the necessary infrastructure investments in transportation, water and sewer, telecommunications, and other utilities as needed to leverage private investments that create jobs; and
- Identification and organization of financial capital resources to assist in attracting new business (e.g., industrial revenue bonds, infrastructure grant/loan).

Option 2: Cultivate Home-grown Businesses

Once overlooked, small cities and rural counties are now discovering that a strong home-grown business development strategy can often become their most powerful business attraction strategy. For many smaller communities and rural areas, a more appropriate and realistic approach may be to grow their own industries job by job than to recruit outside industry.

Every community and area has the opportunity to develop home grown businesses. Most of these businesses have modest beginnings. They start small and keep overhead to a minimum and remain flexible. Keeping costs low, these local entrepreneurs can compete effectively with larger, more established competitors. As they gain experience and market visibility, many expand and hire employees. For local economic developers, the bottom line is growth job by job.

Historically, little has been done to take advantage of this opportunity. However, there is much an area or community can do to cultivate and nourish home grown businesses:

- For many areas and communities, a realistic starting point is to identify individuals living in the vicinity who have either recently started a business or have a business idea that they would like to develop. This may include an established business with an interest in developing a new product or business line. First-time entrepreneurs seldom have much knowledge of business management, marketing, business plans, and applicable government regulations. A valuable local area role is establishing a mentoring program—simply matching individuals with business ideas to those able to help develop their ideas. Another possible avenue is to encourage the local high school to establish an entrepreneurship program for students.
- Local area studies of market potential for new retail, wholesale, service, or industry input-providing businesses may identify opportunities for new local establishments.
- Organization of local area capital resources to assist new business formation by encouragement of investment of private funds locally through the formation of capital groups, or the use of secondary capital markets.

- Provision of small business incubators to nurture new local businesses. Typically, these incubators are community- or port-owned facilities that provide low-cost space and technical assistance to help local entrepreneurs turn a hobby into a full-time business and successful component of the local business community.
- Related to the business incubator concept, Grant County (or Big Bend Community College) should assess the prospects of developing a telecenter. Among the fastest growing occupations into the next century will be within information-based businesses such as data processing, legal research, computer-assisted engineering design, and accounting. A telecenter is similar in concept to a business incubator. Both provide the necessary support for start-up businesses. Telecenters, however, specialize in information-based jobs that can be performed using computers and telecommunication technologies. Individual businesses in Moses Lake, for example, could provide data processing services for large companies located in Olympia, Tacoma, Portland, and Seattle.

Option 3: *Diversify the Existing Economic Base*

The economy of Grant County has been dependent upon the natural resource-based industries of agriculture production and processing. Agriculture, however diverse, can be seriously affected by market conditions. Much can be done to assist these basic firms; by increasing their competitiveness, the greater likelihood that firms will be retained or expanded within the local area. Action steps/policies recommended include:

- Strengthen the management capacities of existing growers and processors through educational programs;
- Encourage business growth through the identification of equity and loan capital sources;
- Increase knowledge of new technology through educational programs in agricultural science and engineering;
- Assist employers in improving workforce quality through vocational and technical education, employment counseling, and supportive social services;
- Develop local infrastructure and technical expertise that improve local business efficiency and access to nonlocal markets; and
- Sponsor business and industry recognition or appreciation events. Although such events do little per se to increase their competitiveness, they are effective stimulants in encouraging business leaders to stay within the local area and to expand.

Option 4: Promote Grant County as a Destination for Tourists

Tourism in the United States has expanded steadily during the past 30 years. Driving factors of tourism are more people with greater leisure time and higher income levels. Tourism has become an important economic opportunity for small towns and rural areas that are able to offer travelers a unique experience. Rural tourism can range from bed and breakfast inns to farm vacations to harvest festivals. A common thread to most successful rural tourism efforts is the promotion of rural qualities and natural resources of small town USA. For instance, many rural areas exploit their natural resource heritage or early settlers' ancestry with interpretive centers.

Thousands of vehicles pass through Grant County on U.S. Interstate-90 and U.S. Route 2 each day. Thousands more traverse the county on state routes. The Washington State Department of Community, Trade & Economic Development estimates that visitors and tourists spend over \$104 million each year in Grant County. Grant County has yet to tap its enormous tourism potential by capturing dollars spent by area travelers and bringing additional tourists to the area.

Needs Assessment Comment

Grant County's needs assessment developed options that will help serve as guides for the County to develop and implement a formal economic action plan. One option is to promote Grant County as a destination for tourists. It is estimated that visitors and tourists spend over \$104 million each year in Grant County. Grant County has yet to tap its enormous tourism potential by capturing dollars spent by area travelers and bringing additional tourists to the area. The Action Alternative will have the opposite effect. When tourists come to Coulee City and see a muddy beach and a boat launch high and dry, they will leave and not come back. This will not attract additional tourists.

Option 5: Keep Shopping Dollars at Home Where They Are Needed

A serious problem facing many rural areas like Grant County is an increasing tendency by local residents to travel to larger cities for shopping. Residents shopping outside Grant County results in lost business for local merchants. Can Grant County merchants regain some of these shopping dollars lost to surrounding regional shopping areas? It may be possible for Grant County retailers to regain a significant share of its local market within five years.

Rural areas and small communities across the nation have successfully implemented a four-point retailing program to bring shoppers back to the local community. These four points are:

- **Organization.** Early and active participation by merchants, residents, and local government is essential for success in recapturing lost retail sales. Strong organization is the key to achieving the necessary community involvement.
- **Appearance.** Cleanliness of streets and sidewalks, attractive stores and buildings, interesting window displays, simple but effective in-store merchandising are some elements of community efforts to encourage local shopping.
- **Promotion.** Shopping locally is partly out of habit. Local businesses must encourage people to patronize their stores by offering special promotions, friendly service, supporting local events, and investing in regular advertisements. These efforts help people develop the habit of shopping locally.
- **Business development.** One of the major reasons why businesses fail is that the needs of their customers' change but the businesses don't. To bring shoppers back, each business needs to make a realistic appraisal of their business. Often by changing long established merchandise lines, improving store appearances, and bettering service, new life can be restored to declining retail businesses.

This approach is a not only a prescription for new economic health for local retailers; it may have broader economic development implications. For instance, these requisite steps in bringing back local shoppers are also needed to attracting tourists and visitors to the community. And recruiting a major new employer to the area may be unsuccessful unless steps are taken to promote more local shopping.

Goals & Policies

Goals and policies follow the shared vision for the future of Grant County for sustaining and improving our quality of life. Goals and policies are also consistent with the Planning Goals of the Growth Management Act. Goals are broad statements of a community's aspirations. Policies express a commitment to a course of action. Policies provide overall direction for implementation of a strategy. Policies provide clear guidance for decision-making subject to this Plan, and form the basis for development regulations. Goals and policies do not apply to incorporated cities, but rather, only to unincorporated areas of the County, including the unincorporated portions of UGAs.

Following are the goals and policies of the Comprehensive Plan related to Economic Development. Included are recommended action steps to pursue each of these economic development goals.

Goal ED-1: Encourage diverse employment opportunities that satisfy the socioeconomic needs of Grant County residents.

Policies

ED-1.1: Facilitate the creation and retention of family wage jobs that meet the needs and demands of Grant County residents.

Actions: The County may consider implementing the following actions under this policy:

1. Streamline zoning, subdivision and other planning and permitting regulations.
2. Maintain an operational computerized database (in GIS format) of industrial properties for planning purposes.
3. Expedite planning and permitting actions to take advantage of appropriate industrial development opportunities.
4. Seek high level of cooperation with other local governments and federal and state agencies in areas that affect issues of mutual concern and that could impact continued countywide economic development.
5. Support local economic development agencies and industry groups in market research efforts.
6. Seek ways to enhance utility and transportation infrastructure needed by industry within county.
7. Seek ways to promote flexibility and deregulation of markets for products sold by or used by industries in county.

ED-1.2: Encourage business investment as a means to provide job opportunities for Grant County residents.

Actions: The County may consider implementing the following actions under this policy:

1. Make necessary public infrastructure investments in transportation, water & sewer, telecommunications, and other utilities to leverage private investments that ultimately create jobs.
2. Provide adequate, serviced and environmentally acceptable sites that would meet the full range of industrial and business needs and opportunities.

3. *Identify and organize financial capital resources to assist in attracting new businesses.*

ED-1.3: Encourage diverse job options and entrepreneurial opportunities for persons interested in full-time or part-time employment or desiring to own their own businesses.

Actions: The County may consider implementing the following actions under this policy:

- a) *Participate in job fairs, information outreach sponsored by local development agencies, job training centers, and industry.*
- b) *Encourage entrepreneurship by removing barriers to new business development and promoting efficiency in government.*
- c) *Identify local and non-local financial capital sources to assist new business formation.*
- d) *Establish a mentoring program for first-time entrepreneurs by matching individuals with business ideas with those able and willing to help develop their ideas.*
- e) *Conduct local area studies of market potential for new retail, wholesale, service or industry input-providing businesses to identify opportunities for new local establishments.*
- f) *Assess the feasibility in providing a small business incubator to nurture new local businesses.*

ED-1.4: Encourage educational opportunities for residents of all ages to develop and upgrade skills required for employment, advancement and entrepreneurship.

Actions: The County may consider implementing the following actions under this policy:

1. *Use development funds to provide education infrastructure and training for existing and prospective workers of local industries.*
2. *Support job training programs and skill enrichment programs.*
3. *Encourage local school districts to establish entrepreneurial program for students.*

ED-1.5: Work cooperatively with the Grant County Economic Development Council, Big Bend Community College, and other local jurisdictions to address employment needs consistent with county-wide regional policies.

ED-1.6: Encourage and accommodate home-based businesses and cottage industries that are consistent with the character of adjoining properties and neighborhoods.

Actions: The County may consider implementing the following actions under this policy:

1. *Promulgate special land use classifications and designate areas of the county as needed for small industry neighborhood zoning. This would enable for so-called "lone eagles" and cottage-based industries to pursue economic activity.*
2. *Support development of telecommunications infrastructure and transportation services (including scheduled air service) required by home-based businesses and cottage industries.*

ED-1.7: Cooperate with education providers and employers in developing facilities and programs meeting a continuum of educational needs at the K-12, college, and continuing education levels.

Goals and Policies Comment

Grant County's goals and policies for economic development (ED-1): encourage diverse employment opportunities that satisfy the socio-economic needs of Grant County residents. Policy (ED-1.2): encourages business investment as a means to provide job opportunities for Grant County residents. The City, County and Port of Coulee City have made significant investment at the park to create tourism. The Action Alternative will have a negative effect because people will not want to stay. This will not encourage business investment.

Goal ED-2: *Encourage economic growth through planning and development of the region's public services and facilities' capacity.*

Policies

ED-2.1: Public service providers in Grant County should provide those services and facilities necessary to support a high quality of life and attract business investment.

ED-2.2: Review land use and permitting procedures to assure that regulatory processes are understandable, predictable, and can be accomplished within

reasonable time periods in a manner that meets or exceeds state statutory requirements.

Actions: *The County may consider implementing the following actions under this policy:*

1. *Undertake comprehensive utility and other public service planning in order to take advantage of development opportunities, while addressing potential capacity shortfalls in given industrially-zoned locations within the county.*
2. *Provide planning flexibility that will be responsive to unforeseen or changing economic conditions and community desires.*
3. *Encourage long-term programs that effectively build local capacity for sustained economic development.*
4. *Support the development of transportation, and public water, sewer and utility systems that enhance economic growth.*
5. *Seek ways of cooperating with local governments and federal and state agencies to expedite land use and permitting procedures.*
6. *Evaluate issues that impinge upon permitting of natural resources and land uses.*

Goals and Policies Comment

Goals and policies (ED-2): encourage economic growth through planning and development of the region's public services and facilities capacity. Again, Coulee City and the County have invested in public water, sewer and infrastructure that effectively build local capacity for sustained economic development. The Action Alternative is contrary to this.

Goal ED-3: *Ensure an adequate supply of commercial and industrial sites to provide opportunity for new and expanding businesses to locate or remain in Grant County.*

Policies

ED-3.1: Encourage a range of commercial retail and service businesses to meet local resident needs and serve visitors to Grant County.

Actions: *The County may consider implementing the following actions under this policy:*

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1. *Encourage convenience-oriented retail within Rural Villages, UGAs, and Rural Communities that are convenient to residential neighborhoods and major employment centers.*
 2. *In cooperation with local jurisdictions, identify an inventory of suitable commercial sites adequate to meet anticipated demand during the planning period.*
- ED-3.2: Plan for a diversity of ready-to-build sites with sufficient support infrastructure and services needed to meet the demand for industrial land for the duration of the planning period.
- Actions: The County may consider implementing the following actions under this policy:*
1. *Undertake periodic studies of industrial growth in order to set planning targets for industrial sites and adjust long-term forecasts accordingly.*
 2. *Undertake evaluations of industrial siting in regard to land use requirements and infrastructure needs.*
 3. *Encourage the re-use and redevelopment of existing industrial sites that are no longer viable for their original or previous use.*
- ED-3.3: Encourage low-cost, easily accessible, state-of-the-art telecommunications services throughout the County.
- Actions: The County may consider implementing the following actions under this policy:*
1. *Undertake evaluations of market conditions, regulatory policies, and franchising requirements pursuant to the permitting and/or licensing of telecommunications services.*
 2. *Encourage development of state-of-the-art cable inerties that meet band-width requirements for high-speed signal transmission.*
- ED-3.4: Facilitate the retention and expansion of existing local businesses and start-up of new businesses particularly those that provide family wage job opportunities and operate in compliance with applicable regulatory requirements.
- Actions: The County may consider implementing the following actions under this policy:*

1. *Undertake prospective (and periodic) analyses of market conditions and land use needs of existing key industries.*
2. *Establish policies and programs in cooperation with local governments and state agencies to ensure business retention within the county.*

ED-3.5: Industrial sites designated under this Plan should be protected from encroaching incompatible uses.

