

## Implications of Budget Reductions Associated with Rainbow Trout Diet Analysis at the LCR Confluence and Incidence of Predation of Humpback Chub by Rainbow and Brown Trout

### Background

The Adaptive Management Work Group (AMWG) met August 13-14, 2003 to discuss approval of the 2004 Grand Canyon Monitoring and Research Center (GCMRC) budget. Following that meeting, budget reductions were realized by two projects: (1) Rainbow Trout Diet Analysis at the LCR Confluence and (2) Incidence of Predation of Humpback Chub by Rainbow and Brown Trout. This briefing paper discusses the major ramifications of those budget reductions.

The GCMRC implemented a non-native fish control in the Little Colorado River (LCR) inflow area in January 2003 as part of a joint federal action entitled "Proposed Experimental Flows and Removal of Non-Native Fishes". The fisheries objective of this effort focuses primarily on three objectives: (1) evaluating the relationship between non-native fish abundance and humpback chub population dynamics; (2) efficacy of non-native fish mechanical removal in a distinct segment of the Colorado River; and (3) diet and predatory habits of non-native fishes in the Colorado River. The diet and predation assessment of non-native fishes was deemed an important aspect of this project for a number of reasons.

First, stakeholders and scientists recognized the importance of evaluating predation of native fishes by various non-native fishes. As identified in the original mechanical removal operational plan, there are a host of objectives designed to gain a better understanding of the factors contributing to predation. These factors include variability in prey and predator density, predator and prey size, and water clarity. Indeed, there are research information needs identified by the AMP that focus on precisely these questions.

Second, non-native fish diet information is essential to fostering a better understanding of trophic links within the aquatic system as well as potential competitive interactions between fishes. The Aquatic Protocol Evaluation Panel convened in 2001 made recommendations related to establishing empirical linkages to foodbase and fish. Specific recommendations included: (1) detailed diet analysis of Colorado River fishes, and (2) development of fish bioenergetic models.

Lastly, diet analyses of samples collected in 2003 are beginning to provide new information. Because these samples were collected over six months of the year and both upstream and downstream of the LCR confluence, patterns in diet composition and feeding success are beginning to emerge as a function of season, location, and water clarity. Of interest is a shift in rainbow trout diet composed predominantly of simuliid larvae during winter to a significant utilization of terrestrial insects during summer. Additionally, during turbid conditions, a high proportion of rainbow trout were found to have empty stomachs. This finding suggests water clarity may constrain successful foraging behavior and has implications to decisions about future sediment augmentation initiatives. Additionally, the temperature of water discharged at Glen Canyon Dam has increased to temperatures not witnessed since the late 1970's. This development potentially allows collections to be made that could provide valuable insight into the possible affect of a future temperature control device on fish diet and predation with increased metabolic demands.

### Implications of Budget Reductions

The final 2004 budget for the diet and predation assessment programs in total represent a reduction of approximately 75%. We project that in order to comply with this reduction we will have to reduce our collections and laboratory assessments commensurate with this decrease. This translates to smaller collections being made during only two trips. How these collections are distributed through the year has implications related to which factors potentially influencing diet can be examined. For instance, we may allocate one collecting trip to January and one to September. This strategy may provide the most information relative to how diet and predation vary by season and also prey availability. However, if both January and September are clear water conditions we may not be able to address the affect of turbidity. Alternately, we could allocate both trips during summer in order to maximize our ability to infer the effect of increased temperature and maximize the likelihood of turbid water downstream of the LCR. However, we might be able to say little about seasonal changes in diet composition. There are of course other options that we will continue to evaluate this fall in order to have the highest likelihood of obtaining the most information. However, the critical implication for these budget cuts is that by reducing the number and temporal distribution of collecting trips, we will have less control of which factors potentially influencing diet and predation are examined. Depending upon planning success in predicting environmental conditions extant on a particular trip, we may miss the opportunity to make conclusions about any or all of the factors contributing to variability in diet or incidence of predation.