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The Glen Canyon Dam Adaptive Management Program Presents:

Colorado River Ecosystem Science Symposium 2005

October 25-27, 2005
Fiesta Inn Resort
Tempe, AZ





Program

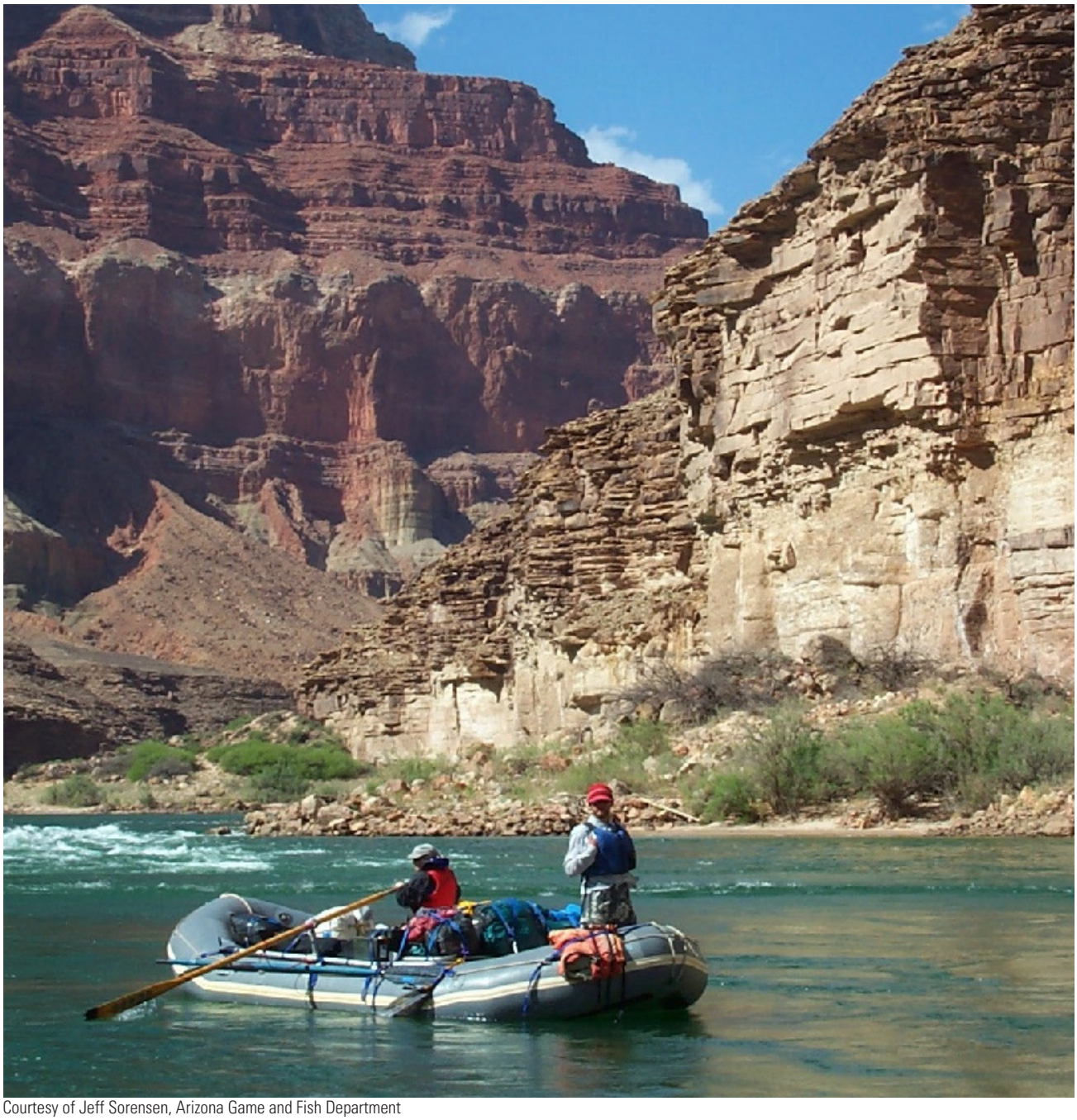
Organized by:
U.S. Geological Survey
Southwest Biological Science Center
Grand Canyon Monitoring and
Research Center

Colorado River Ecosystem Science Symposium 2005

Program

October 25-27, 2005
Fiesta Inn Resort
2100 South Priest Drive
Tempe, AZ

Presented by the Glen Canyon Dam Adaptive Management Program and organized by the Grand Canyon Monitoring and Research Center, U.S. Geological Survey, U.S. Department of the Interior, Flagstaff, AZ, Theodore S. Melis, Acting Chief.



