# Technical Review
# A Literature Review and Discussion of the Trophic Structure in Reservoirs Similar to Hells Canyon Complex (E.3.1-5, Chapter 5)

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## I. Introduction

A literature search was conducted on food habits for species found in the Hells Canyon Complex reservoirs. This search was limited to studies conducted in the Northwestern United States. Fish species were separated into basic trophic levels and trophic groups based on diet. Relative weights were used to determine whether a fish species might be limited by food availability.

## II. Conclusions

*1. "To measure fish condition, three basic condition indices are available; one of the more easily interpreted indices is relative weight ($W_r$), which also allows comparisons among species. Richter and Chandler (2001) calculated $W_r$ for selected species in the HCC (Table 8). Species whose mean $W_r$ is above 105 are considered to have an overabundant food supply; species whose mean Wr is between 85 and 105 are considered to be in balance with their food supply; those below 85 are considered to have a limited food supply." (Page 4, Paragraph 2)*

*"Examples of species in the HCC that have an overabundant food supply are black crappie, bluegill, largemouth bass, and pumpkinseed. Channel catfish have a mean $W_r$ over 105 in Oxbow and Hells Canyon reservoirs, suggesting that food sources in these reservoirs may be different from those in Brownlee Reservoir, where mean $W_r$ is 97. Species considered in balance with their food supply are smallmouth bass, northern pikeminnow, chiselmouth, and white crappie." (Page 4, Paragraph 3)*

*"The data collected in the HCC indicates that several species have $W_r$ below 85, but not for all HCC reservoirs. In Brownlee Reservoir, bridgelip sucker was the only sampled species having a $W_r$ less than 85. In Hells Canyon Reservoir, common carp, largescale sucker, mountain whitefish, rainbow trout, and yellow perch had low $W_r$. Of species sampled in Oxbow Reservoir, only rainbow trout had a $W_r$ less than 85. In the reach above Brownlee Reservoir, low $W_r$ were calculated for largescale sucker and mountain whitefish." (Page 4, Paragraph 4)*

*"When limited food supply is investigated, species in this study that had sufficient sample sizes and $W_r$ below 85 should receive priority. Species that may have limiting food supplies in at least one of the HCC reservoirs are largescale sucker, bridgelip sucker, common carp, mountain whitefish, rainbow trout, and yellow perch." (Page 4, Paragraph 5)*

Response: The BLM agrees with the weight factor finding but disagrees with the cause of reduced weights for some species. The species with a $W_r$ less than 85 may be suffering from stress caused by poor water quality rather than a food shortage. Rainbow trout, yellow perch, and mountain whitefish are generally considered to be coldwater species.

## III. Study Adequacy

The study is adequate. The use of relative weight ($W_r$ ) to determine fish species population condition is a standard in fisheries science.

## IV. BLM Conclusions and Recommendations

Conclusions

The findings of this study suggest that some species are not finding sufficient food supply in some of the reservoirs. It is likely that water temperature and water quality may be reducing some species' ability to feed or metabolize food at a normal rate. The fact that rainbow trout have a low $W_r$ is not surprising. The high water temperature in the reservoirs is likely to impair growth of a coldwater species like rainbow trout.

Recommendations

The BLM should accept the study findings for the reservoirs. Improved water quality in the reservoirs would likely improve the $W_r$ of the native species such as native redband rainbow trout, white fish, largescale sucker, and bridgelip sucker mentioned in this study.

No information was presented for the $W_r$ of species in the Hells Canyon Reach. IPC should develop a $W_r$ for species found below the Hells Canyon Reach to determine their relative health. This would be useful in verifying that the operation of the Hells Canyon Complex is not adversely affecting fish communities below Hells Canyon Dam. Collection of information should extend from Hells Canyon Dam to Captain John's Rapids near Asotin, Washington.