Northwest Power and Conservation Council

May 28, 2009

MEMORANDUM

TO: Fish and Wildlife Committee

FROM: Nancy Leonard, Tony Grover, Tom Karier

SUBJECT: Public Comment on HLI

We received 20 sets of comments from the following entities: Montana Fish, Wildlife & Parks; Pacific Northwest Anadromous Monitoring Partnership; Pacific Northwest Utilities Conference Committee; Oregon Water Trust; The Freshwater Trust; Washington Forum on Monitoring; Kootenai Tribe of Idaho; Eddie Farr; Lynn Card; Washington Department of Fish and Wildlife; StreamNet; Federal Caucus members; Bonneville Power Administration; NOAA Fisheries; Public Power Council; RiverPartners; Columbia Basin Fish and Wildlife Authority; Richard Whitney; Idaho Office of Species Conservation; and the Independent Science Advisory Board and Independent Science Review Panel.

We will provide the Committee with a summary of the 13 general public comments made on the Council's draft HLI.

In response to comments we recommend a one or two day workshop in June of 2009 involving interested Council members and commentors. The purpose of the workshop will be to finalize the list of attached management questions and high level indicators. The goal is to adopt final versions of 6 implementation performance measures and related indicators, as well as 4 biological performance measures and related indicators at the July Council meeting in Portland. At that time we will also recommend adopting the related proposed Council's management questions to facilitate communicating intent of these performance measures and their indicators to the region.

We also recommend engaging the region through additional targeted workshop(s) to further refine and develop the additional biological indicators once the Council has adopted the first round of indicators and management questions.

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Summary of May 2009 Public Comments on Council's Draft High Level Indicators (HLIs)

We received 20 sets of comments from the following entities:

Montana Fish, Wildlife & Parks; Pacific Northwest Aquatic Monitoring Partnership (PNAMP); Pacific Northwest Utilities Conference Committee (PNUCC); Oregon Water Trust; The Freshwater Trust; Washington Forum on Monitoring; Kootenai Tribe of Idaho; Eddie Farr; Lynn Card; Washington Department of Fish and Wildlife (WDFW); StreamNet; Federal Caucus; Bonneville Power Administration (BPA); NOAA Fisheries (NOAA); Public Power Council (PNUCC); RiverPartners; Columbia Basin Fish and Wildlife Authority (CBFWA); Richard Whitney; Idaho Office of Species Conservation (ID OSC); and the Independent Scientific Review Panel (ISRP).

There are 13 general comments that were mentioned by at least 2 entities. Entities making these comments are listed after each general comment.

1. Supportive of effort to develop HLI (18 entities)
   - Support explicitly stated: PNAMP, The Freshwater Trust, WDFW, StreamNet, Federal Caucus, BPA, NOAA, RiverPartners, CBFWA, and ISRP.
   - Support contingent on no extra cost: PNUCC, PPC, and ID OSC.
   - Support implied by providing comments on HLI: MFW&P, Oregon Water Trust Program, WA Forum, and Kootenai Tribe of Idaho.
   - Support not stated: Eddie Farr, and Lynn Card.

2. Encourage coordination with others in the region to develop indicators and to coordinate data needed for indicators (12 entities)
   - PNUCC, PPC, WDFW, Federal Caucus, BPA, NOAA, WA Forum, PNAMP, RiverPartners, Kootenai Tribe of Idaho, ID Office of Species Conservation, and Freshwater Trust.

3. Suggest a workshop to assist with coordination of biological indicators (6 entities)
   - Federal Caucus, BPA, ISRP, RiverPartners, NOAA, and WA Forum (suggest technical-level coordination between NPCC and Forum Staff over next months).

4. Need to identify management questions that the HLIs are answering to assist with evaluation of whether indicators are appropriate to answer those questions and appropriate for assessing F&W Program progress (6 entities)
   - StreamNet, NOAA, BPA, and Federal Caucus, WA Forum, and StreamNet.

5. Need to identify goals and targets to which HLI will be compared to assess progress (4 entities)
   - NOAA, Federal Caucus, BPA, and WDFW.

6. Need more information / clarification on proposed indicators (i.e., metrics, definition, scale) and terms used (i.e., Council fish) to assist in evaluating if proposed HLIs are appropriate, data is available, and if align with indicators used in the region (7 entities)
   - WDFW, StreamNet, Federal Caucus, and NOAA.

7. Total number of HLI should be few in number (3 entities)
   - ISRP (unspecified number on status and trend of biota), ID OSC (3 to 5 biological indicators), and PPC (implementation indicators, hydro-survival, and wildlife metric).

8. Value of implementation indicators (3entities)
   - ISRP (measures of activities), NOAA (reporting fiscal accountability but not causal relationship between implementation and changes in other indicators), and PPC (implementation indicators appropriate to communicate F&W Program progress; whereas biological indicators are outside of F&W Program scope).

9. No value in implementation indicators as they do not address if the F&W Program has successfully compensated for loss (2 entities)
   - Richard Whitney, and ID OSC.

10. Suggest work with CBFWA either as data-source or to report progress through SOTR (2 entities)
    - CBFWA, and WDFW.

11. Support that implementation indicators can move forward (2 entities)
    - PNUCC, and PPC (less directly stated but seems to suggest this).

12. Suggest link indicators to progress made on sub-basin plan objectives, although sum up data from sub-basin biological indicators to derive the basin-wide indicators (2 entities)
    - Richard Whitney, and ISRP.