Courtesy of Jeff Sorensen, Arizona Game and Fish Department

What is it that confers the noblest delight? What is that which swells a man's breast with pride above that which any other experience can bring to him? Discovery!

Mark Twain - *Innocents Abroad*

Symposium Program Overview

Tuesday, October 25, 2005

8:30–8:40	Opening Remarks
8:40–9:20	Keynote Speech
9:20–10:00	Keynote Speech
10:00–10:20	Break
	The State of the Colorado River Ecosystem in Grand Canyon Report Presentations
10:20–Noon	Report Presentations
Noon–1:00	Lunch (On your own)
1:00–2:40	Report Presentations
2:40–3:00	Break
3:00–4:00	Report Presentations
4:00–5:30	Panel Discussion
5:30-7:00	Dinner (On your own)
7:00-9:30	Poster Session and Technology Demonstrations

Wednesday, October 26, 2005

8:00–8:40	Keynote Speech
	Preliminary Results of Experimentation
8:40–10:20	Hydrology and Sediment Presentations
10:20–10:30	Break
10:30–11:30	Fishes Presentations
11:30–12:30	Lunch (On your own)
12:30–2:10	Aquatic Biology Presentations
2:10–2:30	Break
2:30–2:50	Aquatic Biology Presentations (continued)
3:10–3:30	Economic Issues Presentation
3:30–4:30	Panel Discussion
4:30–5:30	Update on Experimental Planning/Knowledge Assessment Review
5:30	Dinner (On your own)

Thursday, October 27, 2005

	Nonexperimental Research
8:00–8:20	Fishes Presentation
8:20–9:55	Spatial and Remotely Sensed Data Presentations
9:55–10:15	Break
10:15–11:15	Water Quality Presentations
11:15–12:30	Physical Science Presentations
12:30–1:30	Lunch (On your own)
1:30–2:14	Primary Productivity Presentations
2:15–2:25	Break
2:25–4:15	Fishes Presentations
4:15–5:00	Closing Remarks
5:00	End of Symposium

Glen Canyon Dam Adaptive Management Program and Grand Canyon Monitoring and Research Center

The international prominence of Grand Canyon National Park and public concern about the impacts of Glen Canyon Dam on downstream resources resulted in the passage of the Grand Canyon Protection Act of 1992. The Glen Canyon Dam Adaptive Management Program (GCDAMP) is largely an outgrowth of this legislation. Adaptive management was selected to create a process whereby the effects of dam operations on downstream resources would be assessed and the results would form the basis for future modifications of dam operations. The GCDAMP is administered by the U.S. Department of the Interior and facilitated by the Adaptive Management Work Group. The U.S. Geological Survey's Grand Canyon Monitoring and Research Center has responsibility for scientific monitoring and research efforts for the program.

Appropriately, the Grand Canyon Monitoring and Research Center is housed within the U.S. Geological Survey (USGS). The USGS is the primary science provider for the U.S. Department of the Interior and serves the Nation as an independent fact-finding agency that collects, monitors, analyzes, and provides scientific understanding about natural resource conditions, issues, and problems. The scientific nature of the USGS, its national perspective, and its non-regulatory role enable USGS scientists to provide information and understanding that are policy relevant and policy neutral.

As such, the mission of the Grand Canyon Monitoring and Research Center is to provide credible, objective scientific information to the Glen Canyon Dam Adaptive Management Program on the effects of operating Glen Canyon Dam under the Record of Decision and other management actions on the downstream resources of the Colorado River ecosystem, utilizing an ecosystem science approach.

Let us not gird science to our loins as a warrior buckles on his sword. Let us raise science aloft as the olive branch of peace and the emblem of hope.

