

Proposed Indices for Measuring and Comparing Benefits Yakima River Basin Study

This paper recommends an initial set of indices for comparing project and Integrated Plan benefits reviewed as part of the Yakima River Basin study. These initial recommendations are not exhaustive. Instead, the intent of the document is to solicit initial input from the Workgroup during the July 28th meeting; provide time for deliberation during August; and arrive at agreed on a set of indices at the August 25 or September 22 Workgroup meetings.

I. Out-of-Stream Supply Benefits

1. **TWSA.** Change in Total Water Supply Available (TWSA) during drought years, expressed in acre-feet. Quantify the difference in TWSA between current facilities and facilities with the projects, under runoff/snowpack/storage conditions similar to: a.) drought-year 2001 and b.) drought-year 1994.
2. **Proration percentage.** Change in proration percentage, in percentage points. Quantify the difference in proration between current facilities and facilities with the projects, under runoff/snowpack/storage conditions similar to a.) drought-year 2001 and b.) drought-year 1994.

II. Stream Flow Benefits

1. **Change in flow at the Parker Gage.** Total change in flow passing the Parker Gage from June through September (total acre-feet over these four months).
2. **Change in flow at the Yakima River mouth.** Total change in flow passing the mouth from June through September (total acre-feet over these four months).
3. **Index of flow improvement in priority reaches above Parker.** The HDR team will develop an index that combines stream flow benefits produced in approximately five to ten priority reaches identified for the Yakima Basin Study (e.g. a weighted sum of flow benefits across multiple reaches, including improvements in low flows and reductions in excessively high flows during irrigation conveyance). Details of the index will be provided for Workgroup review; and the resulting index will be used for project comparisons.
4. **Spring pulse flows.** Consideration was given to developing a metric for spring pulse flows that support habitat forming processes and fish migration benefits. The volume of water provided at Parker from April-June will be reported. Spring pulses during drought years will benefit smolts by pushing them out of the river and encourage adults to migrate into the river. In wet years, the spring pulses would provide channel forming flows, thereby, renewing fish habitat and benefit

fish migration. The index will include the volume of water available for pulses and the number and size of the pulse base on wet and drought years.

III. Fish Benefits

1. **Fish smolt production.** Change in number of smolts produced from Yakima Basin. Four species will be estimated: Chinook, Coho, Steelhead, and Sockeye.
2. **Fish adult production.** Change in number of adults projected to return to Yakima Basin. Based on smolt results above, multiplied by assumed return rates (range of return rates from low to high).
3. **Fish habitat area.** Change in total quantity of available fish habitat in the Basin, measured in square meters. Estimates will be presented for three types of fish habitat:
 - Lower Yakima River mainstem habitat (combined riffle/pool/run);
 - Upper Yakima River and tributaries habitat (combined riffle/pool/run);
 - Reservoir habitat.

IV. Costs

1. **Design and Construction.** The cost to secure land, engineer, permit and construct projects.
2. **Operations and Maintenance.** The costs to operate and maintain potential new facilities (e.g. pumping costs, life cycle analysis).

V. Other Considerations

1. **Municipal/domestic supply.** Consideration was given to developing a metric for municipal and domestic water supply. This was not developed, because it is assumed that municipal and domestic supply allocations would be made through policy choices. Increased water supply from any of the supply projects can contribute to municipal/domestic supplies, if they are allocated partly to these uses.
2. **Flood management benefits.** Some of the projects identified, such as those improving floodplain habitat, also have flood management benefits. These will be noted and characterized qualitatively, but may not be included in the matrix
3. **Energy Recovery.** It is anticipated that some of the projects will require energy for pumping and others will recover energy. Energy recovery is viewed primarily as a means of generating revenue to partially offset costs; or to offset energy losses from other projects. If included in the matrix the net energy gain or loss will be recorded.

4. **Adaptability to Future Climate Change.** Ability to adapt to changing flow conditions/store higher winter flows and sustainability of fish runs under future climate conditions.
5. **Job Creation.** Number and type of jobs added to the region.
6. **Environmental Impacts.** The index has not been defined as of yet, in part because it represents impacts, rather than benefits. If this category was included in the benefit comparison matrix it could include indices such as: land/habitat inundated and habitat functions impacted.