13. Suggest splitting, deleting, or adding HLIs
    Note: entities associated with a comment are listed within parenthesis.
    - There is one general comment pertaining to splitting implementation HLIs into multiple implementation HLIs due to different units used to report them, this is mentioned by various entities either directly or by asking if we are combining 'apples and oranges' (CBFWA, BPA, NOAA, StreamNet etc).
    - There is one comment pertaining to deleting HLIs, specifically deleting the indicator on "Life stage survival" (Richard Whitney).
    - There are 11 comments pertaining to HLI additions:
      i. Add genetic purity of native westslope cutthroat trout and bull trout as this impacts recruitment (MFW&P).
      ii. Add indicator of tropic level biological effects from various dam operating strategies (MFW&P).
      iii. Add an HLI on the changes in fish productivity or capacity or a change in estuary habitat function relative to maximum potential (BPA).
      iv. Add harvest and escapement rates of hatchery fish in Council's F&W Program (BPA).
      v. Add adult mainstem hydrosystem survival for each evolutionarily significant unit (ESU) and distinct population segment (DPS) (BPA).
      vi. Add Environmental Condition Index consisting of Ocean Productivity Index, Pacific Northwest Index, Pacific Decadal Index, Multivariate El Nino/Southern Oscillation Index, Spring and fall Transition Dates, Air/Ocean Moored Buoy Data, and Ocean Coastal Upwelling Index (BPA).
      vii. Add portion of FCRPS Dams meeting Environmental and Physical Standards (BPA).
      viii. Add number of BiOp projects being successfully implemented (BPA).
      ix. Add research and monitoring HLI (BPA, CBFWA and provides the metrics to use).
      x. Add 5 wildlife potential HLI and metrics: (1) abundance of wildlife species; (2) wildlife population status and trends; (3) production of wildlife; (4) wildlife life cycle mortality; (5) wildlife passage. (ISRP).

xi. Add water quality indicator (ISRP).

Staff Recommendations for Biological Indicators

1. Recommend a workshop in June of 2009 involving interested Council members and commenters. The purpose of the workshop is to finalize the list of management question and high level indicators. The goal is to be ready in July to adopt the final version of the Council's 4 biological management questions that clarify intended use of selected biological indicators, and the 4 biological performance measures and related modified indicators (Table1; details on modification recommendations are in section titled "Summary of Major Comments by Indicator and Staff Recommendations on Indicator Modifications" on page 4).

The 4 biological management questions and their indicators are:

- What is the trend in adult salmonids passing above FCRPS hydro-projects in the Columbia and Snake Rivers?
  - Related indicator: modified version of "Total adult salmon and steelhead returns to the Columbia."
- What is the in-river harvest of wild and hatchery salmonids and white sturgeon in commercial, sport, and tribal fisheries compared to set harvest rate/exploitation rate?
  - Indicators: modified version of "Harvest number and rate" and "Harvest of hatchery fish."
- What are the hydrosystem survival rates for juvenile salmonids passing in-river and barged?
  - Related indicator: modified version of "Survival rates through the hydrosystem for adults and juvenile fish passing in-river and barged."
- What are the hydrosystem survival rates for adult salmonids?
  - Related indicator: modified version of "Survival rates through the hydrosystem for adults and juvenile fish passing in-river and barged."

2. Suggest working with interested parties in the region to define needed metrics and for identifying data sources to assure regional alignment where needed.

Staff Recommendations for Implementation Indicators

1. Recommend a workshop in June of 2009 involving interested Council members and commenters. The purpose of the workshop is to finalize the list of management question and high level indicators. The goal is be ready in July to adopt the final version of the Council's 6 implementation management questions that clarify intended use of selected implementation indicators, and the 6 implementation performance measures and related modified indicators (Table 2; details on modification recommendations are in section titled "Summary of Major Comments by Indicator and Staff Recommendations on Indicator Modifications" on page 4).

The 6 implementation management questions and their indicators are:

- Are wildlife habitat losses related to the hydrosystem being mitigated through the Council's F&W Program?
  - Related indicator: modified version of "Wildlife Habitat Unit."
- How much has the Council's F&W Program contributed towards expanding salmonid passage?
  - Related indicators: modified version of "Instream passage improvements."

- How much has the Council's F&W Program contributed towards returning diverted water to the river?
  - Related indicators: modified version of "Water conservation."
- How much has the Council's F&W Program contributed towards protecting land for fish via purchase or easement stream banks and adjacent land?
  - Related indicators: modified version of "Land acquisition/conservation easement."
- How much has the Council's F&W Program contributed towards screening irrigation diversions?
  - Related indicators: modified version of "Installed fish screens."
- How much riparian and instream habitat have received habitat improvement actions through projects funded by the Council's F&W Program?
  - Related indicator: modified version of "Habitat."

2. Suggest working with interested parties in the region to define needed metrics and for identifying data sources to assure regional alignment where needed.

Staff Recommendations to Reserve Indicators for Additional Work

1. Suggest refining Council's biological management questions pertaining to below topics (Table 3), as well as working with the region to refine, identify, and develop needed performance measures, indicators, metrics, and data sources pertaining to these questions. The topics reserved to additional work are:
- Abundance of adult fish,
- Fish population status and trends for each ESU,
- Ocean harvest of wild and hatchery salmonids,
- Harvest of resident fish,
- Productivity of wild fish,
- Relative fitness of supplemented stocks from hatcheries funded by the Council F&W Program,
- Life-stage survival estimates for representative populations Chinook and steelhead,
- Number of juvenile salmon saved from all predators (moved from implementation indicator),
- Number and percentage of targeted watersheds that provide adequate fish habitat (moved from implementation indicator).

2. Suggested process for regional refining, identifying, and developing needed performance measures, indicators, metrics, and data sources for the Council's biological management question topics identified above.
- Council will refine biological management questions pertaining to topics of interest to guide region with the refinement and development of Council's HLIs (June 2009).
- Wild and Hatchery Salmonids Related HLIs
  - Working with interested parties, the Council will refine the wild and hatchery salmonids HLI performance measure and the high level indicator definition to assure alignment on these HLIs of common interest within the NW region (July-August 2009)
  - The proposed salmonid and watershed HLI performance measure/standard and the high level indicator definition will be presented to the Council for adoption (August 2009)
  - Working with interested parties, the Council will identify the needed metrics and data source to derive the salmonids to assure alignment on these HLIs of common interest within the NW region (August-September, 2009).

- Watershed Related HLIs
  - Working with interested parties, the Council will refine the watershed HLI performance measure and the high level indicator definition to assure alignment on these HLIs of common interest within the NW region.
  - Process to be determined.
- Predation Related HLIs
  - Process to be determined.

Summary of Major Comments by Indicator and Staff Recommendations on Indicator Modifications

Note: entities making comment are indicated within parenthesis.

