



**Findings from the
Reservoir Operations / Flow
Survival Symposium**

November 9-10, 2004

(Report ISAB 2004-2, Dec. 10, 2004)



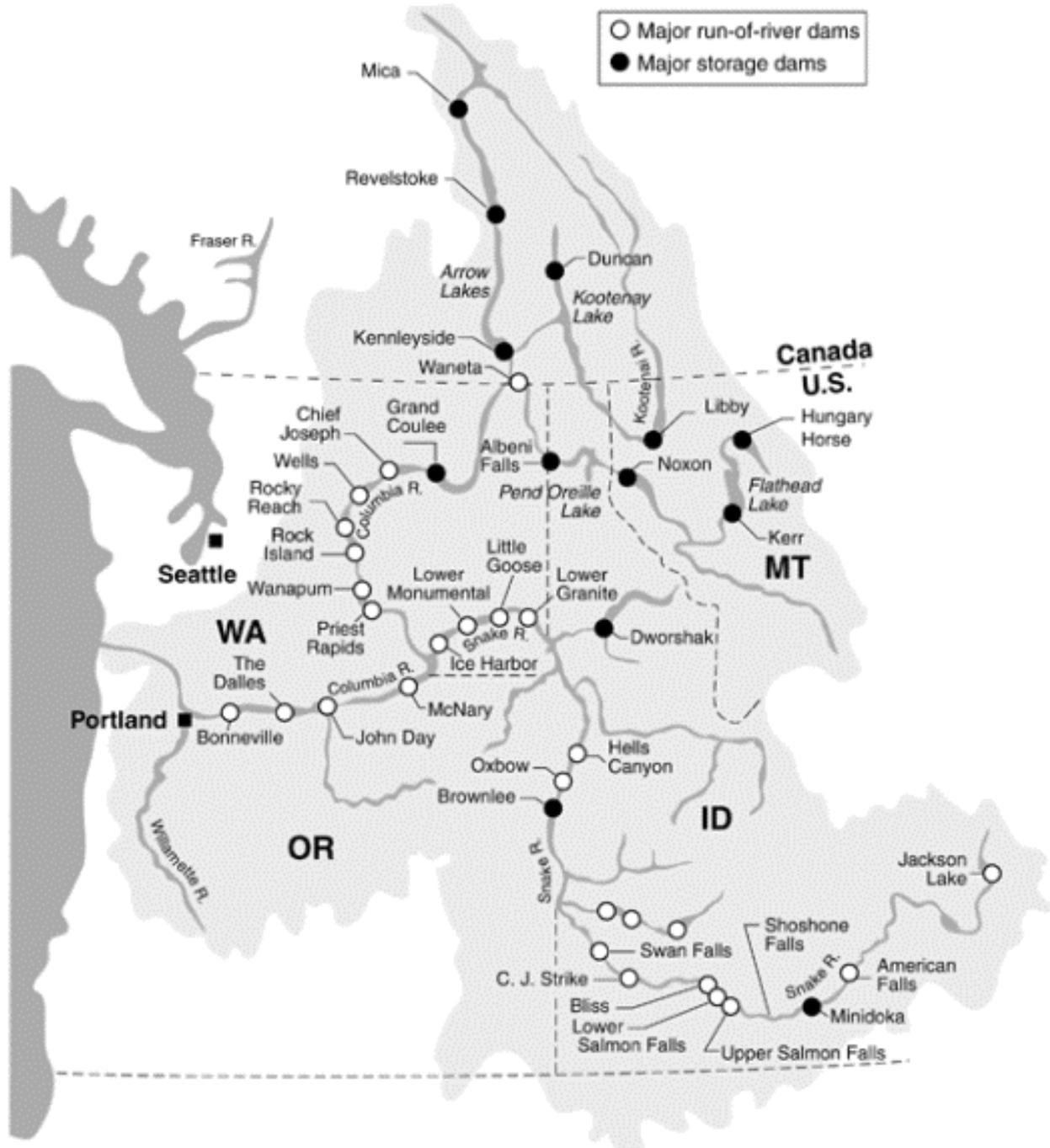
Background

- Council's Mainstem Amendments of 2003 directed the region to test, implement, and evaluate an interim summer operation that employs new drafting limits for Hungry Horse and Libby dams
- Montana submitted a System Operation Request (SOR) to do it (SOR 2004-MT-2)
- Summer flow augmentation would differ from NMFS' 2000 BiOp flows
- Shift elevated flows from August to September

Background, Continued



- Hungry Horse and Libby are two of the main water storage reservoirs in the Federal Columbia River Power System
- They provide summer flow augmentation for summer outmigrants (particularly Snake River fall Chinook salmon) in the lower Columbia River
- Montana has documented detrimental biological effects of BiOp releases on their reservoirs and on rivers downstream of the dams (ISAB and ISRP reviews)
- Montana SOR seeks to reduce these effects



Council requested the ISAB
to examine the Council's hypothesis

that the proposed Montana operations

“will significantly benefit listed and non-listed resident fish in the reservoirs and in the portions of the rivers below the reservoirs without discernable effects on the survival of juvenile and adult anadromous fish [in the Columbia River mainstem] when compared to ordinary operations under the biological opinions.” (page 26, Council 2003)

NOAA Fisheries' questions about potential changes in anadromous fish migration from Montana's SOR, especially ESA stocks

- What is the state of science?
- Which attributes are most important for this decision and what research is needed?
- Is there a practical and feasible experimental design?
- Strengths/weaknesses of available models?