Actions: The County may consider implementing the following actions under this policy:

1. *Develop performance and/or site design standards on non-industrial lands adjacent to designated industrial lands.*
2. *Lands designated as "Heavy Industrial" should be governed by performance standards set forth in the zoning ordinance. Such performance standards should include, but shall not be limited to:*
 - *Compliance with pertinent regulations regarding discharge of pollutants;*
 - *A maximum noise level standard;*
 - *Stream and watercourse protection;*
 - *Odor, glare, smoke, traffic and other nuisance standards.*

ED-3.6: Jurisdictions in Grant County shall regularly update inventories of land utilization, land demand, and suitable available properties for residential, industrial, commercial, public facility, and agricultural uses.

Goal ED-4: *Preserve the strength of the existing agricultural industry while diversifying the local economy by strengthening manufacturing and promoting producer services and other basic industries.*

Policies

ED-4.1: Focus business recruitment and development on firms that will diversify the local economy and can effectively serve state, national, Pacific Rim and other global markets from a Grant County location.

Actions: The County may consider implementing the following actions under this policy:

1. *1. Develop target industry profiles and analysis screens.*
2. *2. Conduct detailed analyses of prospective needs of candidate industries.*
3. *3. Conduct formal pro forma, market and regulatory analyses, and siting studies as needed.*

ED-4.2: Encourage high value-added resource based products and businesses.

ED-4.3 Encourage the establishment of industrial parks and other light manufacturing facilities and provide zoning of facilities engaged in producer services, including computer, health services, and telecommunications.

Goal ED-5: *Maximize the positive economic impact of tourism and recreational development.*

Policies

ED-5.1: Promote visitor opportunities that are compatible with or complement the character and existing uses of natural resource lands and critical areas or the rural lifestyles of Grant County.

Actions: *The County may consider implementing the following actions under this policy:*

1. *1. Encourage lodging, retail and transportation services to accommodate enhanced visitor opportunities.*
2. *2. Support efforts to develop, refurbish and maintain scenic open space, cultural and heritage resources that are attractive to both local residents and visitors.*

ED-5.2: Support local jurisdiction efforts to improve and market visitor services.

ED-5.3: Visitor facilities should be sited at locations that can be served with necessary public infrastructure and that are compatible with neighboring uses.

ED-5.4: Provide for siting and development of Master Planned Resorts.

Goals & Policies Comment

Goals and policies (ED-5): maximize the positive economic impact of tourism and recreational development. The Action Alternative will have a negative impact to this goal.

Goal ED-6: *Improve Grant County's economy by supporting efforts to improve human and social services.*

Policies

ED-6.1: Encourage development of human and social service facilities that create job opportunities, meet community needs, and maintain Grant County's quality of life.

Actions: *The County may consider implementing the following actions under this policy:*

1. *1. Cooperate with other private and public agencies to promote the establishment of adequate housing and health care to low- and moderate-income workers and their families.*
2. *2. Expedite permitting of temporary housing, including group quarters.*
3. *3. Promote alternative financing and development initiatives for permanent housing for low- and moderate-income workers and their families.*

ED-6.2: Support development and maintenance of human and social service facilities including, but not limited to, health care, education, transportation and other services for persons with special needs.

Goals and Policies Comment

Goals and policies (ED-6): improve Grant County's economy by supporting efforts to improve human and social service. The policy to encourage development of human and social service facilities that create job opportunities, meet community needs, and maintain Grant County's quality of life. The Action Alternative clearly does not create job opportunities and from the Coulee Community customs and culture, does not meet the community needs and negatively impacts the quality of life.

Goal ED-7: Promote economic growth that conserves natural resources and open spaces, maintains environmental quality and rural character, and enhances the overall quality of life.

Policies

ED-7.1: Encourage commercial and industrial developments that incorporate innovative and/or experimental applications and demonstrate an ability to conserve natural resources and/or protect or enhance environmental quality.

Actions: The County may consider implementing the following actions under this policy:

- 1. Establish incentive programs oriented to developments using best-practice technologies (e.g., use of renewable natural resources).*
- 2. Establish program that rewards developers through expedited processes and site capacity incentives for siting or relocating facilities to areas that are compatible with surrounding land uses or critical natural resource areas.*

ED-7.2: Long-term commercially significant natural resource lands or lands in urban settlements shall be protected from encroachment from conflicting uses.

Goal ED-8: *Coordinate economic development efforts so that a clear and consistent economic policy is followed.*

Policies

ED-8.1: Work cooperatively with the Grant County Economic Development Council, Big Bend Community College, Port Districts, and other local jurisdictions to address economic development issues and make policies that are consistent with this Plan.

Actions: The County may consider implementing the following actions under this policy:

- 1. Build support for this economic development element by presenting its recommended policies and actions from the County's public and private partners.*
- 2. Place Grant County Economic Development Council and Grant County Long-Range Planning in joint-charge of the implementation of this element.*

Chapter 13 – Natural Setting Element

Introduction

Growth management, natural resource land conservation, and critical areas protection share problems related to governmental costs and efficiency. Sprawl and the unwise development of areas susceptible to natural hazards may lead to inefficient use of limited public resources, jeopardize environmental resource functions and values, subject persons and property to unsafe conditions, and affect the perceived quality of life. It is more costly to remedy the loss of critical areas than to conserve and protect them from loss or degradation. The inherent economic, social, and cultural values of critical areas should be considered in the development of strategies designed to conserve and protect lands.

In recognition of these common concerns, classification and designation of critical areas is intended to preclude land uses and development that are incompatible with critical areas. There are qualitative differences between critical areas: some are critical because of the hazard they represent to public health and safety; others because of the values they represent to the public welfare. In some cases, the risk posed to the public by use or development of a critical area can be mitigated or reduced through design; in other cases that risk cannot be effectively reduced except by avoidance of the critical area. Therefore, classification and designation of critical areas is intended to recognize the differences among these areas, and to develop appropriate regulatory and non-regulatory actions to respond to the differences.

Implementing development regulations that preclude uses and development that are incompatible with critical areas does not mean a prohibition of all uses or development. Rather, it means governing changes in land uses, new activities, or development that could adversely affect critical areas. Thus for each critical area, classification schemes should be defined and development regulations prepared that govern changes in land uses and new activities by prohibiting clearly inappropriate actions and restricting, allowing, or conditioning other activities as appropriate.

Critical area designations “overlay” other land use designations. That is, if two or more land use designations apply to a given parcel or portion of a parcel, both or all designations shall be made.

Purpose Of Element

The Natural Setting element emphasizes the conservation and protection of our natural environment while preserving people’s lifestyles and property. Grant County and the communities within it can and will continue to grow, but this growth must occur in a way that balances nature’s needs with our own. By embracing a philosophy of sustainable land use management, the County can help prevent many environmental problems and avoid the unforeseen costs associated with correcting them.

The Natural Setting Element serves two purposes. The first is to clarify the relationship between the natural environment and our built environment. The second is to carry forward the intent of the Grant County Resource Lands and Critical Areas Development Ordinance No. 93-49-CC. The ordinance provides guidelines for the designation and classification of natural resource and critical area lands and establishes regulations for their protection. This element further discusses classification and identification of such areas. By providing substantive policies and criteria that can be considered during the review of a development proposal, this element assures there is a tool not only to meet the requirements of the GMA, but also to maintain these valuable resources that help define the quality of life in Grant County. It is not the intent, however, to require existing uses to be subjected to these policies unless a change in land use is proposed in the form of a development application.

Environmental degradation or depletion of our natural resources negates some of the many reasons people wish to live here. Sensitive areas such as wetlands, open spaces, and fish and wildlife habitat contain much of the natural wealth valued by County residents. Other sensitive areas, such as land located outside fire districts or those prone to flooding are important because of the risk to lives and property posed by developing in them.

Requirements Of Other Plans

GMA Goals

The Washington State Growth Management Act (GMA) does not require a Natural Setting Element, but it does require that it address the following related goals:

- (8) **Natural Resource Industries** – Maintain and enhance natural resource-based industries, including productive timber, agricultural, and fisheries industries. Encourage the conservation of productive forest lands and productive agricultural lands and discourage incompatible uses.
- (9) **Open Space and Recreation** – Encourage the retention of open space and development of recreational opportunities, conserve fish and wildlife habitat, increase access to natural resource lands, and discourage incompatible uses.
- (10) **Environment** – Protect the environment and enhance the state's high quality of life, including air and water quality, and the availability of water.
- (13) **Historic Preservation** – Identify and encourage the preservation of lands, sites, and structures that have historical or archeological significance.

Critical Areas

The GMA also requires that local jurisdictions designate five critical areas and adopt development regulations that protect them. These critical areas are:

Wetlands;

- Aquifer recharge areas;
- Fish and wildlife habitat;
- Frequently flooded areas; and
- Geologically hazardous areas.

WAC Chapter 365-190 identifies “Minimum Guidelines to Classify Agriculture, Forest, Mineral Lands and Critical Areas” (hereafter referred to as Minimum Guidelines). Grant County is required to consider the definitions found in the Minimum Guidelines when designating environmentally sensitive areas. Definitions of each critical area according to the Minimum Guidelines, including discussion of their functions and importance, are included in this Chapter.

Grant County Resource Lands and Critical Areas Development Ordinance

Grant County adopted Grant County Resource Lands and Critical Areas Development Ordinance No. 93-49-CC on May 25, 1993, in compliance with the GMA.

The Ordinance furthered the County’s objectives to promote the public health, safety and general welfare by adopting provisions designed to:

1. Protect human life and health;
2. Further the public’s interest in the conservation and wise use of our lands;
3. Assure the long term conservation of resource lands;
4. Preclude land uses and developments which are incompatible with critical areas;
5. Classify and designate critical areas and resource lands; and
6. To develop appropriate regulatory and non-regulatory actions in response.

The Ordinance applies to all real property within the corporate limits of Grant County. Activities on lands under federal, state, or tribal ownership may be exempt from the requirements of the Ordinance.

Natural Setting Comment

In the Natural Setting element of Grant County's Comprehensive Plan, one of the state's goal is to encourage the retention of open space and development of recreation opportunities, conserve fish and wildlife habitat, increase access to natural resource lands, and discourage incompatible uses. Grant County has designated 95 percent of Banks Lake

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as open space. This was to protect the shoreline and access to the lake. Also, this was to promote and develop recreation and tourism. The Action Alternative is contrary to this goal. The drawdown will eliminate the majority of boat access to the lake. It will have a negative impact on recreation. The County has zoned 95 percent of the lake open space to protect recreation and access to the lake.

Major Issues

Critical Area Protection

The administration and enforcement of critical area protection regulations will be a recurrent issue in Grant County for some time to come. Often just talking about the protection of things like habitat and water quality protection will anger people who already believe that government regulation is too restrictive. Now that state law and local ordinance require critical area protection, education efforts on the importance of critical area protection may be the best way to address public resentment.

Water Supply

As with much of the West, water in Grant County serves competing, and often conflicting, uses. Securing certainty in our water supply will be a major issue over the 20-year planning period. Reliable access to water is necessary for direct human uses like household, agricultural, commercial, and industrial operations, and for indirect human needs such as recreation. Today, irrigated agriculture is the biggest user of water. But recently the needs of other surface water uses, particularly those dealing with the protection and restoration of anadromous fish runs, have been fiercely pursued at all levels of government.

Anadromous fish are those species, like salmon and steelhead, which are born in fresh water and eventually migrate out to sea where they spend a large part of their life. Ultimately, they attempt to return to the fresh water stream in which they were hatched in order to reproduce.

The Bureau of Reclamation Columbia Basin Project (the "Project") currently serves more than 550,000 acres of desert that have been transformed into some of the most productive agricultural land in the country. The Columbia Basin Project has fueled extensive growth in Grant County's agriculture industry, which has led to growth in complementary industries such as food processing, agricultural services, warehousing and trucking. In terms of farm-gate production value, Grant County is the second largest (behind Yakima) in the state. The overall plan for the Project calls for a total of about 1,095,000 acres of irrigated land. Due primarily to competing interest for available water to support poor salmon runs, the promise of the second phase of the Project is in jeopardy.

In February 1991, the U.S. Fish and Wildlife Service, the Washington Department of Fish & Wildlife, the three irrigation districts that make up the Project, and the U.S.

Bureau of Reclamation developed a Fish and Wildlife Plan to address the potential impacts of the proposed expansion of the Project.

In November, 1991, the National Marine Fisheries Service listed the Snake River spring/summer chinook and the Snake River fall chinook as threatened. The formal listing triggered the initiation of a recovery plan and federal agency consultation on the effects of actions on the listed salmon. This listing required the Bureau of Reclamation and other cooperating agencies in the operation of the Columbia River Power System to ensure their actions are not likely to jeopardize the continued existence of the listed species.

In 1998, the Snake River steelhead, Snake River sockeye and Upper Columbia River steelhead were listed. Over the next few years, more than a dozen additional species are anticipated to be listed under the Endangered Species Act. In September 1998, a report was issued that supported removing four dams on the lower Snake River to restore spring chinook salmon runs. The accuracy and reliability of that report has not been authenticated, and is disputed by many Grant County residents and agencies alike.

The Northwest Power Planning Council (NWPPC) is required by law to protect, mitigate, and enhance fish and wildlife affected by dams in the Columbia River Basin while also assuring the region an adequate, efficient, economical, environmentally benign, and reliable power supply. In response to the proposal to remove dams, the NWPPC has not yet taken a position on dam-breaching as of October 1998. The NWPPC implemented the largest fish and wildlife protection plan in the nation in late 1998, and intends to work closely with state and federal fish and wildlife agencies and Native American tribes to develop a decision-making framework to assist in the difficult decisions that lie ahead (J. Etchart, Chairman, Northwest Power Planning Council, October 1, 1998).

With the listing of several species as endangered and the possibility of several other listings, the competition for water uses is likely to escalate. Along with the water needs of anadromous fish habitat, the demand for water to serve our growing urban areas will increase based on expected growth and agricultural needs. The proposal to remove dams on the Snake River, while not directly affecting water supply to the Columbia Basin Project, is certainly worrisome to many.

Based on 73 years of record (1913-1986), the average annual flow of the Columbia River at Grand Coulee Dam is 79.6 million acre-feet. The net diversion from the Columbia River at Grand Coulee Dam to serve the Columbia Basin Project is about 1,500,000 acre-feet. Thus the total diversion is less than 2.0 percent of average annual flow. Some of the diverted irrigation water that is in excess of the consumptive needs of crop production eventually returns to the Columbia River between Rock Island and McNary Dams. Portions of the irrigation return flows are captured in the Potholes Reservoir system, where they are used to irrigate lands served by the Potholes system or reduce the need to supplement the Potholes Reservoir by feeding water directly from the Columbia River. Total return flows are approximately 550,000 acre-feet. (*Draft Environmental Impact*

Statement, Continued Development of the Columbia Basin Project, Bureau of Reclamation, Pacific Northwest Region, September 1989.)

If we are to sustain growth, every resident and jurisdiction within Grant County must meet the ongoing challenge of protecting and managing our water resources, and resisting proposals for elimination of the public investment we have made in reclamation and flood control projects and in economic, environmentally benign electrical power production.

Natural Setting Comment

In the natural setting element of the Comprehensive plan, one of the major issues is water supply. Securing certainty in our water supply will be a major issue over the twenty year planning period. Reliable access to water is necessary for direct human uses like household, agricultural, commercial, and industrial operations, and for indirect human needs such as recreation. The Action Alternative will create uncertainty in Coulee City's park. We have witnessed this in the past, people leave and it takes years to bring them back. Uncertainty will negatively impact the customs and culture, recreation and tourism, and the economy of the Coulee Community.

Water Quality

The water quality of our streams, lakes, and ground water influences the domestic, economic, recreational, natural and manmade environments of Grant County. We all need clean water for daily use in our homes. Residents and tourists alike use our lakes and streams extensively for recreational activities such as boating, fishing, and swimming. Many industries require clean water for manufacturing processes.

In many areas of Washington State, clean water has been taken for granted. As growth and development have increased, so have the problems associated with maintaining water quality. From industry to the individual, and commercial business to agriculture, each of us contributes in some way to reduced water quality. From this perspective, each of us must work towards its protection.

In Grant County, the impact to water quality is predominantly influenced by the Columbia Basin Project. Those impacts have been largely beneficial ones. Prior to implementation of the Project, many water bodies in the County were seasonally fed, becoming stagnant pools during dry summer months. Development of the Project enhanced such water bodies, created significant amounts of fish and wildlife habitat, and enhanced water quality.

Critical Areas & Resource Lands

Protection Standards, Land Use & Notification

Under statutory authorization of RCW 36.70A.060, Grant County adopted Grant County Resource Lands and Critical Areas Development Ordinance No. 93-49-CC on May 25, 1993, in compliance with the GMA. The Ordinance addresses agricultural, mineral and forest resources; cultural resources; and critical areas of the County. The Ordinance may:

- identify specific protection standards, including buffers, setbacks, and mitigation, for critical areas;
- identify specific land use restrictions or requirements, including requirements for primary use, accessory use, and incidental use for critical areas; and/or
- require that notification be placed on property title and/or land division documents or for regulated activities for properties within an area identified as critical areas.

Identification and Classification

Critical areas shall be identified and classified in accordance with the requirements of Grant County Resource Lands and Critical Areas Development Ordinance No. 93-49-CC.

Maps And References

The Grant County Current Planning Department maintains a series of data maps containing the best available graphic depiction of critical areas in Grant County for the purpose of administering its Resource Lands and Critical Areas Development Ordinance. These maps are for information and illustrative purposes only and are not regulatory in nature.

The maps are intended to alert the development community, appraisers, and current or prospective owners of a potential encounter with a use or development limiting factor based on the natural systems present. The indication of the presence of a critical area on the maps is sufficient cause for the County to request a site-specific analysis for the critical areas identified prior to acceptance of a development application as being complete and ready for processing.

The maps are to be used as a general guide to the location and extent of critical areas. Critical areas indicated on the maps are presumed to exist in the locations shown. The exact location and extent of critical areas shall be determined by the applicant as a result of field investigations performed by qualified professionals using the definitions found in the Resource Lands and Critical Areas Development Ordinance.

Resource Lands

Agricultural, Mineral and Forest Resources are defined and designated as specified in the Resource Lands Sub-element contained in Chapter 5 – Land Use Element.

Cultural Resources

Cultural resources are those items, both tangible and intangible, that provide us with ties to the past, a better understanding of the present, and our hope for what the future might hold. Native Americans, like the Columbia and Wanapum people, have traveled over the landscape that is now Grant County harvesting the roots and plants for food and medicine, taking shelter where the land suited them. Ensuring that a record of their presence is preserved is of concern not only to Native Americans, but to all residents. Preservation of our cultural resources, including archaeological sites and objects, traditional cultural lands, food gathering areas, and burial grounds, is important to Grant County's health and prosperity. The goals and policies of this Element serve to preserve and protect significant cultural resources of the County.

Wetlands

Wetlands are fragile ecosystems that serve a number of important beneficial functions. Wetlands assist in the reduction of erosion, siltation, flooding, ground and surface water pollution, and provide wildlife, plant, and fisheries habitat. Wetland destruction or impairment may result in increased public and private costs or property loss.

In Grant County, the wetland environment is predominantly a function of irrigation. The Columbia Basin Project currently irrigates about 660,000 acres. Reservoirs, canals, laterals, and waste ways constructed to serve these irrigated lands have contributed to rising water tables, seep lakes, ponds, and perennial wetlands in nearly all areas of the Project. The Project has provided beneficial wetlands to more than 110,000 acres of naturally drainage-impaired lands. Vegetative growth in such drainage-impaired lands has improved food, cover, and nesting habitats for many wildlife species. These wildlife populations have provided recreational opportunities in the project area for sportsmen.

In Grant County, the term "wetlands" pertains to both naturally and artificially created wetlands—except those wetlands intentionally created from nonwetland sites, including, but not limited to, irrigation and drainage ditches, grass-lined swales, canals, detention facilities, wastewater treatment facilities, farm ponds, and landscape amenities, or those wetlands created after July 1, 1990, that were unintentionally created as a result of the construction of a road, street, or highway. In accordance with the above and the requirements of the Resource Lands and Critical Areas Development Ordinance, the following activities are exempt:

- Operation, maintenance, and construction of Columbia Basin Project-related facilities by the U.S. Bureau of Reclamation as they pertain to the unintentional creation of wetland sites, namely those unintentional wetlands created after 1952 as a result of the Columbia Basin Irrigation Project;

- Ongoing and existing farming and ranching activities such as, but not limited to, (1) grazing, plowing, seeding, cultivating, harvesting for the production of food, (2) construction of facilities in support of farming operations, or (3) upland soil and water conservation practices;
- Maintenance of farm or stock ponds, irrigation ditches, drainage ditches, and farm roads in accordance with best management practices to assure that wetlands and/or their buffers are not adversely impacted;
- Maintenance, repair, operation or minor improvement of existing public streets, highways, or roads within the right-of-way; and
- Maintenance, repair, or operation of existing public utilities and noxious weed control.

In their natural state, wetlands are transitional areas between upland and aquatic environments where water is present long enough to form distinct soils and where specialized "water loving" plants can grow. Wetlands include natural marshy areas along shorelines, inland swamps, and seasonal water courses. Wetlands are typified by a natural water table that usually is at or near the surface, and there may be standing water all or part of the year. Soils that are present in wetlands are known as "hydric soils". Certain plant species, including trees, shrubs, grasses, and grasslike plants have adapted to the low oxygen content of wetland soils. These plants are known as "hydrophytes".

Another distinguishing characteristic of wetlands, in addition to soil type and types of plants present, is the wetness of the soil, or "hydrology" (i.e., how often is the soil saturated or flooded with water and how long does it last?) Indicators of wetland hydrology may include drainage patterns, sediment deposition, watermarks, stream gauge data, flood predictions, historic data, visual observation of saturated soils, or flooded soils.

In their natural state, wetlands perform functions that are impossible or difficult and costly to replace. Wetlands provide erosion and sediment control; the extensive root systems of wetland vegetation stabilize stream banks, floodplains, and shorelines. Wetlands improve water quality by decreasing the velocity of water flow, resulting in the physical interception and filtering of waterborne sediments, excess nutrients, heavy metals, and other pollutants. Wetlands also provide food and shelter, essential breeding, spawning, nesting and wintering habitats for fish and wildlife, including migratory birds, anadromous fish, and other species.

The following references may provide an indication of wetland locations in Grant County. However, these and similar resources were not prepared at a level of detail sufficient to accurately portray the exact location and extent of wetlands in Grant County, and cannot be used in place of an on-site field determination of wetlands. Mapping resources include:

- National Wetland Inventory; and
- Natural Resources Conservation Service soils maps for Grant County, hydric soils designations.

Wetlands are fragile ecosystems that serve a number of important beneficial functions. Wetlands assist in the reduction of erosion, flooding, ground and surface water pollution, and provide wildlife, plant, and fisheries habitat. Wetlands destruction or impairment may result in increased public and private cost of property loss. The Action Alternative may impair the wetlands around Banks Lake. Lowering the lake ten feet during the hottest time of the year over a month could be damaging. Again, this is contrary to what the County considers important.

Shoreline Master Program

Overview

The shorelines of the state are among the most valuable and fragile of our natural resources and there is great concern throughout the state relating to their utilization, protection, restoration, and preservation. In addition, ever increasing pressures of additional uses are being placed on the shorelines necessitating increased coordination in their management and development. Furthermore, much of the shorelines and uplands adjacent thereto are in private ownership. Unrestricted construction on the privately- or publicly-owned shorelines is not in the best public interest; and, therefore, coordinated planning is necessary in order to protect the public interest associated with the shorelines while, at the same time, recognizing and protecting private property rights consistent with the public interest. There is, therefore, a clear and urgent demand for a planned, rational and concerted effort, jointly performed by local, state, and federal governments, to prevent the inherent harm in uncoordinated and piecemeal development of our shorelines.

By ratifying Initiative 43B in the 1972 General Election, the people of the state approved the Shoreline Management Act of 1971 (RCW 90.58). This law vests counties and cities with the primary responsibility for comprehensively planning and reasonably regulating shoreline development and use. The goals, shoreline area designations, policies, regulations, and procedures set forth in the shoreline management master program are essential to the protection of the public health, safety and general welfare of the people of Grant County.

Purpose

The purposes of the Master Program are:

- To promote the public health, safety and general welfare by providing long range, comprehensive policies and effective, reasonable regulations for development and use of Grant County shorelines.

- To implement this program in a positive, effective, and equitable manner.
- To further assume and carry out the responsibilities established by the act for Grant County, and to foster by adoption the policy contained in RCW 90.58.020 for shorelines of the state: It is the policy of the state to provide for the management of the shorelines of the state by planning for and fostering all reasonable and appropriate uses. This policy is designed to insure the development of these shorelines in a manner which, while allowing for limited reduction of rights of the public in the navigable waters, will promote and enhance the public interest. This policy contemplates protecting against adverse effects to the public health, the land and its vegetation and wildlife, and the waters of the state and their aquatic life, while protecting generally public rights of navigation and corollary rights incidental thereto. The legislature declares that the interest of the people shall be paramount in the management of shorelines of statewide significance. The Department of Ecology, while adopting guidelines for shorelines of statewide significance, shall give preference to uses, in the following order which:
 1. recognize and protect the statewide interest over local interest;
 2. preserve the natural character of the shoreline;
 3. result in long-term over short term benefit;
 4. protect the resources and ecology of the shoreline;
 5. increase public access to publicly owned areas of the shorelines;
 6. increase recreational opportunities for the public in the shoreline;
 7. provide for any other element as defined in RCW 90.58.100 deemed appropriate or necessary.

In the implementation of this policy the public's opportunity to enjoy the physical and aesthetic qualities of natural shorelines of the state shall be preserved to the greatest extent feasible consistent with the overall best interest of the state and the people generally. To this end, uses shall be preferred which are consistent with control of pollution and prevention of damage to the natural environment or are unique to or dependent upon use of the state's shoreline. Alterations of the natural condition of the shorelines of the state, in those limited instances when authorized, shall be given priority for single family residences, ports, and shoreline recreational uses. These recreational uses include, but are not limited to parks, marinas, piers, and other improvements facilitating public access to shorelines of the state, industrial and commercial developments which are particularly dependent on their location on or their use of the shorelines of the state, and other developments that will provide an opportunity for

substantial numbers of people to enjoy shorelines of the state. Permitted uses in the shorelines of the state shall be designed and constructed in a manner to minimize, insofar as practical, any resultant damage to the ecology and environment of the shoreline area and any interference with the public's use of the water. Any damage that occurs as a result of permitted uses should be mitigated.

Grant County Shoreline Master Program

The Growth Management Act requires counties with an adopted shoreline master program to include the goals and policies of such program in the county's comprehensive plan. The shoreline master program goals and policies are to be considered an element of the comprehensive plan and the regulations are to be considered a part of the county's development regulations (RCW 36.70A.480). The Grant County Shoreline Master Program was adopted in 1975, and needs revision. Grant County intends to update the Shoreline Master Program after this Plan is adopted. Therefore, rather than include the goals and policies of the 1975 Shoreline Master Program in this Comprehensive Plan, the County adopts the following goals and policies to guide the update of the Shoreline Master Program.

Program Goals

In addition to the purpose stated above, the development of the Shoreline Master Program will be guided by the following nine goal statements pursuant to the program elements specified in RCW 90.58.100(2). These goals provide an overall, comprehensive foundation and sense of direction upon which the policies, regulations, shoreline area designations, and administrative procedures will be based. These following goals will provide overall guidance for the management of the shorelines of Grant County:

- **Shoreline use** – To allow for compatible uses of the shorelines in relationship to the limitations of their physical and environmental characteristics. Such uses should enhance rather than detract from, or adversely impact, the existing shoreline environment.
- **Conservation** – To preserve, protect, and restore the natural resources of Grant County's shorelines in the public interest and for future generations. These natural resources include but are not necessarily limited to fish, wildlife, vegetation, and natural features found in shoreline regions. Only renewable resources should be extracted and in a manner that will not adversely affect the shoreline environment.
- **Public access** – To provide safe, convenient, properly administered and diversified public access to publicly owned shorelines of Grant County without infringing upon the personal or property rights of adjacent residents. Such access should not have an adverse impact upon the environment.