Total Adult Salmon and Steelhead returns to the Columbia

- This is not an overall indicator of anadromous fish returning to the Columbia (CBFWA, Richard Whitney).
- Suggest these indicators for wild and hatchery fish populations (total abundance) for listed species by major population group (MPG) and ESU: Total adult spawners, Total adults harvested, Total juveniles and for all species & by ESU (not currently compiled): Total adult spawners, Total adults harvested, Total juveniles (PNAMP, WA Forum).
- Provide context for indicator: harvest (BPA), hatchery production (BPA, NOAA) information both above and below Bonneville, ocean productivity indices, marine survival estimates (NOAA).
- We suggest it would be useful to use at least two other dam count indicators to more adequately indicate large scale patterns and trends of regional salmon runs (ISRP).
  - **Recommend:** Rename indicator so matches its definition of dam counts.
  - **Recommend:** Increase number of dams at which fish are counted.

Abundance of adult fish in Council's FW Program

- Suggest these indicators for wild and hatchery fish populations (total abundance) for listed species by MPG and ESU: Total adult spawners, Total adults harvested, Total juveniles and for all species & by ESU (not currently compiled): Total adult spawners, Total adults harvested, Total juveniles (PNAMP, WA Forum).
- Not familiar with the jargon "fish in the Council's program" (Streamnet, NOAA).
- Separate hatchery fish population data where available or note proportion of abundance from hatcheries (BPA, StreamNet, NOAA).
- Adult fish abundance is most appropriately reported at the population scale and should be accompanied by reports of productivity. The appropriate high level indicator for cumulative adult salmon, steelhead, bull trout, and white sturgeon abundance is included as described under Trends in Abundance and Productivity (CBFWA).
- CBFWA's Status of the Resource provides data on abundance by province and subbasin, which when consolidated can show overall trends and abundance; Trends will be greatly affected by variations in ocean survival (ISRP).
  - **Recommend:** For Anadromous count fish at population scale and count as suggested by entities using spawner abundance, juvenile abundance, separating hatchery from wild. **Recommend:** Rename so not using unclear terminology such as 'Council fish.'
  - **Recommend:** For resident fish count as done by CBFWA, separating wild and hatchery. Include Kootenai sturgeon and bull trout.
  - **Recommend:** Refine and develop with region.

Fish Population Status and Trends for each ESU

- Add Kootenai white sturgeon and bull trout (MFW&P).
- Suggest these indicators for wild and hatchery fish populations (total abundance) for listed species by MPG and ESU: Total adult spawners, Total adults harvested, Total juveniles and for all species & by ESU (not currently compiled): Total adult spawners, Total adults harvested, Total juveniles (PNAMP, WA Forum).
- Need to clarify if status is based on all NOAA's Viable Salmonid Populations, if yes then this may be difficult, as data are not currently being collected evenly or systematically for all of these parameters (WDFW).
- Clarify how trend will be reported (StreamNet).
- We suggest two metrics: 1. For each ESU/DPS, list federal ESA status. 2. Percentage of populations within an ESU/DPS that are stable or increasing (StreamNet, CBFWA, ISRP).
- Track and differentiate hatchery versus natural origin spawners (BPA).
- Agree that population-level status and trends is the primary indicator for tracking progress toward ESA recovery and other management objectives. It is important to summarize the recovery targets to provide the necessary context for current status (NOAA).
- For most resident fish, the following high-level units are recommended for bull trout and white sturgeon: Bull Trout percent/number Recovery Units increasing, stable, decreasing or percent very low, low, moderate, and high risk categories meeting objectives (USFWS definitions). White sturgeon populations increasing, stable, decreasing or percent very low, low, moderate, and high risk categories. The success of resident fish substitution projects is determined by attainment of the individual project objectives. o We suggest adding the following resident fish substitution high level reporting unit: percent/number of projects meeting objectives (CBFWA).
    - **Recommend:** Population-level status and trends with recovery targets. For each ESU/DPS, list federal ESA status. 2. Percentage of populations within an ESU/DPS that are stable or increasing.
    - **Recommend:** For resident fish count as done by CBFWA: Bull Trout percent/number Recovery Units increasing, stable, decreasing or percent very low, low, moderate, and high risk categories meeting objectives (USFWS definitions). White sturgeon populations increasing, stable, decreasing or percent very low, low, moderate, and high risk categories. The success of resident fish substitution projects is determined by attainment of the individual project objectives. We suggest adding the following resident fish substitution high level reporting unit: percent/number of projects meeting objectives.
    - **Recommend:** Report status based on NOAA and USFWS definition.
    - **Recommend:** Refine and develop with region the trend aspect of this HLI.

Productivity of wild fish in select watersheds targeted by Council F&W Program

- Need to rename so matches definition and not confuse people in thinking using fish to assess habitat productivity, or confuse on which watershed will be selected. The habitat productivity work may be integrated into the intensively monitored watershed projects to link fish productivity to habitat.
- Sounds more like population productivity. I assume that this is a smolt to adult ratio (SAR), by ESU or DPS or watershed, adult population estimate such as from redd counts, dam counts, and estimated smolt outmigration such as from smolt trap data. (StreamNet, CBFWA, BPA).
- Such work may realistically only be implemented for some index populations. As such productivity alone is probably not an appropriate high level indicator and is best reported at the population scale and through VSP assessments (CBFWA, ISRP).

- The use of juveniles per spawner can be a good indicator but like all ratios, it must be used cautiously. For example, low levels of spawners can lead to high levels of juveniles per spawner, even though the stock status is poor. Similarly, a large stock can theoretically have comparatively few juveniles per spawner but still be healthy (ISRP).
    - **Recommend:** Rename to wild fish smolt to adult ratio. Report SAR at population scale based on index populations.
    - **Recommend:** Wait for recommendation of Anadromous M&E workgroup recommendation on which index populations to monitor.
    - **Recommend:** Refine and develop with region.