(paraphrased from Lohn July 19, 2004 letter to Danielson)

The overarching issue is the tradeoff between adverse and beneficial effects on fish

- to resident fish in Montana and upper Idaho (especially ESA-listed white sturgeon and bull trout)
- to anadromous fish in the middle and lower Columbia River (especially ESA listed stocks, including Snake River fall Chinook)



The Symposium

- Participation by top scientists
- Brief presentations on how the Montana SOR would reduce adverse effects on resident fish
- Symposium focused on providing the most current information on the lower river, including relevant information on the listed Snake River fish populations
 - Flow, velocity and temperature
 - Status/presence of affected stocks
 - Biological responses (life history, delayed effects, adult passage, modeling)
 - Research needs and experimental feasibility

ISAB Conclusions:

- The Council's hypothesis is reasonable
- Detrimental effects of current operations on overall biological productivity at HH/L are demonstrated, although effects on listed fish are not yet clear
- Effects on anadromous fish in lower river will be small, but it is uncertain whether net positive or negative because new flows would be slightly more at times and slightly less at other times
- An experimental trial of the SOR is unlikely to show effects in a few decades because annual variability in flow and salmon survival (for other reasons) are much larger than the expected effect of the Montana proposal

Rationale: Flow-survival issue

- Science is in flux
- Flow-survival issue has progressed from simplifying assumptions, regression of broadly averaged variables, and sweeping generalizations to synthesis of issue-specific, detailed data
- The Montana SOR has refined the issue

Rationale: Flow and Velocity Changes

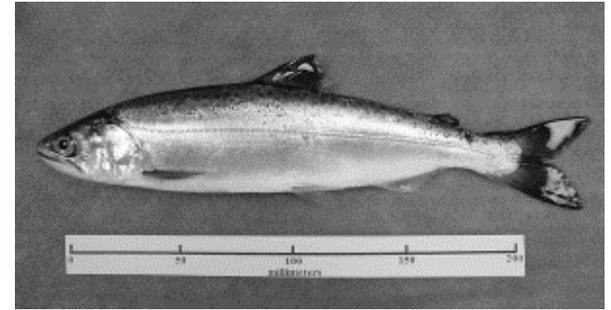
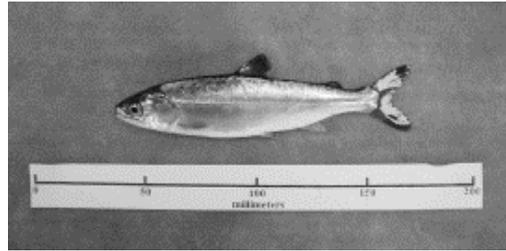
- The water routing models (that predict changing flows in August and September) are inadequate for detailed analysis of biological effects in the lower river
- Stable operation of the Canadian system of downstream dams and reservoirs is not assured
- Little is known about actual velocities in reservoirs that affect fish migration
- Variability of flow (for other reasons) is likely much greater than can be measured from the changed HH/L operation



Rationale: Temperature

- Knowledge of temperature relationships is misperceived and misapplied (it likely has a larger direct effect than assumed)
- HH/L changes will not affect lower Columbia River temperatures (too far away)
- Augmentation of Snake River flow in summer is confused with addition of cold water (from Dworshak Dam) that has temperature benefits
- More flow does not necessarily mean lower temperatures

Rationale: Fish Stocks



- Newly recognized importance of “reservoir” life history of Snake River fall Chinook
- Some juveniles hold over the summer and fall and migrate the next spring
- Some summer “mortalities” are now seen as survivors (holdovers)
- Holdovers show a high return rate of adults
- Management of fall Chinook needs re-evaluation (including both flow augmentation and transportation)

Rationale: Biological Effects



- Details of river operations affect survival beyond just average flows
- Delayed effects of hydrosystem passage likely occur in the estuary and ocean
- Adult migrations are affected oppositely than juveniles (higher flows slow migrations)
- Even small changes in flows might have cumulative effects, which are uncertain

Which attributes are most critical for further analyses?

1. Better resolution of the physical changes in downstream flows and temperatures to be expected from upstream changes in operations
2. Better understanding of the life-history status of Snake River fall Chinook and perhaps other stocks
3. Better understanding of the cumulative effects of small, incremental changes in physical factors and biological responses

Recap

- The Council's hypothesis is reasonable
- Using the best available science, the demonstrated adverse effects of flow operations at Hungry Horse and Libby dams are contrasted with estimates of very small effects on survival of anadromous fish in the lower Columbia River
- Effects in the lower river are likely too small to measure practically against both measurement error and background variation due to other causes
- Questions about the reservoir life history of fall Chinook present the greatest biological uncertainty for summer flow augmentation