- **Circulation** – To permit safe, adequate, and diversified transportation systems that are compatible with the shorelines, resulting in minimum disruptions to the shoreline environment.
- **Economic development** – To promote and encourage the optimum use of existing industrial and economic areas for users who are shoreline dependent and shoreline related and can harmoniously coexist with the natural and human environments; and, subsequently, to create similar areas as need arises with minimum disruption of the shorelines.
- **Recreation** – To encourage the provision and improvement of private and public recreation along the shorelines of Grant County only to the extent that the environment is not impaired or degraded.
- **Historical/Cultural/Educational** – To identify, protect, and restore those shoreline areas and facilities that are of historical, cultural or educational value. Public or private organizations should be encouraged to provide public access and protection of such areas and facilities.
- **Restoration and enhancement** – To restore and enhance those shoreline areas and facilities that are presently unsuitable for public or private access and use.
- **Implementation Process** – Provide an efficient system for administering shoreline permit applications which would eliminate unnecessary duplication of effort or jurisdictional conflicts, yet assure complete coordination and review. Provide a process to periodically update the inventory, goals, policies, and regulations to achieve responsiveness to changing attitudes and conditions.

Shorelines of Statewide Significance

The Washington State legislature designated certain shorelines as shorelines of statewide significance from which all of the people of the state derive benefit and that these shorelines should, therefore, be managed with the interest of all of those people in mind. The Act requires that the Master Program give preference to uses and developments that are consistent with the principle of statewide over local interest. The legislature determined that in order to fulfill the goal of statewide public interest in shorelines of statewide significance, local Master Programs shall give preference to uses that are consistent with the policies applied in the following order, pursuant to RCW 90.58.020:

1. The statewide interest should be recognized and protected over the local interest.
2. The natural character of shorelines of statewide significance should be preserved.
3. Uses of shorelines of statewide significance should result in long term benefits to the people of the state.

4. The natural resources and ecological systems of shorelines of statewide significance should be protected.
5. Public access to publicly owned areas in shorelines of statewide significance should be increased.
6. Recreational opportunities for the public should be increased on shorelines of statewide significance.

Shoreline Master Program Comment

Grant County's shoreline master program has the following goals that will provide overall guidance for the management of the shorelines of Grant County; shoreline use, economic development and recreation. The state recognizes public access and recreational opportunities be given preference in our local shoreline master program. The Action Alternative is contrary to both the State and County's goals. The drawdown limits access to the lake because the majority of the boat launches will be high and dry thereby limiting recreational opportunities especially around the Coulee Community.

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Goals & Policies

Goals and policies follow the shared vision for the future of Grant County for sustaining and improving our quality of life. Goals and policies are also consistent with the Planning Goals of the Growth Management Act. Goals are broad statements of a community's aspirations. Policies express a commitment to a course of action. Policies provide overall direction for implementation of a strategy. Policies provide clear guidance for decision-making subject to this Plan, and form the basis for development regulations. Goals and policies do not apply to incorporated cities, but rather, only to unincorporated areas of the County, including the unincorporated portions of UGAs.

Following are the goals and policies of the Comprehensive Plan related to the Natural Setting of Grant County.

Resource Lands

Goals and policies related to resource lands are presented in the Resource Lands Sub-element.

Cultural Resources

Goal NS-1: Identify, preserve and protect historic, cultural and archaeological resources found to be significant by recognized local, state or federal processes.

Policies

- NS-1.1: Identify known, recorded archaeological, cultural and historic resources.
- Action: Obtain a listing of sites in Grant County from the Washington State Office of Archaeology and Historic Preservation, Department of Community, Trade and Economic Development .*
- Action: The County should develop an "Cultural Resource Lands Map and Database" to gather relevant information on cultural, historic and archaeological resource lands into one location and format. The map should show the locations of all Cultural Resource Lands and relate to an OAHP database and the Grant County Assessor database.*
- Action: The County should establish a Cultural Resource Task Force comprised of citizens, Wanapum Band, OAHP, DNR, other state agency, Grant County PUD, city and County representatives to develop inventories of significant and potentially significant sites.*
- NS-1.2: Develop a local process for evaluating the significance of historic, cultural, and archaeological resources.
- NS-1.3: Preserve areas that contain valuable historical or archaeological sites of Federal, State, tribal, or local significance. Maintain and enforce provisions to the Resource Lands and Critical Areas Ordinance requiring conditioning of project approval on findings made by a professional archaeologist for development activities on sites of known cultural, historical or archaeological significance.
- NS-1.4: Prior to demolition, moving, or alteration to any designated historic, cultural, and archaeological landmark, ensure that due consideration is given to its preservation or, at a minimum, documentation of its historic, cultural or archaeological value.

Critical Areas

Goal NS-2: *Wetlands should be protected because they provide important functions that add to the quality of life.*

Policies

- NS-2.1: Wetland areas should be identified by the development applicant and reviewed by the County prior to development. If a wetland is determined to exist on a parcel subject to a non-exempt development activity, a written delineation should be required of the applicant.

- NS-2.2: The County should consider accepting written determinations, delineations and mitigation plans only from the U.S. Army Corps of Engineers, the Department of Ecology, the Natural Resources Conservation Service, or a qualified critical areas professional. The County should consider requiring that mitigation plans for unavoidable wetland impacts to be based on a wetland functional assessment.
- NS-2.3: Based on their quality demonstrated by the classification system defined in the Resource Lands and Critical Areas Ordinance, wetlands should be protected from alterations due to land use changes that may create adverse impacts to the wetland.
- NS-2.4: The County should consider incorporation of the Washington State Wetlands Rating system for Eastern Washington (Ecology Publication #91-58) into the classifications system adopted in the Resource Lands and Critical Areas Ordinance.
- NS-2.5: The County should consider incorporation of the Washington State Department of Ecology Manual titled "Washington State Wetlands Identification and Delineation Manual, March 1997" into the classifications system adopted in the Resource Lands and Critical Areas Ordinance.
- NS-2.6: Whenever feasible, innovative techniques that enhance a wetland and promote it as a useful, functioning part of the development will be encouraged.
- NS-2.7: Wetland preservation strategies and efforts, including wetland banking, should be coordinated with appropriate local, state and federal agencies and private conservation organizations to take advantage of both technical and financial assistance and to avoid duplication of efforts.

Shoreline Management

Protecting Grant County's shoreline environment is of importance to preserving the economic, environmental and cultural resources of our community. The shoreline policies that follow have been crafted to recognize these unique and valuable shoreline resources and to protect them for the benefit of future generations. These policies are intended to be consistent with the Shoreline Management Act, Chapter 90.58 RCW.

Goal NS-9: The County should recognize and protect the functions and values of the shoreline environments of statewide and local significance. For shorelines of state-wide significance (SSWS), protection and management priorities are to:

- a. Recognize and protect the state-wide interest over local interest;***

- b. Preserve the natural character of the shoreline;*
- c. Provide long-term over short-term benefit;*
- d. Protect the resources and ecology of shorelines;*
- e. Increase public access to publicly owned areas of shorelines; and*
- f. Increase recreational opportunities for the public in shoreline areas.*

Policies

NS-9.1: General Shoreline Use:

1. Maintain areas within the shoreline jurisdiction with unique attributes for specific long-term uses, including agricultural, commercial, industrial, residential, recreational and open space uses.
2. Ensure that proposed shoreline uses are distributed, located and developed in a manner that will maintain or improve the health, safety and welfare of the public when such uses occupy shoreline areas.
3. Ensure that activities and facilities are located on the shorelines in such a manner as to retain or improve the quality of the environment.
4. Ensure that proposed shoreline uses do not infringe upon the rights of others, upon the rights of private ownership, upon the rights of the public under the Public Trust Doctrine or federal navigational servitude, and treaty rights of Indian tribes.
5. Minimize the adverse impacts of shoreline uses and activities on the environment during all phases of development (e.g. design, construction, management and use).

NS-9.2: Economic Development:

1. Ensure healthy, orderly economic growth by allowing those economic activities which will be an asset to the local economy, and for which the adverse effects on the quality of the shoreline and surrounding environment can be mitigated.
2. Protect current economic activity (e.g. shipping, marinas, agriculture, etc.) that is consistent with the policies of the SMP.
3. Develop, as an economic asset, the recreation industry along shorelines in a manner that will enhance public enjoyment.

4. Ensure that any economic activity taking place along the shorelines operates without causing irreparable harm to the quantity of the site's environment or adjacent shorelands.
5. Protect current agricultural land uses of long-term commercial significance and provide for development of new agricultural uses for which adverse environmental effects can be mitigated.

NS-9.3: Circulation:

1. Provide safe, reasonable, and adequate circulation systems to shorelines where routes will minimize adverse effects on unique or fragile shoreline features and existing ecological systems, while contributing to the functional and visual enhancement of the shoreline.
2. Within the shoreline jurisdiction, locate land circulation systems that are not shoreline dependent as far from the land-water interface as practicable to reduce interference with either natural shoreline resources or other appropriate shoreline uses.

NS-9.4: Conservation:

1. Develop and implement management practices that will ensure a sustained yield of renewable resources of the shorelines while preserving, protecting, enhancing and restoring unique and nonrenewable shoreline resources, environments, or features.
2. Reclaim and restore areas that are biologically and aesthetically degraded to the greatest extent feasible.
3. Preserve scenic vistas, aesthetics, and vital estuarine areas for fisheries and wildlife protection.

NS-9.5: Public Access:

1. Ensure that developments, uses, and activities on or near the shoreline do not impair or detract from the public's access to the water. Where practicable, public access to the shoreline should be enhanced.
2. Design public access projects such that they provide for public safety and minimize potential impacts to private property and individual privacy.

NS-9.6: Recreation:

1. Optimize recreational opportunities now and in the future in shoreline areas.
2. Encourage federal, state and local governments to acquire additional shoreline properties in Grant County for public recreational uses.

NS-9.7: Historic/Cultural/Scientific:

1. Identify, protect, preserve, and restore important archeological, historical, and cultural sites located in shorelands.
2. Encourage educational projects and programs that foster a greater appreciation of the importance of shoreline management, maritime activities, environmental conservation, and maritime history.
3. Prevent public or private uses and activities from destroying or damaging any site having historic, cultural, scientific or educational value without appropriate analysis and mitigation.

NS-9.8: Wetlands:

1. Preserve and protect natural (non-exempt) wetlands to prevent their loss and degradation.
2. Identify natural (non-exempt) wetlands areas and boundaries according to established identification and delineation procedures.
3. Provide adequate mitigation for disturbance of natural (non-exempt) wetlands and buffers in the shoreline environment.
4. Maintain a wetland buffer zone of adequate width between a natural (non-exempt) wetland and adjacent development to protect the functions and values of the wetland.
5. Base the width of the established buffer zone upon the functions and values of the natural (non-exempt) wetlands.
6. Natural (non-exempt) wetlands that are impacted by activities of a temporary nature should be restored upon project completion.
7. Give preference to in-kind and on-site replacement of wetland functions and values. Where in-kind and/or on-site replacement is not feasible or practical due to the characteristics of the existing

wetland or property, mitigation of equal or greater ecological value should be provided off site.

8. Require an applicant to monitor mitigation plans, and to take corrective action if necessary, in order to ensure long-term success of mitigation projects.
9. Develop standards and procedures for wetland banking allowing for approval of wetland mitigation banks on a case by case basis until such standards and procedures are adopted.

NS-9.23: Recreational Development:

1. Locate and design shoreline recreational developments to reflect population characteristics, density and special activity demands.
2. Design recreational developments to minimize adverse impacts on the environment.
3. Encourage a variety of compatible recreational experiences and activities to satisfy diverse recreational needs.
4. Encourage the linkage of shoreline parks, recreation areas, and public access points with linear systems, such as hiking paths, bicycle paths, easements and/or scenic drives.
5. Locate and design recreational developments to preserve, enhance, or create scenic views and vistas.
6. Locate, design and maintain trails and pathways to protect bank stability.

Natural Setting Comment

In the Natural Setting element of the County's comprehensive plan, the Action Alternative is in conflict with the goals and policies. Goal NS-9.2; wetlands should be protected because they provide important functions that add to the quality of life. Dropping the lake down ten feet during the driest, hottest time of the year could negatively affect the wetlands around the lake. Goal NS-9: Shoreline Management. Lowering the lake will impact the shoreline, it will negatively impact economic development, it restricts public access to the lake, impedes recreational opportunities, could damage wetlands and lower residential development because of the negative visual quality of the mud bogs and the threat of the West Nile virus.

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Environment Justice

The US Census Bureau shows Coulee City at 15 percent of the population below the poverty level. Grant County is 13 percent and the State of Washington is seven percent population below the poverty level. The Action Alternative will have an adverse environmental justice impact on the low-income population. With a relatively high level of families at poverty level and 21 percent of families income below \$25,000 per annum, which is much higher than the County or State, loss of business to the Coulee Community will only exasperate this situation.

The Action Alternative will negatively impact the low-income in this community. Because the Northern Region relies heavily on tourism/recreation, dropping the lake to an unusable level will negatively impact business, causing layoffs, only adding to a relatively high impoverished area.

Visual Quality

The Action Alternative will have a negative impact on the visual quality of this area. There will not be a five foot strip of base land around the lake, but a ten foot strip of land. There are many shallow areas in the lake, especially the southern part along Highway 155. The drawdown will create large mud flats that will decrease the visual quality of the lake in the northern part of the lake at Steamboat Rock State Park; the Devils Punch Bowl Bay will also create large mud flats. In addition, Osborn Bay will have a large mud flat. The drawdown will have a negative visual quality to this area, especially the most heavily visited areas. The five foot drawdown is bad enough, but a ten foot drawdown will be excessive to the visual quality of our environment.

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Wildlife

The drawdown occurs at peak fishing/tourism season and would devastate the local communities along the lake, on the major Highway Routes of Highways 2, 17, and 155. Without the ability to generate revenue and taxes, these communities lose their tax base and the ability to survive. The Action Alternative will create a large shoreline of mud and stagnant water pools, the breeding grounds for mosquitoes. Nowhere in the EIS does it address the issue of mosquitoes, the mosquito born disease West Nile Virus. This virus has reached Washington and documented cases of infected horses and crows have occurred. Experts expect to document human cases and other bird cases in 2003. The EIS makes no attempt to document any impacts, or casual effects of this mosquito borne virus on humans, animals, or birds. No strategy of the use of pesticides, or the impacts is given. Alternative supplies of water to enhance flow augmentation are available from dam and reservoir release in Canada. Needlessly threatening the health of humans, animals, and birds makes no sense.

Banks Lake is a known habitat for the endangered specie, the Bald Eagle. Northrup Canyon, near the north end of Banks Lake supports a small but surviving population of our country's national bird, the Bald Eagle. Impacts to the Bald Eagle as a listed endangered species and potential negative ramifications must be researched. Prior to the arbitrary choice of any one of the Action Alternatives, it would be prudent to determine the impact any Action Alternative may have on currently listed, dependant species. This may include the recently listed pygmy rabbit populations in neighboring Douglas County. Will decreasing the level of Banks Lake effect down gradient, dependant watering sources during the hottest driest time of the year? Hydraulic

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continuity of underground aquifers is not addressed in any of the Action Alternatives. There are a number of similar questions left unanswered or omitted in this draft EIS. The Action Alternative could have a negative impact to not only animals but also the Bald Eagle.

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Social Environment

While recreation opportunities will decline at Banks Lake during the period of drawdown, especially the Coulee Community, other opportunities for water-based recreation are nearby. The problem with the nearby opportunities is they are already heavily used. It is a fallacy to believe there is other nearby recreational opportunities that Bank Lake has to offer. Overall impact to the Northern Region of Grant County economy will be great. This area depends on tourism/recreation. While lost income for the businesses will negatively affect their financial viability; the degree of impact will depend in part upon their ability to adapt their facilities to the lower lake levels in August. It will be extremely difficult to adapt their facilities with a drop in income. Grand County, the City of Coulee City and the Port of Coulee have invested a large amount of money in infrastructure in the park, camping area, boat facilities and the swimming area. This was to attract tourism/recreation and create jobs for the Coulee Community. The Action Alternative will adversely affect this investment. It will also adversely affect the low-income in the Coulee Community as explained in the environmental justice section and economic section.

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The social value of those who desire increased water for endangered salmon will have a minimal effect. The additional drawdown in the Action Alternative will only supply an additional one to two percent flows at McNary Dam. The Snake River fall

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Chinook juvenile migration tends to peak in mid-July with numbers tapering off into mid-August. Nearly half of the Snake River fall Chinook can be transported from the Snake River collector dams and will not benefit from flow augmentation from the Columbia River. In addition, there is uncertainty surrounding flow augmentation benefits for fish survival. Therefore, the social value of the Action Alternative will be nil.

The Action Alternative will negatively impact the recreational opportunities and economy of the Northern Region of Grant County. The local governments have made large investments in infrastructure to increase tourism thereby creating jobs. Again the Action Alternative will negatively impact this. The drawdown in August and part of September to increase flows of one to two percent to help salmon when their peak migration is mid-July has no social value, especially when you can barge them and there is uncertainty surrounding flow augmentation as a benefit.

Grant County government, which is responsible for our public's health, safety and general welfare, is very, very concerned over the potential negative impacts the Action Alternatives hold for our citizens!

We are also doing our best to understand the process we and our citizens are being forced to endure.

First, a biological opinion was produced which included a theory or hypothesis that increasing the river flow would support more fish.

Second, action plans are developed to support the theory presented in the biological opinion.

Third, the public, dependent on the river's water, is put through numerous processes to defend their uses of this water.

Fourth, studies designed to support and reinforce the biological opinion theory have repeatedly missed the mark and are non-conclusive and are generally questioned by the scientific community.

Common sense must prevail in this process.

1. Put this draft EIS on hold;
2. Prove or disprove the biological opinion theory;
3. Then study the impacts of all Action Alternatives; and
4. Address and mitigate all impacts raised during the EIS process, including our populations, customs and culture.

In conclusion, in 1998 the legislature passed, and Governor Lock signed, ESHB 2496, an act relating to salmon recovery. In passing the Salmon Recovery Act, the legislature declared that the state should “retain primary responsibility for managing the natural resources of the state, rather than to abdicate those responsibilities to the federal government.” This law set up a voluntary and locally-based salmon habitat restoration process, led by lead entities consisting of counties, cities, and tribal governments. The function of the entities is to develop a list of projects that help restore and protect habitat for fish within a Water Resource Inventory Area. The Act also created our state’s Independent Science Panel to “help ensure that sound science is used in salmon recovery efforts.”

Independent scientific review provides decision makers with technical feedback and perspectives that do not reflect a particular vested interest or point of view. The Independent Science Panel was established under the Salmon Recovery Act of 1998; its purpose is to provide scientific review and oversight of the state’s salmon recovery efforts and to review the adequacy of the salmon recovery plans developed by the state. Other independent science bodies have been established and are operating in the

Columbia River Basin; they were established under the Northwest Power Planning Act to advise the Power Council and its fish and wildlife program, and to review projects proposed for funding. The Governor's Salmon Recovery Office will review the role of the Independent Science Panel to ensure their work is aligned with the most pressing needs facing the state and report to the Governor by April 15, 2003. It seems premature to implement the Action Alternative prior to the Independent Science Panel report to the Governor.

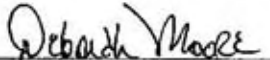
The Action Alternative will negatively impact the Coulee community customs and culture. Grant County is demanding that those customs and culture be preserved under NEPA.

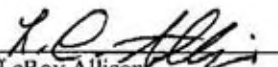
The Action Alternative is contrary to elements of our Comprehensive Plan. It is in conflict with our policies and goals of our Policy Plan. It is in conflict with our policies and goals of the Economic Development element. It is also in conflict with our policies and goals of our natural settings.

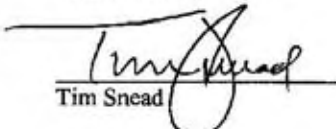
The Action Alternative will negatively impact the visual quality, environmental justice, social environment, wildlife and the local economy of the Coulee Community. The negative impact of the Action Alternative far out weighs the minimal, uncertain benefits to salmon.

Respectfully submitted,

BOARD OF COUNTY COMMISSIONERS


Deborah Moore, Chair


LeRoy Allison


Tim Snead



GRANT COUNTY
OFFICE OF
BOARD OF COUNTY COMMISSIONERS
POST OFFICE BOX 37
EPHRATA, WASHINGTON 98823
(509) 754-2011

May 31, 2001

Jim Blanchard
Bureau of Reclamation
32 C Street, Box 815
Ephrata, WA. 9882

Re: Request to participate in NEPA Process as Cooperating Agency

Dear Mr. Blanchard:

Pursuant to 40 C.F.R. @ 1506.2(b), the purpose of this letter is to request that Grant County be granted cooperating agency status in the completion of the environmental assessment or environmental impact statement pursuant to the National Environmental Policy Act (NEPA) for 10 foot draw down of Banks Lake. Pursuant to the regulations implementing NEPA, to which all federal agencies must comply (40 C.F.R.@1507.1) state and local governments may be granted (see 40 C.F.R.@1508.12) cooperating agency status when the state or local government has "special expertise with respect to any environmental impact involved in a proposal (or a reasonable alternative) for legislation or other major Federal action significantly affecting the quality of the human environment". 40 C.F.R.@1508.5. In this case, Grant County has special expertise relating to the analysis of the federal agency's proposed decision on the physical environment, custom, culture and local tax base

Additionally, according to the regulations, federal agencies shall cooperate to the fullest extent possible with state and local agencies. The regulations specifically state:

- (b) Agencies shall cooperate with State and local agencies to the fullest extent possible to reduce duplication between NEPA and State and local requirements, unless the agencies are specifically barred from doing so by some other law...such cooperation shall be to the fullest extent possible including:
 - (1) Joint planning processes;
 - (2) Joint environmental research studies
 - (3) Joint public hearings (except where otherwise provided by stature).
 - (4) Joint environmental assessments.
- (c) Agencies shall cooperate with State and local agencies to the fullest extent possible to reduce duplication between NEPA and comparable State and local requirements, unless the agencies are specifically barred from doing so by some other law. Except for cases covered by paragraph (a) of this section, such

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MOSES LAKE, WA 98837
PHONE 787-3169

LEROY ALLISON
DISTRICT 2
20266 RD. 1 SE
WARDEN, WA 98857
PHONE 349-2513

Attachment 1

cooperation shall be to the fullest extent possible, including joint environmental impact statements. In such cases one or more Federal agencies and one or more State or local agencies shall be joint lead agencies. When State laws or local ordinances have environmental impact statement requirements in addition to but not in conflict with those in NEPA, Federal agencies shall cooperate in fulfilling these requirements as well as those of Federal laws to that one document will comply with all applicable laws.

- (d) To better integrate environmental impact statements into State or local planning processes, statements shall discuss any inconsistency of a proposed action with any approved State or Local plan and laws (whether or not federally sanctioned). Where an inconsistency exists, the statements should describe the extent to which the agency would reconcile its proposed action with the plan or law.

40 C.F.R.@1502.2(b)(c)(d).

Therefore to ensure that the federal agency fully and adequately considers the effect of its proposed decision on the physical environment, customs, culture, and tax base of the citizens of Grant County, Grant County hereby request to be named a cooperating agency.

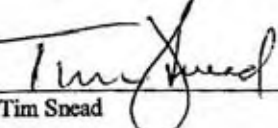
We thank you for your consideration.

Sincerely,

Board of Commissioners Grant County



LeRoy Allison, Chairman

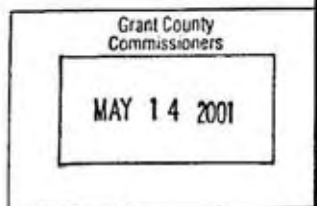


Tim Sneed

TS/gp

PUBLIC SCOPING MEETING ON BANKS LAKE DRAWDOWN

Please come to the Bureau of Reclamation's (Reclamation) scoping meeting to get information about the potential drawdown of Banks Lake in northwest Washington State. Reclamation will present alternatives being considered to draw the lake down up to 10 feet and provide opportunities to identify issues and concerns associated with the proposed alternatives or identify other alternatives for the Banks Lake drawdown. This scoping meeting is *not* part of the Banks Lake Resource Management Plan Environmental Assessment.



WHEN AND WHERE

TUESDAY, MAY 15, 2001
COULEE CITY
7:00 - 9:00 p.m.
Coulee City Middle School
Gym
312 East Main Street
Coulee City, Washington
(509) 632-5312

DIRECTIONS:
From State Highway 22, turn south at 4th Street — the Main Entrance to Coulee City. Continue south for five blocks to Main Street (the post office is on the east corner). Turn east on Main Street. Continue east on Main Street for five blocks. Main Street ends at the Coulee City Middle School. Parking is available in front of the main entrance to the school. After entering the building, proceed straight to the gym.

BACKGROUND

Action 31 of the Federal Columbia River Power System (FCRPS) Biological Opinion, issued by the National Marine Fisheries Service on December 21, 2000, calls for the assessment of operation of Banks Lake at up to 10 feet below full pool during August of each year. The reduction of pumping into Banks Lake will increase the amount of water available to support endangered salmonid stocks in the Columbia River.

This action would constitute a change in existing operations, although it is within existing operating authorization. Reclamation is currently authorized to operate the reservoir down to 5 feet below full pool; however, for the past 5 years it has been operated at close to full pool throughout the year to increase the generating capability of the pump/generators at Grand Coulee. Previous operations were within the top 2 feet of full pool during irrigation season, and then the reservoir level was drawn down 5 feet during the nonirrigation season.

BANKS LAKE

Banks Lake is operated as a re-regulation reservoir for the Columbia Basin Project (CBP). The reservoir is approximately 27 miles long and contains slightly more than 1 million acre-

feet of water at full pool. The water supply for the reservoir is stored behind Grand Coulee Dam and is lifted from Franklin Delano Roosevelt Reservoir into Banks Lake. Water is delivered into the Main Canal at Dry Falls Dam on the southern end of Banks Lake and from there delivered to approximately 670,000 acres. This is just over one-half of the authorized lands for the CBP.

WHAT RECLAMATION IS DOING

Reclamation is preparing an environmental impact statement (EIS) under the National Environmental Policy Act (NEPA). The No Action Alternative will be the current operation, which is a 5-foot drawdown in August for fish flows as called for by Action 23 of the December 21, 2001, FCRPS Biological Opinion. Under NEPA, impacts of this alternative must be evaluated and will form the basis for comparison of impacts among the action alternatives. A range of action alternatives to draw the lake down 10 feet during August of each year will be developed. The draft EIS will evaluate impacts of these alternatives compared to the No Action Alternative.

WHAT YOU CAN DO

ATTEND THE SCOPING MEETING

We need your interest and input to help address this action. Please come to the public scoping meeting and share your thoughts with us. A scoping summary describing issues identified at the scoping meeting, and in written comments received, will be developed and made available to the public. If you are unable to attend, please send us your written comments on the attached sheet by May 31, 2001.

The meeting facilities are physically accessible to people with disabilities. Please direct requests for sign language interpretation for the hearing impaired, or other special needs, to Jim Blanchard, Bureau of Reclamation at telephone (509) 754-0226, or fax (509) 754-0239. The hearing impaired may contact Mr. Blanchard at the above number via a toll free TTY relay at (800) 833-6388.

PROVIDE YOUR COMMENTS

If you would like to be on the mailing list, provide a comment, or request a copy of the draft EIS, you can send the attached comment sheet in the enclosed postage-paid envelope.

**IF WE DO NOT HEAR FROM YOU,
WE WILL REMOVE YOUR NAME FROM THIS MAILING LIST.**

**FOR ADDITIONAL INFORMATION,
YOU MAY CONTACT:**

Jim Blanchard
Special Projects Officer
Bureau of Reclamation
32 C Street, Box 815
Ephrata, WA 98823
telephone: (509) 754-0226
fax: (509) 754-0239

**GRANT COUNTY BOARD OF COMMISSIONERS
Grant County, Washington**

**Resolution No. 01-172-CC
ORDINANCE NO. 01 -172 CC**

**AN ORDINANCE FOR THE PURPOSE OF COORDINATING COUNTY,
FEDERAL AND STATE GOVERNMENT ACTIONS AFFECTING LAND
AND NATURAL RESOURCES USE IN GRANT COUNTY**

WHEREAS, Grant County has an interest in securing and promoting the public peace, general welfare, health and safety of the citizens of Grant County through preservation of their custom, culture, and economic stability, protection and use of their environment, and endorsement of their private property rights; and

WHEREAS, Grant County has an interest in providing a basis and process for determining how federal and state agencies are to coordinate and consult with Grant County in actions affecting land and natural resources, in order that the citizens of Grant County may preserve their customs, culture, and economic stability, and protect and use their land and natural resources; and

WHEREAS, preservation of the custom, culture, and economic stability of the citizens, and the protection and use of their environment, are inseparably tied to their ability to be involved in determining any regulation of their rights to use and enjoy their unique lands and natural resources; and

WHEREAS, the Board of County Commissioners have determined that the provisions of the Washington State Growth Management Act ("GMA"), regulations promulgated thereunder, the GMA Planning Policies for Grant County, and the existing land use planning process followed by the County, collectively, have not sufficiently addressed the effects that actions by federal and state agencies may have on land and natural resources use in Grant County, and which the County may address as finances dictate; and

WHEREAS, actions taken by federal and state agencies without consultation and coordination with the County and which conflict with the Comprehensive Plan and other County laws, could interfere with and defeat the purposes and goals of the Comprehensive Plan and such laws, could fail to preserve the custom, culture, economic stability and environmental quality of the citizens, and could otherwise work to the detriment of the livelihood and well-being of the citizens of Grant County;

WHEREAS, the validity of this Ordinance is based upon the rights of citizens granted by the Constitutions of the United States and the State of Washington, the authority of the County to protect and uphold such rights, and existing federal and state laws mandating that federal and state agencies consult and coordinate with local governments in actions affecting the use of land and natural resources; and,

WHEREAS, it is the desire and intent of the Board of Grant County Commissioners to interpret and enforce the Ordinance in such a manner that is consistent with the Constitutions of the United States and the State of Washington, and existing federal and state statutes; and

WHEREAS, this Ordinance shall be interpreted as providing no greater authority than the authority provided by the Constitutions of the United States and the State of Washington, existing federal and state statutes affecting use of land and natural resources, and laws of the State of Washington authorizing the actions of county governments; and

WHEREAS, this ordinance provides that any action that may be taken or authority that may be exercised by Grant County pursuant to the Ordinance or otherwise in accordance with law may be taken or exercised by the action of the Board of Grant County Commissioners.

WHEREAS, the Board of County Commissioners have taken action to set up committees and subcommittees as set forth in GCC 21.04.150; Now, Therefore,

BE IT HEREBY ORDAINED, by the Board of County Commissioners of Grant County:

1. That adoption of this Ordinance is required to secure and promote the public peace, general welfare, health and safety of the citizens of Grant County through preservation of their custom, culture, and economic stability, protection and use of their environment, and endorsement of their constitutionally protected private property rights; and
2. That a new title be added to the County Code, entitled "Title 21 – Coordinating Government Regulation" and that the initial chapter of such title be entitled "Chapter 21.04 – Coordinating Government Regulation of Land and Natural Resources Use;" and
3. That such new title shall contain the following:

TITLE 21

COORDINATING GOVERNMENT REGULATION

Chapters:

21.04 Coordinating Government Regulation of Land and Natural Resources Use

Chapter 21.04

**COORDINATING GOVERNMENT REGULATION OF LAND
AND NATURAL RESOURCES USE**

Sections:

ARTICLE I. PRELIMINARY PROVISIONS

21.04.010 Purpose
21.04.020 Coordination with Growth Management Act and Comprehensive Plan
21.04.030 Validity Under Constitutional, Federal and State Law
21.04.040 Definitions

ARTICLE II. GENERAL GUIDANCE

21.04.50 General Guidance
21.04.55 Notice

ARTICLE III. SPECIFIC GUIDANCE

21.04.060 Agriculture
21.04.070 Timber and Wood Products
21.04.080 Cultural Resources, Recreation, Wildlife and Wilderness
21.04.090 Land Acquisition and Disposition
21.04.100 Water Resources
21.04.110 Clean Air
21.04.120 Mining and Minerals
21.04.130 Private Property Rights

ARTICLE IV. MONITORING AND ENFORCEMENT

- 21.04.140 General Authorization
- 21.04.150 Coordinating Committee and Subcommittees
- 21.04.160 Research and Data Collection
- 21.04.170 Enforcement
- 21.04.180 Invalidity.

ARTICLE I. PRELIMINARY PROVISIONS

21.04.010 Purpose. The purpose of this Ordinance is to establish as County law the basis and process for determining how federal and state agencies are to coordinate and consult with Grant County in actions affecting, land and natural resources use, in order that the citizens of Grant County may preserve their customs, culture, and economic stability, and protect and use their environment. This Ordinance addresses federal and state agency regulation of land and natural resources use directly and is intended to be used as a positive guide for federal and state agencies in their development and implementation of regulations affecting land and natural resources use in Grant County.

21.04.020 Coordination With Growth Management Act. Comprehensive Plan and Existing County Law.

- A. The provisions of this Ordinance shall be in addition to and, to the extent permitted by law, coordinated with the final Grant County Comprehensive Plan adopted pursuant to the Washington State Growth Management Act. The effectiveness of this Ordinance, however, shall not depend upon the Comprehensive Plan or the authority of the County to adopt such a plan.
- B. This Ordinance shall be coordinated with existing and future County ordinances, resolutions, policies and plans. It is intended as a set of provisions that shall provide a general framework as well as specific guidance and shall work in conjunction with other County ordinances, resolution policies and plans. In the event this Ordinance conflicts with such other ordinances, resolutions, policies and plans, the provisions of this Ordinance shall be given effect to the fullest extent possible.

21.04.030 Effectiveness: Validity Under Constitutional, Federal and State Law.

- A. This Ordinance shall be effective upon adoption by the Board of County Commissioners.

- B. The validity of this Ordinance is based upon the rights of citizens granted by the Constitutions of the United States and the State of Washington, the authority of the County to protect and uphold such rights, and existing federal and state laws mandating that federal and state agencies consult and coordinate with local governments in actions affecting use of land and natural resources. If any provision of this Ordinance shall be found invalid or unenforceable by a court of competent jurisdiction, the remaining provisions shall not be affected thereby, but shall remain in full force and effect, and to that extent the provisions of this Ordinance shall be severable.

21.04.040 Definitions.

For the purpose of this Ordinance, and any regulations promulgated hereunder, the following words shall be defined as follows:

- A. "Action," when used with respect to any federal or state agency, shall have the broadest possible meaning in the context of any exercise of authority, and shall include, without limitation, any proposal, policy, regulation, rule, consideration, finding, study, or gathering or review of data, that may lead to any substantive rule, regulation or administrative action or determination.
- B. "Federal agency," "state agency" or any combination thereof, shall mean each department, agency, commission or other instrumentality receiving its authority from the executive, legislative or judicial branch of the United States or the State of Washington respectively, including without limitation independent regulatory agencies and public corporations, together with each officer, agent or employee thereof in the performance of official duties.
- C. "Private property" shall mean all property protected by the Fifth and Fourteenth Amendments to the United States Constitution.

ARTICLE II. GENERAL GUIDANCE

21.04.050 General Guidance. To the fullest extent required or permitted by law, including this Ordinance, all federal and state agencies shall in all actions considered, proposed or taken, that affect or have the potential of affecting the use of land or natural resources within Grant County:

- A. consider the effects such actions have on (i) community stability, (ii) maintenance of custom, culture and economic stability, and (iii) conservation and use of the environment and natural resources, as part of the action taken;
- B. coordinate. procedures to the fullest extent possible with the County, on an equal basis and not with the County as subordinate, prior to and during the taking of any federal or state action;
- C. meet with the County to establish, through a memorandum of understanding or otherwise, the process for such coordination, including joint planning, joint environmental research and data collection, joint hearings, and joint environmental assessments;
- D. submit a list and description of alternatives in light of possible conflicts with the County's laws, policies and plans, including the Comprehensive Plan; consider reconciling the proposed action with the County's laws, policies, and plans, including the Comprehensive Plan; and after such consideration, take all practical measures to resolve such conflict and display the results of such consideration in appropriate documentation;
- E. not, in any environmental impact statement or otherwise, assume that any proposed actions would be consistent with County conditions or would have a non-significant impact, without coordination and consultation with the County and review of data specific to the County;
- F. in absence of a direct constitutional conflict, coordinate with the County so as to comply with federal and state statutes and regulations, and County laws, policies and plans, including the Comprehensive Plan;
- G. take appropriate mitigation measures adopted with the concurrence of the County to mitigate adequately adverse impacts on culture, custom, economic stability or protection and use of the environment; and
- H. not violate through regulatory means or otherwise any private property rights of citizens of Grant County.

21.04.055 Notice. Compliance with any provision of the Ordinance by any federal or state agency shall be required only after specific notice by the Board of Grant County Commissioners to such agency that its actions are not in compliance with the Ordinance.

ARTICLE III. SPECIFIC GUIDANCE

21.04.060 Agriculture and Livestock. The custom and culture associated with agricultural and livestock production in Grant County is significant to the economic stability, livelihood and well-being of its citizens and protection and use of their environment. The purpose of this section is to provide clear guidance to federal and state agencies when actions taken by such entities affect or have the potential of affecting agricultural and livestock production in Grant County.

- A. In general, since the regulation of any aspect of agricultural and livestock production may impact the ability of County citizens to use land and use and conserve natural resources for agricultural and livestock purposes, all federal and state agencies shall (i) notify the County of proposed actions, (ii) provide a detailed statement assessing the specific effects on the custom, culture, economy and environment of Grant County, (iii) consider all alternatives to the taking of such actions, and (iv) to the extent permitted by law, take appropriate mitigation measures adopted with the concurrence of the County.
- B. To the extent permitted by law, federal and state agencies shall avoid taking actions that are inconsistent with the Grant County Right to Farm/Mineral Resource Land Protection Provisions, Chapter 23.04.040 of the Grant County Unified Development Code , enacted on October 1, 2000, or any successor resolution, ordinance or like provision in the Comprehensive Plan, without the concurrence of the County.
- C. To the extent permitted by law, federal and state agencies shall avoid taking actions that have the effect of obstructing, or making financially inefficient, agricultural and livestock production within Grant County.
- D. To the extent permitted by law, federal and state agencies shall give adequate consideration to the designation and use of lands as agricultural lands in the Comprehensive Plan and as otherwise consistent with the custom, culture, and economy of Grant County.

21.04.070. Timber and Wood Products. The custom and culture associated with timber and wood products production in Grant County is significant to the economic stability, livelihood and well-being of its citizens and protection and use of their environment. The purpose of this section is to provide clear guidance to federal and state agencies when actions taken by such entities may affect timber and wood products production in Grant County.

- A. All federal and state agencies shall prior to initiating, studying or taking any action affecting timber or wood products production in Grant County (i) notify the

County of proposed actions, (ii) provide a detailed statement assessing the specific effects on custom, culture, economy and environment of Grant County, (iii) consider all alternatives to the taking of such actions, and (iv) to the extent permitted by law, take appropriate mitigation measures adopted with the concurrence of the County.

- B. To the extent permitted by law, federal and state agencies shall avoid taking actions that reduce opportunities for a timber and wood products industry to be continued at levels consistent with the custom, culture and economy of Grant County.
- C. The production of timber from sources in Washington, Oregon and Idaho has been and continues to be an important part in the preservation of custom, culture and economic stability and protection and use of the environment of Grant County. The provisions of this section shall therefore apply fully to actions taken by federal and state agencies with respect to sources of timber in such states.

21.04.080 Cultural Resources, Recreation, and Wildlife. The custom and culture associated with cultural resources, recreation, and wildlife in Grant County are significant to the livelihood and well-being of its citizens and protection and use of their environment. It is the continuing policy of Grant County to (i) assure for all citizens safe, healthful, productive and aesthetically and culturally pleasing surroundings, (ii) preserve important historic, cultural and natural aspects of our County heritage, and (iii) maintain whenever possible an environment which supports diversity and variety of individual choice. The purpose of this section is to provide clear guidance to federal and state agencies when actions by such agencies may affect cultural resources, recreation, and wildlife in Grant County.

- A. Before any action is considered, proposed or taken' affecting cultural resources, recreational, or wildlife uses in Grant County, federal and state agencies shall (i) notify the County of any proposed action, (H) provide a detailed statement assessing the specific effects on custom, culture, economy and environment of Grant County, including, without limitation, public health and safety, (iii) consider all alternatives to the taking of such actions, and (iv) to the extent permitted by law, take appropriate mitigation measures adopted with the concurrence of the County.
- B. Federal and state agencies shall avoid taking actions affecting recreational, cultural, and wildlife opportunities within Grant County that are incompatible with local custom, culture and economic stability or preservation and use of the environment, or that otherwise fail to protect private property rights and local determination.