Harvest number and rate

- Suggest abundance of adults harvested for both wild and hatchery (PNAMP, WA Forum, WDFW).
- Reporting at population scale may not be feasible as data may be provided by management unit instead. HLI should apply to entire fishery, not populations (StreamNet, WDFW). Not clear if this indicator is providing harvest estimates by biological species as well as by listed ESU? (NOAA).
- The rate indicator should be evaluated relative to the levels established by managers, and relative to the natural population levels established for recovery goals (NOAA). For naturally produced fish, harvest rates per se, will have little if any interpretive value for decision-makers unless they can be related to levels shown to be excessive relative to what can be tolerated for a particular stock (ISRP).
- Harvest in a year, or harvest across a brood? (StreamNet)
- Ocean commercial harvest is available from PSMFC's PACFIN database, not RMIS which contains the coded wire tag data (StreamNet).
- Need more accurate ocean, mainstem and sport harvest information (BPA).
- Total harvest is an appropriate high level indicator. Harvest by ESU and impact rates are best reported at the ESU scale. The information can be displayed but are not a high level indicator. The suggested high level indicator units for the Basin by species/race are: Harvest number by fishery type (sport, tribal, commercial), location, and fish origin such as hatchery or natural (CBFWA).
    - **Recommend:** For each anadromous and ESA-listed resident fishery report harvest number by fishery type (sport, tribal, commercial), location (ocean, in-river), and fish origin (hatchery or natural) per year.
    - **Recommend:** Compare fishery rate to levels established by managers for relevant fisheries.
    - **Recommend:** For resident fish harvests refine and develop with region.
    - **Recommend:** For ocean harvests refine and develop with region.

Harvest of Hatchery fish in the Council's F&W Program

- Not sure what the phrase "in the Council's Program" means (StreamNet).
- For hatchery fish, population exploitation rate of each hatchery could be used (StreamNet).
- Need more accurate ocean, mainstem and sport harvest information (BPA).
- Will this be reported relative to the approved harvest rates and targets articulated in ESA authorizations (HGMPs) for each hatchery and ESA population, such as percent natural-origin and hatchery-origin spawners (NOAA).
- Harvest attributed to individual hatcheries should be reported at the subbasin scale. We suggest that the Council report the harvest of fish within the Council's F&W Program in relation to all hatchery programs in the Basin, therefore the suggested high level reporting

units for harvest of hatchery fish are by species/race: Harvest number by fishery location, Harvested fish produced by the Council's F&W Program and other. As there are objectives for white sturgeon harvest we suggest adding the following high level harvest information for white sturgeon reported by population: commercial, sport, tribal, yield/unit area (CBFWA).

- It is also important to know how significant the harvest from BPA-funded hatcheries is compared to the total harvest of all hatchery fish in the province. We recommend that this metric indicate total hatchery harvest, not harvest per fish released. The latter indicator, if used, is more of a survival indicator. To separate F&W Program results from results of efforts of all the other agencies in the Basin for hatchery fish, the smolt output from Council-supported hatcheries can be compared with non-Council supported hatcheries. It is also important to depict oceanic harvest of the stocks by region to show which stocks are contributing regionally or locally, versus outside of the region (ISRP).
  - **Recommend:** Rename to total hatchery harvest.
  - **Recommend:** Report population exploitation rate of each hatchery.
  - **Recommend:** Report by hatchery species/race the harvest number by fishery location (river, ocean, subbasin). Report the number or proportion of harvested hatchery fish produced by hatcheries receiving funding from the Council's F&W Program.
  - **Recommend:** For resident fish harvests refine and develop with region.
  - **Recommend:** For ocean harvests refine and develop with region.

Relative fitness of supplemented stocks from hatcheries in the Council's F&W Program

- Need to define the spatial scale of the calculation (WDFW).
- Being developed by the Ad Hoc Supplementation Workgroup and ISRP. May include number of natural origin spawners. Completion goal is 2009. This indicator would support FCRPS BiOp Hatchery Action Effectiveness comprehensive evaluation reporting needs (BPA).
- Will this be reported relative to the goals and ESA authorizations (HGMPs) for each hatchery and ESA population? Establishing general targets for some indicators (e.g., PNI) can be difficult as it often depends on location-specific circumstances. Targets may differ between populations identified in recovery plans as "primary" versus "sustaining" etc. Targets may also differ among populations associated with conservation supplementation hatchery programs versus populations associated with harvest mitigation hatchery programs. NOAA Fisheries will develop facility and population specific metrics and targets as part of its consultations on HGMPs (NOAA).
- It is recommended that hatchery indicators be displayed with harvest indicators. The hatchery indicators are in fact implementation goals and therefore should be categorized as implementation indicators. From that perspective we recommend moving the hatchery indicators to the implementation indicator category. We suggest adoption of high level indicators for RSS and PNI are deferred until the final report and recommendations of the Collaborative Systemwide Monitoring and Evaluation Project (CSMEP) hatchery group and the Ad Hoc Supplementation Work Group reports. Additional information to report hatchery implementation will need to be aggregated from individual hatchery programs at the subbasin scale. We suggest adding the following indicators for hatcheries: Total releases by species by life-stage (smolt, parr, etc.) and program type (production, supplementation, conservation). Total adult returns to hatcheries by species/race. Total funding under the Council's F&W Program and other. We also suggest adding for white sturgeon: Total hatchery releases by life stage, and program type & total funding by source (CBFWA).

- The measure of fitness must be clearly and specifically defined. It is not evident at this time how the three potential candidate indicators; relative reproductive success, PNI, and number of natural spawners compared to reference streams will be used to develop an index of fitness. o Maps showing straying rates of non-local hatchery fish and the proportions of supplementation and total hatchery fish in the naturally spawning population for each population and ESU could serve as an initial indicator of potential hatchery influence (ISRP).
  - **Recommend:** Wait for completion of this work by Ad Hoc Supplementation Workgroup and ISRP in 2009.
  - **Recommend:** Wait for NOAA's HGMPs targets to be developed.
  - **Recommend:** Refine and develop with region.

