

# Overview of Science Advisors Recommendations & Science Plan for Experimental Treatment

Glen Canyon Dam Adaptive  
Management Work Group Meeting

Phoenix, AZ

January 28, 2003



## **REVIEW OF SCIENCE ADVISORS' RECOMMENDATIONS ON TREATMENTS**

- I. The AMWG and GCMRC should **CREATE A SENSE OF URGENCY** regarding activities associated with protection of the HBC and its habitat. The entire experiment should use an adaptive management process.
  
- II. AMWG and GCMRC **should engage the USFWS** and implement an assessment of the minimum viable population of the humpback chub.

## REVIEW OF SCIENCE ADVISORS' RECOMMENDATIONS ON TREATMENTS

- III. GCMRC should maximize parameters in study designs that address control of trout populations, i.e., direct kill, flow regimes, TCD, etc. The specific analysis techniques should be presented, rather than example design or technique.
  
- IV. AMWG should pursue development of the TCD immediately.
  
- V. AMWG should pursue development of a refugia population of HBC.

## REVIEW OF SCIENCE ADVISORS' RECOMMENDATIONS ON TREATMENTS

- VI. AMWG should pursue fluctuating flows in the treatments to effect reductions in the trout populations, i.e., strand fish, destroy spawn, increase adult population, etc.
- VII. Treatments should evaluate the impacts of flow regimes on recreation, including both boating impacts and fishing impacts.
- VIII. GCMRC and associates should continue ongoing sediment and hydrology monitoring using advanced technology.

## REVIEW OF SCIENCE ADVISORS' RECOMMENDATIONS ON TREATMENTS

- XI. AMWG should implement BHBF only in years with appreciable (high) tributary sediment input events.
- X. The fluctuating flow events should include the normal monitoring of water, sediment, power, fish, etc., but also include additional monitoring in chub and exotic fish, recreation, cultural resources, etc.
- XI. Cultural resources... 15 to 19 (sites) have been identified to have such significance and are under such threat of destruction that an immediate mitigation program is recommended over a ten-year period, with associated funding to resolve pending impacts.

## **REVIEW OF SCIENCE ADVISORS' RECOMMENDATIONS ON TREATMENTS**

- XII. American Indian involvement in the development of the experimental treatments program should be such that any reasonably foreseeable impacts to areas of traditional and/or cultural significance can be minimized.
- XIII. Monitoring of anglers and river visitors (private and commercial) should be performed before, during and after any experimental flows.

# PLANNING FOR EXPERIMENTAL TREATMENTS

## The Science Plan

- Developed and Revised by TWG and GCMRC during 2002
- Final Revision Based on Review by TWG Budget Ad Hoc Committee
- Elements Reflect Scenarios With and Without Sediment Inputs

# **SEDIMENT & EXPERIMENTAL FLOWS**

## **WY 2002-2003**

### **FINE-SEDIMENT MASS BALANCE**

- **Stream Flow, Sediment Transport at 9 stations**
- **High-Resolution Suspended-Sediment Data**
- **Mass Concentration and Grain-Size Data**
- **Influx versus Efflux of Sand & Silt/Clay**
- **Evaluation of *Beta* as Proxy for Conventional Methods**

### **Questions?**

- **How Much Can the Sand Supply be Enriched by Under Lowest ROD Operations?**
- **How Does Enriching the Sand Supply Influence Bar Restoration Response to BHBF (bar size and texture)?**

### **Experimental Project Coordinators**

**David Topping, Ted Melis & Greg Fisk**





# **SEDIMENT & EXPERIMENTAL FLOWS**

## **WY 2002-2003**

### **FINE-SEDIMENT STORAGE MONITORING (FIST)**

- **Changes in Sand Storage Throughout Channel**
- **Terrestrial and Aquatic Physical Habitats**
- **Integrated, Reach-Scale Measurements**
- **“Checks and Balance” for Running Mass Balance Data**
- **Study Relationships between Sediment and Cultural Sites**