John Wesley Powell, 1882

Purpose of this Symposium

Courtesy of Jeff Sorenson, Arizona Game and Fish Department

The 2005 symposium represents an exciting opportunity to learn and to share recent findings from ongoing monitoring and research activities. The symposium also coincides both with the tenth anniversary of the environmental impact statement (EIS) that set the stage for the Glen Canyon Dam Adaptive Management Program and the release of first comprehensive summary on the impacts of the operation of Glen Canyon Dam on downstream natural, cultural, and recreational resources within Glen Canyon National Recreation Area and Grand Canyon National Park.

The report, *The State of Colorado River Ecosystem in Grand Canyon*, serves as a focal point for the first day of the symposium. It is an significant milestone in the use of adaptive ecosystem management (AEM) to support the Grand Canyon Protection Act of 1992 (GCPA). Importantly, its analysis and results can be a catalyst for education and interaction among the scientific community, resource managers, and the public.

The second day offers a preliminary update of the results of the November 2004 Experimental High Flow and efforts to mechanically remove nonnative fishes in the Colorado River within Grand Canyon. During the afternoon of the second day, monitoring and research activities in the realms of aquatic biology, economics, planning and experimentation are highlighted. The third day explores other important components of the monitoring and research program, including spatial and remotely sensed data, water quality, physical science, and primary productivity. The symposium concludes with recent findings related to the endangered humpback chub (*Gila cypha*) population in Grand Canyon.

The over arching goal of the symposium is to engender discussion on how best to use the scientific results contained in the report and other findings to advance the future monitoring and research efforts. Thank you for attending and participating in this exciting event.

Goals for the Glen Canyon Dam Adaptive Management Program

Courtesy of Roy Averill-Murray, Arizona Game and Fish Department

1. Protect or improve the aquatic foodbase so that it will support viable populations of desired species at higher trophic levels.

2. Maintain or attain viable populations of existing native fish, remove jeopardy from humpback chub and razorback sucker, and prevent adverse modification to their critical habitat.

3. Restore populations of extirpated species, as feasible and advisable.

4. Maintain a naturally reproducing population of rainbow trout above the Paria River, to the extent practicable and consistent with the maintenance of viable populations of native fish.

5. Maintain or attain viable populations of Kanab ambersnail.

6. Protect or improve the biotic riparian and spring communities including threatened and endangered species and their critical habitat.

7. Establish water temperature, quality, and flow dynamics to achieve the adaptive management program ecosystem goals.

8. Maintain or attain levels of sediment storage within the main channel and along shorelines to achieve the adaptive management program ecosystem goals.

9. Maintain or improve the quality of recreational experiences for users of the Colorado River ecosystem, within the framework of the adaptive management program ecosystem goals.

10. Maintain power production capacity and energy generation, and increase where feasible and advisable, within the framework of the adaptive management program ecosystem goals.

11. Preserve, protect, manage, and treat cultural resources for the inspiration and benefit of past, present, and future generations.

12. Maintain a high quality monitoring, research, and adaptive management program.

Tuesday, October 25, 2005

8:30 ***Opening Remarks*** - Dennis Fenn, U.S. Geological Survey, Biological Resources Discipline, Southwest Biological Science Center

8:40 ***Keynote Speech: The Pros and Cons of Long-Term Ecological Research Based on Lessons from Five Decades*** - Whit Gibbons, University of Georgia, Savannah River Ecology Laboratory

9:20 ***Keynote Speech: The Wisdom of the River: Why Argue with Several Million Years of Success?*** - Gary K. Meffe, University of Florida, Department of Wildlife Ecology and Conservation and Society for Conservation Biology

10:00 Break

The State of the Colorado River Ecosystem in Grand Canyon Report Presentations

10:20 ***Influence of Glen Canyon Dam Operations on Downstream Sand Resources of the Colorado River in Grand Canyon*** - Scott A. Wright, U.S. Geological Survey, Biological Resources Discipline, Southwest Biological Science Center, Grand Canyon Monitoring and Research Center

10:40 ***Fishes of Grand Canyon*** - Steven P. Gloss, U.S. Geological Survey, Biological Resources Discipline, Southwest Biological Science Center, Sonoran Desert Research Station

11:00 ***Climatic Fluctuations, Drought, and Flow in the Colorado River*** - Robert H. Webb, U.S. Geological Survey, Water Resources Discipline, National Research Program