Survival rates through the hydrosystem for adult and juvenile fish passing in-river and barged

- Although biological measure it is an important indicator of habitat improvement (ISRP).
- Include trophic biological effects from dam operations as done in MT (MFWP).
- Define. Percentage survival? What specific field measurements will be needed? (StreamNet)
- Ensure that targets are consistent with FCRPS BiOp benchmarks (NOAA).
- High level reporting should present information for each hydroelectric facility and total system survival. The comparison of the survival of barged or transported fish compared to fish that pass through the system in-river is referred to as the Transport-In-River Ratio (TIR). The TIR should be reported as the ratio of the SARs for transported fish over the SARs for fish migrating in-river. We suggest the following reporting units by species/race, hatchery and natural: Total System Survival for Lower Granite to Bonneville and McNary to Bonneville annually over time. TIR at Lower Granite annually over time, percent adult and juvenile mortality by hydroelectric facility. A survival indicator for Pacific lamprey should be developed and reported (CBFWA).
- Topic omits the mainstem above the confluence with the Snake River. This is a serious omission because it leaves out the only stock of Chinook salmon in the Columbia Basin, namely Hanford Reach Chinook and Wenatchee River sockeye. Data are available from the PUDs on survival rates past each mainstem project in the mid-Columbia Reach and collect abundance data. Recommend including mid Columbia survival rates and abundance (Richard Whitney).
- A measure would be mortality rates of salmon smolts and adult migrants through the successive dams and passage facilities. This is an important HLI of in-river migration restoration efforts for both hatchery-reared and wild fish, separately (ISRP).
  - **Recommend:** Ensure that targets are consistent with FCRPS BiOp benchmarks
  - **Recommend:** Present information for each hydroelectric facility and total system survival. The TIR should be reported as the ratio of the SARs for transported fish over the SARs for fish migrating in-river. We suggest the following reporting units by species/race, hatchery and natural: (1) Total System Survival for Lower Granite to Bonneville and McNary to Bonneville annually over time. (2) TIR at Lower Granite annually over time (3) percent adult and juvenile mortality by hydroelectric facility. (4) A survival indicator for Pacific lamprey should be developed and reported.
  - **Recommend:** Including mid Columbia survival rates and abundance.

Life stage survival estimates for representative populations

- Difficult to comment on this high level indicator without more information, e.g., define indicator, field data needed, define scale life cycle mortality (StreamNet, WDFW).
- This Indicator is already covered by other Indicators that were added (BPA).

- Will hatchery versus natural-origin survivals be distinguished? (NOAA)
- SARs for salmon and steelhead should be reported over time, plotted against the Council's SARs objective by species, hatchery and natural. The SARs should be reported for the Upper Columbia, Snake River, and mid-Columbia populations (CBFWA).
  Life stage mortality indicators would likely be estimated for representative populations and reported at the subbasin/population level rather than for every salmon and steelhead population (CBFWA, NOAA).
- Life stage specific estimates are a component of SARs but are not high level indicators themselves (CBFWA).
- I see little value in the data collection. The same information would be obtained with the habitat productivity indicator for naturally produced stocks and with indicator Harvest number and rate for hatchery stocks (Richard Whitney).
- The use of SARs is highly recommended under this HLI, but SARs are obtained from dam counts of smolts versus returning adults and do not provide estimates of mortality at all life stages.
  Survival or mortality estimates for other periods in the life cycle (e.g. egg to smolt) are often more limited and imprecise. It is not clear that meaningful data would be available, but a review of the information generated in intensively monitored watershed projects could provide a useful perspective (ISRP).
  - **Recommend:** Delete this indicator. Rely on the fish production indicator based on SAR/
  - **Recommend:** Refine and develop with region.

Wildlife habitat units by dam: lost and acquired

- Reporting Habitat Units (Hus) lost and acquired should be considered an implementation indicator (CBFWA, ISRP, BPA).
- Suggest the following be reported for theF&W Program and the individual hydroelectric facility: (1) HUs lost due to construction and inundation, (2) HU Mitigation Goal, (3) Total HUs credited, (4) percent Completion (total HUs credited divided by HU mitigation goal), (5) Proportion of projects w/long-term management funding agreements (WDFW, CBFWA).
- Habitat units acquired (total and trend over time?), or, number HUs added each year? (StreamNet)
- Can "habitat units" be better defined? It doesn't seem that PISCES can provide the information necessary to inform this indicator. The Council should consider land-use/land-cover analyses to provide a more synoptic picture of the gain or loss of habitats in the basin (NOAA)
- Because of the high cost to obtain HUs and their unclear relation to biological responses, we recommend that HUs not be considered high priority HLIs in some instances, even as implementation indicators (ISRP).
- We recommend either adding a biological indicator, and using HU as an implementation indicator, or simply substituting a biological indicator (ISRP).
  - **Recommend:** Move to implementation indicator.
  - **Recommend:** For individual hydroelectric facility report: (1) HUs lost due to construction and inundation, (2) HU Mitigation Goal, (3) Total HUs credited, (4) percent Completion (total HUs credited divided by HU mitigation goal), (5) Proportion of projects w/long-term management funding agreements.
  - **Recommend:** define goals or targets.

Instream passage improvements. Additional habitat made accessible

- Data should be coordinated with co-manager Salmon and Steelhead Inventory and Assessment (SSHIAP) program (WDFW).
- Should include other efforts that remove barriers (non-BPA). Number of miles of habitat opened and number of barriers removed are two different metrics. Should decide whether this is total miles accessible and how that changes every year, or is this simply habitat opened to access each year? Also, should be net habitat. There could be new barriers installed that block (decrease) habitat. Note that there is no complete inventory of barriers anywhere yet (StreamNet).
- There is the need to standardize how these estimates are generated among various reporting entities such as PCSRF grantees, Restoration Center, PISCES (BPA).
- Need to further clarify the definition for this indicator. The number of stream miles made accessible differs among salmonid species. Will you report passage improvements by species or will you report the maximum (e.g., for steelhead)? There is the need to standardize how these estimates are generated among various reporting entities such as PCSRF grantees, Restoration Center, PISCES. Does "passage improvement" include projects where partial barriers (versus outright impassible barriers) were improved by reconstructing fish ladders to increase rates of passage and adult survival, etc. How do we give "credit" for projects that have improved existing passage structures versus those that have restored passage to otherwise inaccessible areas? Will you distinguish among types of barriers removed/improved? Washington State of Salmon reports improvements relative to the total complete and partial blockages. The number of associated project types and work elements in PISCES may change as RPA number73 is implemented (NOAA).
- We suggest that the passage barriers, water, land, improvement, and screens indicators be grouped together as habitat implementation indicators. Most if not all of this information in the appropriate units should be available from the Pisces program. To the extent it is not the agencies and Tribes stand ready to work with the Council and Bonneville to assure it is. The organizational structure should be consistent with Pacific Coast Salmon Recovery Fund annual report, the Washington's State of the Salmon in Watersheds report and others. Implementation indicators are split into habitat type (CBFWA).
- This information is valuable, but it does not necessarily reveal the quantity or the quality of the habitat that has become available as a result of barrier removal or modification. Nevertheless, the tally of barrier removal projects and estimate of newly accessible habitat constitutes a useful high level indicator, even though a comprehensive inventory of all actual or potential anthropogenic barriers does not yet exist for the Columbia River Basin, it should be possible to assemble a reasonably accurate measure of sites with improved passage, although the actual number of stream miles made available will always have inherent uncertainty. Records of passage improvement projects should also be available from other regional salmon enhancement programs. It is unlikely that any single current database includes data on all known fish barriers, and the task of consolidating the information will require considerable cooperation between federal, state, and local organizations (ISRP).
  - **Recommend:** Update how derived when RPA 73 is implemented.
  - **Recommend**: Rename and define indicator so matches limitation of PISCES work element. Number of instream passage barriers removed by projects funded by Council F&W Program. Or match to PCSRF's name if applicable.
  - **Recommend**: If estimate number of miles made accessible, describe the associated. uncertainty in estimate, quality, and variability among fish species regarding what is accessible habitat.
  - **Recommend:** define goals or targets.

Water conservation and irrigation practices and water transactions. Additional water available for fish, anadromous and resident

- Use photo monitoring to show effectiveness of flow restoration (OR Water Trust).
- Net water loss/gain may be a more appropriate measurement. Additional acre-feet of water measurement does not have a standardized calculation method (WDFW)
- Should also include work on other funding, or is this FWP only? The second metric, number of miles of primary stream reach improvement, does not sound like it relates to water conservation. It sounds more like physical habitat improvement. Is the second metric better described as "number miles affected by improved flow"? Would a better (more concise) name for this indicator be "Water flow enhancement"? (StreamNet)
- suggest split into 2 indicators so not mixing units: acre-feet/yr & number miles of primary stream reach improvement (BPA).
- This is a match with PCSRF reporting metrics (NOAA).
- The number of associated project types and work elements in PISCES may change as RPA number73 is implemented (NOAA).
- Water conservation is also an important high level indicator. Metrics of how much water formerly was withdrawn from streams for agriculture and other human uses but now is left in streams and rivers are useful in communicating the Fish and Wildlife Program's progress. While the suggested metrics (acre-feet/yr., number of miles of primary stream reach improvement) can be quantified, they would benefit from being placed in the broader context of stream flow conditions in the Columbia River Basin. Thus, it would be helpful to relate water conservation estimates, e.g., acre-feet/yr, to the total amount of water available for natural flows and human uses (ISRP).
- Water quality indicators are currently underrepresented among the habitat metrics used to track progress in the Columbia Basin. It is important to include measures of water quality impairment beyond 303(d) criteria in order to demonstrate that progress is being made to assure that the water being returned to streams is clean and will not harm aquatic ecosystems (ISRP).
  - **Recommend:** Clarify that indicator summarizes data of different units that are not combined together.
  - **Recommend:** Matches PCFRS so keep as is for consistency.
  - **Recommend:** Update how derived when RPA 73 is implemented.
  - **Recommend**: Rename and re define indicator so matches limitation of PISCES work element. If possible match with PCSRF's name.
  - **Recommend:** define goals or targets.

Land acquisition/conservation easement. Additional land acquired or leased for fish habitat

- Good as is (MFW&P).
- Should also include work on other funding, or is this F&W Program only? Would a better (more concise) name for this indicator be "Land protected"? If this Indicator is for all land protected, might it be a better idea to separate out land purchase/easement/protection into the purpose for protecting, such as Lands protected for wildlife and Lands protected for fish? (StreamNet)
- Suggest split into multiple indicators so keep different units separate: number miles of primary stream improved & number of acres of wetlands, of uplands, of estuarine, etc. (BPA).

- Match with PCSRF reporting metrics: number miles streambank acquired or protected, number acres acquired or protected (NOAA).
- These indicators (number of riparian miles protected, number of acres) are useful, but the linkage between land acquisition or conservation and actual improvement in fish habitat is often obscured by other limiting factors (ISRP).
- Often missing is an expression of what percentage of the overall stream system has benefited from the actions (ISRP).
  - **Recommend:** Clarify that indicator summarizes data of different units that are not combined together.
  - **Recommend:** Matches PCFRS so keep as is for consistency.
  - **Recommend:** If needed match with PCSRF's name for consistency or change to "Land Protected."
  - **Recommend:** define goals or targets.

Habitat

- Good as is (MFW&P).
- Measurements and metrics should be coordinated with updated Pacific Salmon Recovery Fund database (WDFW).
- Two basic metrics. If there is a universal estimator for instream habitat complexity, then that might serve as a third metric, although it would have to be applied to the entire ESU/DPS range to show changes over time, a significant challenge to measure. This would be a better metric to measure improvements on a project by project scale, not as a High Level indicator at the ESU/DPS scale. This should probably be separated out into a number of categories, based on the intended purpose of the habitat improvement, at a minimum, separate fish from wildlife purposes (StreamNet).
- Suggest split into multiple indicators so keep different units separate: miles of habitat by type improved & acres of habitat by habitat type improved (BPA).
- Does this really measure "habitat improvement" or rather does it track the implementation of habitat restoration projects? Unclear what the actual metric or metrics are being reported. Is it lumping all these project types into one metric? Isn't this adding apples and oranges (e.g., how do you add miles fenced + acres wetland restored)? Does not match with PCSRF reporting metrics which distinguish among habitat types. Also, we need to ensure consistency in how habitat and project types are defined (for example, PCSRF defines wetlands as adjacent to anadromous waters while PISCES includes upland (non-contiguous) wetland areas (NOAA).
- Most of the metrics describe actions that we think will increase the carrying capacity or survival of target species, but our assumptions are too often not accompanied by effectiveness monitoring that could document real improvements. This category includes no measures of the rate of habitat loss in the Columbia Basin. This is problematic because the current reporting structure describes only gains, but does not complete the picture by describing simultaneous habitat losses. The indicators given in the table are implementation indicators, and as such are appropriate metrics of the types of habitat restoration actions being undertaken through the Fish and Wildlife Program. Some of the metrics included under this category (enhance floodplain, install fence, plant vegetation, practice no-till & conservation tillage systems, upland erosion & sedimentation control) could easily be included under the "Land" category. Habitat improvement will presumably include estuarine projects such as length of rejuvenated tidal channels and number of culverts/floodgates upgraded to provide access. It will take time to develop a coordinated, region-wide habitat

monitoring effort, but given the centrality of this question to the F&W Program's ultimate success, the effort is justifiable (ISRP).

