ISAB Response to Grant County Public Utility District comments on the ISAB's Review of Spring Chinook Salmon in the Upper Columbia River (ISAB 2018-1)

June 4, 2018

In an April 16, 2018 letter, Grant County Public Utility District provided comments on the ISAB's Review of Spring Chinook in the Upper Columbia River. The ISAB Executive Committee – including Ex Officio members Nancy Leonard (NPCC), Zach Penney (CRITFC), and Mike Ford (NOAA) – agreed that the ISAB should respond to the scientific issues raised in Grant PUD's useful comments. The ISAB appreciates Grant PUD's constructive comments and believes that this further dialogue improves the scientific information for fish managers and restoration practitioners to draw from in their protection and mitigation efforts for Upper Columbia spring Chinook.

Grant PUD's comments fall into four basic topic areas they felt were most important to the report's conclusions:

1. The characterization of mainstem juvenile and adult survival
2. Presentation of harvest
3. Density dependence as a limiting factor
4. Integration of All Hs

In the text below, we include Grant PUD's comment followed by our response for each of the four topics.

1. Mainstem Juvenile and Adult Survival

a. Juveniles

> **Grant PUD:** The Review states that nearly 60% of yearling Chinook salmon smolts enter the mainstem prior to the onset of the fish spill season in the Mid-Columbia and are therefore expected to have higher dam passage mortality rates. From page 90:
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> *"Spill to facilitate juvenile emigration in the mainstem begins in mid-April and by that time almost 60% of the yearling Chinook smolts (largely spring Chinook smolts) have already entered the mainstem. Conversely, less than 10% of summer Chinook subyearlings have entered the mainstem before the onset of spill. Thus, the later migration timing of summer subyearlings matches well with the increased spill regime (Murdoch 2017) and they are expected to have lower mortality rates due to dam passage."*
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> The connection between timing of Columbia River entry and dam passage mortality rates is misleading. Smolt migration timing is monitored at Rock Island Dam as part of the Fish Passage Center's Smolt Monitoring Program. Data collected at Rock Island Dam is used to ensure that fish spill operations are in effect for 95% of both the spring and summer migrants passing Wanapum and Priest Rapids Dams, as required by the Priest Rapids Project's FERC License. Grant PUD is party to a 'spill team', comprised of representatives from federal, state, and tribal agencies, which jointly monitors smolt passage timing and

manages fish spill operations at Wanapum and Priest Rapid Dams to ensure that the spill season captures 95% of emigrants.

The Review also suggests that fish spill influences river conditions in the mainstem Columbia River (i.e., fish spill increases flow). This is a common misconception of fish spill in the Mid-Columbia. Spill to facilitate fish passage is a dam operation that routes water to spillways or juvenile fish passage devices. This routing of water improves dam passage survival. Fish spill, however, does not change the flow or volume of water in the mainstem Columbia River. The Mid-Columbia dams are run-of-river; flow through the Mid-Columbia is primarily determined by releases from Grand Coulee Dam and inflow from tributaries. The onset of fish spill and increasing flow is coincidental, not causative. As suggested in the Review, fish that migrate later in the summer may benefit from increased flow, but this increase in flow would be a result of an ascending hydrograph from Grand Coulee releases and runoff, not fish spill.

ISAB Response:

The passage cited above (from ISAB 2018-1, page 90-91) does not state that there is a specific difference in survival between spring and summer Chinook emigrants but speculates that there could be a difference based on timing of mainstem entry. The ISAB is aware that the PUD passage tests have documented dam-passage survival estimates of greater than 90% at specific dams. However, data from the Comparative Survival Study (CSS) has survival of about 60% (ISAB 2018-1, Figure 3.19, page 63) for combined hatchery-wild juvenile spring Chinook from Rock Island (RIS) to McNary (MCN) dams. Faulkner et al. (2017) reported that survival from hatcheries to MCN was 55.5% (ISAB 2018-1, Table 3.6, page 64). The causes of the difference between passage survival and total migration survival could be predation, but, at least in comparing upper Columbia River spring Chinook to Snake River spring/summer Chinook, predation did not appear to differ (ISAB 2018-1, Table 3.7, page 64).

The comment in the Grant County PUD letter regarding spill not being the cause of changes in flow or volume is accurate. We were not, however, able to find the place in the report referred to in the letter. We did use the phrase "spill/flow" twice when referring to variables in life-cycle models used by the CSS and CHaMP. In two places in the report, we used identical language to refer to increased flow, but attribute it to spring runoff, not spill (underlining added for emphasis):

> "Later out-migration timing of summer Chinook subyearlings coincides with the increased spill regime that was established to reduce dam related mortalities. Their outmigration timing is also better synchronized with increased flows and higher turbidity due to spring run-off." (ISAB 2018-1, Executive Summary on page 3 and in a bulleted list on page 91)

b. Adults

> **Grant PUD:** The Review, using data provided by Washington Department of Fish and Wildlife, reported that conversion rates of migrating adults from McNary Dam to Rock Island Dam was 73.8% for spring-run and 80.5% for summer-run Chinook Salmon. The review states that conversion rates were calculated *"by estimating the number of adults passing Rock Island Dam and dividing that value by the number that passed over McNary Dam."* This is not an accurate or generally accepted method for calculating conversion rates, particularly in cases when detection efficiencies are less than 1.0, as is the case at Rock Island Dam. Accurate conversion rates between dams can easily be estimated using unique PIT-tag detections and mark-recapture methods (see University of Washington DART or Keefer et al. 2015). A more thorough and detailed analysis would show that the survival of spring-run adults from McNary Dam to Rock Island is typically greater than 90% and often above 95%.

ISAB Response:

After our February 13, 2018 presentation to the Northwest Power and Conservation Council, Upper Columbia River researchers provided new information to the ISAB on mainstem survival rates of adult spring and summer Chinook, which prompted us to re-examine Table 3.12 and the associated text. Our revised text excludes Table 3.12 but provides analyses in line with the Grant County PUD's comments. Please see our revision: April 10, 2018 Update Statement.

2. Presentation of harvest

> **Grant PUD:** It appears that management of harvest is based upon a sliding scale of many mixed stocks including stocks that are healthier than the UC stocks. This suggests strong potential for negative weak stock fishery impacts and this topic is well known in the literature. Harvest estimates on upper Columbia Spring Chinook Salmon were available in documents provided to the ISAB (Hillman et al. 2017) and appear to be significant relative to the spawning escapement in many years (Table 1). For example, in the last 10 years with complete data, the annual Spring Chinook escapement to the Chiwawa River has averaged 958 fish (hatchery and natural-origin fish). Over these same 10 years, average annual total harvest has been 445 hatchery-origin fish (estimates of harvest were only available for coded wire-tagged hatchery-origin fish, an unknown number of natural-origin fish were harvested). On page 103 of the Review it says, *"If return [sic] of adult spawners or recruitment substantially limit recovery in the Upper Columbia, then discussions of the effects of harvest on escapement between co-managers and participants in the UCSRB could strengthen future approaches to improve recovery efforts."* As stated above, estimates of upper Columbia Spring Chinook Salmon harvest appear to be significant relative to the spawning escapement and it would be worthwhile to communicate this in the report.

ISAB response:

The Grant County PUD's comment is well taken, and harvest may very well be important. The issue requires more analysis and discussion. The question of harvest rates involves many

jurisdictions and issues outside of the upper Columbia River spring Chinook ESU, which are beyond the scope of our review.

3. Density Dependence

> **Grant PUD:** The Review's discussion of density dependence as a limiting factor primarily focused on complete life-cycle analyses (adult-to-adult productivity). While analyses at this scale are informative, they are also challenged by a high degree of inter-annual variability. We believe the inclusion of data collected in the freshwater environment as part of the PUD's hatchery M&E programs would benefit the consideration of density dependence as a limiting factor. As an example, the PUD's M&E programs have found and reported that:
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> - In all three monitored populations in the Wenatchee Basin (Chiwawa Creek, Nason Creek and White River) egg deposition explained most of the variability in productivity and survival of juvenile Spring Chinook Salmon. This is, for estimates based on within-basin life stages (e.g., parr and smolts), survival and productivity decrease as seeding levels increase. This suggest that density dependence regulates juvenile productivity and survival within the three tributaries.
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> - In the Chiwawa River, three stock-recruit models (Beverton-Holt, smooth hockey stick, and Ricker) all indicate a density-dependent relationship between spawning levels and juvenile Chinook production and that there is a significant negative relationship between juveniles per redd and numbers of redds in the Chiwawa River basin. Indeed, the highest spawning escapement have resulted in the lowest egg-to-parr survival rates.
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> It is important this type of information be communicated to managers as we implement hatchery and habitat programs intended to increase the number of natural-origin fish. The viewpoint of many is that density dependence should not be an important issue for ESUs that are endangered. The viewpoint can influence expectations about the potential of hatchery and habitat projects.

ISAB Response:

The ISAB agrees that the information presented in the Grant County PUD's letter supports and strengthens the discussion of density dependent regulation of the three populations and this needs to be considered when making management decisions about recovery actions. In the report, we did state "Within these basins, Chinook populations in smaller watersheds, such as the Chiwawa and Twisp, exhibited density dependence." (ISAB 2018-1. Page 38). We agree that analysis of juvenile production in the freshwater phase of the life history is informative, but complete life cycle analysis of density dependence (adult-to-adult productivity) is the ultimate measure of density dependence for the population. Interannual variation makes analysis and interpretation more complex, but it potentially reflects important dynamics of the population and factors that influence their productivity.

4. Integration of All Hs

> **Grant PUD**: The Review emphasizes that the coordination of the Hs is important and that current coordination efforts may be insufficient. As described in Section 4.4.3 of the Review, in the Upper Columbia there are numerous independent and overlapping coordinating committees, but overall coordination between committees has not been systematic. We believe the role of oversight coordination and integration across the H's is the responsibility of NOAA. NOAA has the authority and responsibility under the ESA to issue permits authorizing activities across the 4 Hs, monitor compliance with the permits, and adapt programs as new information becomes available. NOAA also has formal representation at all of the PUD committees and so contributes to regular decisions about PUD hatchery programs, hydro operations, habitat expenditures, study design and implementation, and monitoring and evaluation. Furthermore, they also are a part of US vs. Oregon harvest decisions. The aforementioned suite of authorities, responsibilities, and opportunities is not represented in any other organization. Therefore GPUD thinks that the most appropriate organization to coordinate the Hs throughout the Upper Columbia is NOAA.

ISAB Response:

In the Recommendation section of the report the ISAB stated:

> "The ISAB encourages the UCSRB and its participants to develop a systematic, collective process for coordination of the actions, monitoring efforts, and decisions across the numerous working groups and coordinating committees in the three subbasins. The UCSRB has developed a useful process for prioritizing restoration projects and coordinating recovery actions. The regional recovery plan, limiting factors assessment, life-cycle models, and monitoring provide critical information for recovery actions. However, a continued challenge is coordinating groups in the three subbasins responsible for the four Hs. More than 16 independent coordinating committees and several other major working groups make critical decisions on recovery actions. Currently, there is no formal process for integrating their separate efforts into a coordinated action plan across the three subbasins." (ISAB 2018-1, pages 142-143)

Enlisting NOAA is not the only mechanism for coordination and is a top-down, regulatory approach. A regional, bottom-up "grass roots" approach could also provide effective coordination without the regulatory authority. The ISAB does not disagree with Grant County PUD's reasoning; however, we also would not disagree if Grant County PUD, the UCSRB, and others chose a collective process with all entities. The ISAB suggests that the issue of coordination would best be discussed with policy-makers.