- C. In connection with any action related to sensitive, threatened or endangered plant or animal species, a federal or state agency shall:
- (i) At the earliest possible time, give actual notice to Grant County of the intent to consider or propose a species for listing, or to change or propose critical habitat;
 - (ii) Base the listing of a species on the best scientific and commercial data relating specifically to Grant County and not generalized over a wider geographic area;
 - (iii) List a species as threatened or endangered only after taking into account the efforts of Grant County to conserve the species;
 - (iv) Only implement a recovery plan if it will provide for conservation of a species;
 - (v) In designating critical habitat, base the designation on the best scientific data available and, after taking into consideration economic impacts, exclude as critical habitat all impacted areas unless, based upon the best scientific and commercial data available, failure to designate would result in extinction of the species;
 - (vi) Complete and forward to Grant County in a timely manner all documentation required by law when designating critical habitat;
 - (vii) Consider and directly respond to comments submitted by Grant County,
 - (viii) Not develop protective regulations or recovery plans if a Grant County plan is in place to protect effectively the species within Grant County,
 - (ix) Protect the species through alternatives with the least impact on the custom, culture and economic stability and preservation and use of the environment of Grant County; and
 - (x) To the extent permitted by law, take appropriate mitigation measures adopted with the concurrence of the County to mitigate adequately any impact on custom, culture, economic stability, and protection and use of the environment including any impact on public use and access and private property rights.

21.04.090 Land Acquisition and Disposition. Land is significant to the preservation of custom, culture and economy, and preservation and use of the environment and natural resources. In addition, land provides much of the tax base for vital public functions, such as funding of public schools and administration of county government. When land (including any interest in land) is acquired or held in trust by federal and state agencies, it may be removed from this tax base and the citizens of Grant County may suffer as a result. For these reasons, it is the policy of Grant County that the design and development of a federal and state land acquisitions, including by forfeiture, donation, purchase, eminent domain or trust, and disposals, including adjustments and exchanges, be carried out to the benefit of the citizens of Grant County.

- A. To the extent permitted by law, federal and state agencies shall prior To acquiring any lands or interest in lands within Grant County (i) notify the County of proposed acquisitions, (ii) provide a detailed statement assessing the specific effects on the custom, culture, economy and environment of Grant. County, (iii) consider all alternatives to the taking of such actions, and (iv) to the extent permitted by law, take appropriate mitigation measures, such as payments in lieu of taxes, adopted with the concurrence of the County.
- B. Before any federal or state agency pursues any disposition, adjustment, or exchange of land within Grant County, the County shall be notified of, consulted about, and otherwise involved in all federal and state land dispositions, adjustments, and exchanges.

21.04.100 Water Resource. Grant County recognizes that the conservation and development of water resources are essential to preservation of the custom, culture and economic stability of its citizens; and protection and use of their environment. To the extent permitted by law, federal and state agencies shall avoid taking actions affecting water rights and water resources that are incompatible with local custom, culture and economic liability or preservation and use of the environment, or that otherwise fail to protect private property rights and local determination.

- A. Any federal or state action that has or could have the effect of changing existing water rights or water uses within the County shall be critically considered in relationship to the historic and current use of water in the County by humans, vegetation, livestock and wildlife. It is the intent of the County to assist federal and state agencies in the planning and management of the County's natural, cultural economic and environmental resources related to water use. Since the regulation of any aspect of water rights or water use may impact the ability of County citizens to use land and natural resources, all federal and state agencies shall, when taking any action related to restricting or limiting water use or water rights (i) notify the County of proposed actions, (ii) provide a detailed statement

assessing the specific effects on the custom, culture, economy and environment of Grant County, (iii) consider all alternatives to the taking of such actions, and (iv) to the extent permitted by law, take appropriate mitigation measures adopted with the concurrence of the County.

- B. Any proposed definition of wetlands, any action affecting the management of river flows or the sources or uses of irrigation, and any other federal or state action that has any effect on water rights or water uses within the County (i) shall be coordinated with the County, (ii) to the extent permitted by law, shall comply with all County water use plans and (iii) shall not violate any water rights.
- C. To the extent permitted by law, Grant County shall have the authority to define and designate wetlands, and to the extent such authority is exercised, and otherwise in accordance with law, federal and state agencies shall act in compliance with acceptance and enforcement of such definitions and designations. In addition, the County may continue to develop, in coordination with private land owners and governmental agencies, water management plans that encompass water resources on both governmentally owned and privately owned lands.
- D. To the extent permitted by law, Grant County shall have the authority to establish development regulations for point source and non-point source water pollution. To the extent such authority is exercised, and otherwise in accordance with law, federal and state agencies shall be subject to, and shall comply with all administrative requirements, controls, processes, and sanctions of such development regulations.
- E. The use of water that originates from sources outside Grant County has been and continues to be an important part in the preservation of custom, culture and economic stability and the protection and use of the environment of Grant County. The provisions of this section shall therefore apply fully to actions taken by federal and state agencies in any jurisdiction that affect water rights and water uses within Grant County.
- F. Before any federal or state agency acquires or agrees to acquire any interest in water rights in Grant County, directly, indirectly or in trust, for any purpose (including for transfer to or use in any other jurisdiction), by donation, purchase, condemnation or otherwise, such agency shall fully comply with all provisions of this Ordinance. In addition, federal and state agencies shall not acquire for any public purpose any interest in water rights within Grant County without (i) first

coordinating and consulting with the County; and (ii) ensuring that private water rights are protected.

21.04.110 Clean Air. Grant County recognizes that the conservation and use of clean air resources are significant to preservation of the custom, culture and economic stability of its citizens and protection and use of their environment.

- A. All federal and state agencies shall prior to taking any action affecting air usage within Grant County (i) notify the County of the proposed action, (ii) provide a detailed statement assessing the specific effects on the custom, culture, economy and environment of Grant County, (iii) consider all alternatives to the taking of such action, and (iv) to the extent permitted by law, take appropriate mitigation measures adopted with the concurrence of the County.
- B. Any federal or state action that has or could have the effect of changing existing use of air resources within the County shall be critically considered in relationship to the historic and current use of air resources in the County by humans, vegetation, livestock and wildlife. Any proposed designation of federal or state pollution non-attainment areas and any other federal or state action that has any effect on air resources within Grant County shall be coordinated with the County and shall comply with all County air quality standards and use plans.
- C. It is the intent of the County to assist federal and state agencies in the planning and management of the County's natural, cultural, economic and environmental resources related to air quality. Grant County shall have the authority to establish development regulations regarding air pollution and develop air quality protections plans of its own design. To the extent such authority is exercised, federal and state agencies shall act in compliance with acceptance and enforcement of such regulations, to the extent permitted by law. In addition, the County shall have the authority to continue to develop, in coordination with private land holders and governmental agencies, air quality management plans that encompass clean air resources throughout Grant County. To the extent such authority is exercised and otherwise as permitted by law, federal and state agencies shall be subject to, and shall comply with, all administrative requirements, controls, processes, and sanctions of such regulations and plans.

21.04.120 Mining and Minerals. Grant County recognizes that the conservation and use of mining and mineral resources are significant to preservation of the custom, culture and economic stability of its citizens and protection and use of their environment.

- A. Any federal or state action that has or could have the effect of changing existing use of mining or mineral resources within the County shall be critically considered in relationship to the historic and current use of such resources in the County.
- B. It is the intent of the County to act within the existing legal framework concerning planning and management of the County's natural, cultural, economic and environmental resources related to mining and minerals.

21.04.130 **Private Property Rights.** Grant County recognizes that the protection of private property rights is essential to preservation of the custom, culture and economic; stability of its citizens and protection and use of their environment. Federal and state agencies shall fully comply with all case law, statutes, regulations, rules, and guidelines concerning protection of private property rights in Grant County, including, without limitation (i) United States Executive Order 12630, *Governmental Actions and Interferences With Constitutionally Protected Property Rights*, dated March 16, 1988, and (ii) Section 18 of the Washington Growth Management Act, Protection of Private Property (RCW 36.70A.370), and guidelines of the Attorney General of the State of Washington promulgated with respect thereto.

- A. All private property and private property rights of Grant County citizens shall be fully protected under the Fifth and Fourteenth Amendments of the United States Constitution and the United States Civil Rights Act, as amended, and this Ordinance.
- B. The violation of the private property rights of any Grant County citizen by any federal or state agency shall be deemed to be a violation of this Ordinance and liability for such violation shall be on the federal or state agency as well as on the federal or state official or employee responsible for making any decision or implementing any action which results in such violation.

ARTICLE V. MONITORING AND ENFORCEMENT

21.04.140. **General Authorization.** Grant County shall have the authority to develop and maintain monitoring and compliance standards to evaluate and enforce compliance by federal and state agencies with the provisions of this Ordinance, the Comprehensive Plan, and other ordinances, resolutions, policies and plans of Grant County. Any actions that may be taken or authority that may be exercised by Grant County pursuant to this Ordinance or otherwise in accordance with law, may be taken or exercised by action of the Grant County Board of Commissioners. The County may by resolution of the Board of Commissioners exempt any action or area of action by a federal or state agency from compliance with this Ordinance.

21.04.150 Coordinating Committee and Subcommittees. A basic premise of this Ordinance is that involvement by citizens is crucial to the preservation of their custom, culture and economic stability and protection and use of their environment This is particularly true with respect to coordinating government regulation of land and natural resources use.

- A. In order to involve citizens in the monitoring and enforcement of compliance with the provisions of this Ordinance, there shall hereby be established the Grant County Coordinating Committee for Federal and State Actions Affecting Land and Natural Resources Use (the "Coordinating Committee"), and the subcommittees thereof named below. The basic function of the Coordinating Committee and the subcommittees shall be to monitor federal and state actions and advise the Board of County Commissioners regarding compliance by such agencies with this Ordinance. The Coordinating Committee and the subcommittees shall be advisory only and shall in no way bind the Board of County Commissioners, who shall have final authority regarding interpretation and enforcement of this Ordinance.
- B. The members of the Coordinating Committee shall be the chair and vice chair of the following subcommittees, each of which shall have the chair, vice-chair, members, and specific duties designated by the Board of County Commissioners from time to time in furtherance of this Ordinance (i) Agriculture and Livestock, (ii) Timber and Wood Products, (iii) Cultural Resources, Recreation, and Wildlife, iv) Land Acquisition and Disposition/ Mining and Minerals, (y) Water Resources, (vi) Clean Air, and (vii) Research and Data Collection. In furtherance of this Ordinance, the Board of County Commissioners may by resolution (i) expand or contract the number of members of the Coordinating Committee and any subcommittee, or On change the subcommittees or establish other subcommittees.
- C. The Board of County Commissioners shall appoint on the first Monday of each year, or as soon thereafter as practical, the chair, vice chair and other members of each subcommittee. Members of the Coordinating Committee and each subcommittee must be citizens of Grant County. over the age of 18 years, with terms of appointment as follows: Initially, members shall be appointed for one, two or three year terms; thereafter, terms shall be for a period of three years, staggered so that the terms of one-third of the members expire each year. Any person may be re-appointed at the pleasure of the Board of County Commissioners. The Board of County Commissioners may remove any person from a chair, vice chair or membership position for cause and may fill vacancies as needed from time to time.

- D. At its initial meeting, the Coordinating Committee shall adopt operational procedures for itself and the subcommittees, which, along with any later amendments thereto, shall be subject to the approval of the Board of County Commissioners. To the extent required by law, the Coordinating Committee and subcommittees shall be subject to the Open Public Meetings Act (RCW 42.30) and the Public Disclosure Act (Chapter 42.17 RCW).
- E. When determining which citizens shall be appointed, the Board of County Commissioners shall consider the purpose of this Ordinance and the functions each subcommittee and the Coordinating Committee shall perform. While no specific criteria must be met, appointments should collectively reflect an expertise and involvement in the primary subject matter, and the broad diversity of the many aspects of the culture, custom, economy and environment of Grant County.

21.04.160. Research and Data Collection. In furtherance of the purposes of this Ordinance, it is the interest of the County to develop and maintain a research data base of information regarding the custom, culture, economy and environment of Grant County.

21.04.170 Enforcement.

- A. The Board of County Commissioners shall have the authority to request the Prosecuting Attorney to bring an action to enforce this Ordinance in any court or administrative tribunal of competent jurisdiction and to seek cumulative remedies, including any criminal or civil penalties allowed by law, equitable relief, and monetary compensation when the County tax base or the general welfare or health and safety of the citizens of the County is at issue.
- B. Nothing in this Ordinance shall be construed to limit any remedy that any person may have under the laws of the State of Washington or of the United States. Every person, who under color of any law, statute, ordinance, regulation, custom or usage, of the United States or of the State of Washington, subjects, or causes to be subjected, any person within Grant County to the deprivation of any property rights secured by this Ordinance shall be liable to the person injured in an action, at law, suit in equity or other proper proceeding for redress.
- C. Any person alleging a violation of the private property rights protected by this Ordinance may, after exhausting all other state and federal remedies, submit a written complaint to the Prosecuting Attorney, who may in his or her discretion determine whether any criminal action may be brought.

- D. Every person, who under color of law, statute, ordinance, regulation, or custom, willfully subjects any person within Grant County to the deprivation of any property rights secured or protected by this Ordinance shall be guilty of a misdemeanor punishable by not more than thirty (30) days in jail, a fine of not more than \$500, or both.

- E. A recommendation for enforcement against any federal or state agency and/or its employees in any particular instance shall be taken by resolution of the Board of County Commissioners only if such enforcement is based upon both the Ordinance and an existing federal or state statute applying to the actions of such agency.

21.04.180 Invalidation.

If any provision of this Ordinance shall be found invalid or unenforceable by a court of competent jurisdiction, the remaining provision shall not be affected thereby, but shall remain in full force and effect, and to that extent the provisions of this Ordinance shall be severable.

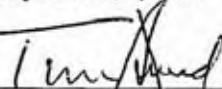
NOW THEREFORE, BE IT HEREBY RESOLVED THAT THE GRANT COUNTY COMMISSIONERS adopt this ordinance effective November 1, 2001.

PASSED this 23rd day of October, 2001.