11:20 ***Water Quality in Lake Powell and the Colorado River*** - William S. Vernieu, U.S. Geological Survey, Biological Resources Discipline, Southwest Biological Science Center, Grand Canyon Monitoring and Research Center

11:40 ***Aquatic Ecology: the Role of Organic Matter and Invertebrates*** - Theodore A. Kennedy, U.S. Geological Survey, Biological Resources Discipline, Southwest Biological Science Center, Grand Canyon Monitoring and Research Center

Noon Lunch (On your own)

1:00 ***Recreational Use Values and Nonuse Values of Glen and Grand Canyons*** - John Loomis, Colorado State University, Department of Agricultural and Resource Economics

1:20 ***Riparian Vegetation and Associated Wildlife*** - Barbara E. Ralston, U.S. Geological Survey, Biological Resources Discipline, Southwest Biological Science Center, Grand Canyon Monitoring and Research Center

1:40 ***Birds of the Colorado River in Grand Canyon: a Synthesis of Status, Trends, and Dam Operation Effects*** - Mark K. Sogge, U.S. Geological Survey, Biological Resources Discipline, Southwest Biological Science Center, Colorado Plateau Research Station

2:00 ***Debris Flows in Grand Canyon and the Rapids of the Colorado River*** - Robert H. Webb, U.S. Geological Survey, Water Resources Discipline, National Research Program

2:20 ***Status and Trends of Hydropower Production at Glen Canyon Dam*** - David A. Harpman, Bureau of Reclamation, Technical Service Center

2:40 Break

3:00 ***Cultural Resources in the Colorado River Corridor*** - Helen C. Fairley, U.S. Geological Survey, Biological Resources Discipline, Southwest Biological Science Center, Grand Canyon Monitoring and Research Center

3:20 ***Recreational Values and Campsites in the Colorado River Ecosystem*** - Matt Kaplinski, Northern Arizona University, Department of Geology

3:40 ***Lessons from 10 Years of Adaptive Management in Grand Canyon*** - Jeffrey E. Lovich, U.S. Geological Survey, Biological Resources Discipline, Southwest Biological Science Center

4:00 ***Panel Discussion: SCORE Findings and Implications for the Glen Canyon Adaptive Management Program's Strategic Plan***

5:30-7:00 Dinner (On your own)

7:00-9:30 ***Poster Session and Technology Demonstrations***

Wednesday, October 26, 2005

8:00 ***Keynote Speech: Surprise and Opportunity in Grand Canyon Adaptive Management*** - Carl Walters, University of British Columbia, Fisheries Centre

Preliminary Results of Experimentation

Hydrology and Sediment

8:40 ***One Hundred Years of Sand in Grand Canyon*** - Jack C. Schmidt; Utah State University; Department of Aquatic, Watershed, and Earth Resources

9:00 ***A Tale of Two Floods: Comparing Sandbar Responses to the 1996 and 2004 High-Volume Experimental Flows on the Colorado River in Grand Canyon*** - Joseph E. Hazel, Jr., Northern Arizona University, Department of Geology

9:20 ***Sediment Transport and Budget during the November 2004 Controlled-Flood Experiment, with Comparisons to the 1996 Controlled-Flood Experiment*** - David J. Topping, U.S. Geological Survey, Water Resources Discipline, National Research Program

9:40 ***Flow, Deposition, and Stability of Recirculation Eddy Bars in Response to Beach/ Habitat-Building Flows*** - Mark Schmeeckle, Arizona State University, Dept. of Geography

10:00 ***Investigating Effects of the November 2004 High-Flow Release from Glen Canyon Dam on Aeolian Sand-Transport Rates in the Colorado River Corridor, Grand Canyon, AZ*** - Amy E. Draut, U.S. Geological Survey, Geologic Discipline, Coastal and Marine Geology Team, Pacific Science Center

10:20 Break

Fishes

10:30 ***Mechanical Removal of Nonnative Fishes in the Colorado River within Grand Canyon*** - Lewis G. Coggins, U.S. Geological Survey, Biological Resources Discipline, Southwest Biological Science Center, Grand Canyon Monitoring and Research Center

10:50 ***Effects of 2003–04 Fluctuating Flows from Glen Canyon Dam on the Early Life History Stages of Rainbow Trout in the Colorado River (Part 1: Effects on the Survival of Eggs and Alevins)*** - Josh Korman; Ecometric Research, Inc.