- **Recommend:** Clarify that indicator summarizes data of different units that are not combined together.
- **Recommend:** Rename and re define indicator so matches limitation of PISCES work element. If possible match with PCSRF's name.
- **Recommend:** Aim to match with PCSRF reporting metrics which distinguish among habitat types. However due to habitat types defined differently by PISCES and PCSRF (e.g., PCSRF defines wetlands as adjacent to anadromous waters while PISCES includes upland (non-contiguous) wetland areas) might need to careful read definition of habitat types until this difference is corrected by BPA and NOAA.
- **Recommend:** Including measures of the rate of habitat loss in the Columbia Basin to complete the picture by describing simultaneous habitat losses while gaining habitat.
- **Recommend:** define goals or targets.

Installed fish screens

- Add barrier installation(MFW&P).
- This measurement does not allow one to consider the quantity of water that is NOT protected. How does the Council intend to capture what is not protected? (WA DFW)
- Two different metrics - volume protected and number of screens. Do you want the Indicator to be screens installed during the year (and presumably used in subsequent years), or do you want to keep a running tally of all screens installed cumulatively, so that the Indicator shows an increasing trend in installed screens over the years? (StreamNet).
- PCSRF also reports the number of fish screens installed or improved (NOAA).
- It might benefit from indicating (1) what fraction of the existing unscreened water withdrawals have been screened in the current cycle, and (2) what target species or subbasins will most likely benefit from the screening projects. The availability and quality of existing data should be reasonably good (ISRP).
  - **Recommend:** Clarify that indicator summarizes data of different units that are not combined together.
  - **Recommend:** Report, for consistency with PCSRF, number of screen installed or improved
  - **Recommend:** Consider whether reporting quantity of water protected in acre-feet is needed. This is most likely an estimate with uncertainty. Or need to define this indicator more clearly so clear what is meant by water protected and limitation of what it conveys.
  - **Recommend:** define goals or targets.

Number of juvenile salmon saved from all predators

- Add resident fish predators (MFW&P).
- This indicator needs more clarification before substantive comments can be provided. We need to know how inclusive the predator assemblage is going to be and how the high level indicator is going to be calculated (WA DFW).
- Note that sea lions are not a primary predator on juveniles. We recommend a separate indicator for adult predation. number juvenile salmon protected from predators. Will this be broken down by type of predator, or simply be a total number saved? number nesting pairs (decrease) of several avian species. number of pikeminnows removed. Consumption rates of each predator species, by species consumed. This is an ambitious indicator (but important). This indicator is focused on juveniles, but predation of adult fish returning (arguably the most important individual fish) are also subject to predation losses. We suggest there should

be a similar indicator for adult predation, and reference to sea lions moved to that indicator, as sea lions do not fit with this juvenile indicator (StreamNet).

- Move to biological indicator (BPA, NOAA).
- The proposed indicator is an "effectiveness indicator." Effectiveness indicators might include reductions in predator populations as a result of the removals/deterrence, and (as proposed) the reduction in predation rates on juvenile salmonids (NOAA).
- Reporting on predator control efforts is an appropriate indicator given the growing emphasis and controversy surrounding some of the efforts. Suggest the Council report: Avian, pinniped, fish predation rates by salmonid species/race and Pacific lamprey. Number and location of bird colonies of interest (CBFWA).
- This category of high level indicator will require further development. The assumptions need to be examined. At present the actual number of juvenile salmon lost to predators in fresh water and the estuary is highly uncertain. However, estimates of tern and cormorant predation are available in the estuary based on recovery of tags found at nesting colonies. Newer insights regarding the interaction of predators and other species, and dynamics of predator populations, suggest that counterintuitive indicators are possible. Also, there are relatively few studies of predation losses in the nearshore marine environment. Climate change and trends in water temperatures and flows are relevant to the invasion of warm-water predators into fresh waters and the estuary (ISRP).
  - **Recommend:** Refine and develop with region.

Number and percentage of targeted watersheds that provide adequate fish habitat

- Suggest MT ranking criteria developed for subbasin plans e.g., MT 6th code HUC based on species assemblage, habitat condition, need/potential habitat restoration, mainstem reaches that crosses multiple HUCs (MFW&P).
- Suggest Water quality index, stream flow, sediment quality index, habitat quality (in stream, riparian) index, biological health (in-stream) index. Land use / land cover (PNAMP, WA Forum).
- Council indicator states that will coordinate through the Executive Summit, task 3. The Washington Monitoring Forum is also developing recommended watershed health indicators that should be AREMP may have indicators. Interesting indicator. We don't know how to calculate this one (StreamNet).
- This isn't really an "implementation indicator." This is an "effectiveness indicator" (BPA, NOAA).
- Executive Summit Task number 3 at this point is very Puget Sound centric. CBFWA has been coordinating with federal land managers to report watershed health indicators from the PIBO and AREMP programs. Washington State of Salmon reports the number of stream segments meeting water quality standards for fecal coliform, dissolved oxygen, pH, and temperature at the watershed scale, and reports the proportion of healthy watersheds using the Water Quality Index at the state-wide scale (NOAA).
- There are several programs we are or will be working with to develop the watershed health indicator. The programs include those of the Forest Service and Bureau of Land Management on federal lands in the Basin, the Kootenai Tribe of Idaho's operational loss assessment methodology using an Index of Ecological Integrity, the Northwest Habitat Institute, and the water quality managers (CBFWA).
- We agree that there should be indicator(s) of watershed health, but this will take some time. The efforts of the Interior Columbia Basin Ecosystem Management Project (ICBEMP http://www.icbemp.gov/) which included assessments of watershed condition and the status of various fish and wildlife species is an example of one attempt. There are many existing

indices of ecosystem “health” including some specific to fresh water, e.g., the Index of Biotic Integrity that includes the community composition of aquatic invertebrates and abundance of pollution tolerant species and the measures of watershed condition used by the Aquatic and Riparian Effectiveness Monitoring Program. Indices of watershed health will likely need to include large-scale measures of vegetation, land use, streamflow, and hydrologic connectivity, as well as multi-species indices of population health. Ultimately an integrated (i.e. upland, riparian, stream network) perspective of watershed condition could prove quite useful, but likely will require thoughtful development and collaboration with others (ISRP).

- The number of non-indigenous species should be considered an aspect of watershed health. This can be measured and is generally interpreted as an indicator of decline. Some information is currently available on the distribution (actual or potential) of introduced fishes that could act as predators or competitors (ISRP).
  - **Recommend:** Refine and develop with region.

Table 1: Biological Indicators
May 28, 2009 - *modified based on public comments for Council adoption*

Proposed Management Questions	**Proposed Performance Measures**	***Original*** **High Level Indicators with Proposed Modifications**
(I) What is the trend in adult salmonids passing above FCRPS hydroprojects in the Columbia and Snake River?	(1) Trend and numbers of adult salmon and steelhead passing Bonneville Dam, Lower Granite Dam, and Priest Rapids Dam.	(1.a) *Total adult salmon and steelhead* passing the dams ~~*returns to the Columbia..*~~
(II) What is the in-river harvest of wild and hatchery salmonids and white sturgeon in commercial, sport, and tribal fisheries?	(2) In-river number and rates for commercial, sport, and tribal fisheries.	(2.a) In-river harvest numbers ~~*Harvest number and rate.*~~
		(2.b) In-river harvest rate ~~*Harvest number and rate.*~~
(III) What are the hydrosystem survival rates for juvenile salmonids passing in-river and barged?	(3) Juvenile salmon and steelhead hydrosystem passage survival targets by ESU and by Juvenile Dam Passage Survival Standards.	(3.a) *Survival rates through the hydrosystem for* ~~*adult and*~~ *juvenile fish passing in-river and barged and juvenile dam survival rates.*
(IV) What are the hydrosystem survival rates for adult salmonids?	(4) Adult salmon and steelhead hydrosystem passage standards specified in the FCRPS Biological Opinion.	(4.a) Adult Mainstem Hydrosystem Survival for each ESU or DPS. ~~*Survival rates through the hydrosystem for juvenile fish passing in-river and barged and juvenile dam survival rates.*~~

Table 2: Implementation Indicators

May 28, 2009 - modified based on public comments for Council adoption

Proposed Management Questions	**Proposed Performance Measures**	***Original*** **High Level Indicators with Proposed Modifications**
I) Are wildlife habitat losses related to the hydrosystem being mitigated through the Council's FW Program?	(1) Habitat units acquired relative to goals, if goals are available.	(1.a) Number of *wildlife habitat units* ~~by dam: lost and acquired wildlife habitat units~~ acquired.
II) How much has the Council's FW Program contributed towards expanding salmonids passage?	(2) Removal of full or partial fish barriers and increasing potential habitat accessible to salmonids relative to goals, if goals are available.	(2.a) Number of full and partial barriers removed. ~~Instream passage improvement. Additional habitat made accessible~~
		(2.b) Additional miles of habitat potentially made accessible. ~~Instream passage improvement. Additional habitat made accessible~~
III) How much has the Council's FW Program contributed towards returning diverted water to the river?	(3) Amount of water conserved and returned to streams to improve streams for anadromous fish passage or survival relative to goals, if goals are available.	(3.a) Amount of water made available to fish through *water conservation and irrigation improvement and water transactions.* ~~*Additional water available for fish, anadromous and resident*~~
		(3.b) Total miles of primary stream reach improved with additional water. ~~*Water conservation and irrigation improvement and water transactions. Additional water available for fish, anadromous and resident*~~
IV) How much has the Council's FW Program contributed towards protecting land for fish via purchase or easement stream banks and adjacent land?	(4) Amount of stream banks and adjacent land protected for fish through purchase or easement relative to goals, if goals are available.	(4.a) Miles of stream bank, by habitat type, that is protected for fish habitat. ~~*Land acquisition/conservation easement. Additional land acquired or leased for fish habitat*~~
		(4.b) Acres of wetlands, upland, estuarine, and other habitat that is protected for fish habitat. ~~*Land acquisition/conservation easement. Additional land acquired or leased for fish habitat*~~
V) How much has the Council's FW Program contributed towards screening irrigation diversions?	(5) Amount of water targeted for protecting fish from water/irrigation diversions that could reduce fish survival relative to goals, if goals are available.	(5.a) *Installed fish screens.*

Table 2 cont.: Implementation Indicators

Proposed Management Questions	**Proposed Performance Measures**	***Original*** **High Level Indicators with Proposed Modifications**
VI) How much riparian and instream habitat have received habitat improvement actions through projects funded by the Council's FW Program?	(6) Amount of wetland, riparian, upland, estuarine, and instream habitat improved relative to goals, if goals are available.	(6.a) Acres of wetland, upland, and estuarine, habitat improved. ~~*Habitat*~~
		(6.b) Miles of riparian and instream habitat improved ~~*Habitat*~~

Table 3: High Level Indicators Reserved for Additional Work

Original High Level Indicator Topics to be refined by workshops
Abundance of adult fish in Council's Program
Fish population status and trends for each ESU
Productivity of wild fish
Ocean harvest of wild and hatchery salmonids (subset of indicators Harvest number and rate & Harvest of hatchery fish in the Council's Program)
Harvest of resident fish (subset of indicators Harvest number and rate & Harvest of hatchery fish in the Council's Program)
Relative fitness of supplemented stocks from hatcheries funded by the Council Program
Life stage survival for representative populations of Chinook and steelhead
Number and percentage of targeted watersheds that provide adequate fish habitat (moved from implementation to biological indicator)
Number of juvenile salmon saved from all predators (moved from implementation to biological indicator)