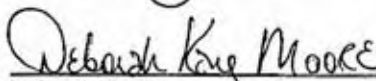
BOARD OF COUNTY COMMISSIONERS
GRANT COUNTY, WASHINGTON



LeRoy C. Allison, Chair



Tim Snead, Member



Deborah Kay Moore, Member

ATTEST:


Clerk of the Board

PUBLISHED: / /

COMMENT SL 08

From: "Lee Blackwell" <lbdirect@gemsi.com>
 To: "Jim Blanchard" <jblanchard@pn.usbr.gov>
 Date: 4/10/03 1:24PM
 Subject: Banks Lake Drawdown

10 April 2003

Dear Mr. Blanchard:

The Grant County Board of Board, its Health Officer and its employees, as well as the Grant County Commissioners and the mayors and councilpersons of most Grant County cities & towns, are deeply concerned by what we see as an ill-advised action to draw-down the water of Banks Lake to a critical level.

Our main emphasis in issuing this objection to the drawn-down, agreed to unanimously by the board, is that it creates the potential for another medical alert, just as the West Nile Virus is reaching our state. Specifically Eastern Washington. As you know, birds and mosquitoes are primary carriers of the virus.

By lowering the lake to the proposed level there will be created pockets of water left to stagnate and become breeding pockets, leading to contacts of the virus carriers with humans. Such contacts have led to deaths. We feel that the proposed level is irresponsible action, if executed.

Additionally at this time health providers, and specifically health districts whose functions are mandated services, are grossly under-budgeted for all the reasons of which you and I are aware. Asking the Health District of Grant County to expend financial resources to combat the negative impact of this inappropriate draw-down is considered a major problem.

When doing so we will basically be requested to ignore other county health issues due to resource constraints, most noticeably tuberculosis. Grant County has 25% higher incidences of TB then the next highest (King County).

With all of this being said as chair of the Grant County Health District, as well as the Mayor, City of Moses Lake, I personally find the action incomprehensible!

Yours,

Lee Blackwell, Chair
 Grant County Board of Health

Cc: GC BofH members

CC: "Patty Anderson" <PANDERSON@ep.co.grant.wa.us>, "Brzezny, Alex L." <BrzeznyA@columbiaba
 sinhospital.org>

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COMMENT SL 09

GRANT COUNTY PORT DISTRICT NO. 4

P.O. BOX 537
COULEE CITY, WA 99115

April 3, 2003

TELEPHONE
(509) 632-5681

COMMISSIONERS:

G. McDONALD
D. JORDAN
J. STARKEY

Mr. Jim Blanchard
Bureau of Reclamation
P O Box 815
Ephrata WA 98823

RE: Banks Lake Drawdown Draft Environmental Impact Statement

Dear Mr. Blanchard:

The Port District # 4 of Grant County in Coulee City would like to go on record opposing the ten-foot draw down of Banks Lake.

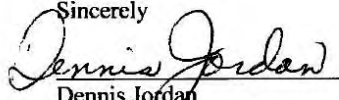
This Port District owns and operates 26 boat slips on the south end of Banks Lake, next to the Coulee City Community Park, where people from all over the state moor their boats. Should Banks Lake drop the proposed ten feet, the boat docks will be rendered useless.

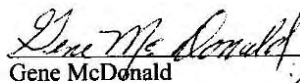
It has taken all of the 19 years the boat docks have been there to fill those boat slips and although there is currently a waiting list, the Port District foresees many problems. Not only will the Port District loose those currently renting boat slips/docks, but also there will be a drastic disinterest in future renting and the waiting list will become non-existent.

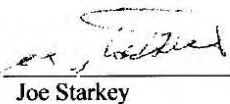
The effects of this 10' draw down will be felt not only with the inability to moor boats, but the lack of access to launch boats during the busiest time of the entire year. It is a sad state of affairs when a minority of fish take precedence over the life style, recreation and needs of human beings.

Grant County Port District # 4 rejects the ten foot draw down. The welfare of the citizen of the Banks Lake area and those who have invested in this area depend on your support of this Community.

Sincerely


Dennis Jordan
Port District # 4 Commissioners


Gene McDonald


Joe Starkey

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COMMENT SL 10



PUBLIC UTILITY DISTRICT NO. 2 OF GRANT COUNTY

MEETING OUR CUSTOMER ENERGY NEEDS IN A COST CONSCIOUS MANNER.

P.O. BOX 878 • EPHRATA, WASHINGTON 98823 • 509/754-0500
April 7, 2003

Mr. Jim Blanchard, Special Projects Officer
Bureau of Reclamation
32 C Street
P.O. Box 815
Ephrata, WA 98823-0815

Dear Mr. Blanchard:

Grant PUD is submitting these comments in response to your Draft EIS for the Banks Lake Drawdown.

Grant PUD agrees with the findings in your EIS that the proposed drawdown of Banks Lake in August will have adverse effects, especially on the recreational related aspects of our local economy but also on the power related aspects. With regard to the power related effects, any water storage capacity provides needed flexibility and reliability in the hydropower system. Many interests in our area feel the impacts, including those on power and recreation, are understated in your EIS.

Given those impacts, Grant PUD questions any positive benefits from the proposed action. First, the proposed action is assumed to provide fisheries benefits by increasing flows in the Columbia River at McNary Dam. These benefits are taken on faith in the EIS since the proposed action is a reasonable and prudent action in a Federal Biological Opinion. Grant PUD is on record in numerous federal and state proceedings questioning the assumed survival benefits from solely increasing flows during the migration season for Columbia River fisheries.

However, without restating all Grant PUD (and many others) concerns about flow augmentation and survival benefits, your EIS fails to prove that the proposed action of Banks Lake drawdown provides measurable flow improvements in real time during the month of August in the lower Columbia River.

Your EIS deals with an average monthly water budget of an additional 127,600 acre-feet, which distributed over a theoretical flat flow at McNary Dam in August provides some calculated flow increases. This is misleading since any creature migrating in the Columbia River deals with real time flow changes and has no way of perceiving assumed average monthly changes.

The Columbia River is managed on at least an hourly basis with flow changes vastly greater than any change your proposed 1% to 2% average monthly water budget change could provide. Therefore the only reasonable way to provide insight into what, if any, a 1% to 2% average monthly increase in water volume would do to hourly and daily flows

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at McNary is to route such a water budget through an hourly flow model for the Columbia River. Your EIS fails to provide such insight and without that it seems unreasonable to assume the impacts to our local area are justified.

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Even without such modeling to determine real affects, our own water managers find it hard to believe any resulting increases in flows in real time from the proposed change at McNary Dam could have any measurable affect. Again, keeping in mind that Grant PUD is on record questioning the biological benefits of flow increases if such increases exist.

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Thank you for the opportunity to comment on your draft EIS and we are hopeful that our comments will result in a better analysis of the real benefits of this proposed action as weighted against the real adverse impacts.

Sincerely,



Vera Claussen, President
Grant County PUD Board of Commissioners

- C: Grant County Commissioners
Quincy Columbia Basin Irrigation District
South Columbia Basin Irrigation District
East Columbia Basin Irrigation District
Black Sands Irrigation District
Columbia Basin Development League
D. Robert Lohn, Regional Administrator, NOAA Fisheries
Bill McDonald, Regional Director, USBR Boise

COMMENT SL 11

SOUTH BANKS LAKE MOSQUITO CONTROL DISTRICT #3

Mr. Jim Blanchard
Bureau of Reclamation
P O Box 815
Ephrata WA 98823

P.O. BOX 776
COULEE CITY, WA 99115
TELEPHONE (509) 632-5497

March 3, 2003

RE: Banks Lake Drawdown Draft Environmental Impact Statement

Dear Mr. Blanchard:

With the potential draw down of Bank Lake by ten feet, the Banks Lake Mosquito District # 3 of Grant County takes this opportunity to voice it's concern and opposition.

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On any 'normal' year, Coulee City and the surrounding area fights a constant battle with the mosquito problem. Citizens of this town pay hundreds of dollars in tax monies to keep the Mosquito District active in combating this problem. However, with this potential draw down, the mosquito population will become enormous, overwhelmingly so. The increased acreage available to the mosquitoes with the draw down and the inability to access this area for spraying will find Coulee City and the surrounding areas inundated with mosquitoes.

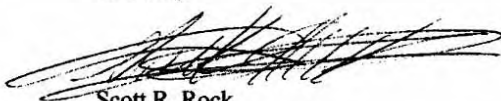
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With the added cases of the West Nile Virus in and around the Pacific Northwest Area, this draw down with its increased swamp and wet lands will only aide in and assist the spread of this disease.

It is incredulous to expect this small Banks Lake Mosquito District to be forced in to or even expected to have to buy additional equipment, hire on additional labor and increase the tax assessment of the local population in order to combat the mosquito increase all due to the draw down of Bank Lake by ten feet at the risk of human lives.

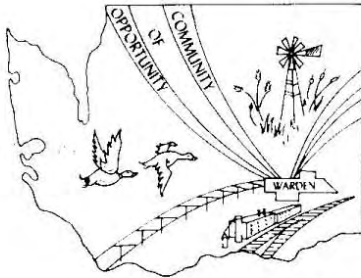
The Banks Lake Mosquito District # 3 of Grant County respectfully requests rejecting the 10' draw down and serious consideration regarding any draw down due to the ramifications this decision will have on the Banks Lake Area.

Sincerely



Scott R. Rock
Chairman
Mosquito District # 3

COMMENT SL 12



City of Warden

509-349-2326 Fax 509-349-2027
201 S. Ash St.
WARDEN, WASHINGTON 98857

Mr. James Blanchard -Special Projects Officer
Bureau of Reclamation
PO Box 815
Ephrata, WA 98823

March 14, 2003

Dear Mr. Blanchard:

This is a formal document, to register my opposition to the action alternative of the ten-foot drawdown of Banks Lake. This drawdown will destroy the fishing in Banks Lake and make public access difficult, if not impossible. There are numerous errors in the Draft Environmental Impact Statement.

The Washington Department of Fish and Wildlife website states that 2002 Salmon returns are high, with an above average projection for 2003. Puget Sound Chum salmon are back with the highest numbers ever. All this occurred with out a Banks Lake drawdown. The five month tourism season is essential for area business survival. Many citizens, whose existence depends on the summer tourist revenue, will be impacted to point of insolvency.

The Draft Environmental Impact Statement states the "impacts on the economy of Grant County are negligible", but no data is submitted to support this statement. In averaging the impact at the county level, you minimize the impact not only on the number of individual small businesses that would be devastated by one season of less than average seasonal income, but also the loss of jobs and tax revenue so urgently needed in our rural area. With the state budget deficit, fewer dollars are available for local assistance. The Dept of Fish & Wildlife proposes to close the Ephrata office. That office interacts with several hundred thousand tourists annually. Washington's small business climate is already foundering under increased regulations and a higher minimum wage than they can support. Does it make sense to propose an action in the hopes of saving a few fish, and knowingly close several small businesses? The multiplier effect of losing those businesses will be felt throughout the county. According to Washington State County 2001 Travel Impacts, Eastern Washington employment directly generated by travel spending is 32.3% of the total jobs. Local tax revenues directly generated by travel spending are \$28 million, and state taxes of \$116 million. Grant County alone generates \$126.3 million from travel spending. Any loss of this hard-earned and cultivated income would certainly have more than a "negligible" effect on the county's citizens and funded programs. Northern Grant County has little in the source of revenue other than tourism.

The Draft EIS suggests that the drawdown should not impact the local economy as "there are many close substitutes for recreation on Banks Lake." Highway 17 is a recognized Tourism Corridor by the WA-DOT. Unmarked and unknown alternative destinations, will leave many established business entities such as Coulee City Community Park and Sunbanks Resort literally "high and dry," as they cannot transfer their operations to these "close substitutes." Coulee City especially, would suffer most in lost revenue, and like other small cities in eastern Washington, Coulee City already suffers from severe economic strain for its continued existence.

This draft EIS, casually discounts the impacts of this actions, with no supporting evidence. If this drawdown occurs, it will expose acres of stagnant water and mud flats. This is the perfect breeding habitat for mosquitoes, and the West Nile Virus. The Center for Disease Control predicts this disease entry into Washington. Its victims will be people and birds, and there are numerous endangered/threatened bird species in the Banks Lake ecosystem. Should this occur, The Bureau of Reclamation may find itself in violation of the Endangered Species Act. I urge you to cancel this proposed drawdown.

Sincerely,

Richard E. Keeney-Mayor

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COMMENT SL 13



DISTRICT NO. 8
P. O. BOX 841
WARDEN, WASHINGTON 98857
(509) 349-2480

February 19, 2003

Mr. Jim Blanchard
Special Projects Officer
Bureau of Reclamation
PO Box 815
Ephrata, WA 98823

RE: Comment on Banks Lake Drawdown DEIS

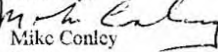
Dear Jim,

The Commissioners of the Port of Warden want to go on record opposing the action alternative of the 10' drawdown of Banks Lake for the following reasons:

1. It will jeopardize the reliable water supply for the Columbia Basin Project, the lifeblood of our agriculture economy for Central Washington.
2. The exposure of additional mud flats and stagnant water ponds will increase the breeding grounds for mosquitoes. With the threat of the West Nile Virus coming to Washington State this year we should not encourage this potential health problem.
3. The serious negative impacts to the recreation industry in North Grant County will impact the total county, which already has many problems.
4. Additional water in the Columbia River in late summer does not assist the ESA listed fish (Spring Chinook & Steelhead) which are not present during that time frame.
5. The Northwest Power Planning Council has gone on record questioning if increased flows assist anadromous fish runs. Where is the science on this question & what assistance will this small amount of water do to aid fish.

We feel the risk to our local economy is far greater than what little benefit will be gained for the listed fish populations. We have had excellent runs of all fish in the Columbia the last several years, what is to be gained by the Banks Lake drawdown to further expand these runs?

Sincerely,


Mike Conley
Manager

CC: Mr. Bob Lohn – NMFS Regional Administrator
7600 Sand Point Way NE
Seattle, WA 98115-0070

Mr. J. William McDonald – Regional Director
USBR - Pacific NW Region
1150 N. Curtis Road
Boise, Idaho 83706

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