11:10 ***Effects of 2003–04 Fluctuating Flows from Glen Canyon Dam on the Early Life History Stages of Rainbow Trout in the Colorado River (Part 2: Effects on Young-of-Year Habitat Use, Growth, and Survival)*** - Josh Korman; Ecometric Research, Inc.

11:30 Lunch (On your own)

Aquatic Biology

12:30 ***What Determines the Length of Stream Food Chains?*** - John L. Sabo, Arizona State University, School of Life Sciences

12:50 ***Patterns within Patterns: Does Trophic Structure Influence Biotic Patterns within the Colorado River*** - Michael D. Yard, EcoNatura

1:10 ***Physical Factors that Influence Spatio/Temporal Differences in Benthic Invertebrate Availability near the Little Colorado River, Grand Canyon, AZ*** - Yael A. Bernstein, Northern Arizona University, Center for Environmental Sciences and Education

1:30 ***Inter- and Intra-Annual Differences in the Availability of Drifting Invertebrates near the Little Colorado River, Grand Canyon, AZ*** - Courtney Giauque, Northern Arizona University, Center for Environmental Sciences and Education

1:50 ***Inter- and Intra-Annual Differences in Rainbow and Brown Trout Diet near the Little Colorado River, Grand Canyon, AZ*** - Emily Thompson, Northern Arizona University, Center for Environmental Sciences and Education

2:10 Break

2:30 ***Interactions between Environment and Biota That Influence Predation of Small Bodied Fish near the Little Colorado River, Grand Canyon, AZ*** - Michael D. Yard, EcoNatura

2:50 ***Response of Drifting Invertebrates and Organic Matter to Disturbance from High Experimental Flows Prescribed for the Colorado River, Grand Canyon, AZ*** - Michael D. Yard, EcoNatura

Economic Issues

3:10 ***(1) Three Years of Experimentation at Glen Canyon Dam: the Electrical Power Economic Costs (2) The Electrical Power Economic Impacts of Liberalizing Glen Canyon Dam Operational Constraints*** - S. Clayton Palmer, U.S. Department of Energy, Western Area Power Administration

Experimentation and Planning

3:30 ***Panel Discussion: Assessing the Value of Experimentation in Support of Glen Canyon Dam Adaptive Management Program Information Needs***

4:30 ***Update on Experimental Planning/Knowledge Assessment Review*** - USGS Grand Canyon Monitoring and Research Center and Ecometric Research, Inc.

5:30 Dinner (On your own)

Thursday, October 27, 2005

Nonexperimental Research

8:00 ***Update on Status and Trends of Humpback Chub in Grand Canyon***, William Pine, University of Florida, Department of Fisheries and Aquatic Sciences

Spatial and Remotely Sensed Data

8:20 ***Effects of Spatial Accuracy Uncertainty on Change Detection and Scientific Analysis*** - Keith A. Kohl, U.S. Geological Survey, Biological Resources Discipline, Southwest Biological Science Center, Grand Canyon Monitoring and Research Center

8:35 ***Lies, Statistics, and Spatial Data Accuracy*** - Michael L. Dennis, Shephard-Wesnitzer, Inc.

8:50 ***Determining Water Surface Datums to Measure Hydrographic Elevations*** - F. Mark Gonzales, U.S. Geological Survey, Biological Resources Discipline, Southwest Biological Science Center, Grand Canyon Monitoring and Research Center

9:05 ***Using an Integrated, Remote-Sensing Methodology to Evaluate the Effects of Dam Operations on Fine-Grained Sediment Storage and Sandbar Restoration in the Eastern Grand Canyon*** - Michael J. Breedlove; Utah State University; Department of Aquatic, Watershed, and Earth Resources

9:20 ***3D Laser Scanning (LiDAR Surveying) and Oblique Photogrammetry Assessment during the 2004 High Flow Test*** - Kristin Brown, U.S. Geological Survey, Biological Resources Discipline, Southwest Biological Science Center, Grand Canyon Monitoring and Research Center