### **Questions?**

- **How Does the 2003 BHBF Sand-bar Response Compare With 1996 Response?**
- **What Is the Fate of New Sand Bars Under Fluctuating Flows?**
- **What is Role of Wind in Transporting Sand to Cultural Sites?**

### **Experimental Project Coordinators**

**David Rubin, Matt Kaplinski, Jack Schmidt & David Topping**



# **SEDIMENT & EXPERIMENTAL FLOWS**

## **WY 2002-2003**

### **COARSE SEDIMENT INPUTS & IMPACTS**

- **Changes in Geomorphic Framework of Channel Elements**
- **Terrestrial and Aquatic Physical Habitats**
- **Impacts to Rapids, Debris Fans and Relationship to Sand Bars**
- **Reworking of Aggraded Sites Under BHBF & Lower Flows**

### **Questions?**

- **How does the 2003 BHBF debris-fan reworking response compare with 1996 response at newly aggraded sites?**
- **What is fate of coarse sediments when transported away from depositional sites (implications for physical habitats)?**

### **Experimental Project Coordinators**

**Bob Webb & Ted Melis**



# **SEDIMENT & EXPERIMENTAL FLOWS**

## **WY 2002-2003**

### **SAND-BAR AND SAND-TRANSPORT MODELING**

- **Daily Sand-Bar Evolution Response during BHBF**
- **Relationships between Bar Evolution and Supply**
- **Research on “Rapid Bar-Failure” Responses during BHBF**
- **Collection of Multi-D Sand-Bar Modeling Verification Data**

### **Questions?**

- **How do 2003 BHBF sand-bar (localized) responses compare with 1996 responses at repeat sites?**
- **Does “Rapid Bar-Failure” response occur under enriched sediment supply conditions?**

### **Experimental Project Coordinators**

**Steve Wiele, Peter Wilcock & Jack Schmidt**



# **BIOLOGY & EXPERIMENTAL FLOWS**

## **WY 2002-2003**

### **STATE OF PRIMARY PRODUCTIVITY & ALTERATION OF FOODBASE**

- **Comparison of ROD and LSSF findings with new flow regime**
- **Organic Carbon Budget Basis for Foodbase**
- **Interaction of Flows and New Foodbase Composition (NZMS)**
- **Drift and Invertebrate Community Status**

### **Questions?**

- **Do Low Fall Flows Designed to Conserve Sediment Affect Foodbase?**
- **Will Change in ROD Flows Increase or Decrease Export of Organic Carbon from the Glen Canyon Reach**

### **Experimental Project Coordinators**

**Mike Yard, Todd Tietjen, Joe Shannon**



# **BIOLOGY & EXPERIMENTAL FLOWS**

## **WY 2002-2003**

### **NEAR SHORE TEMPERATURE AND HABITAT USE MONITORING** **DURING LOW STEADY FALL FLOWS**

- **Comparison of ROD and LSSF findings with new flow regime**
- **Monitoring of backwater habitat utilization by HBC and other native fishes**
- **Movement of HBC from LCR to mainstem**
- **Monitor Temperature and other key habitat variables in backwaters**

### **Questions?**

- **Do Low Fall Flows Designed to Conserve Sediment Affect Backwater habitat?**
- **Will Change in ROD Flows Increase or Decrease Use of Backwaters by Native Fish**

### **Experimental Project Coordinators**

**GCMRC & TBD**



# **BIOLOGY & EXPERIMENTAL FLOWS**

## **WY 2002-2003**

### **KANAB AMBERSNAIL COMPLIANCE MONITORING**

- **Winter sampling of KAS population at Vasey's Paradise**
- **Before and After Experimental High Flow Treatment**
- **May involve Habitat Removal/Restoration**
- **Compare Effects of EHF with 1996 BHBFB**

### **Questions?**

- **Do flows of 40-45,000 cfs adversely affect KAS**
- **What is mid-winter population of KAS relative to routine monitoring in spring and summer**

### **Experimental Project Coordinators**

**AZGFD-Sorensen**



# **BIOLOGY & EXPERIMENTAL FLOWS**

## **WY 2002-2003**

### **FOODBASE IMPACT OF EHF IN THE GLEN CANYON REACH**

- **Sampling in the Glen Canyon reach to determine EHF effects on trout food base**
- **Export or scouring of foodbase**
- **Recovery of foodbase**
- **Effects of EHF v Fluctuating Flows**

### **Questions?**

- **Does the EHF (40-45,000 cfs) have an affect on the Aquatic Foodbase at Lees Ferry**
- **How does EHF compare to BHBF and Fluctuating Flows**

### **Experimental Project Coordinators**

**NAU-Shannon**



# **BIOLOGY & EXPERIMENTAL FLOWS**

## **WY 2002-2003**

### **MONITORING OF RAINBOW TROUT STRANDING AND MORTALITY DURING FLUCTUATING FLOWS, JAN-MAR**

- **Sampling in the Glen Canyon reach to determine if stranding of rainbow trout is significant**
- **Identify stranding locations if observed**
- **Consider possible mitigation measures**

#### **Questions?**

- **Does significant stranding of rainbow trout occur during fluctuating flows from 5,000 to 20,000 cfs**
- **How does stranding rate compare to pre-ROD operations**

#### **Experimental Project Coordinators**

**EcoPlan, Davis**





# **BIOLOGY & EXPERIMENTAL FLOWS**

## **WY 2002-2003**

### **DISTRIBUTION OF TROUT REDDS AND MECHANISM** **ACCOUNTING FOR REDUCED RECRUITMENT**

- **Sampling in the Glen Canyon reach to determine distribution of redds relative to flow releases and stage elevation**
- **Identify size classes of YOY RBT and follow survival over time**
- **Develop data on incubation and survival of YOY RBT to compare to other flow conditions**

### **Questions?**

- **Does significant mortality of YOY rainbow trout occur during fluctuating flows from 5,000 to 20,000 cfs**
- **How does mortality rate compare to pre-ROD operations**
- **What stage/elevation are rainbow trout redds observed during Fluctuating Flows v ROD operations**

**Experimental Project Coordinators**  
**Ecometric Research, Korman**



# **BIOLOGY & EXPERIMENTAL FLOWS**

## **WY 2002-2003**

### **FOODBASE IMPACTS OF FLUCTUATING FLOWS IN GLEN CANYON REACH**

- **Sampling in the Glen Canyon reach to determine distribution and abundance of benthic organisms and biomass before, during and after 5,000 to 20,000 cfs fluctuating flows**
- **Identify changes over time compared to ROD operations**
- **Determine relationships between flow regime and other parameters, e.g. temp, light, etc.**

### **Questions?**

- **Does significant change occur in the distribution, composition, or biomass of the aquatic foodbase in response to FF**
- **Does drift increase in response to flow fluctuations**
- **What stage/elevation accounts for most of the observed foodbase during FF**

### **Experimental Project Coordinators**

**NAU, Shannon**



# **BIOLOGY & EXPERIMENTAL FLOWS**

## **WY 2002-2003**

### **MECHANICAL REMOVAL OF NON-NATIVE FISHES FROM THE COLORADO RIVER NEAR THE CONFLUENCE OF THE LCR**

- **Potential method to reduce abundance of non-native (primarily RBT & BT) from most critical habitat area for HBC**
- **May reduce incidence of predation and competition with HBC and other native fishes**

#### **Questions?**

- **Does significant change occur in the distribution, size composition, or abundance of non-native fishes as a result of mechanical removal in the LCR reach**
- **What is the rate of immigration of non-native fishes into the LCR reach following implementation of mechanical removal**

#### **Experimental Project Coordinators**

**GCMRC, Yard & Coggins**



# **BIOLOGY & EXPERIMENTAL FLOWS**

## **WY 2002-2003**

### **RAINBOW TROUT DIET ANALYSIS IN GLEN CANYON REACH AND AT THE LCR CONFLUENCE**

- **RBT are a critical sport fish in the Lees Ferry reach and may be variously affected by experimental flow treatments including changes in diet both seasonally and annually**
- **Downstream RBT and BT populations may have substantially different diet composition and dependencies as well as affects**

#### **Questions?**

- **Does significant change occur in the diet of RBT as a result of fluctuating flows at Lees Ferry and the LCR**
- **Does mechanical removal of RBT & BT (density) affect diet of these species at the LCR confluence**

#### **Experimental Project Coordinators**

**GCMRC, Yard & Caron**



# **BIOLOGY & EXPERIMENTAL FLOWS**

## **WY 2002-2003**

### **INCIDENCE OF PREDATION ON HUMPBACK CHUB BY RBT & BT IN THE LCR REACH OF THE COLORADO RIVER**

- **HBC are declining in numbers in the LCR population which is the only remaining viable population in the Lower Basin**
- **Non-native fishes (primarily RBT & BT) are hypothesized to be one principal cause of the decline**
- **The decline may be the result of predation and/or competition from RBT and BT**

### **Questions?**

- **What is the incidence of predation on native fishes (particularly HBC) by RBT & BT**
- **Does mechanical removal of RBT & BT (density) affect the incidence of predation by these species at the LCR confluence**

### **Experimental Project Coordinators**

**GCMRC, Yard & Caron**



# **SOCIO-CULTURAL RESOURCES & EXPERIMENTAL FLOWS WY 2002-2003**

## **MONITORING THE EFFECTS OF TEST FLOWS AT ARCHEOLOGICAL SITES**

- **Experimental High Flows of 40,000-45,000 cfs could impact archeological sites by sediment deposition or erosion**
- **EHFs may produce different impacts at these flows versus the BHBF and with sediment enriched conditions**
- **EHFs may directly or indirectly affect archaeological sites**

### **Questions?**

- **What is the rate of deposition/erosion at archeological sites under sediment enriched conditions with the EHF**
- **Does an EHF enhance the integrity of sites**

**Experimental Project Coordinators  
GCMRC, NPS, USBR-TBD**



# **SOCIO-CULTURAL RESOURCES & EXPERIMENTAL FLOWS WY 2002-2003**

## **ECONOMIC IMPACTS TO WHITEWATER & ANGLER CONCESSIONAIRES & PRIVATE PARTIES**

- **Past studies indicate that concessionaires and private boaters and anglers may be economically affected by varying flow regimes.**
- **Existing information supplemented with comparably collected data during proposed flows may articulate economic impacts to these groups.**

### **Questions?**

- **Economic impacts to concessionaires will not significantly differ from impacts under normal daily operations.**
- **Economic impacts to private boaters and anglers will not significantly differ from impacts under normal daily operations.**

### **Experimental Project Coordinators**

**Since this study is essentially an extension of the same type of study conducted under LSSF in 2000, we propose to work with the same researchers – NAU Dr. Yeon-Su Kim**



# **SOCIO-CULTURAL RESOURCES & EXPERIMENTAL FLOWS WY 2002-2003**

## **CHANGES IN CAMPABLE BEACH AREAS**

- **Based on past studies, availability of campable beach areas appears to vary with flow regimes due to beach size and location.**
- **Aerial data has been collected in the past to study camping beaches and comparable methods are proposed for this study.**

## **Questions?**

- **Campable beach areas during the proposed experiment will not significantly differ from campable beach areas under normal daily operations.**
- **Campable beach areas in critical (narrow) reaches will not significantly differ from campable beach areas in these reaches under normal daily operations.**

## **Experimental Project Coordinators**

**Since this study is essentially an extension of the same type of study conducted under LSSF in 2000, we propose to work with the same researchers – NAU Drs. Parnell and Kaplinski**