9:35 ***Cable-to-the-Sky: Two-Way Telemetry Adaptive Control and Communications*** - Glenn E. Bennett, U.S. Geological Survey, Biological Resources Discipline, Southwest Biological Science Center, Grand Canyon Monitoring and Research Center

9:55 Break

Water Quality

10:15 ***Monitoring Streamflow on the Paria River at Lees Ferry*** - Nancy Hornewer, U.S. Geological Survey, Water Resources Discipline, Arizona Water Science Center

10:30 ***Further Effects of Drought and Drought Rebound on the Tailwaters of Glen Canyon Dam in 2003–05*** - Susan Hueftle, U.S. Geological Survey, Biological Resources Discipline, Southwest Biological Science Center, Grand Canyon Monitoring and Research Center

10:45 ***An Improved Stars Model: Predicted Grand Canyon Water-Surface Elevations and Virtual Shorelines for Flows up to 200,000 cfs*** - Christopher S. Magirl, U.S. Geological Survey, Water Resources Discipline, National Research Program

11:00 ***Evaluating Sandbar Stability with Groundwater Instrumentation and Modeling*** - Abraham E. Springer, Northern Arizona University, Department of Geology

Physical Science

11:15 ***Changes in Debris Fans and Rapids: 21 Years of Monitoring Debris Flows in Grand Canyon*** - Peter G. Griffiths, U.S. Geological Survey, Water Resources Discipline, National Research Program

11:35 ***Large-Scale Modeling of Flow, Sand Transport, and Sand Storage between Glen Canyon Dam and Phantom Ranch*** - Stephen Wiele, U.S. Geological Survey, Water Resources Discipline, Arizona Water Science Center

11:55 ***High-Resolution Monitoring of Suspended-Sediment Concentration and Grain Size in the Colorado River in Grand Canyon Using Laser-Diffraction Instruments and a Three-Frequency Acoustic System*** - David J. Topping, U.S. Geological Survey, Water Resources Discipline, National Research Program

12:15 ***An Ex Post Facto Evaluation of Sand Mass Balance in Grand Canyon: Measurements Versus Rating Curves as a Means of Assessing the Value of Adaptive Management*** - Scott A. Wright, U.S. Geological Survey, Biological Resources Discipline, Southwest Biological Science Center, Grand Canyon Monitoring and Research Center

12:30 Lunch (On your own)

Primary Productivity

1:30 ***Trends in Terrestrial Riparian Resources, 2001–04*** - Michael Kearsley, Northern Arizona University, Department of Biological Sciences

1:45 ***Estimates of Systemwide Above-Ground Biomass and Terrestrial Vegetation Inputs for the Colorado River Ecosystem*** - Theodore A. Kennedy, U.S. Geological Survey, Biological Resources Discipline, Southwest Biological Science Center, Grand Canyon Monitoring and Research Center

2:00 ***Linking Whole-System Carbon Cycling to Quantitative Food Webs in the Colorado River*** - Robert Hall, University of Wyoming, Department of Zoology and Physiology

2:15 Break

Fishes

2:25 ***A Test of the Utility of Otolith Chemistry for Studying Humpback Chub Movements*** - Brian P. Kennedy, University of Michigan, Department of Geological Sciences

2:40 ***Evaluation of the Statistical Properties of Grand Canyon Humpback Chub Population Parameter Estimates from ASMR and Alternative Mark-Recapture Models*** - David L. Otis, Iowa State University, Department of Natural Resource Ecology and Management

3:00 ***Conservation Genetics of Gila Cypha in the Colorado River Ecosystem: Shallow History*** - Marlis R. Douglas, Colorado State University, Department of Fishery and Wildlife Biology

3:20 ***Conservation Genetics of Gila Cypha in the Colorado River Ecosystem: Deep History*** - Michael E. Douglas, Colorado State University, Department of Fishery and Wildlife Biology

3:40 ***Electrofishing in the Grand Canyon, 2000–05 Status and Trends*** - R. Scott Rogers, Arizona Game and Fish Department, Research Branch

4:00 ***Little Colorado River, Lower 1200 Meter Fish Monitoring Trends, 1987–2005*** - David Ward, Arizona Game and Fish Department, Research Branch

4:15 ***Closing Remarks***

5:00 ***End of Symposium***

Symposium Presenters

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Symposium Notes: