Wednesday November 10, 2004

9:00AM - ROUNDTAIL CHUB WORKGROUP MEETING - Contact Matthew Andersen <matthewandersen@utah.gov>; Palo Verde Room, Doubletree

4:00PM - OPEN DISCUSSION SESSION AMONG DFC MEMBERS about future directions and other issues of interest to be announced

6:00PM - INFORMAL SOCIAL

Thursday November 11, 2004

8:30AM - INTRODUCTORY REMARKS

9:00AM - Ernest Niemi*[1] (Managing Director, ECONorthwest, Eugene, Oregon (http://www.econorthwest.com)) **SPECIAL INVITED PRESENTATION - Reconciling economic return and ecological values: a new approach to protect native desert fishes and their habitats**

10:00AM - Tim Modde*[1], Chuck McAda[1], Tom Chart[1], Matthew Anderson[2] (1 U.S. Fish and Wildlife Service, 2 Utah Division of Wildlife Resources) **Nonnative fish control efforts, successes, failures and the black holes: Upper Colorado River basin area report**

10:15AM - Salvador Contreras-Balderas*[1] (Universidad Autónoma de Nuevo León / Bioconservación, A.C.) **DFC NE Mexico Area Coordinator & country report 2004**

10:30AM - Kara Hilwig*[1], Rob Bettaso[2], Glenn Knowles[3], Mary Richards[4], John Rinne[5] (1 SWCA Environmental Consultants, 2 Arizona Game and Fish Department, 3 US Fish and Wildlife Service, 4 US Fish and Wildlife Service, 5 USFS Rocky Mountain Research Station) **Lower Colorado River Basin area conservation strategies report**

10:45AM - Gary P. Garrett*[1], Robert J. Edwards[2], Alice F. Echelle[3], Nathan L. Allan[4], Clark Hubbs[5] (1 Texas Parks & Wildlife, HOH Fisheries Science Center, 2 University of Texas-Pan American, Department of Biology, 3 Oklahoma State University, Zoology Department, 4 U.S. Fish & Wildlife Service, Ecological Services, 5 The University of Texas, Section of Integrative Biology) **Area report: Texas. Desert fishes research and management in Texas during 2004**

11:00AM - Matthew E. Andersen*[1] (Utah Division of Wildlife Resources) **Propagation as a component of native fish recovery in the Bonneville and Virgin River basins**

11:15AM - Gorgonio Ruiz-Campos*[1], Alejandro Varela-Romero[2], Glenn Knowles[3], Faustino Camarena-Rosales[1] (1 Universidad Autónoma de Baja California, Facultad de Ciencias, 2 Universidad de Sonora - DICTUS, 3 U.S. Fish and Wildlife Service, Phoenix, Arizona) **Recent studies of conservation status of fishes of northwest Mexico**

11:30AM - Hilary E. Watts*[1], Jim E. Brooks[1], Marilyn Myers[2], David L. Propst[1], W. Jason Remshardt[1], Stephen R. Davenport[1], Robert K. Dudley[3], Steven P. Platania[3] (1 U.S. Fish and Wildlife Service, 2 New Mexico Department of Game and Fish, 3 American Southwest Ichthyological Research Foundation) **Native fish research and management in the upper/middle Rio Grande basin during 2004**

11:45AM - Stewart B. Reid*[1], Chris Allen[2], Amy Horstman[2], Rollie White[2], Doug Young[2], Paul Chappell[3], Roger Smith[4] (1 U.S. Fish and Wildlife, Klamath Falls OR, 2 U.S. Fish and Wildlife, Portland OR, 3 California Dept. Fish and Game, Susanville CA, 4 Oregon Dept. Fish and Wildlife, Klamath Falls OR) **The importance of private land stewardship in the northwestern deserts: the Oregon / Northern California Area Report**

12:00PM - LUNCH

1:30PM - Jonathan N. Baskin*[1], Thomas R. Haglund[1], Steven H. Bryant[1] (California State Polytechnic University Pomona and San Marino Environmental Associates) **Santa Ana sucker (*Catostomus santaanae*) distribution and habitat selection in different river regions**

1:45PM - Robert H. Bettaso*[1] (Arizona Game and Fish Department) **Native aquatic species and public welfare**

2:00PM - Scott A. Bonar*[1] (Arizona Cooperative Fish and Wildlife Research Unit, U.S. Geological Survey) **Can people be influenced to improve their conservation ethic towards desert fishes? Lessons from psychology and marketing**

2:15PM - Salvador Contreras-Balderas*[1] (Universidad Autónoma de Nuevo León / Bioconservación, A.C.) **Exotic freshwater fishes in México: summary and worst cases**

2:30PM - Peter J. Unmack*[1], William F. Fagan[2] (1 Arizona State University, School of Life Sciences, 2 University of Maryland, Department of Biology) **Patterns of exotic and native fish richness in the Gila River basin**

2:45PM - Kevin D. Christopherson*[1], Ronald Brunson (Utah Division of Wildlife Resources) **Larval razorback sucker and bonytail survival and growth in the presence of non-native fishes in the Stirrup floodplain, Green River, Utah**

3:00PM - Michael D. Mills*[1], Mark C. Belk[2], Russell B. Rader[2] (1 Utah Division of Wildlife Resources, 2 Brigham Young University, Department of Integrative Biology) **Vulnerability of native fishes to predation by introduced western mosquitofish *Gambusia affinis*: a model and test of assumptions**

3:15PM - John Hawkins*[1], Cameron Walford[1], Tasha Sorensen[1] (Colorado State University, Larval Fish Laboratory) **Evaluation of non-native fish removal from the Yampa River, Colorado**

3:30PM - David Ward*[1], Andrew Schultz[2] (1 Arizona Game and Fish Department, Research Branch, 2 Arizona Cooperative Fish and Wildlife Research Unit, University of Arizona) **Species-specific piscicides: Dream or reality?**

3:45PM - Jeanette Carpenter*[1], Jeremy Hoekstra[2] (1 USGS Fort Collins Science Center, 2 Colorado State University) **Diet of *Orconectes virilis*, an introduced crayfish in the Colorado River basin**

4:00PM - John N. Rinne[1], Dennis Miller*[2] (1 USDA, Forest Service, Rocky Mountain Research Station, 2 Western New Mexico University) **Riparian habitat restoration and southwestern native fish assemblage: A tale of two rivers**

4:15PM - Bill Leibfried*[1], Kara Hilwig[1], Matt Lauretta[1], Jeff Cross[2] (1 SWCA Environmental Consultants, 2 Grand Canyon National Park) **Restoring native fish habitats in selected tributaries of the Colorado River, Grand Canyon National Park**

4:30PM - David L. Rogowski*[1], Craig A. Stockwell[1] (North Dakota State University, Dept. Biological Sciences) **Are translocated populations really replicate populations?**

4:45PM - William G. Kepner*[1], David F. Bradford[1], Todd D. Sajwaj[2] (1 U.S. Environmental Protection Agency, Office of Research and Development, 2 Lockheed Martin Environmental Services) **An approach for determining regional land cover and species habitat conservation status in the American southwest: the Southwest Regional Gap Analysis Project**

7:00PM - INFORMAL SOCIAL - hosted by the University of Arizona American Fisheries Society Student Chapter.Food, drink (including spirits), and music included. All are welcome to attend. There will be no cover charge for students; others are encouraged to make a small donation

7:30PM - INFORMAL EVENING SESSION TO DISCUSS SOUTHERN NEVADA WATER AUTHORITY PROJECT

Friday November 12, 2004

8:00AM - Jared Crowley*[1], Dennis Shiozawa[1], R. Paul Evans[2] (1 Brigham Young University, Department of Integrative Biology, 2 Brigham Young University, Department of Microbiology and Molecular Biology) **Phylogenetics and cottids**

8:15AM - Douglas Threloff*[1], Linda Manning[2] (1 private consultant, 2 National Park Service) **Thermal environment of the Devils Hole pupfish**

8:30AM - Dennis K. Shiozawa*[1], R. Paul Evans[2] (1 Brigham Young University, Department of Integrative Biology, 2 Brigham Young University, Department of Microbiology and Molecular Biology) **Insights into the drainage basin history of western North America - fragmentary information based on phylogenetics of aquatic organisms**

8:45AM - Michael L. Collyer*[1] (Iowa State University, Department of Ecology, Evolution, and Organismal Biology) **Ecomorphological diversification of *Cyprinodon***

9:00AM - Michael E. Douglas*[1], Marlis R. Douglas[1] (Colorado State University, Fish & Wildlife Biology) **Phylogeography of the humpback chub, *Gila cypha*, from the Colorado River ecosystem**

9:15AM - Becky A. Miller*[1], Paul Evans[2], Dennis K. Shiozawa[3] (1 Brigham Young University, Department of Microbiology and Molecular Biology, 2 Brigham Young University, Department of Microbiology and Molecular Biology, 3 Brigham Young University, Department of Integrative Biology) **Phylogeography of *Prosopium* in western North America based on Cytochrome B**

9:30AM - Clark Hubbs*[1] (Integrative Biology, University of Texas at Austin) **Spring fishes and their habitats**

9:45AM - Astrid Kodric-Brown*[1], James H. Brown[1] (University of New Mexico, Biology Department) **The importance of disturbance for the conservation of desert springs**

10:00AM - Jackie Watson*[1], Timothy H. Bonner[1] (Texas State University - San Marcos, Dept of Biology/Aquatic Biology) **Assemblage structure and habitat associations of fishes in Independence Creek, Texas**

10:15AM - Steve Parmenter*[1] (California Department of Fish and Game) **Rehabilitation of Mule Spring Pond, and evidence for competitive displacement of Owens tui chub by Owens pupfish**

10:30AM - Peter N. Reinthal*[1], Timothy L. Corley[2], J. Brent Hiskey[3], Joaquin Ruiz[4], John T. Chesley[4] (1 Ecology and Evolutionary Biology, University of Arizona, 2 Hydrology and Water Resources, University of Arizona, 3 Materials Science & Engineering, University of Arizona, 4 Geosciences, University of Arizona) **Metal contamination and food web dynamics in a desert stream fish community, Aravipa Creek, Arizona**

10:45AM - Jason Vinje*[1], Craig Stockwell[1] (North Dakota State University, Department of Biological Sciences) **The costs of parasitism by *Gyrodactlyus tularosae* for White Sands pupfish (*Cyprinodon tularosa*)**

11:00AM - Michael T. Bogan*[1] (Oregon State University, Environmental Sciences Graduate Program) **The overlooked majority: aquatic insects in montane desert streams of the southwestern U.S. and northwestern Mexico**

11:15AM - Krissy W. Wilson*[1], Carmen Bailey[1] (Utah Division of Wildlife Resources) **Response of Columbia spotted frog to restoration efforts**

11:30AM - Stephanie Carman*[1], John Branstetter[2], Bill Conrod[3], Jeanne Dye[4], Robert Myers[5] (1 New Mexico Department of Game and Fish, 2 U. S. Fish and Wildlife Service, 3 White Sands National Monument, 4 Holloman Air Force Base, 5 White Sands Missile Range) **Status of White Sands pupfish conservation**

11:45AM - Marlis R. Douglas*[1], Michael E. Douglas[1] (Colorado State University, Fish & Wildlife Biology) **Purity assessment of Rio Grande cutthroat trout (*Oncorhynchus clarki virginalis*)**

12:00PM - LUNCH

1:30PM - Sean C. Lema*[1], Gabrielle A. Nevitt[1] (Section of Neurobiology, Physiology, and Behavior, University of California, Davis) **Testing a physiological model for morphological change in Devils Hole pupfish** (Best student paper award competitor)

1:45PM - Arlys J. Finch*[1] (Eastern New Mexico University, Biology; DNFH&TC) **Isolation and sequencing of the cDNA for Steroidogenic Acute Regulatory Protein from an endangered fish (*Gambusia nobilis*)** (Best student paper award competitor)

2:00PM - Kara D. Hilwig*[1], W. Linn Montgomery[1] (Northern Arizona University, Biological Sciences Department) **Displacement of nonnative red shiner and native spikedace with flood simulation** (Best student paper award competitor)

2:15PM - Ann M. Widmer*[1], Corissa J. Carveth[1], Scott A. Bonar[1], Jeff R. Simms[2] (1 Arizona Cooperative Fish and Wildlife Research Unit, University of Arizona, 2 Bureau of Land Management, Tucson Field Office) **Upper thermal tolerance of loach minnow (*Tiaroga cobitis*)** (Best student paper award competitor)

2:30PM - Corissa J Carveth*[1], A Widmer, Scott A. Bonar (1 University of Arizona, Fisheries and Wildlife Cooperative Research Unit, 2 University of Arizona, Fisheries and Wildlife Cooperative Research Unit, 3 University of Arizona, Fisheries and Wildlife Cooperative Research Unit) **Upper lethal tolerance of Arizona's native fishes** (Best student paper award competitor)

2:45PM - Codey D. Carter*[1], John N. Rinne[2] (1 Rocky Mountain Research Station and Norther n Arizona University, 2 Rocky Mountain Research Station) **Fire effects on aquatic organisms: LD-50s and native southwestern fishes** (Best student paper award competitor)

3:00PM - Michael R. Bower*[1], Wayne A. Hubert[2], Frank J. Rahel[3] (1 Wyoming Cooperative Fish and Wildlife Research Unit, University of Wyoming, 2 Wyoming Cooperative Fish and Wildlife Research Unit, University of Wyoming, 3 Department of Zoology and Physiology, University of Wyoming) **Factors affecting conservation strategies for roundtail chub, flannelmouth sucker, and bluehead sucker in an isolated headwater watershed in Wyoming** (Best student paper award competitor)

3:15PM - Norman Mercado-Silva*[1], Edmundo Díaz-Pardo[2], John Lyons[3] (1 Center for Limnology, University of Wisconsin - Madison, 2 Facultad de Ciencias Naturales, Universidad Autónoma de Querétaro, 3 State of Wisconsin, Department of Natural Resources) **Long term trends in the fish assemblage of the Laja River, Guanajuato, Mexico; an example of the decline of fish communities in Central Mexico** (Best student paper award competitor)

3:30PM - Lindsey T. Lyons*[1], Abraham P Karam[1], Michael S. Parker[1] (Southern Oregon University, Department of Biology) **Temporal and spatial variation in larval pupfish abundance and associated microhabitat variables in Devils Hole, Nevada** (Best student paper award competitor)

3:45PM - Abraham P. Karam*[1], Lindsey T. Lyons[1], Michael S. Parker[1] (Southern Oregon University, Department of Biology) **Comparison of ecological characteristics of three Devils Hole pupfish refuges** (Best student paper award competitor)

4:00PM - Andrew A. Schultz*[1], Scott A. Bonar[1] (Arizona Cooperative Fish and Wildlife Research Unit; University of Arizona) **Determining effective culture temperatures for larval and juvenile Gila chub (*Gila intermedia*)** (Best student paper award competitor)

4:15PM - POSTER SESSION

4:15PM - Jason D. Schooley*[1] (Arizona State University, School of Life Sciences) **Stocking history for razorback sucker *Xyrauchen texanus* - Lower Colorado River**

4:15PM - Richard F. Feeney[1], Camm C. Swift*[1] (Natural History Museum of Los Angeles County) **Description of field-collected larvae of two native freshwater southern California fishes, *Catostomus santaanae* and *Gila orcutti***

4:15PM - Sean C. Tackley*[1], Scott A. Bonar[1], Anindo Choudhury[2] (1 Arizona Cooperative Fish and Wildlife Research Unit, University of Arizona, 2 St. Norbert College, Division of Natural Sciences) **Effects of Asian tapeworm (*Bothriocephalus acheilognathi*) on native fishes from the Rio Yaqui basin, Arizona**

4:15PM - David Ward*[1] (Arizona Game and Fish Department, Research Branch) **Collection of Asian fish tapeworm *Bothriocephalus acheilognathi* from the Yampa River, Colorado**

4:15PM - Jim Heinrich*[1], Vicki Tripoli[2] (1 Nevada Department of Wildlife, 2 Nevada Power Company) **A Virgin River chub refuge at the Reid Gardner Power Generation Facility in Moapa, Nevada**

4:15PM - Darrel E. Snyder*[1], Sean C. Seal[1] (Colorado State University, Larval Fish Laboratory) **Computer-interactive keys for the larvae and early juveniles of selected southwestern fishes (hands-on experimentation)**

4:15PM - Andrea D. Montony*[1], Chester R. Figiel[2] (1 National Park Service, Lake Mead National Recreation Area, 2 US Fish and Wildlife Service, Willow Beach National Fish Hatchery) **PIT tag retention in bonytail chub**

4:15PM - Leanne H. Roulson*[1], Jim Tilmant[2], Lynn Starnes[3] (1 Garcia and Associates, 2 Natinal Park Service, 3 US Fish and Wildlife Service) **Western Native Fishes Database; species status, distribution, and information needs**

4:15PM - Sam Finney*[1], Tim Modde[1], Kevin Christopherson[2] (1 US Fish and Wildlife Service Colorado River Fish Project, 2 Utah Division of Wildlife Resources- Northeast Region) **Yampa Canyon subpopulation of humpback chub: past, present, and future**

4:15PM - Helene C. Johnstone*[1], Matthew Lauretta (SWCA Environmental Consultants) **Current monitoring strategies and results for native fishes of the Colorado River through Grand Canyon, Arizona**

4:15PM - Darrel E. Snyder*[1], Kevin R. Bestgen[1], Sean C. Seal[1], C. Lynn Bjork[1] (Colorado State University, Larval Fish Laboratory) **Identification of desert and Sonora sucker larvae and early juveniles**

4:15PM - Darrel E. Snyder*[1], Kevin R. Bestgen[1], Sean C. Seal[1], C. Lynn Bjork[1] (Colorado State University, Larval Fish Laboratory) **The larvae and early juveniles of three Gila River basin cyprinids: *Agosia chrysogaster, Meda fulgida,* and *Rhinichthys cobitis***

4:15PM - Sam Finney*[1], Mark Fuller[1] (US Fish and Wildlife Service Colorado River Fish Project) **Northern pike (*Esox lucius*) population size, movement, and removal effectiveness in the Upper Yampa River, Colorado**

4:15PM - Nathan Allan[1], Matthew E. Andersen[2], James Brooks[1], Robert J. Edwards[3], Gary P. Garrett[4], Kara Hilwig[5], Clark Hubbs[6], Nadine R. Kanim*[1] (1 U.S. Fish and Wildlife Service, 2 Utah Department of Natural Resources, 3 University of Texas-Pan American, Department of Biology, 4 Texas Parks and Wildlife, HOH Fisheries Science Center, 5 SWCA Environmental Consultants, Inc., 6 University of Texas, Section of Integrative Biology, 7 Nevada Natural Heritage Program, 8 California Department of Fish and Game) **Desert Fishes Council 2003 species status tracking tables**

5:00PM - BUSINESS MEETING Includes **Resolution relative to the use of piscicides and conservation of native fishes in New Mexico**

7:00PM - BANQUET

Saturday November 13, 2004

8:30AM - SPECIAL SESSION : The legacies of Seth Meek and Robert Rush Miller to the ichthyology of North American deserts.

8:30AM - Phil Pister*[1] (Desert Fishes Council) **Robert Rush Miller: scientist, conservationist, and friend**

8:45AM - Mark R. Jennings*[1] (Rana Resources and Research Associate, Department of Herpetology, California Academy of Sciences) **Seth Eugene Meek: the scientist, the man, and his personality**

9:00AM - John Lyons*[1], Norman Mercado-Silva[2] (1 University of Wisconsin Zoological Museum, 2 Center for Limnology, University of Wisconsin-Madison) ***Notropis calabazas*, a new minnow species from central México in the *Notropis calientis* complex, with an update on the conservation status of the complex**

9:15AM - Clark Hubbs*[1] (Integrative Biology, University of Texas at Austin) **Bob Miller - the early years**

9:30AM - Henry L. Bart*[1], Royal D. Suttkus[1], John Lyons[2], Norman Mercado-Silva[3] (1 Tulane University Museum of Natural History, Belle Chasse, LA 70037, 2 University of Wisconsin Zoological Museum and Wisconsin Department of Natural, 3 Center for Limnology, University of Wisconsin, 680 N Park St., Madison WI 53706) **Status of Mexican ictiobines: a tribute to Meek and Miller**

9:45AM - Salvador Contreras-Balderas*[1], Edmundo Diaz-Pardo[2] (1 Universidad Autónoma de Nuevo León / Bioconservación, A.C., 2 Universidad Autónoma de Queretaro) **J. Alvarez and F. De Buen in Mexican ichthyology**

10:00AM - Rocio Rodiles-Hernandez[1], Dean A. Hendrickson*, John G. Lundberg (1 Colegio de la Frontera Sur (ECOSUR), San Cristobal de las Casa, Chiapas, México & Texas Memorial Museum, Univ. Texas, Austin, 2 Texas Memorial Museum, Univ. Texas, Austin, 3 Philadelphia Academy of Natural Sciences) **A new phylogenetically puzzling catfish in mesoamerica underscores how much remains to be discovered about Mexico's ichthyofauna**

10:15AM - Hector P. Espinosa*[1], Gustavo Casas[1] (Instituto de Biología, UNAM) **The fishes of the Malespina expedition (1789-1794) in New Spain**

10:30AM - Anthony A. Echelle*[1], Alice F. Echelle[1] (Oklahoma State University, Department of Zoology) **Tempo of diversification in southwestern pupfishes**

10:45AM - Jeremy B. Voeltz*[1] (Arizona Game and Fish Department) **The San Pedro River – historical composition of native fishes, observations by Hubbs and Miller in the 1950s, conditions in 2004, and plans for the future**

11:00AM - Robert C. Cashner*[1] (University of New Orleans) **The natural history of Robert Rush Miller and other life history traits**

11:15AM - Steven Norris*[1] (Biology Program, California State University Channel Islands) **Robert Rush Miller and his life work, Freshwater Fishes of Mexico**

11:30AM - Steven Norris*[1] (Biology Program, California State University Channel Islands) **Meek/Miller Session - Closing remarks**

12:00PM - LUNCH

1:30PM - Tom Busiahn[1], Jason Goldberg[2], Hannibal Bolton[3], Stewart Jacks*[4] (1 U.S. Fish & Wildlife Service, 2 U.S. Fish & Wildlife Service, 3 U.S. Fish & Wildlife Service, 4 U.S. Fish & Wildlife Service) **Coming together for conservation: The National Fish Habitat Initiative**

1:45PM - William E. Werner*[1] (Arizona Department of Water Resources) **The development and status of the Lower Colorado River Multi-Species Conservation Program**

2:00PM - Paul B. Holden*[1], Tim L. Welker[1], Kirk S. Dahle[1], Jim Heinrich[2] (1 BIO-WEST, Inc., 2 Nevada Department of Wildlife) **The Influence of reservoir fluctuations on recruitment and spawning characteristics of razorback sucker in Lake Mead**

2:15PM - Cynthia Tech*[1], Astrid Kodric-Brown[1] (University of New Mexico, Department of Biology) **Conspecific males are sexiest: female mate choice generates strong assortative mating between the Comanche Springs pupfish and sheepshead minnow**

2:30PM - Dennis M. Stone*[1] (U.S. Fish and Wildlife Service) **Effect of turbidity on miniature hoop net catch rates of humpback chub and other fishes in the Little Colorado River, Arizona**

2:45PM - Craig Paukert*[1], David Ward[2], Pamela Sponholtz[3], Kara Hilwig[4] (1 Kansas Cooperative Fish & Wildlife Research Unit, Kansas State University, 2 Arizona Game and Fish Department, 3 US Fish and Wildlife Service, 4 SWCA Environmental Consultants) **Effects of repeated handling on bonytail chub**

3:00PM - Michael E. Golden*[1], Paul B. Holden[1], S. Kirk Dahle[1], David L. Propst[2], Robert Larson[2], W. Howard Brandenburg[3], Michael A. Farrington[3], Julie K. Jackson[4] (1 BIO-WEST, Inc., 2 New Mexico Department of Game and Fish, 3 University of New Mexico, Museum of Southwestern Biology, 4 Utah Division of Wildlife Resources) **Can we increase stocking success of hatchery-reared endangered fish? Trials with Colorado pikeminnow in the San Juan River**

3:15PM - Patti Clinton*[1] (Bureau of Reclamation, Lower Colorado River) **Culture methods of the endangered razorback sucker, *Xyrauchen texanus*, at Willow Beach National Fish Hatchery for 2004**

3:30PM - Pamela Sponholtz*[1], Dennis Stone[1] (U.S. Fish and Wildlife Service) **Monitoring efforts for humpback chub (*Gila cypha*) above Chute Falls, Little Colorado River**

3:45PM - David R. Van Haverbeke*[1] (U.S. Fish and Wildlife Service) **Closed population estimates of humpback chub (*Gila cypha*) in the Little Colorado River, Grand Canyon, Arizona**

4:00PM - Kevin R. Bestgen[1], Robert I. Compton*[1], Koreen A. Zelasko[1], John Alves[2] (1 Colorado State University, Larval Fish Laboratory, Department of Fishery and Wildlife Biology, 2 Colorado Division of Wildlife) **Distribution and staus of Rio Grande chub, *Gila pandora*, in Colorado**

4:15PM - Paul V. Badame[1], J. Michael Hudson[1], Julie A. Jackson[1], David W. Speas*[2] (1 Utah Division of Wildlife Resources-Moab Field Station, 1165 S. Hwy. 191-Suite 4, Moab, UT 84532, 2 Utah Division of Wildlife Resources, 1594 W. North Temple Ste. 2110, PO Box 146301, Salt Lake City, UT 84114-6301) **Population trends and distribution of flannelmouth and bluehead sucker in the lower Green River, Utah 2001-2003**

4:30PM - Kevin R. Bestgen*[1], John A. Hawkins[1], Gary C. White[2], Kevin Christopherson[3], Michael Hudson[4], Mark Fuller[5], Chris Kitcheyan[5], And Others (1 Larval Fish Laboratory, Fishery and Wildlife Biology, Colorado State University, 2 Fishery and Wildlife Biology, Colorado State University, 3 Utah Division of Wildlife Resources, Vernal, Utah, 4 Utah Division of Wildlife Resources, Moab, Utah, 5 U. S. Fish and Wildlife Service, Vernal, Utah) **Status of Colorado pikeminnow *Ptychocheilus lucius* in the Green River basin, Utah and Colorado, 2000 to 2003**

4:45PM - Linda Manning*[1], John Wullschleger[2] (1 National Park Service, Death Valley National Park, 2 National Park Service, Water Resource Division) **Devils Hole update**

2004 Program with abstracts

11/10/2004 9:00AM - ROUNDTAIL CHUB WORKGROUP MEETING - Contact Matthew Andersen <matthewandersen@utah.gov>; Palo Verde Room, Doubletree

11/10/2004 4:00PM - Open discussion session among DFC members about future directions and other issues of interest to be announced

11/10/2004 6:00PM - INFORMAL SOCIAL

11/11/2004 8:30AM - INTRODUCTORY REMARKS

11/11/2004 9:00AM - Ernest Niemi*[1] (Managing Director, ECONorthwest, Eugene, Oregon (http://www.econorthwest.com)) **SPECIAL INVITED PRESENTATION - Reconciling economic return and ecological values: a new approach to protect native desert fishes and their habitats** - This topic stems from a concern among members of the DFC regarding the means to effect change in the management and conservation of native fishes and their habitats in Arizona, and other western states. Concurrent with the concerns of DFC, 100 economists sent a letter to President Bush and the Western Governors to urge better environmental protection for economic reasons. The Executive Committee of the Council recognized a connection between the findings of expert economists and aquatic habitat conservation strategies that may offer a more convincing platform for facilitating conservation of desert fishes. As one of the economists who wrote this letter to the President, DFC invited Ernie Niemi to give a plenary talk at this year's Annual Symposium.

Niemi is managing director, and has been a vice president and project manager, at ECONorthwest since 1978. He specializes in applying the principles of cost-benefit analysis to the problems of economic valuation and decision-making. Niemi has managed numerous projects related to natural-resource management, economic development, land-use management, energy pricing, hazardous-waste disposal, and transportation. He also manages ECONorthwest's litigation-support projects, overseeing the analysis of markets, the calculation of economic damages, the preparation of reports, and the development of testimony. Niemi has taught cost-benefit analysis and economic development at the University of Oregon's Department of Planning, Public Policy, and Management. He is or has been a member of the Budget Advisory Committee for Lane Electric Cooperative, the Roads Advisory Committee for Lane County, the Board of Directors of the Pacific Rivers Council, Center for Community and Watershed Health, the Budget Committee for the Pleasant Hill School District, the Technical Advisory Committee on Land Use and Economic Development for the Oregon Department of Land Conservation and Development, the Citizen's Task Force for Developing a Strategic Plan for the Oregon Department of Fish and Wildlife, and the Water Marketing Task Force for the Oregon Water Resources Department.

11/11/2004 10:00AM - Tim Modde*[1], Chuck McAda[1], Tom Chart[1], Matthew Anderson[2] (1 U.S. Fish and Wildlife Service, 2 Utah Division of Wildlife Resources) **Nonnative fish control efforts, successes, failures and the black holes: Upper Colorado River basin area report** - Instream Flow:

In response to the Flaming Gorge flow recommendations (2000) the Bureau of Reclamation has prepared a draft EIS that is planned to be distributed in September for a 60 day review and comment period to the public. The Management Plan for Endangered Fishes in the Yampa River Basin (Plan) was finalized and a draft Programmatic Biological Opinion, based on the plan will be distributed among affected agencies in September, after which it will be finalized. Design and permitting for Elkhead Reservoir (impoundment of a major tributary to the Yampa River) enlargement are on schedule. The Biology Committee for the Upper Basin Recovery Program approved the Flow Recommendations for the Duchesne River report. The Utah Ecological Services office is preparing a Programmatic Biological Opinion for the Duchesne River that will amend the existing Biological Opinion. In response to the new flow recommendations, a trial base flow augmentation was tested in July 2004 that indicated flows from an upstream Reservoir (Starvation) could be successfully transferred to the target reaches.

Habitat Restoration

Five Colorado pikeminnow, and three stocked razorback sucker ascended the fish ladder at the Redlands Diversion Dam on the Gunnison River in 2003. As of mid-August 2003, the ladder has been used by 53,000

native fishes (versus 7,600 nonnative fishes), including 59 Colorado pikeminnow, and nine previously-stocked razorback suckers. Construction of passage structure at the Grand Valley Project Dam was completed in August. Drought conditions have hampered the ability to run these structures in 2004. Passage needs to be completed at the Price Stubbs dam before it becomes a greater issue. The Upper Basin Recovery Program has completed a subbasin and site-specific floodplain management plan to provide clear objectives, costs, and measures of success. The levee along the Thunder Ranch floodplain easement (451 acres) located 6 miles downstream from the Green River razorback spawning bar was recently breeched at seven locations and allow the floodplain to be inundated at approximately 13,000 cfs for the first time in over 25 years. Further research using the 'reset' approach to floodplain management indicated water manipulation in floodplains holds promise for increasing survival of early life stages of bonytail and razorback sucker.

Nonnative Fishes

Nonnative fish reduction efforts continued in an effort to lower the number of northern pike, smallmouth and channel catfish on the Yampa, Duchesne, Colorado and Green rivers. Significant reductions were seen in the numbers of northern pike in the Yampa and Green rivers, but smallmouth bass numbers appear to be the greatest problem. Although large numbers of smallmouth bass have been removed in the Yampa, Green and Colorado rivers, attempts to reduce their numbers have not been as successful as northern pike efforts. Channel catfish removal was abandoned in the Green and Colorado rivers, but was maintained in Yampa Canyon because it appeared to be effective. Under drought conditions smallmouth bass numbers have grown dramatically in most warm, large river sections of the Upper Colorado River Basin. Efforts to implement effective nonnative control have been hampered by resistence from sport fishing interests, drought and abundance of the target species. In late November or early December, biologists in the upper basin will meet to discuss their research findings from 2004 nonnative fish management activities. At that time, the Upper Basin Recovery Program will determine what future directions these projects will take.

Propagation Activities

Razorback sucker and bonytail continue to be stocked according to the Upper Basin Recovery Program Stocking Plan. Stocking in 2004 will not been completed until this fall. In the fall of 2003, nearly 11,000 razorback sucker (>200 mm) were stocked into the Green River, just over 1,000 Colorado pikeminnow were stocked in both the Gunnison and Colorado rivers, and a total of 13,600 bonytail were stocked between the Green and Colorado rivers. Hatchery produced razorback sucker and bonytail continue to be captured in the Colorado and Green rivers.

Research, Monitoring, and Data Management

The first round of mark-recapture population estimates were completed for Colorado pikeminnow and humpback chub in the upper Colorado River basin to evaluate progress toward achieving recovery goals. The final report describing the four year effort for Colorado pikeminnow is currently being prepared and the individual reports on humpback chub are no available from the authors. Sampling for larval razorback sucker continued on the Gunnison River and began in the Colorado River in 2004. Analysis of samples collected during 2003 revealed 7 larval razorback sucker from the Gunnison River.

11/11/2004 10:15AM - Salvador Contreras-Balderas*[1] (Universidad Autónoma de Nuevo León / Bioconservación, A.C.) **DFC NE Mexico Area Coordinator & country report 2004** - Fish communities in the Rio Bravo/Rio Grande continue to show invasions by lowland warmwater and coastal species, with native species still receding, in spite of recent rains. Also, springs are not yet returning to standard flows. An Index of Biological Integrity, historical version, in the Río Conchos, yielded grades from 35-90% (headwaters only). Desert fishes continue to be at high risks. New legislation gives some hope that the water problems may be analyzed in better views. The new federal water law (2004), gives Comisión Nacional del Agua (CNA) jurisdiction over ecosystems, and stresses basin management. However, the planned flow control dams in the Río Aguanaval are still pending final resolution, after being protested by NGO's and other social forces. Also, agricultural development in Valle Hundido has been frozen on charges of harming aquifers shared with Cuatro Ciénegas; final resolution is pending, considering the bio-ecological and geological evidences that such aquifers are common, and the opposers showing some geological evidence of no connection. The Congreso Nacional de Ictiología was held in Villahermosa, Tabasco in September 13-16, 2004.

11/11/2004 10:30AM - Kara Hilwig*[1], Rob Bettaso[2], Glenn Knowles[3], Mary Richards[4], John Rinne[5] (1 SWCA Environmental Consultants, 2 Arizona Game and Fish Department, 3 US Fish and

Wildlife Service, 4 US Fish and Wildlife Service, 5 USFS Rocky Mountain Research Station) **Lower Colorado River Basin area conservation strategies report -** Native fish conservation efforts in the Lower Colorado River Basin continue to be productive and successful in protecting native fish and their habitats, in spite of expected difficulties. Success in native fish conservation efforts can often be attributed to cooperation among multiple agencies and organizations. For example, the range of humpback chub (*Gila cypha*) in the Little Colorado River was successfully expanded through the efforts of Fish and Wildlife Service (USFWS), Arizona Game and Fish (AGFD) and SWCA Environmental Consultants. A multi-agency group consisting of members from The Nature Conservancy, Bureau of Land Management (BLM), Forest Service (USFS), USFWS, State Lands Department, and AGFD are working cooperatively to translocate spikedace (*Meda fulgida*) and loach minnow (*Tiaroga cobitis*) to Hot Springs and Cherry Springs canyons on the Muleshoe Ecosystem Preserve. In addition, Gila topminnow (*Poeciliopsis occidentalis*), desert pupfish (*Cyprinodon macularius*) and several other native fishes are targeted for placement in appropriate habitats. The key to success for moving forward with habitat restoration and restocking of spinedace (*Lepidomeda vittata*) into the East Clear Creek drainage is cooperation between USFWS, The Flagstaff Arboretum, Coconino National Forest (CNF), AGFD, and private landowners and ranchers. Native fish recovery in the West Fork of Oak Creek, including Gila trout (*Oncorhynchus gilae*) is moving forward through the cooperative efforts of Northern Arizona Flycasters, Federation of Flyfishers, Bureau of Reclamation (BR), CNF, USFWS, and AGFD. Down listing and delisting efforts for Gila and Apache trout (*Oncorhynchus apache*) are also driven by similar cooperative programs. Native fish salvage, including Gila topminnow, longfin dace (*Agosia chrysogaster*), speckled dace (*Rhinichthys osculus*) and Gila chub (*Gila intermedia*) and stream renovation projects for Cave Creek are in the planning stages with cooperation from ASU, BR, Tonto National Forest, USFWS, Desert Foothills Land Trust, and Spur Cross Conservation Area. The razorback sucker (*Xyrauchen texanus*) repatriation program on Lake Mohave continues to be highly successful due to cooperation and active participation among members of the Native Fish Work Group. This ad hoc working group consists of BR, USGS, AGFD, Nevada Division of Wildlife (NDOW), Arizona State University (ASU), National Park Service (NPS), and several other agencies. Many of these successful conservation efforts have cooperative agreements in place to assist in the formation and implementation of management plans. For example, a draft Safe Harbor Agreement for the State of Arizona would assist in implementing statewide conservation and management of Gila topminnow and desert pupfish on non-federal lands. A conservation agreement and strategy between Utah, Nevada, Wyoming, Colorado, and New Mexico and others for roundtail chub (*Gila robusta*), bluehead sucker (*Catostomus discobolus*) and flannelmouth sucker (*Catostomus latipinnis*) is in place. Conservation agreements and strategies are being initiated by AGFD for several species of native fish including roundtail chub, Chihuahua chub (*Gila nigrescens*), Gila chub, flannelmouth and bluehead sucker, and other sucker species. Furthermore, AGFD has formed a state-led effort called the Native Fishes Conservation Team to provide 'comprehensive, cohesive, and collaborative' guidance for statewide native fish conservation and management actions. Many other cooperative efforts and agreements, which will be discussed in the presentation, have resulted in successful native fish conservation and habitat protection and restoration.

11/11/2004 10:45AM - Gary P. Garrett*[1], Robert J. Edwards[2], Alice F. Echelle[3], Nathan L. Allan[4], Clark Hubbs[5] (1 Texas Parks & Wildlife, HOH Fisheries Science Center, 2 University of Texas-Pan American, Department of Biology, 3 Oklahoma State University, Zoology Department, 4 U.S. Fish & Wildlife Service, Ecological Services, 5 The University of Texas, Section of Integrative Biology) **Area report: Texas. Desert fishes research and management in Texas during 2004 -** The Devils River minnow (*Dionda diaboli*) population in San Felipe Creek is threatened by the introduction of suckermouth catfish (*Hypostomus* sp.). This exotic was first noted in 1997, but numbers remained low. In the last two years the catfish numbers have grown to thousands and recent collections have yielded no *D. diaboli* and very few of the once common *D. argentosa*. The populations of *D. diaboli* in the Devils River and Pinto Creek remain stable, however, the source aquifer of upper Pinto Creek is at risk from water marketing. The Pecos pupfish (*Cyprinodon pecosensis*) population in upper Salt Creek remains pure and large numbers are present in the high marsh area. Because of its remoteness and isolation from the remainder of Salt Creek, the high marsh will hopefully remain a reasonably safe refuge for pure *C. pecosensis*. Hybrid frequencies in the lower segment of Salt Creek continue to increase. Work continues on reestablishing refuge populations on shrimp farms in West Texas. A survey to evaluate the potential for reintroduction of Rio Grande silvery minnow (*Hybognathus amarus*) in the Big Bend National Park region was undertaken this summer. Conditions appear favorable, but changes in existing fish populations were noted. These changes appear correlated with modifications in channel morphology brought on by massive stands of giant reed (*Arundo donax*) and salt cedar (*Tamarix* sp.).

11/11/2004 11:00AM - Matthew E. Andersen*[1] (Utah Division of Wildlife Resources) **Propagation as a component of native fish recovery in the Bonneville and Virgin River basins** - Habitat degradation, water development, and introduced non-native fish species are the most commonly cited factors of decline of fish populations native to western North America. These factors have contributed to the decline of two Bonneville Basin species, least chub *Iotichthys phlegethontis* and June sucker *Chasmistes liorus*. Over harvest has also contributed to the decline of June sucker. Cooperative programs have been established to help conserve and recover both least chub and June sucker. Among a suite of efforts, a common component of the conservation actions undertaken by both programs has been human-mediated propagation. When wild population sizes of fish species have dropped to extremely low levels cooperative programs have often, though not always, concluded that rearing native fish in protected environments and then releasing them into the wild will help contribute to the species recovery. Basing propagation on the best available science, including genetic analysis, is critical to success in these efforts. Initial results of these efforts in the Bonneville Basin are limited but encouraging. June sucker have been taken into captivity or refugia for 20 years. Survival in the hatchery and in refuge environments has been variable but seems to be improving. June sucker were first released back into Utah Lake beginning in 1994 and periodically since then, most recently in the spring of 2004. While stocking survival rates need to be improved, some of the June sucker reared in various types of protected habitats and then released into Utah Lake have been growing and even returning to spawn along with wild fish in the Provo River. Least chub have been captured from native habitats and taken into captive care over the last two years. This species has proven relatively easy to transport and propagate, and population sizes in hatcheries are now increasing to the point that releases into the wild and experiments are possible. An experiment to evaluate least chub effectiveness at taking mosquito larvae is just being initiated using captive-produced fish. In the Virgin River basin woundfin *Plagopterus argentissimus* have been taken into two hatcheries over the past 14 years and have experienced variable survival. Woundfin apparently require much more specialized care, including careful transport conditions and prophylactic treatments during the winter months, to survive and reproduce in captivity. Captive bred woundfin have now been released into the Virgin River both above the Washington Fields Diversion in Utah and below Mesquite in Nevada. Observers in the Bonneville Basin are watching the efforts to rear woundfin with great interest because of the potential applicability of techniques to the rearing of leatherside chub *Snyderichthys copei* in captivity. While some successes have been observed in rearing native desert fish in captivity it is unlikely that recovery of these fish is attainable without continued efforts to protect habitat and control nonnative fish populations in the wild.

11/11/2004 11:15AM - Gorgonio Ruiz-Campos*[1], Alejandro Varela-Romero[2], Glenn Knowles[3], Faustino Camarena-Rosales[1] (1 Universidad Autónoma de Baja California, Facultad de Ciencias, 2 Universidad de Sonora - DICTUS, 3 U.S. Fish and Wildlife Service, Phoenix, Arizona) **Recent studies of conservation status of fishes of northwest Mexico** - (1) Two hydrological regions of Baja California Sur (Río San Ignacio and Río La Purísima drainages) were surveyed from October 2002 to July 2004 to evaluate the distribution and impact of exotic fishes on the native fishes. This project is funded by the Mexican federal government (SEMARNAT-CONACyT). The endemic Baja killifish (*Fundulus lima* Vaillant, 1894) was detected in four localities of the each drainage, with high to moderate of exotic fishes (common carp, redbelly tilapia, guppy, and green swordtail). Baja killifish showed contrasting densities within each basin, being higher in San Ignacio basin where had a significant inverse correlation with that of the exotic redbelly tilapia. Likewise, high levels of parasitism by the nematode *Contracaecum multipapillatum* were registered in Baja killifish, especially in individuals of the San Ignacio basin. In San Ignacio oasis (type locality), the relative abundance of Baja killifish has decreased radically after the introduction of redbelly tilapia in 1997. Programs of control and eradication of exotic fishes are needed to the prompt recovery of the populations of Baja killifish.

(2) Synopsis for 21 fish species from northwestern Mexico considered in the Mexican Official Norm (NOM-059-ECOL-2002) were compiled as part of the CONABIO project "Conservation status of freshwater fishes in northwestern Mexico: Sonora and Baja California". This information plus other 28 synopses of fish species are available in the web page: www.conabio.gob.mx/conocimiento/ise/fichas/doctos/peces.html. Some corrections will be required, at least, for some of the species involved in this project.

(3) The Rio Sonoyta in the Pinacate and Gran Desierto de Altar Biosphere Reserve was surveyed for fishes in and for fishes and turtles in July. The status of the Sonoyta mud turtle remains stable, as do populations of native fishes, the Quitobaquito pupfish and longfin dace, despite the near drying of the river at the height of

the dry season in early July. A single tilapia was observed in this reach in October 2003; no tilapia were found in 2004 surveys, although mosquitofish and black bullhead remain abundant. The National Park Service, Arizona Game and Fish Department, and Pinacate and Grand Desierto de Altar Biosphere Reserve initiated a project in 2004 to assess eradication of nonnative fishes from the Rio Sonoyta. The international multi-agency Quitobaquito and Rio Sonoyta Working Group continued work on a conservation assessment and strategy for the region.

(4) The phylogenetic relationships of native Ictalurids from northwestern Mexico will be surveyed on the basis of mitochondrial genes. Fish sampling in the Pacific drainages of the Sierra Madre Occidental and Chihuahua to Nayarit and northern Jalisco) will be carried out. Cyt-b, 12S rRNA and 16S rRNA will be used to show the phylogeny of the genus *Ictalurus*. Traditional Maximum Likelihood and Maximum Parsimony methods will be used to analyze the phylogenetic relationships.

11/11/2004 11:30AM - Hilary E. Watts*[1], Jim E. Brooks[1], Marilyn Myers[2], David L. Propst[1], W. Jason Remshardt[1], Stephen R. Davenport[1], Robert K. Dudley[3], Steven P. Platania[3] (1 U.S. Fish and Wildlife Service, 2 New Mexico Department of Game and Fish, 3 American Southwest Ichthyological Research Foundation) **Native fish research and management in the upper/middle Rio Grande basin during 2004** - Status of Rio Grande cutthroat trout (*Oncorhyncus clarki virginalis*; RGCT) continues to be of concern in the upper/middle Rio Grande basin. The U.S. Fish and Wildlife Service (USFWS) was petitioned in 1998 to add RGCT to the list of threatened and endangered species, and an initial 90-day finding determined that the petition did not present substantial information indicating that listing was warranted. Subsequently, as a result of a court settlement agreement, USFWS conducted a candidate status review. The candidate status review defined criteria (genetic purity, population stability, and population security) for evaluating the 267 populations in New Mexico and Colorado. Thirteen pure populations, each with over 2,500 fish secured by a barrier, and not co-existing with non-native trout, were identified. In December 2003, a multi-agency "Conservation Agreement for the Range-wide Preservation and Management of the Rio Grande Cutthroat Trout" was finalized to establish cooperative objectives and strategies for conservation and restoration of RGCT within its historic range. The agreement does not meet the USFS Policy for "Evaluation of Conservation Efforts when Making Listing Determinations" and to date no coordination activities have occurred. In July 2004, a petition was filed to challenge USFWS candidate status review findings. Meanwhile, the New Mexico Game Commission moved in August 2004 to disallow piscicide application for non-native trout removal by the NM Department of Game and Fish, lead authority on RGCT conservation, in New Mexico. Proponents of this ruling requested that non-native trout, the greatest threat to RGCT conservation, be removed from streams by alternative methods, such as electro-fishing. This will pose a challenge to restoration projects proposed for RGCT because data have shown piscicide applications to be more effective than electro-fishing in complete removal of non-native species.

In the middle Rio Grande, recurring surface flow intermittence in the lower portion of occupied range continued to be the major threat to Rio Grande silvery minnow (*Hybognathus amarus*; RGSM). Since 2002, a total of 242,123 captive RGSM have been released, and a total of 160,000 are designated for release in fall 2004 and spring 2005. Current augmentation monitoring data indicate that hatchery-propagated RGSM represent 35% of all adults sampled in the Angostura Reach. Salvage during drying periods by agency personnel continued without scientific determination of the benefit to conservation.

In the Pecos River Basin, Pecos bluntnose shiner (*Notropis simus pecosensis*; PBNS) monitoring has continued to determine long-term population trends. Major threats to conservation are low flow, surface flow intermittence, and block releases for irrigation purposes. Although 2004 data are still in preparation, fewer total PBNS were observed during monitoring from January to August 2004 than during the same period in 2003. Conservation activities for Pecos pupfish (*Cyprinodon pecosensis*), whose primary threat is hybridization with Sheepshead minnow (*Cyprinodon variegatus*), included monitoring selected sinkhole habitats at Bitter Lake National Wildlife Refuge. Current distribution of Sheepshead minnow in the Pecos River is from Carlsbad, NM, to Red Bluff Reservoir. (Additional Author - #9 - Gottleib, Sarah J., affiliation 3).

11/11/2004 11:45AM - Stewart B. Reid*[1], Chris Allen[2], Amy Horstman[2], Rollie White[2], Doug Young[2], Paul Chappell[3], Roger Smith[4] (1 U.S. Fish and Wildlife, Klamath Falls OR, 2 U.S. Fish and Wildlife, Portland OR, 3 California Dept. Fish and Game, Susanville CA, 4 Oregon Dept. Fish and Wildlife, Klamath Falls OR) **The importance of private land stewardship in the northwestern**

deserts: the Oregon / Northern California Area Report - The northwestern extreme of the American deserts includes seven interior drainage basins in Oregon and northeastern California (Harney, Fort Rock, Chewaucan, Goose, Warner, Catlow, and Alvord), which contain the remnant fish faunas of once extensive pluvial Pleistocene lakes. Aquatic habitat is severely limited, and the fishes must contend with periodic natural droughts that dessicate whole lakes and reduce streams to isolated pools. Man's activities have altered aquatic habitat, competed for scarce water resources, introduced exotic competitors, and obstructed connectivity corridors. For many populations of concern crucial, and often the only available habitat, is on private lands. Successful conservation of the native fishes will ultimately depend both on the ability of governmental agencies to cooperate with local communities and directly on private land stewardship. Species of particular conservation concern in this region include: Alvord Chub (*Siphateles alvordensis*), Borax Lake Tui Chub (*Siphateles boraxobius*), Cowhead Lake Tui Chub (*Siphateles bicolor vaccaceps*), Hutton Springs Tui Chub (*Siphateles obesus* ssp.), Foskett Dace (*Rhinichthys osculus* ssp.), Modoc Sucker (*Catostomus microps*), Warner Sucker (*Catostomus warnerensis*), Lahontan Cutthroat Trout (*Oncorhynchus clarki henshawi*), and Interior Redband trouts (*Oncorhynchus mykiss* sspp.).

11/11/2004 12:00PM - LUNCH

11/11/2004 1:30PM - Jonathan N. Baskin*[1], Thomas R. Haglund[1], Steven H. Bryant[1] (California State Polytechnic University Pomona and San Marino Environmental Associates) **Santa Ana sucker (*Catostomus santaanae*) distribution and habitat selection in different river regions** - The federally Threatened Santa Ana sucker (*Catostomus santannae*) occurs presently in the lowland floodplain of the Santa Ana River, and in the upland, mountain tributaries of the adjacent San Gabriel and Los Angeles rivers. It also occurs in the Santa Clara River to the north, where it is thought to be introduced. Details of its present habitat are given, and a comparison of the results of habitat selectivity studies in the high gradient mountain portions of the San Gabriel River and the low gradient floodplain portions of the Santa Ana River are presented showing the specific habitats selectively utilized by various life history stages in each of there river regions. An proposed ideal stream morphological configuration of a typical lowland stream is given, illustrating the various microhabitats that support life history stages this species.

11/11/2004 1:45PM - Robert H. Bettaso*[1] (Arizona Game and Fish Department) **Native aquatic species and public welfare** - Many native aquatic species can assist our social services and the general public in various ways pertaining to public health and public safety. One recent example is using native mosquito eating species to protect the public and assist the local health services by controlling vectors for such illnesses as West Nile Virus and other forms of encephalitis. This talk will explore areas in which native species could help in this effort and will look to historic efforts using both aquatic and native species for the common good of societies. A discussion of current and future strategies will also be examined.

11/11/2004 2:00PM - Scott A. Bonar*[1] (Arizona Cooperative Fish and Wildlife Research Unit, U.S. Geological Survey) **Can people be influenced to improve their conservation ethic towards desert fishes? Lessons from psychology and marketing** - Fisheries professionals have a long history of conducting surveys to identify public needs and wants, but little information is available in the fisheries literature describing techniques on how people can be influenced. Successful strategies for influencing people are important to make regulations effective, to develop a public conservation ethic, and to aid conservation programs. The fields of psychology and marketing have long examined how people are influenced. Maslow's Hierarchy of Needs and Cialdini's six influence strategies have been used extensively to market products and ideas. I discuss how managers and biologists might use these commonly applied marketing and psychological techniques to aid in desert fish recovery efforts.

11/11/2004 2:15PM - Salvador Contreras-Balderas*[1] (Universidad Autónoma de Nuevo León / Bioconservación, A.C.) **Exotic freshwater fishes in México: summary and worst cases** - Exotic or alien freshwater fishes are a source of worries on their role in native species damages world-wide. México is one of the best known countries in this matter. Any species out of original place is included in this paper. Starting with trout in 1884, they have increased up to 2004, when 113 species are recorded, plus 8 hybrids. The main vectors are food (41), sports (30), ornamental (18), forage (8), biocontrol (6), bait (4), conservation (3), all aquacultural, plus accidentals (17), and invasives after any of the former (61). By origin, they are nearctic (56), palearctic (9), neotropical (34), ethiopic (7), and oriental (2). By countries, they are from USA (27), shared US/Mex (22), Guatemalan (3), shared Guatemala/Mexico (3), and strictly Mexican (25). Important families are cyprinids (21), cichlids (16), poeciliids (15), and atherinopsids (10), with 14 more families contributing. Increments in exotic fishes are strongly parallel to Mexican native species at risk.

Misunderstanding of the niche concept and application of the mythical "empty niche" result in many purposeful introductions. There are some worst cases. The African jewel fish in 4 springs in Cuatro Ciénegas, that is harming stromatolites, cichlids, and gambusia, now invading creeks, and is nearly impossible to control. The plecos are invading Río Balsas (4 species), Río Usumacinta (1), Río Grijalva (1), and Río Bravo (1); in Río Balsas they have impacted the Tilapia fisheries 80%, damaging nets and habitats. Local fishermen have lost US 12 million income.

11/11/2004 2:30PM - Peter J. Unmack*[1], William F. Fagan[2] (1 Arizona State University, School of Life Sciences, 2 University of Maryland, Department of Biology) **Patterns of exotic and native fish richness in the Gila River basin -** Using the Minckley Sonfishes database, we will examine spatial patterns of native fish decline and exotic fish occurrence within the Gila River Basin. It is generally thought that exotic fish richness tends to be highest in the lower reaches of the system, with a gradual decrease into upstream reaches. The loss of native fish richness also seems to follow the same pattern, with more losses occurring downstream, fewer upstream. The goal of this presentation is to initially test the above assumptions and to identify what types of streams deserve more focus for actions relative to the impacts of exotic fishes and the reduction of further native fish declines.

11/11/2004 2:45PM - Kevin D. Christopherson*[1], Ronald Brunson (Utah Division of Wildlife Resources) **Larval razorback sucker and bonytail survival and growth in the presence of non-native fishes in the Stirrup floodplain, Green River, Utah -** Despite successful reproduction by razorback suckers (*Xyrauchen texanus*) in the middle Green River, recruitment beyond the larval stage has not been recently observed. Bonytail (*Gila elegans*) are essentially extirpated in the wild and nearly all bonytail present in the Green River are hatchery-stocked fish. Floodplain wetlands may provide important rearing habitat for both larval razorback sucker and bonytail. However, survival of razorback suckers in restored floodplain habitat has not been observed since 1997, even when larvae were introduced directly into floodplain sites. Large nonnative fish populations in floodplain habitats have likely suppressed survival. The recent drought eliminated, or reset, nonnative fish populations in floodplain sites through complete dewatering of sites. During the next inundation period following a reset, initial nonnative fish densities are low. This study's goal was to test at what density introduced larval razorback sucker and bonytail could survive in the presence of reduced predation similar to that present in a reset wetland. Different densities of razorback sucker and bonytail larvae were tested using enclosures with approximately equal numbers of nonnative fish. Survival in these enclosures was observed.

11/11/2004 3:00PM - Michael D. Mills*[1], Mark C. Belk[2], Russell B. Rader[2] (1 Utah Division of Wildlife Resources, 2 Brigham Young University, Department of Integrative Biology) **Vulnerability of native fishes to predation by introduced western mosquitofish *Gambusia affinis*: a model and test of assumptions -** Although western mosquitofish *Gambusia affinis* have been linked to the decline of native fish populations through a variety of mechanisms, predation is considered one of the most important ways that mosquitofish contribute to the decline of native populations. To better understand the predatory potential of mosquitofish we developed a model incorporating the gape size of mosquitofish to predict the size of native fish vulnerable to predation by both adult female and juvenile mosquitofish. We tested the parameters and assumptions of the model through laboratory experiments using mosquitofish and native least chub *Iotichthys phlegethontis*, a threatened species. The model predicted that if mosquitofish have a parabolic versus a flat consumption function the amount of time native fish are vulnerable to predation is decreased. Additionally, native fish that display a concave versus a linear or sigmodial growth rate may be vulnerable to mosquitofish predation for a reduced amount of time. Management options that reduce the size structure of mosquitofish populations may increase native fish survival by decreasing native fish vulnerability to mosquitofish predation. Habitat manipulations and trapping may reduce the predatory impact of mosquitofish on native fish populations.

11/11/2004 3:15PM - John Hawkins*[1], Cameron Walford[1], Tasha Sorensen[1] (Colorado State University, Larval Fish Laboratory) **Evaluation of non-native fish removal from the Yampa River, Colorado -** Introduced northern pike (*Esox lucius*), smallmouth bass (*Micropterus dolomieu*), and channel catfish (*Ictalurus punctatus*) pose a predatory threat to native endangered fishes, including Colorado pikeminnow (*Ptychocheilus lucius*) in the Yampa River. Recovery goals for endangered fishes recommend reduction of these wide-ranging and abundant piscivores. Effective management requires understanding the abundance of introduced piscivores and the effort required to remove a desired proportion of them. Using capture-recapture techniques, we evaluated the efficiency of boat electrofishing and fyke net gears to remove

three nonnative species from portions of the Yampa River. We marked 298 northern pike and 365 channel catfish in a 120-km reach on three sampling occasions and 1,407 smallmouth bass in a 20-km reach on five sampling occasions. We estimated about 565 (95% CI, 485-675) northern pike, 5,121 (95% CI, 4,526-5,832) smallmouth bass, and 7,474 (95% CI, 3,600-15,988) channel catfish occupied the study reaches. Probabilities of capture suggest about 21% of northern pike, 6% of smallmouth bass, and 2% of channel catfish could be removed on each sampling occasion. These data suggest that mostly unregulated river systems like the Yampa River are not immune to colonization by large populations of introduced predators. Our results will be useful for designing and evaluating control strategies for nonnative fish in western rivers.

11/11/2004 3:30PM - David Ward*[1], Andrew Schultz[2] (1 Arizona Game and Fish Department, Research Branch, 2 Arizona Cooperative Fish and Wildlife Research Unit, University of Arizona) **Species-specific piscicides: Dream or reality? -** Attempts to remove unwanted nonnative fishes from areas with native fish are common but success is limited because very few tools are available for managing invasive fish populations. Only four chemicals are currently registered as piscicides, two of which are toxins specific to lampreys and the others are not selective for specific species. The first step in development of a species-specific piscicide is to perform toxicity screening on candidate chemicals. We recently discovered one such chemical that has the ability to selectively kill problematic nonnative fishes without harming three of Arizona's native fish species. In repeated laboratory tests this synthetic salicylanilide was found to kill nonnative fathead minnow *Pimephales promelas*, red shiner *Cyprinella lutrensis*, yellow bullhead *Ameiurus natalis*, and smallmouth bass *Micropterus dolomieui* without harming native longfin dace *Agosia chrysogaster*, Gila chub *Gila intermedia*, or Gila topminnow *Poeciliopsis occidentalis*. The apparent species-specific selectivity of this chemical and its similarity to currently licensed lampricides makes it a good candidate for further evaluation as a fish toxin. Testing, and licensing of new piscicides is very costly, but not pursuing new tools for managing invasive fishes may be even more costly if current trends are not reversed and native fishes continue to decline.

11/11/2004 3:45PM - Jeanette Carpenter*[1], Jeremy Hoekstra[2] (1 USGS Fort Collins Science Center, 2 Colorado State University) **Diet of *Orconectes virilis*, an introduced crayfish in the Colorado River basin -** Crayfish are not native to the Colorado River basin, however they are now established in portions of the mainstem and in many tributaries. The most common crayfish species in the basin is *Orconectes virilis*. We examined food habits of O. virilis in Sabino Creek (Pima County) and Boneyard Creek (Apache County). Species of concern include *Gila intermedia* and *Argia sabino* in Sabino Creek; and *Anodonta californiensis*, as well as several native fishes in Boneyard Creek. From May through October 2001, 309 crayfish were collected by hand and digestive tracts and stable isotope samples were collected. Gut contents were classified into nine food categories, and parts identifiable as aquatic insects were identified to order. We determined frequency of occurrence and relative contributions of various food categories. We will present diel trends in crayfish diet, as well as variations between sex and size class. We will also compare the results of gut contents analysis with the stable isotope data.

11/11/2004 4:00PM - John N. Rinne[1], Dennis Miller*[2] (1 USDA, Forest Service, Rocky Mountain Research Station, 2 Western New Mexico University) **Riparian habitat restoration and southwestern native fish assemblage: A tale of two rivers -** Aquatic habitat and its quality are keystone features for conservation and sustaining fishes. In the southwestern United States, livestock grazing has occurred on the landscapes for over a century. Because of aridity of climate and frequent drought, domestic livestock resort to wetlands and riparian stream corridors for forage and water. One argument against this land use is the indirect impact on native, many threatened and endangered fish species within these aquatic habitats. Removal and reduction of livestock to improve and restore riparian vegetative habitat has been a management alternative that has been implemented across a large proportion of streams in the southwestern USA. We will present data on two river systems, the Gila and the Verde, from which livestock have been removed for similar periods of time. Fish assemblages in these "improved" riparian areas have responded in two markedly different manners. In one, introduced species of fishes are now dominant. In the other, native fishes predominate fish assemblages. The question relative to the theme of this Congress is " Does riparian restoration always translate into native fish restoration and conservation?" Or, "Does one size fit all?" We will compare physical habitat data and fish assemblages in these two rivers. We will suggest that overriding, natural geomorphic and hydrologic influences are perhaps more important in terms of habitat important for sustaining fishes assemblages than is simple increase in riparian vegetation.

11/11/2004 4:15PM - Bill Leibfried*[1], Kara Hilwig[1], Matt Lauretta[1], Jeff Cross[2] (1 SWCA Environmental Consultants, 2 Grand Canyon National Park) **Restoring native fish habitats in selected tributaries of the Colorado River, Grand Canyon National Park** - Grand Canyon National Park has initiated a project to restore native fish habitat in tributaries of the Colorado River within the Park's boundaries. The ultimate goal of this effort is to reduce non-native fish populations from selected streams and restore the habitats to enhance native fish populations. Target fishes include humpback chub, flannelmouth and bluehead suckers and speckled dace. In 2004 two field efforts were conducted to sample fish populations in Shinumo, Tapeats, and Kanab Creeks and determine whick of these streams will be the most feasible for non-native fish removal efforts and native fish restoration. Population estimates and non-native fish removal data were analyzed and Shinumo and Kanab Creeks were selected for further study. Our results indicate that non-native salmonids can be effectively removed from Shinumo Creek while non-native cyprinids and some salmonids found in Kanab Creek could effectively be removed. Two additional field efforts are planned for 2005 and the potential for repatriation of humpback chub into Shinumo Creek is being considered by federal agencies.

11/11/2004 4:30PM - David L. Rogowski*[1], Craig A. Stockwell[1] (North Dakota State University, Dept. Biological Sciences) **Are translocated populations really replicate populations?** - Translocations and the establishment of "replicate" populations are often recommended for the management of small and isolated populations. This has been carried out for a variety of desert fishes with limited success. The White Sands pupfish (*Cyprinodon tularosa*) is typical of most pupfishes. They have a very limited distribution which puts them at peril from stochastic events. Two native populations exist (at Salt Creek and Malpais Springs) while two populations (at Lost River and Mound Spring) were established by translocation of Salt Creek fish circa 1970. Lost River is a saline riverine system environmentally similar to the native Salt Creek habitat. Mound Spring is a low salinity spring habitat very different from the native habitat. A comparison of life history traits was conducted in fish from all three systems. The most surprising difference was a negative shift in the age frequency distribution of the introduced populations. Whereas the native populations have age distribution with 0-4 year old fish, the non-native populations have an age distribution of 0-2 year old fish. This age shift suggests that Mound Spring and Lost River present pupfish with novel selection pressures. Oddly, this altered selective regime has not resulted in measurable responses in other life history parameters, but this may reflect an inability to measure the response.

11/11/2004 4:45PM - William G. Kepner*[1], David F. Bradford[1], Todd D. Sajwaj[2] (1 U.S. Environmental Protection Agency, Office of Research and Development, 2 Lockheed Martin Environmental Services) **An approach for determining regional land cover and species habitat conservation status in the American southwest: the Southwest Regional Gap Analysis Project** - The Gap Analysis Program (GAP) is a national interagency program that maps the distribution of plant communities and selected animal species and compares these distributions with land stewardship to identify biotic elements at potential risk of endangerment. GAP uses remote sensing (Landsat 7) and Geographic Information System (GIS) technology to assemble and view large amounts of biological and land management data to identify areas (gaps) where conservation efforts may not be sufficient to maintain diversity of living natural resources. Historically, GAP has been conducted by individual states, however this has resulted in inconsistencies in mapped distributions of vegetation types and animal habitat across state lines because of differences in mapping and modeling protocols. This was further compounded from the lack of a national vegetation classification nomenclature. In response to these limitations, GAP embarked on a second-generation effort to conduct the program at a regional scale, using a vegetation classification scheme applicable across the US, and ecoregional units as the basis for segmenting the landscape into manageable units. The program's first formalized multi-state regional effort includes the five states (Arizona, Colorado, Nevada, New Mexico, and Utah) comprising the Southwest Regional GAP Analysis Project (SW ReGAP).

11/11/2004 7:00PM - INFORMAL SOCIAL - hosted by the University of Arizona American Fisheries Society Student Chapter.Food, drink (including spirits), and music included. All are welcome to attend. There will be no cover charge for students; others are encouraged to make a small donation

11/11/2004 7:30PM - INFORMAL EVENING SESSION TO DISCUSS SOUTHERN NEVADA WATER AUTHORITY PROJECT

11/12/2004 8:00AM - Jared Crowley*[1], Dennis Shiozawa[1], R. Paul Evans[2] (1 Brigham Young University, Department of Integrative Biology, 2 Brigham Young University, Department of Microbiology and Molecular Biology) **Phylogenetics and cottids -** Cottids occur commonly in the streams and rivers of the Bonneville, Snake-Columbia River, and Colorado River basins. 624 sculpin were collected from 45 locations from Utah, Idaho, Nevada, Wyoming, Montana, Colorado, and Washington states. The ND4/4L gene region of the mitochondrial genome was sequenced and 64 unique haplotypes identified. Phylogenetic analyses were performed in PAUP using maximum parsimony (MP) and maximum likelihood (ML) using an evolutionary model predicted by MODELTEST. *C. bairdi*, *C. beldingi* and *C. confusus* are distinct genetic lineages. The *C. bairdi* complex includes multiple mitochondrial lineages consistent with a Colorado form (nr. *C. punctulatus*), *C. extensus*, a Bonneville form, an Upper Snake River form and a Montana form (*C. bondi* as proposed by D. Neely). *C. beldingi* specimens were found living sympatrically among populations of *C. bairdi* and *C. confusus*, usually in small numbers except in Nevada. The mitochondrial genetic variability in *C. bairdi* is complex and results in largely unresolved polytomies in MP, ML, and Bayesian analyses. The data suggest recent connections and gene flow between the upper Snake and Bear River systems, and between the Colorado and Bonneville drainages (upper Uintas).

11/12/2004 8:15AM - Douglas Threloff*[1], Linda Manning[2] (1 private consultant, 2 National Park Service) **Thermal environment of the Devils Hole pupfish -** Concerns about a decline in the number of Devils Hole pupfish (*Cyprinodon diabolis*) in Devils Hole, Nevada have prompted a number of studies that are designed to identify the causal factors for the lower number of fish. Because the thermal regime of a habitat may affect a fish's metabolism, reproductive success, and behavior, digital temperature data loggers were installed at three locations within Devils Hole to continuously monitor water temperature in 1999, 2000, and 2001. In contrast to several published reports that suggest the water temperature in Devils Hole is a constant 32 or 33 degrees Celsius, water temperature in the middle, southeastern, and western portions of the fish's spawning habitat were found to fluctuate. During the summer months of May, June, and July each year, daily high water temperatures in the middle of the fish's spawning habitat consistently went as high as 35.0 to 36.49 degrees for a period of four to six hours when sunlight illuminated the spawning substrate. Daily high water temperatures in the southeastern portion of the spawning habitat were slightly cooler (i.e., 34.0 to 35.99 degrees) during these same months, and the length of time when water temperature increased was shorter (i.e., 3 to 4 1/4 hours) than in the middle of the spawning shelf. An area along the western portion of the spawning habitat experienced daily high water temperatures that were similar to those in the southeastern portion of the spawning habitat. Studies on the reproductive ecology of other pupfish taxa suggest water temperatures in Devils Hole are likely to be near the upper maximum threshold for successful egg production and fry recruitment. These studies also suggest small increases in water temperature on the order of a few degrees Celsius may be sufficient to decrease or eliminate successful recruitment of Devils Hole pupfish. Studies in a laboratory setting will likely be required to more fully understand the relationship between different water temperature regimes and the recruitment of Devils Hole pupfish. A growing body of published literature suggests global climate change may result in elevated environmental temperatures; if the predicted temperatures were to occur, they may have the potential to affect the status of the Devils Hole pupfish.

11/12/2004 8:30AM - Dennis K. Shiozawa*[1], R. Paul Evans[2] (1 Brigham Young University, Department of Integrative Biology, 2 Brigham Young University, Department of Microbiology and Molecular Biology) **Insights into the drainage basin history of western North America - fragmentary information based on phylogenetics of aquatic organisms -** Phylogenies of aquatic species with limited dispersal capabilities should reflect the geological history of an area. Our lab has examined phylogenetic relationships among a number of groups, including cyprinids, salmonids, cottids, catostomids, and stoneflies. These studies have allowed us to look for a general concordance with basin history. Some species show evidence of relatively recent dispersal while others carry genetic signatures that may be Miocene in age. Collectively, such phylogenies should allow a refinement of the geological history of parts of western North America..

11/12/2004 8:45AM - Michael L. Collyer*[1] (Iowa State University, Department of Ecology, Evolution, and Organismal Biology) **Ecomorphological diversification of *Cyprinodon* -** In 1948, Robert Rush Miller posited that local ecological conditions may have contributed to interspecific and intraspecific morphological diversification of *Cyprinodon*.. This hypothesis suggested that ecological differences among habitats of post-Pleistocene populations of *Cyprinodon* may have promoted faster morphological divergence than could be expected with vicariance. Although Miller's hypothesis predates most discussion of ecological

speciation and adaptive radiation, his intuition was correct. In this study, I assessed body shape variation among species and among populations for several species of Cyprinodon. I found that morphological divergence among some populations of Cyprinodon that have only been isolated for decades often exceeded divergence between species. Further, there was a much stronger association of body shape and local environment than body shape and phylogeny. These results suggest that morphological diversification of Cyprinodon may have occured even faster than previously thought.

11/12/2004 9:00AM - Michael E. Douglas*[1], Marlis R. Douglas[1] (Colorado State University, Fish & Wildlife Biology) **Phylogeography of the humpback chub, *Gila cypha*, from the Colorado River ecosystem** - Life history of *G. cypha* in the Colorado River Basin is mostly enigmatic, and interrelationships among subpopulations are virtually unknown. Lack of an historic baseline further complicates an understanding of present-day patterns, and causal relationships between physical and biological parameters are merely the source of speculation. The most pressing questions pertain to genetic distinctiveness of local populations in the Colorado River Basin, the interrelationships among these populations, and how the sum can be adaptively managed in a perturbed environment. The objectives of this ongoing study are therefore to (a) infer interrelationships among populations of *G. cypha* within the basin, (b) to identify, if possible, genetically distinct units, and (c) to derive a management strategy for this endangered species. In this presentation, we deal with issue (a) through an assessment of genetic interrelationships among 9 populations based on amplification and sequencing of 1,820 base pairs from four rapidly evolving mitochondrial (mt) DNA markers (ATPase 8 & 6, ND2, and D-loop). Analyses revealed low levels of genetic variation, both within and among populations. While this is surprising, given the number of specimens and amount of sequence data generated, it is congruent with findings in other big river fishes from the Colorado River basin. Our basin-wide assessment of genetic diversity in Flannelmouth Sucker (*Catostomous latipinnis*) also revealed similar patterns of low genetic diversity. Potential causes for such low genetic diversity and implications for management and recovery are discussed.

11/12/2004 9:15AM - Becky A. Miller*[1], Paul Evans[2], Dennis K. Shiozawa[3] (1 Brigham Young University, Department of Microbiology and Molecular Biology, 2 Brigham Young University, Department of Microbiology and Molecular Biology, 3 Brigham Young University, Department of Integrative Biology) **Phylogeography of Prosopium in western North America based on Cytochrome B** - Seventeen populations of mountain whitefish (*Prosopium williamsoni*) were collected from the upper Missouri River, lower Columbia River, Colorado River, upper and lower Snake River, and Bonneville basins. The three endemic whitefish (*Prosopium spilontus, Prosopium gemmifer*, and *Prosopium abyssicola*) from Bear Lake, Utah-Idaho were also examined. The cytochrome B mitochondrial gene was sequenced, and phylogenies were generated assuming parsimony and maximum likelihood. Two distinct whitefish clades were found. The Colorado River, Snake River, and Bonneville basins comprise one clade and the Missouri River and Columbia River basins the second. Within these two clades, individual populations mainly clustered by drainage basin. The endemic Bear Lake whitefish complex forms a separate clade interior to the Colorado River, upper Snake River, and Bonneville Basin whitefish group. Our data suggest that the mountain whitefish is comprised of as many as four separate species, in addition to the Bear Lake complex. Phylogenetic analysis of cytochrome B sequence suggests the three endemic Bear Lake whitefish forms are not a result of separate invasions into Bear Lake, but rather are diverged from a common ancestral mountain whitefish population in Bear Lake.

11/12/2004 9:30AM - Clark Hubbs*[1] (Integrative Biology, University of Texas at Austin) **Spring fishes and their habitats** - Fishes in large springs are often endemics and endangered. Downstream fishes are usually congeneric and competitive with the spring fishes. This occurs on all continents except Antarctica. My studies involve 10 Texas springs and 2 Oklahoma springs. All 12 spring systems have stenothermal conditions in springs and eurythermal conditions downstream. Low pH is in many springs and high pH downstream. In one system low ammonia is upstream and high ammonia downstream. In one locality the spring temperature standard error is less than 0.0001 C but 100 m downstream the temperature change may exceed 1 C / hour and the fish species are essentially non-overlapping.

11/12/2004 9:45AM - Astrid Kodric-Brown*[1], James H. Brown[1] (University of New Mexico, Biology Department) **The importance of disturbance for the conservation of desert springs** - Field studies in central Australia and southwestern North America show the importance of large scale disturbance for the preservation of fish species and ecosystem function in desert springs. Recent management practices, which have endeavored to 'restore' springs by removing exotic mammal megafauna

have triggered growth of dense riparian vegetation, decrease of open-water habitat, extinction of fish populations, and reduction of biodiversity. We use photographs and field surveys to document these changes over decadal time scales in Witjira National Park of South Australia and Ash Meadows National Wildlife Refuge in Nevada. We hypothesize that at both sites a more or less continuous history of disturbance involving native megaherbivores, aboriginal people, wildfires, and introduced grazing mammals controlled vegetation and maintained diverse habitats. This disturbance regime was terminated with the establishment of managed preserves and the removal of large exotic mammals: camels, donkeys, and horses in Australia, and horses, donkeys, and cattle in North America. In order to preserve biodiversity and ecosystem function in desert springs, we recommend implementing new adaptive management practices that incorporate disturbance and monitor its impacts.

11/12/2004 10:00AM - Jackie Watson*[1], Timothy H. Bonner[1] (Texas State University - San Marcos, Dept of Biology/Aquatic Biology) **Assemblage structure and habitat associations of fishes in Independence Creek, Texas** - Independence Creek is the largest freshwater contributor to the lower Pecos River and supports a diverse fish assemblage, including two state-listed threatened species (Cyprinella proserpina, Etheostoma grahami), two state-listed species of special concern (Ictalurus lupus, Notropis jemezanus), and two regionally endemic species (Dionda episcopa, Notropis amabilis). We compared historical fish records to recent collections to assess long-term changes in assemblage structure. Little change was noted in the assemblage during a 50-year period, even though N. jemezanus has not been collected since 1991. We also assessed habitat associations of dominant taxa through time and among stream reaches using canonical correspondence analysis (CCA) and univariate analyses. Results showed that E. grahami, I. lupus, and C. proserpina were associated with higher current velocities and riffle, pool, run habitats, respectively. While, D. episcopa were associated with lower current velocities and shallower habitats, and N. amabilis were associated with run/pool habitats and lower current velocities.

11/12/2004 10:15AM - Steve Parmenter*[1] (California Department of Fish and Game) **Rehabilitation of Mule Spring Pond, and evidence for competitive displacement of Owens tui chub by Owens pupfish** - Mule Spring is diverted below its source to supply an artificial 110 m^2 x 2 meter deep native fish refuge. The pond was constructed in 1988 to provide habitat for Owens pupfish. It receives 2.3 L/s of water, is situated in limestone mine tailings, and lined with 36 mil Hypalon® and 10-50 cm of soil. A genetically distinct stock of Owens tui chub *Siphateles bicolor snyderi* was established in the pond in 1988. Annual surveys indicate the chubs prospered until 1995, at which time Owens pupfish Cyprinodon radiosus were introduced. Subsequent monitoring suggests the pupfish population gradually increased at the expense of the chubs. In August 2003 tui chubs were no longer evident in cursory visual and trapping efforts. More intense trapping revealed few chubs, frequently with frayed fins and missing scales. In response, all fish were removed prior to onset of spring spawning, requiring 73 nights of minnow trapping. Cumulative catch consisted of 2,881 pupfish, 14 adult tui chub, and 217 YOY tui chub. The pupfish were established in newly restored BLM Spring, and the tui chub were maintained in an artificial pond where they spawned in 2004. Subsequently, Mule Spring pond was dried and excavated to remove cattails. After refilling, approximately half of the salvaged tui chub were returned to Mule Spring Pond, along with a similar proportion of their new progeny. A management practice of clearing emergent littoral vegetation may have inadvertently favored pupfish by maintaining shallow sunny areas they prefer. Future management will exclude both cattails and pupfish, to provide a more secure refuge for the unique tui chubs.

11/12/2004 10:30AM - Peter N. Reinthal*[1], Timothy L. Corley[2], J. Brent Hiskey[3], Joaquin Ruiz[4], John T. Chesley[4] (1 Ecology and Evolutionary Biology, University of Arizona, 2 Hydrology and Water Resources, University of Arizona, 3 Materials Science & Engineering, University of Arizona, 4 Geosciences, University of Arizona) **Metal contamination and food web dynamics in a desert stream fish community, Aravipa Creek, Arizona** - The fish community of Aravaipa Creek, Graham and Pinal Counties, Arizona, with seven native species, including threatened species Meda fulgida and Tiaroga cobitis, and relatively few well established exotic species, is considered to be the foremost remnant assemblage of the imperiled Gila River basin fauna. This study presents preliminary results from (1) high-precision isotopic analyses of lead (^{208}Pb, ^{207}Pb, and ^{206}Pb) to determine levels of contamination in fishes, identify specific major contaminant sources and off-site transport mechanisms; and (2) stable isotopes of carbon (σ13C ‰) and nitrogen (σ15N ‰) to determine trophic interactions among various community members and mechanisms of bioaccumulation. We find that the major source (Grand Reef) and transport mechanism of contamination is not from mine tailings previously implicated (Klondyke). Furthermore, we

present distinct trophic interactions and mechanisms of accumulation within the Aravaipa food web. These findings are discussed in regard to management and theoretical implications associated with these findings.

11/12/2004 10:45AM - Jason Vinje*[1], Craig Stockwell[1] (North Dakota State University, Department of Biological Sciences) **The costs of parasitism by Gyrodactlyus tularosae for White Sands pupfish (Cyprinodon tularosa) -** A common assumption of host-parasite interactions is that parasites impose a cost on their hosts. However, parasitism costs are not assessed. Here I evaluate the costs of Gyrodactlyus tularosae to its host, the White Sands pupfish (Cyprinodon tularosa). Fish were housed individually in 18 L aquaria maintained at approximately 23 C and kept on a 14:10 light/dark cycle. Fish were fed 5% body mass each day. Treatment fish were manually infected with six flukes and their parasite loads monitored every seven days, until day 21, at which point all fish either lost, or significanly reduced, their parasite loads. Growth rate was influenced by initial mass (ANCOVA covariate, F_{1,77} = 36.98, P = 0.000), while treatment showed no significant effect (F_{1,77} = .007, P = .932). Under these laboratory conditions there are no costs, in terms of growth and mortality, to C. tularosa associated with G. tularosae infection. This observation is consistent with findings from most other gyrodactylid species.

11/12/2004 11:00AM - Michael T. Bogan*[1] (Oregon State University, Environmental Sciences Graduate Program) **The overlooked majority: aquatic insects in montane desert streams of the southwestern U.S. and northwestern Mexico -** In recent years, aquatic insects have been widely recognized as indicators of stream water quality. Studies involving aquatic insects as bioindicators, however, are rarely geographically extensive and generally do not involve high levels of taxonomic precision. The few previous rigorous aquatic insect surveys in the Madrean Sky Islands region found between 50 and 100 species of aquatic insects in a given stream reach. In 2004, I collected aquatic insect community samples from 25 streams in southeastern Arizona, U.S. and northwestern Sonora, Mexico. These data were used to perform biogeographic and community analyses to elucidate patterns in regional aquatic insect diversity and to determine what factors are associated with diversity and community structure. From preliminary analyses and field observations it appears that elevation, geographic location, and the presence of exotic fish species are associated with diversity and/or community structure. Future plans include expanded surveys in Mexico, with more complete biotic stream surveys (fish, amphibians, insects, riparian plants) in collaboration with biologists and students from El Centro de Estudios Superioes del Estado de Sonora.

11/12/2004 11:15AM - Krissy W. Wilson*[1], Carmen Bailey[1] (Utah Division of Wildlife Resources) **Response of Columbia spotted frog to restoration efforts -** The Provo River Restoration Project in Wasatch County, Utah, has provided opportunity to expand habitat for the imperiled Wasatch Front Columbia spotted frog (Rana luteiventris). Spotted frog habitats within the Restoration Project are protected from impactive land uses and are maintained by a constant water supply, independent of weather related factors. Over 200 wetlands have been created as part of river resoration during 1999-2003. Approximately 65% were constructed following guidelines developed for creating spotted frog habitat. Over the four-year period, 20% of the newly created wetlands have been colonized by spotted frog. Four-hundred and twenty egg masses have been deposited in newly created ponds representing 21% of the overally reproductive effort for the Heber Valley. Reproductive effort (number of egg masses obseved throughout the breeding period) has increased 30% in the Heber Valley since 2001. In comparison, spotted frog populations and habitats outside of the Heber Valley have suffered five years of drought-induced effects and exhibit over a 50% decline in reproductive effort. The Restoration Project exemplifies how protecting and enhancing habitat can result in a positive population response.

11/12/2004 11:30AM - Stephanie Carman*[1], John Branstetter[2], Bill Conrod[3], Jeanne Dye[4], Robert Myers[5] (1 New Mexico Department of Game and Fish, 2 U. S. Fish and Wildlife Service, 3 White Sands National Monument, 4 Holloman Air Force Base, 5 White Sands Missile Range) **Status of White Sands pupfish conservation -** White Sands pupfish, Cyprinodon Tularosa, New Mexico state-listed as threatened, is endemic to the endorheic Tularosa Basin, New Mexico. In 1994, New Mexico Department of Game and Fish, U. S. Fish and Wildlife Service, Holloman Air Force Base, White Sands Missile Range, and White Sands National Monument entered into the White Sands Pupfish Cooperative Agreement and established an interagency team to direct protection and conservation of the species. The Agreement set in motion several significant activities that provided greater habitat and population security for White Sands pupfish, including the removal of feral horses from the Range. The conservation team's biannual monitoring program has provided data that indicate White Sands pupfish populations have remained comparatively stable over the past ten years and allows for comparison with fluctuating water levels and other habitat

components. The team was also fundamental in the identification of sub-populations and support of subsequent studies on the Evolutionarily Significant Units (ESU) of the species. Conservation issues now facing the team include replication of the ESUs and invasion prevention and removal of non-native aquatic species in the basin.

11/12/2004 11:45AM - Marlis R. Douglas*[1], Michael E. Douglas[1] (Colorado State University, Fish & Wildlife Biology) **Purity assessment of Rio Grande cutthroat trout (*Oncorhynchus clarki virginalis*)** - Numerous factors contribute to the decline of indigenous fishes in Western North America. While habitat alteration is a major concern, introductions of alien species is increasingly recognized as a more serious threat to long-term survival of native fishes, and often has unanticipated and deleterious effects on native species. Non-native trout have replaced Rio Grande Cutthroat Trout (RGCT; *Oncorhynchus clarki virginalis*) in 90-95% of the latter's historic distribution. Recovery efforts now focus on maintaining "genetically pure" (i.e., <1% introgressed) core populations of RGCT for propagation, as well as "slightly introgressed" (i.e., <10%) conservation populations that express the form's unique ecological and behavioral characteristics. However, successful allocation of RGCT populations to management categories (above) requires a molecular genetic assessment. We employed two fluorescent-based molecular genetic approaches (i.e., BIAM and PINEs) to assess potential introgression of RGCT populations by Rainbow Trout (RBT; *O. mykiss*) and inland cutthroat trout (*O. clarki*) subspecies. Both methods examine genetic variation at nuclear loci by assessing presence/absence of species-diagnostic alleles. Consequently, introgressed individuals exhibit either heterozygote genotypes with RGCT and alien alleles (e.g., C/R), or homozygous genotypes with two alien alleles (e.g., R/R). Each locus is independent (i.e., in a different part of the genome) and backcrossed individuals will show a mix of RGCT and alien alleles. To achieve >99 % statistical confidence (as stipulated by the species' Recovery Plan), sample size limitations must be rectified by increasing numbers of diagnostic loci assessed. Findings are discussed for 12 populations examined to date.

11/12/2004 12:00PM - LUNCH

11/12/2004 1:30PM - Sean C. Lema*[1], Gabrielle A. Nevitt[1] (Section of Neurobiology, Physiology, and Behavior, University of California, Davis) **Testing a physiological model for morphological change in Devils Hole pupfish** - Devils Hole pupfish (*Cyprinodon diabolis*) are endemic to a single desert spring – Devils Hole – and are characterized by a unique morphology that includes a small body, a large head and eye, and the absence of pelvic fins. To help ensure the survival of this species, artificial refuges were constructed and stocked with pupfish from Devils Hole. Yet, fish in these refuges now show an altered morphology with a larger body, smaller head, and pelvic fins. As a first step toward understanding mechanistically how these changes occurred, we are exploring how two environmental factors – food availability and temperature – influence morphological development in a closely related pupfish species, the Amargosa River pupfish (*Cyprinodon nevadensis amargosae*). Specifically, we were interested in knowing whether changes in these environmental factors could developmentally shift Amargosa River pupfish toward the morphology typical of pupfish in Devils Hole. To test this idea, we first examined how growth rate influenced morphological development. Amargosa River pupfish were bred in captivity and divided into three treatments at 15 days post-fertilization. By regulating food availability, we generated three treatments with low (mean: 2.22 mm standard length per month), medium (3.82 mm per month), and high (4.50 mm per month) growth rates. Examination of morphology in these treatments at 141 days post-fertilization showed that significantly fewer fish in the low growth rate treatment developed pelvic fins (14%) than in the medium (66%) and high (78%) growth groups. Fish in the low growth rate group were also larger in relative head and eye size. One physiological mechanism by which food availability may have altered the growth of pupfish in these treatments is through influences on thyroid hormone physiology. To examine whether morphological changes seen between growth rate treatments might be mediated in part by changes in thyroid physiology, other groups of larval pupfish were given two goitrogens (methimazole and KClO₄) that pharmacologically inhibit the production of thyroid hormones. Significantly fewer fish in the methimazole (52%) and KClO₄ (41%) groups developed pelvic fins relative to a control group (88%). Pupfish in the treatment given KClO₄, but not methimazole, also showed a significantly larger relative head size. Combined, these results provide evidence that environmental factors that affect the growth and thyroid physiology of pupfish might in part developmentally generate the morphological differences seen among C. diabolis in the refuges and Devils Hole.

11/12/2004 1:45PM - Arlys J. Finch*[1] (Eastern New Mexico University, Biology; DNFH&TC) **Isolation and sequencing of the cDNA for Steroidogenic Acute Regulatory Protein**

from an endangered fish (*Gambusia nobilis*) - Steroids are essential hormones for development of gonadal organs and maintenance of reproductive cycles in vertebrates including humans. The initial step of steroid synthesis is the translocation of cholesterol from cytoplasmic lipid droplets into mitochondria in steroidogenic cells. It has been found that Steroidogenic Acute Regulatory (StAR) protein regulates the cholesterol transfer in vertebrates. No study has been reported for the StAR protein from live-bearing fishes. In the present study the complementary deoxyribonucleic acid (cDNA) for the StAR was isolated from *Gambusia nobilis*, an endangered fish distributed only in part of Pecos river, New Mexico. Total messenger ribonucleic acid (mRNA) was extracted from ovarian tissues of *G. nobilis*, and reverse-transcribed to synthesize cDNAs. The cDNAs were amplified by polymerase chain reaction (PCR). A partial cDNA for StAR was isolated and sequenced. A comparison of the cDNA sequence of G. nobilis with that of other fishes, frogs and mammals with computer programs (GCG and BLAST) has shown a high similarity, indicating a high level of conservation in the StAR gene. It is expected that the cloned *G. nobilis* StAR gene from this study will be used as a biomarker for monitoring the habitat environmental changes for protection of the endangered species *G. nobilis*. (The project described was supported by NIH Grant Number RR-16480 from the BRIN Program of the National Center for Research Resources.)

11/12/2004 2:00PM - Kara D. Hilwig*[1], W. Linn Montgomery[1] (Northern Arizona University, Biological Sciences Department) **Displacement of nonnative red shiner and native spikedace with flood simulation -** Nonnative red shiner (*Cyprinella lutrensis*) and native spikedace (*Meda fulgida*) were tested in a flood simulation apparatus (FSA) to compare physical displacement of young of the year (YOY) fish at three velocity levels between 0.41-0.87 m/s. Cumulatively, displacement of red shiner was 37% greater than spikedace; i.e., 48.5 ± 4.7% and 35.5 ± 4.8%, respectively ($P < 0.0001$).

The three variables tested were species, substrate and velocity. There was a significant interaction ($P = 0.0001$) between substrate and velocity. Displacement tended to increase with increasing velocity, and was greatest over cobble, slightly less over gravel, further reduced over boulder, and least over sand. The deviation from this pattern was that fish displacement was less over cobble than over gravel at high velocity.

Spikedace used an eddy habitat created by a boulder substrate 4.5 times greater than red shiner; i.e., 10.3 ± 2.7% and 2.3 ± 2.7%, respectively ($P < 0.0001$). The analysis indicated no interaction between substrate and velocity ($P = 0.7104$) and no significant effect of velocity on use of eddies ($P = 0.2108$). Use of eddy habitat by fish tended to be greatest at medium velocities.

Juvenile spikedace and red shiner learned to avoid displacement from the flood simulator after 4 consecutive trials. There was no effect of size on the likelihood of displacement of either spikedace ($P = 0.105$) or red shiner ($P = 0.278$). Nonnative red shiner can be displaced at a greater rate than native spikedace through flow manipulation that increases water velocity.

11/12/2004 2:15PM - Ann M. Widmer*[1], Corissa J. Carveth[1], Scott A. Bonar[1], Jeff R. Simms[2] (1 Arizona Cooperative Fish and Wildlife Research Unit, University of Arizona, 2 Bureau of Land Management, Tucson Field Office) **Upper thermal tolerance of loach minnow (*Tiaroga cobitis*) -** The distribution of loach minnow (Tiaroga cobitis, a threatened species native to the Gila River basin, has declined by over 85% in the last 75 years. Suspected reasons for decline include dams, water diversions, sedimentation, channelization, competition and predation from non-native fish species, and changes in thermal regimes. Temperature influences virtually all of the biochemical, physiological, and life history activities of fishes. Understanding the effects of changing temperature regimes on loach minnow survival is essential to effective species conservation. We used three methods to examine the upper thermal tolerance of loach minnow: the Critical Thermal Methodology (CTM), the Acclimated Chronic Exposure method (ACE), and the ACE method with fluctuating temperatures. Each method differs in the rate of temperature change or duration of exposure, so each evaluates slightly different aspects of thermal stress. We report the final results of these thermal tolerance tests on loach minnow and discuss some of the strengths and weaknesses of each method. We also look at real stream temperatures in the critical habitat of loach minnow and suggest applications for management.

11/12/2004 2:30PM - Corissa J Carveth*[1], A Widmer, Scott A. Bonar (1 University of Arizona, Fisheries and Wildlife Cooperative Research Unit, 2 University of Arizona, Fisheries and Wildlife Cooperative Research Unit, 3 University of Arizona, Fisheries and Wildlife Cooperative Research Unit) **Upper lethal tolerance of Arizona's native fishes -** Unique assemblages of native fish species

are in peril, as intense competition for water continues in the southwest. Water withdrawals and riparian vegetation destruction are suspected to cause increasing water temperatures in Southwestern rivers. These changes in water temperature may have contributed to the decline of native fish species, as fish in these systems are more likely to be exposed to their upper thermal limit. Water temperature affects all biochemical, physiological, and life history activities of fishes. This makes water temperature the most vital aspect of their habitat. Although field data does exist with estimates of lethal limits for a few species, little is known about the thermal tolerance of these species and how it compares to the thermal limits of nonnative species that have been introduced to many of Arizona's lakes and rivers. It is essential to determine the upper lethal tolerance of these native desert fishes in order to identify habitat and to effectively manage watersheds. By testing the thermal tolerance of non-native species as well as native species, we can determine whether non-native fish have an advantage over the native desert fishes at high temperatures. To determine the upper thermal limits we conducted an acute temperature tolerance study using the critical thermal maximum (CTM) method, with acclimations temperatures of 250C and 300C.

11/12/2004 2:45PM - Codey D. Carter*[1], John N. Rinne[2] (1 Rocky Mountain Research Station and Norther n Arizona University, 2 Rocky Mountain Research Station) **Fire effects on aquatic organisms: LD-50s and native southwestern fishes** - Recent research has demonstrated that post fire runoff impacts can be devastating to aquatic habitats and lethal to fishes. At present, it has not been deciphered if the cause for mortality results from ash flows, floods flows or the combination of the two. LD 50s obtained in laboratory experiments on a suite of native fishes suggests that toxicty associated with ash flows may be lethal in themselves. The often successive flood events may then be fatal to surviving organisms with reduced resistance. Stream hydrology, annual southwestern weather patterns and timing of fire events all contribute to the short and long term impacts on native southwestern fishes, many which are threatened and endangered species. Introductory information on results of field research and LD 50s will be presented and compared and management recommendations offered based on data accumulated to date.

11/12/2004 3:00PM - Michael R. Bower*[1], Wayne A. Hubert[2], Frank J. Rahel[3] (1 Wyoming Cooperative Fish and Wildlife Research Unit, University of Wyoming, 2 Wyoming Cooperative Fish and Wildlife Research Unit, University of Wyoming, 3 Department of Zoology and Physiology, University of Wyoming) **Factors affecting conservation strategies for roundtail chub, flannelmouth sucker, and bluehead sucker in an isolated headwater watershed in Wyoming** - The occurrence of bluehead sucker (Catostomus discobolus), flannelmouth sucker (*Catostomus latipinnis*), and roundtail chub (Gila robusta) in the isolated headwaters of the Muddy Creek watershed in south-central Wyoming has prompted investigations into factors affecting the distribution and viability of populations of these three native fishes. A major factor affecting these species is habitat fragmentation. Within the upper reaches of the watershed efforts are ongoing to reintroduce native Colorado River cutthroat trout (*Oncorhynchys clarki pleuriticus*). As a part of this process, a fish barrier was constructed in the downstream reaches of the reintroduction area to facilitate the removal of exotic fishes in upstream reaches and preclude their reinvasion. Roundtail chub, flannelmouth sucker, and bluehead sucker occur within and immediately downstream of the identified reintroduction area, suggesting that the design of the reintroduction area may need to be adjusted to consider the natural distributions, life histories, and habitat requirements of the entire native fish community. Additional barriers constructed farther downstream may affect populations of the native species by limiting access to habitats needed for refuge during periods of stream intermittence and for spawning. Another factor adversely affecting the two native catostomid species is hybridization with introduced white sucker (*Catostomus commersoni*). The observation of hybrids of each of the two native catostomids with white sucker has prompted concerns about extinction via hybridization or decreased viability of populations of the native taxa. Ongoing and planned research within this unique headwater system will be pursued in order to enable meaningful conservation strategies to be developed that consider the diverse life histories and habitat requirements of the native fishes.

11/12/2004 3:15PM - Norman Mercado-Silva*[1], Edmundo Díaz-Pardo[2], John Lyons[3] (1 Center for Limnology, University of Wisconsin - Madison, 2 Facultad de Ciencias Naturales, Universidad Autónoma de Querétaro, 3 State of Wisconsin, Department of Natural Resources) **Long term trends in the fish assemblage of the Laja River, Guanajuato, Mexico; an example of the decline of fish communities in Central Mexico** - Freshwater fish communities in the central plateau of Mexico face increasing human impacts. We analyzed Mexican and U.S. museum collection records and our own recent field data for the Laja River, Guanajuato, Mexico, with a repeated measures ANOVA to determine trends in fish species richness for the period 1960 – 2003. We considered the numbers of species

in various functional groups (native, exotic, trophic position, tolerance of environmental degradation, and preferred habitat) for both individual river and reservoir sites and the river system as a whole. We found significant declines in the number of benthic species and species sensitive to environmental degradation for the entire Laja River system but not for individual reservoir and river sites. Total species richness, number of exotics, and other richness metrics did not show statistically significant changes over time but the establishment of certain exotic species (e.g. *Xiphophorus variatus, Micropterus salmoides*) poses a serious potential threat for some of the native species. Our recent surveys revealed 20 species in the Laja River system versus 18 that were known historically. Seven exotic fishes have entered the Laja in recent years and the natives *Scartomyzon austrinus, Ictalurus dugesi, Poecilia sphenops* and *Notropis sallei* have disappeared. *Notropis calientis* and *Algansea tincella* are the two most restricted native species in the Laja. The changes in fish species richness in the Laja provides a model of how other rivers in central Mexico, for which no 'long term' databases exist, are likely to change if environmental deterioration is not halted.

11/12/2004 3:30PM - Lindsey T. Lyons*[1], Abraham P Karam[1], Michael S. Parker[1] (Southern Oregon University, Department of Biology) **Temporal and spatial variation in larval pupfish abundance and associated microhabitat variables in Devils Hole, Nevada -** Frequent censuses of the Devils Hole pupfish (*Cyprinodon diabolis*) population have long been used to monitor its status and have revealed a troubling and largely unexplained population decline since 1997. These censuses, though, do not typically include information on the distribution and abundance of early life stages. Determining factors most strongly affecting larval abundance and distribution on the upper spawning shelf will likely contribute to a better understanding of conditions responsible for changes in population size as revealed by adult counts. Since August 2003 we have been monitoring larval pupfish distribution and abundance across the upper shelf in Devils Hole in relation to differences in key physical (temperature variation and substrate composition), chemical (dissolved oxygen and hydrogen sulfide), and biological (algal abundance and phenology) variables. Larval fish are captured monthly or bi-monthly using inverted funnel traps at nine sites across the shelf to assess seasonal changes in abundance. Visual surveys, conducted during the spring and summer, assess daily activity patterns. Larval fish were observed throughout the year with peak abundances in March and April. Abundance declined sharply during May and remained low throughout the summer when algal abundance, water temperature and temperature fluctuations, and dissolved oxygen fluctuations were greatest. Diel surveys revealed that larval fish are inactive during the day, particularly when direct sunlight illuminates the shelf, increase activity after dusk and remain active throughout the night. Large juvenile and adult fish follow the opposite pattern. Access to substrate interstices, which serve as predator and thermal refuges, is a key factor in determining larval abundance and spatial distribution across the shelf. Availability of interstitial space is strongly influenced by disturbance as shown by a dramatic decrease in substrate embeddedness and percent fines following a seismic event that caused re-sorting of the shelf sediments. Photo documentation of seasonal algal phenology shows that algal abundance and taxonomic composition may also be strongly influenced by disturbance, and in turn affect access to substrate interstices and thus larval distribution and activity. Due to large interannual differences in disturbance and algal abundance and composition, long-term monitoring of larval pupfish abundance, in conjunction with adult counts, will likely allow us to make better predictions about future population trends.

11/12/2004 3:45PM - Abraham P. Karam*[1], Lindsey T. Lyons[1], Michael S. Parker[1] (Southern Oregon University, Department of Biology) **Comparison of ecological characteristics of three Devils Hole pupfish refuges -** Attempts to maintain refuge populations of Devils Hole pupfish (*Cyprinodon diabolis*) in artificial tanks have achieved limited success. Changes in morphological, behavioral and genetic characteristics of refuge populations suggest that environmental conditions, and thus selective pressures, are much different than in Devils Hole. Yet, to date, there have been no attempts to quantify differences among refuges or between refuges and Devils Hole. Over the past year, we compared physical, chemical and biological characteristics of the three existing pupfish refuges (Hoover Dam, School Springs and Point of Rocks). Temperature monitoring revealed large differences in mean temperatures and diel and seasonal fluctuations among the three refuges and between all three refuges and Devils Hole. On two occasions we recorded extreme temperature fluctuations due to water supply malfunctions at Hoover Dam (8 C temperature drop) and School Springs (20+ C drop). Similar malfunctions have caused large declines in, or losses of entire refuge populations in the past. Substrate composition is very different in refuges than in Devils Hole. Because they are closed systems, thick layers of organic-rich, anoxic sediment have accumulated, particularly in School Springs (mean depth 19.1 cm; range 1-30 cm) and Point of Rocks (mean depth 8.9 cm; range 5-39 cm) refuges, burying the rocky substrate designed to replicate the spawning shelf in Devils Hole. Algal standing crops differed several-fold among the three refuges and in two of three refuges

were consistently greater than peak standing crops reported in Devils Hole. In addition, algal biomass showed much less seasonal variation within all three refuges than has been reported for Devils Hole. Dissolved oxygen concentrations were much less variable in the refuges than in Devils Hole, particularly during the spring and summer when there are short periods of direct sunlight on the upper shelf. Benthic invertebrate abundances and taxonomic diversity also differed considerably among the three refuges and taxa abundant in Devils Hole were consistently rare or absent. Our results show that existing refuge environments deviate considerably from natural conditions in Devils Hole and further illustrate the challenges faced in trying to establish and maintain refuge populations of *C. diabolis*.

11/12/2004 4:00PM - Andrew A. Schultz*[1], Scott A. Bonar[1] (Arizona Cooperative Fish and Wildlife Research Unit; University of Arizona) **Determining effective culture temperatures for larval and juvenile Gila chub (*Gila intermedia*) -** The information needed to effectively culture Arizona's threatened native fishes for recovery efforts is lacking for many species, yet is critical for proper management and conservation of this fauna. Culture techniques and requirements are virtually unknown for Gila chub (Gila intermedia), a species recently proposed to be listed as endangered. The limited information available on culture techniques and general life-history of Gila chub is a deterrent to the recovery of this species. We tested the effect of water temperature on growth, survival, and health of larval and juvenile Gila chub. Mean weight and length gains of larval chub were largest at 28C and smallest at 32C (two-sided P-value = 0.02 and 0.03, respectively; Kruskal-Wallis test). Survival rates of larval chub were largest at 24C and smallest at 20C; however, there is only suggestive evidence of a difference between groups (two-sided P-value = 0.09; Kruskal-Wallis test). Spinal deformities were most prevalent for larval fish reared at the highest temperature (i.e., 32C). Although mean weight and length gains of small and large juvenile chub were smallest at 20C when compared with higher temperatures, no statistical evidence exists of a difference between groups. Survival was 100% (one accidental mortality) and no external abnormalities were noted for experiments using small and large juveniles. We discuss the implications of our results with regard to the development of culture techniques for Gila chub.

11/12/2004 4:15PM - POSTER SESSION

11/12/2004 4:15PM - Jason D. Schooley*[1] (Arizona State University, School of Life Sciences) **Stocking history for razorback sucker *Xyrauchen texanus* - Lower Colorado River -** The razorback sucker *Xyrauchen texanus*, a large catostomid, was historically abundant throughout the larger streams of the Colorado River basin, ranging from Sonora, Mexico to Wyoming. Presently, the fish is federally listed as endangered and the few remaining wild populations are concentrated in Lake Mohave of the lower basin and the Green and lower Yampa Rivers of the upper basin. The species is virtually extirpated elsewhere. The razorback sucker's decline is widely attributed to habitat loss and modification in concert with predation by introduced, non-native fishes. Although adults regularly spawn and produce sufficient numbers of offspring in these modified habitats, the early life stages of their progeny are rapidly consumed by introduced predators resulting in insufficient recruitment to adulthood. The elderly, wild adults of this long lived species (>40 years) are disappearing and predominant recovery efforts involve replacement of these fish with repatriated (or reintroduced) adults. This poster graphically depicts the razorback sucker stocking efforts to date for the state of Arizona.

11/12/2004 4:15PM - Richard F. Feeney[1], Camm C. Swift*[1] (Natural History Museum of Los Angeles County) **Description of field-collected larvae of two native freshwater southern California fishes, *Catostomus santaanae* and *Gila orcutti* -** Larval series of the Santa Ana sucker (*Catostomus santaanae*, Federally Threatened) and arroyo chub (*Gila orcutti*, California Species of Special Concern) are described from specimens collected from the Los Angeles and Santa Ana river drainages. Catostomus santaanae larvae are elongate. They have 41-46 myomeres and a distinctive paired-triangle patch of melanophores over the midbrain. Melanophores are present on the snout, dorsal body, lateral line, dorsal gut, post-anal ventral body and caudal fin. Pre-anal length equals 74-79% SL, typical of catostomids. Gila orcutti larvae are relatively deep-bodied. They have 36-39 myomeres and a distinctive heart-shaped patch of melanophores over the midbrain with a line of melanophores trailing posteriorly. Heavy pigment is present on the snout, lower jaw, dorsal body, lateral line, gill arches, dorsal gut, post-anal ventral body and caudal fin; they have a shorter pre-anal length of 65-72% SL, typical of cyprinids. These two species often occur together, and less commonly with the local native form of *Rhinichthys osculus* (another cyprinid that is a California Species of Special Concern). Characters distinguishing the three from each other and from other local freshwater fish larvae are discussed along with habitat preferences.

11/12/2004 4:15PM - Sean C. Tackley*[1], Scott A. Bonar[1], Anindo Choudhury[2] (1 Arizona Cooperative Fish and Wildlife Research Unit, University of Arizona, 2 St. Norbert College, Division of Natural Sciences) **Effects of Asian tapeworm (*Bothriocephalus acheilognathi*) on native fishes from the Rio Yaqui basin, Arizona** - The Asian tapeworm (*Bothriocephalus acheilognathi*), first detected in the southwestern United States in 1979, is now found throughout the region. Despite widespread concern among fisheries professionals, little is known about the effects of Asian tapeworm on native fishes in the Southwest. Our study is examining the effects of Asian tapeworm on the growth and survival of Yaqui chub (*Gila purpurea*) and Yaqui topminnow (*Poeciliopsis occidentalis sonoriensis*). Cyclopoid copepods are intermediate hosts for Asian tapeworm. We will propagate Yaqui chub and Yaqui topminnow in laboratory facilities, and feed infected copepods to 50% of the juvenile fish. Infected and non-infected fish will be stocked in separate 1,098-liter fiberglass tanks, in various combinations of Yaqui chub and Yaqui topminnow. We will compare the growth and survival of infected and non-infected fish for 6 to 8 months to ascertain effects of Asian tapeworm.

11/12/2004 4:15PM - David Ward*[1] (Arizona Game and Fish Department, Research Branch) **Collection of Asian fish tapeworm *Bothriocephalus acheilognathi* from the Yampa River, Colorado** - On July 20, 2004 a single Asian fish tapeworm *Bothriocephalus acheilognathi* was collected from the intestine of a roundtail chub Gila robusta in the Yampa River in Dinosaur National Monument. This is the first record of Asian fish tapeworm being found in fish from the Yampa River drainage. Asian fish tapeworm can cause high mortality in cyprinid fishes especially when spreading into new locations and infecting new host species. The Yampa River is one of the few places where all of the endangered big river fishes of the Colorado can still be found, but habitat alteration, predation by introduced fishes, and introduction of new parasites such as the Asian fish tapeworm may threaten their continued persistence.

11/12/2004 4:15PM - Jim Heinrich*[1], Vicki Tripoli[2] (1 Nevada Department of Wildlife, 2 Nevada Power Company) **A Virgin River chub refuge at the Reid Gardner Power Generation Facility in Moapa, Nevada** - The Muddy River population of *Gila seminuda*, the Virgin River chub, has shown drastic declines in the wild since the invasion of the exotic blue tilapia into the system in the early 1990’s. More recent concern for this reduction resulted in a cooperative effort to develop a secure refuge population of chub in three raw water storage ponds located at the Reid Gardner Power Generating Station in Moapa, Nevada, operated by the Nevada Power Company. The agreement, whose signatories include the Nevada Power Company, the Nevada Department of Wildlife, and the U.S. Fish and Wildlife Service, produced a working Memorandum of Understanding, and a Scope of Work for managing fish at this facility. The 3 ponds used for this project are impressive, confining 5.37 million cubic feet of Muddy River water and are currently undergoing chemical treatments to remove the established blue tilapia. The ponds should provide an excellent backup population of chub while the construction of barriers and follow-up chemical treatments proceed downstream to remove tilapia from the Muddy River as well.

11/12/2004 4:15PM - Darrel E. Snyder*[1], Sean C. Seal[1] (Colorado State University, Larval Fish Laboratory) **Computer-interactive keys for the larvae and early juveniles of selected southwestern fishes (hands-on experimentation)** - Computer-interactive keys for the larvae and early juveniles of selected southwestern fishes are provided for hands-on experimentation. One covers the Catostomidae of the Upper Colorado River Basin (*Catostomus ardens, C. catostomus, C. commersoni, C. discobolus, C. latipinnis, C. platyrhynchus*, and *Xyrauchen texanus*) and is intended to be used with the recently expanded and updated guide to those larvae by Snyder and Muth (2004, Colorado Division of Wildlife Technical Publication 42). The others are intended for use with a guide to (selected) Native Cypriniform Fish Larvae of the Gila River Basin which is being prepared for publication (Snyder et al. 2004, Draft Final Report to the U.S. Bureau of Reclamation, Phoenix, Arizona) and include keys to families, the Catostominae (*C. clarkii, C. insignis, C. latipinnis*, and *X. texanus*), and selected native cyprinids (*Agosia chrysogaster, Gila elegans, G. robusta, Meda fulgida, Ptychocheilus lucius, Rhinichthys cobitis*, and *R. osculus*). Computer-interactive keys are more flexible and user-friendly tools for specimen identification than printed dichotomous or polychotomus keys. Among other features, users of such keys can limit consideration to only likely candidate species, have available characters listed in best (most diagnostic) order for remaining taxa, and select from that list in any desired sequence, bypassing characters that are unfamiliar, difficult to assess, or based on structures that are damaged or missing. Depending on the similarity of taxa included, such keys may be easier to prepare and are almost always much easier to correct, modify, or expand than

more traditional printed keys. Most computer-interactive keys consist of a descriptive data set and a commercial, share-ware, or free-ware program for its interrogation (see web site below for a list of such programs). Data sets for the keys presented here were prepared in DELTA format (DEscriptive Language for TAxonomy) and transformed to files for use by Intkey, a widely used program available free over the internet (http://delta-intkey.com).

11/12/2004 4:15PM - Andrea D. Montony*[1], Chester R. Figiel[2] (1 National Park Service, Lake Mead National Recreation Area, 2 US Fish and Wildlife Service, Willow Beach National Fish Hatchery) **PIT tag retention in bonytail chub -** Bonytail chub (*Gila elegans*) are one of the most imperiled freshwater fish species existing primarily as a small population in the lower Colorado River basin. Few individuals have been collected in the last decade and recruitment is rare to non-existent. To assist in recovery efforts, a large number of bonytail are reared to greater than 25 cm and tagged with a Passive Integrated Transponder (PIT tag) before stocking. However visible evidence suggests that there may be a significant tag loss (1 – 5% loss). To determine an efficient tagging method and to promote better tag retention, we conducted experiments on two size class of bonytail (small = 147.0±14.2; large = 207.2± 19.70). Our objectives were to examine the use of biological glue and tagging technique (ventral-anterior versus ventral-posterior) on tag retention in bonytail. Survival after four weeks was 100% for the larger size class and 60% for the small size class (including non-tagged control fish). Preliminary results indicate that biological glue did not affect survival or tag retention for either size class. Additionally, tag retention was not affected by tagging technique. Mortality of fish in the small size class may have resulted from handling fish as opposed to the PIT-tagging procedure.

11/12/2004 4:15PM - Leanne H. Roulson*[1], Jim Tilmant[2], Lynn Starnes[3] (1 Garcia and Associates, 2 Natinal Park Service, 3 US Fish and Wildlife Service) **Western Native Fishes Database; species status, distribution, and information needs -** The Western Native Fishes Database is a project developed by the Native Species Committee of the Western Division of the American Fisheries Society (WDAFS). The goal of the project is to compile the most recent information on approximately 300 fish species native to western North America including the Canadian Provinces of Brittish Columbia and Yukon; the Sonoran, Chihuahuan, and Baja California Norte States of Mexico; and the United States that include or are west of the continental divide and Hawaii. Garcia and Associates (GANDA) completed the database design in the summer of 2004, and the data compilation process has begun. We will be presenting the data interface and gathering information sources for species native to desert aquatic systems.

11/12/2004 4:15PM - Sam Finney*[1], Tim Modde[1], Kevin Christopherson[2] (1 US Fish and Wildlife Service Colorado River Fish Project, 2 Utah Division of Wildlife Resources- Northeast Region) **Yampa Canyon subpopulation of humpback chub: past, present, and future -** The Yampa subpopulation of humpback chub is one of the smallest populations of existing humpback chub. We examined historical records, distribution, trends and the possibility of population size estimates for the subpopulation of humpback chub. Humpback chub were sampled in Lodore, Whirlpool, and Split Mountain Canyons on the Green River as well as Yampa Canyon on the Yampa River in 2003 and 2004. Humpback chub adults were captured in the Yampa River and Whirlpool Canyons and not in Lodore or Split Mountain Canyons. Juvenile sampling did not yield any young of year humpback chub in any areas sampled. It is likely that drought and nonnative fishes are paying a heavy toll on the Yampa humpback chub subpopulation.

11/12/2004 4:15PM - Helene C. Johnstone*[1], Matthew Lauretta (SWCA Environmental Consultants) **Current monitoring strategies and results for native fishes of the Colorado River through Grand Canyon, Arizona -** Native fish research in the Colorado River through Grand Canyon has seen many phases, from the early days of descriptive and reconnaissance work to the life history and ecological studies of the humpback chub (*Gila cypha*). Currently, managers are striving to create a feasible and sustainable long-term monitoring program. The goal of this program is two-fold: 1) To create a river-wide baseline of fish distribution and abundance data so that effects of management actions (such as the proposed temperature control device or flow manipulations) may be detected, and 2) to monitor existing populations of humpback chub and other native species. The year 2002 was the first year of a 5-year monitoring program. A stratified-random sampling approach was implemented. Random sampling while also monitoring for rare and endangered native fish presents obstacles to many stream researchers. In this presentation the Grand Canyon native fish monitoring program is examined as a case study. Sample allocation concepts are addressed as well as how researchers might strike a balance between funding and logistical constraints, available historic information, and data collection needs or priorities

11/12/2004 4:15PM - Darrel E. Snyder*[1], Kevin R. Bestgen[1], Sean C. Seal[1], C. Lynn Bjork[1] (Colorado State University, Larval Fish Laboratory) **Identification of desert and Sonora sucker larvae and early juveniles** - Desert sucker (*Catostomus clarkii*, subgenus *Pantosteus*) and Sonora sucker (*Catostomus insignis*, subgeneus *Catostomus*) are common native fishes of the Gila River Basin in southern Arizona and southwestern New Mexico. Appearance and development are similar to that of bluehead sucker (C. discobolus) and flannelmouth sucker (*C. latipinnis*), respectively, which have been described for the Upper Colorado River Basin. Desert sucker larvae hatch at 8-10 mm standard length (SL), complete yolk absorption by 12-14 mm SL, and become juveniles by 23-24 mm SL. Sonora sucker larvae are generally 1-2 mm larger at comparable states of development. Desert sucker protolarvae and flexion mesolarvae are characterized by broadly and evenly scattered melanophore pigmentation over the dorsal surface, gradually extending onto lateral surfaces of the body, and a highly variable, but usually very extensive, line or band of melanophores on the ventral midline between heart and vent. In contrast, dorsal surface pigmentation in Sonora sucker is limited to a line or band of grouped, obliquely aligned, melanophores lateral to each side of the midline, and ventral midline pigmentation is also highly variable but usually absent or sparse. Desert sucker metalarvae and juveniles have 8-12 principal dorsal-fin rays, distinct notches separating upper and lower lips at the corners of the mouth, broadly connected lower-lip lobes, a well-folded gut, and a dark peritoneum. Sonora sucker metalarvae and early juveniles have 10-12 principal dorsal-fin rays, lips continuous at the corners of the mouth, deeply divided lower-lip lobes, a simple s-shaped gut until well after transition to the juvenile period, and little if any ventro-lateral to ventral peritoneal pigmentation.

11/12/2004 4:15PM - Darrel E. Snyder*[1], Kevin R. Bestgen[1], Sean C. Seal[1], C. Lynn Bjork[1] (Colorado State University, Larval Fish Laboratory) **The larvae and early juveniles of three Gila River basin cyprinids: *Agosia chrysogaster, Meda fulgida,* and *Rhinichthys cobitis*** - Longfin dace (*Agosia chrysogaster*), spikedace (*Meda fugida*), and loach minnow (*Rhinichthys cobitis*, formerly *Tiaroga cobitis*) are native cyprinids of the Gila River Basin in Arizona. Spikedace and loach minnow are federally listed as threatened species and longfin dace is a species of special concern. Detailed descriptions and illustrations of the larvae and early juveniles are needed to facilitate visual identification of captured specimens. All three species hatch at about 5 to 6 mm standard length (SL) but yolk is absorbed at a smaller size in longfin dace larvae (6-7 mm SL) than the other two species (about 8 mm SL). Development proceeds fastest relative to size in loach minnow, which become metalarvae by about 10 mm and juveniles by 14-15 mm SL. It proceeds most slowly in spikedace which become metalarvae by about 13 mm SL and juveniles by about 27-29 mm SL, mostly because of extensive preanal finfold retention. Spikedace mesolarvae have a very distinctive oblique, superior mouth. Spikedace larvae also have more myomeres, develop more anal-fin rays (9 vs. 7 for the others), and develop a unique dorsal fin with two spinous rays followed by (usually) six more-typical branched principal fin rays. The first spinous ray is a stout spike that forms from a single rudimentary ray and largely envelops the second, a more slender spine that develops from the first principal (unbranched) fin ray. Additionally, spikedace larvae are very strongly pigmented on the dorsal surface and as metalarvae and juveniles most are characterized by unique "square" melanophores on their sides. Longfin dace larvae are very similar to larvae of the fathead minnow (Pimephales promelas) in body form, fin position, fin-ray counts, and pigmentation, including a dark peritoneum, but develop a low-terminal to subterminal rather than terminal mouth. Loach minnow larvae are similar to other Rhinichthys, but as juveniles they develop a low terminal mouth with a uniquely thick upper lip, no mouth barbels, and a distinctive caudal-fin pigmentation pattern.

11/12/2004 4:15PM - Sam Finney*[1], Mark Fuller[1] (US Fish and Wildlife Service Colorado River Fish Project) **Northern pike (*Esox lucius*) population size, movement, and removal effectiveness in the Upper Yampa River, Colorado** - Northern pike is a predatory species that has been introduced in the Yampa River. The large population provides a source for continual movement of pike into the lower Yampa River and further downstream into the Green River where it coexists with three endangered fishes — Colorado pikeminnow *Ptychocheilus lucius*, razorback sucker *Xyrauchen texanus*, and humpback chub *Gila cypha*. Pike have been tagged to evaluate population size, movement, and removal effectiveness in 2003 and 2004 using different sampling designs between years. In 2003, due to study design concerns, accurate and precise movement estimates, population estimates, and removal effectiveness were difficult to obtain, if possible at all. Changes in study design in 2004 have made it possible to look at movement, removal, and population size that are discussed within. Results and comparison of the two years will help to further advance our knowledge of nonnative control techniques, particularly with respect to pike.

11/12/2004 4:15PM - Nathan Allan[1], Matthew E. Andersen[2], James Brooks[1], Robert J. Edwards[3], Gary P. Garrett[4], Kara Hilwig[5], Clark Hubbs[6], Nadine R. Kanim*[1] (1 U.S. Fish and Wildlife Service, 2 Utah Department of Natural Resources, 3 University of Texas-Pan American, Department of Biology, 4 Texas Parks and Wildlife, HOH Fisheries Science Center, 5 SWCA Environmental Consultants, Inc., 6 University of Texas, Section of Integrative Biology, 7 Nevada Natural Heritage Program, 8 California Department of Fish and Game) **Desert Fishes Council 2003 species status tracking tables -** To facilitate the dissemination and gathering of current information on the status of desert aquatic species at risk, Desert Fishes Council Area Coordinators have developed Species Status Tracking Tables, organized by geographic area, for the period of November 2002 to November 2003. The 10 geographic areas for which annual oral reports are regularly presented at Desert Fishes Council meetings are Oregon and Upper Pit River Drainage of California, California, Nevada, Bonneville Basin, Upper Colorado River, Lower Colorado River, Upper/Middle Rio Grande and Pecos Rivers, Texas, Northwestern Mexico, and Northeastern Mexico. This year, for 8 of the 10 geographic areas, information is presented on species status, specific threats, previous year's conservation activities, and sources of status and other information. Following each table is space for meeting participants to provide comments and additional data. Area Coordinators hope that the tracking tables will provide a forum for exchange of detailed information that normally can not be accommodated within the time limits of an oral Area Report. A relational database that will allow access to species status information through the Desert Fishes Council's web page is currently being developed. In the future, Species Status Tracking Tables will serve to summarize annual changes in species status for all North American desert aquatic species at risk and identify data gaps and research needs. (Additional authors and their affiliations are: Martinez,Cynthia-1; Miskow,Eric-7; Modde,Timothy-1; Parmenter,Steve-8; Reid,Stewart-1; Rissler,Peter-U.S. GeologicalSurvey, Biological Resources Division, Reno, NV; Shaul, Anita - Nevada Department of Wildlife; Skiles,Tom; Stefferud, Jerry; Stefferud, Sally; Watts, Hilary-1)

11/12/2004 5:00PM - BUSINESS MEETING

11/12/2004 5:00PM - David Propst*[1] (New Mexico Department of Game and Fish) **Resolution relative to the use of piscicides and conservation of native fishes in New Mexico -** Whereas the Desert Fishes Council (http://www.desertfishes.org) is an international organization numbering in excess of 250 agency, university, and private research and management scientists and resource specialists and other individuals concerned with the long-term integrity of North America's desert ecosystems, and

Whereas the expertise of its members collectively reflects many years of education and experience working in the fields of aquatic ecosystem research, conservation and management, and

Whereas New Mexico's aquatic ecosystems support a diverse and rich native fish fauna that contributes immeasurably to the state's biological heritage; and

Whereas many of New Mexico's native fish species that utilize these habitats are imperiled by habitat modification and predation, competition, and hybridization with non-native fish species; and

Whereas without continuing and concerted efforts to control and diminish factors that threaten native New Mexico fishes, many will continue to decline in status; and

Whereas elimination or control of noxious non-native fish species is a primary means by which security of several imperiled native fish species may be enhanced; and

Whereas the piscicides antimycin A and rotenone are proven environmentally safe, effective, and efficient means to control or eliminate non-native fishes, particularly trouts; and

Whereas each of these piscicides has been a critical tool in successful restoration and contributed to the recovery of several rare fish species throughout the United States, including Greenback trout, Apache trout, California golden trout, and Gila topminnow; and

Whereas prohibition of use of piscicides for elimination of noxious non-native fish species by the New Mexico State Game Commission will seriously impede, if not halt, recovery and conservation of rare native fish species in New Mexico, particularly Gila trout and Rio Grande cutthroat trout; now therefore be it

Resolved that the Desert Fishes Council, by majority vote of the membership assembled at its thirty-sixth annual business meeting on November 12, 2004 in Tucson, Arizona, urges the New Mexico State Game Commission to reverse its decision to ban use of the piscicides antimycin A and rotenone in native fish conservation and management.

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11/12/2004 7:00PM - BANQUET

11/13/2004 8:30AM - SPECIAL SESSION : The legacies of Seth Meek and Robert Rush Miller to the ichthyology of North American deserts.

11/13/2004 8:30AM - Phil Pister*[1] (Desert Fishes Council) **Robert Rush Miller: scientist, conservationist, and friend** - Robert Rush Miller stands not only as a preeminent ichthyologist, but also as a pioneer conservationist. His landmark 1961 paper, "Man and the changing fish fauna of the American Southwest," served as an early awakening for major conservation efforts, resulting in formation of the Desert Fishes Council in 1969. Miller's research on the systematics of the cyprinodont fishes, accomplished in collaboration with his legendary mentor, Carl L. Hubbs, laid the basis for later preservation work, clearly revealing that good science must necessarily underlie meaningful and enduring management or conservation programs, an observation underscored during Miller's tenure as President of the Desert fishes Council. Collecting trips and conservation efforts in company with the Miller/Hubbs clan are related, and their role in establishing one of the nation's first refuges for native fishes, in California's Owens Valley surrounding the type locality of Cyprinodon radiosus, are described in detail, along with other incidents involving Dr. Miller and his remarkable wife and family. Through his legendary efforts and his legacy to all future generations, Bob Miller has indeed reached the plateau of immortality.

11/13/2004 8:45AM - Mark R. Jennings*[1] (Rana Resources and Research Associate, Department of Herpetology, California Academy of Sciences) **Seth Eugene Meek: the scientist, the man, and his personality** - Seth Eugene Meek (1859-1914) was one of an early group of students trained in ichthyology under David Starr Jordan at Indiana University during the last quarter of the 19th century. As an assistant with the U.S. Fish Commission and a curator with the Field Museum of Natural History in Chicago, he conducted a significant amount of fieldwork in the United States, Mexico, Nicaragua, and Panama during the late 1800s and early 1900s. He collected thousands of fishes, amphibians, and reptiles, and coped with arduous working environments despite having a major heart condition. His monumental works on the fishes of Mexico, Nicaragua, and Panama are still useful today and the Nicaragua book has been reprinted several times over the past 80 years. Although relatively little has been published about this remarkable scientist, a manuscript by the late Samuel Frederick Hildebrand reveals that Meek was much in demand as an ichthyologist and herpetologist at the Field Museum and had some rather interesting disfunctionalities despite being a successful and respected scientist. In this presentation, I will describe the high points of Meek's career, as well as providing anecodotes about his work in the field and interactions with other professionals over his 35-year career.

11/13/2004 9:00AM - John Lyons*[1], Norman Mercado-Silva[2] (1 University of Wisconsin Zoological Museum, 2 Center for Limnology, University of Wisconsin-Madison) **Notropis calabazas, a new**

minnow species from central México in the Notropis calientis complex, with an update on the conservation status of the complex - In 1986, Barry Chernoff and Robert R. Miller defined the Notropis calientis complex to include three small minnows from the highlands of central México, the widespread *N. calientis* from the upper Río Lerma-Santiago basin on the Pacific slope, the adjacent endorheic Río Morelia basin, and the headwaters of the Río Santa Maria subbasin of the Río Pánuco basin on the Atlantic slope, the newly described N. amecae from the upper Río Ameca basin on the Pacific slope, and the newly described *N. aulidion* from the upper Río Mezquital basin on the Pacific slope. Here we describe a new member of the complex, *N. calabazas*, from the Río Verde subbasin of the Río Pánuco basin. *Notropis calabazas* can be distinguished from other members of the complex in having 17 or more gill rakers on the second gill arch versus 16 or fewer and also by its relatively high numbers of gill rakers on the first arch, total lateral line scales, pored lateral line scales, body circumferential scale rows, and caudal peduncle circumferential scale rows and its relatively low numbers of supraorbital and infraorbital cephalic sensory pores. *Notropis calabazas* has been found only in the small Río Calabazas in San Luis Potosí state, where it is uncommon and warrants official designation as a protected species. Overall the complex is in trouble and in need of active conservation efforts. *Notropis aulidion* is extinct and *N. amecae* nearly so. *Notropis calientis* remains widespread but has sharply declined or disappeared from most of its historic localities.

11/13/2004 9:15AM - Clark Hubbs*[1] (Integrative Biology, University of Texas at Austin) **Bob Miller - the early years -** I first met Bob Miller 5 July 1938. He went with the Hubbs family for most of the rest of that summer. I recall a number of events that may be of interest to the members at large.

11/13/2004 9:30AM - Henry L. Bart*[1], Royal D. Suttkus[1], John Lyons[2], Norman Mercado-Silva[3] (1 Tulane University Museum of Natural History, Belle Chasse, LA 70037, 2 University of Wisconsin Zoological Museum and Wisconsin Department of Natural, 3 Center for Limnology, University of Wisconsin, 680 N Park St., Madison WI 53706) **Status of Mexican ictiobines: a tribute to Meek and Miller -** Our studies of Méxican ictiobines (Catostomidae: Ictiobinae) were inspired by Bob Miller, who encouraged us to obtain much needed study material from the large rivers of México. In this paper, we report on the progress of this work to date, and share our insights on the taxonomic status of extant ictiobines in México, in view of the conclusions of Seth Meek and Bob Miller. Preliminary morphological and genetic evidence suggests that México is inhabited by at least six species of ictiobines. The *Carpiodes* form in the upper Río Bravo/Rio Grande system, which Meek described as *C. microstomus*, is morphologically distinct from *Carpiodes carpio*. Based on genetic evidence, this species' affinities are with *Carpiodes cyprinus*, not *C. carpio*. We are uncertain about the status of the *Carpiodes* form in the lower Río Bravo and Gulf Slope rivers on northern México, which Meek described as *C. elongatus*, but was later synonymized with *C. carpio*. We are also uncertain about the status of the *Carpiodes* form in the Río Yaqui system, which has been referred to in the literature as a transplanted population of *C. carpio*. Meek described *Carpiodes labiosus* as the most distinctive ictiobine in México. Our evidence supports conclusions of Miller and others that the species is a member of genus *Ictiobus*. However, it is morphologically and genetically distinct from other living *Ictiobus*. Its preference for upland habitats in the Río Pánuco system is also unique among members of genus *Ictiobus*. We agree with Miller that two species of *Ictiobus* (*I. bubalus* and *I. niger*) inhabit large Gulf coastal rivers from the Río Bravo to the Río Pánuco. We have yet to study the isolated *I. niger* form in the Río Nazas. Our reassessment of morphological variation of *Ictiobus* inhabiting large rivers of the southern Gulf of Mexico (Río Papaloápan to Río Usumacinta) is consistent with Meek's conclusion that *I. meridionalis* Günther is a valid species.

11/13/2004 9:45AM - Salvador Contreras-Balderas*[1], Edmundo Diaz-Pardo[2] (1 Universidad Autónoma de Nuevo León / Bioconservación, A.C., 2 Universidad Autónoma de Queretaro) **J. Alvarez and F. De Buen in Mexican ichthyology -** José Alvarez del Villar (Mexican), and Fernando de Buen (Spanish), were two real promoters of freshwater fish research. Alvarez started his career describing a Poecilia (Mollienesia) from Baños de Azufre, Tabasco, and other poeciliids and cyprinodontids. After that he published his keys to the entire Mexican fish fauna (1950), where he updated distributions and names. He followed with descriptions of at least 28 species, mostly valid, Neotropical or from Central México, covering goodeids, characids, cyprinids, cichlids, atherinopsids, poeciliids, cyprinodontids, profundulids, and hemirhamphids. He also published on other subjects, like fauns, hydrobiology, history. He initiated the fish collection at Escuela Nacional de Ciencias Biológicas, Instituto Politècnico Nacional, and trained ichthyologists from 1948 to 1988. Fernando de Buen was a Spain-born ichthyologist, migrated to México, to escape the purges of Spanish revolution. In México he was involved in the foundation of the Estación Limnológica de Pátzcuaro. His work involved cataloguing and describing new fishes, and research on

limnology of Lago de Pátzcuaro. His papers were a preliminary listing of Mexican freshwater fishes, later describing goodeids, poeciliids, atherinopsids, and a cyprinid between 1940 and 1956. He reported on the Mexican ichthyogeography. He moved to the Instituto de Biología, Universidad Nacional A. de México (1945-57). Later on, he took a job with FAO, and moved to Chile, where he died in 1958. When he was at Pàtzcuaro, he established contacts with local purépecha fishermen, training them on the misteries of ichthyology and providing rudiments of science, including fish names, as attested by some anecdotes. Be them remembered as the founders of modern Mexican Ichthyology.

11/13/2004 10:00AM - Rocio Rodiles-Hernandez[1], Dean A. Hendrickson*, John G. Lundberg (1 Colegio de la Frontera Sur (ECOSUR), San Cristobal de las Casa, Chiapas, México & Texas Memorial Museum, Univ. Texas, Austin, 2 Texas Memorial Museum, Univ. Texas, Austin, 3 Philadelphia Academy of Natural Sciences) **A new phylogenetically puzzling catfish in mesoamerica underscores how much remains to be discovered about Mexico's ichthyofauna** - Despite the fact that Mexico's largest river, the Río Usumacinta had been considered one of the better collected basins of the country, including collections by both S.E. Meek and R.R. Miller, not to mention Donn E. Rosen and many others, recent discoveries there underline how little we know about the biodiversity of not only this basin, but probably most of México. In 1996 the first specimen of a new, relatively large (up to 427 mm SL) catfish was collected in the Lacanjá River, Chiapas, México, by the first author while working on her doctoral thesis project. Other specimens were collected later elsewhere in the Usumacinta drainage, however, preliminary taxonomic analyses were frustrating since the new species was not easily assigned to any known genus. In 1998 a collaboration began between the University of Texas and ECOSUR to carry out additional osteological and morphological analyses. Continuing ambiguity regarding assignment of the specimens to now either genus or family led to initiation of collaboration with siluriform experts at the Academy of Natural Sciences. Externally, the new catfish is very similar to *Pylodictis* and (except for size) *Noturus*, and superficially appears to be assignable to Ictaluridae with which it shares a nasal barbel on the posterior naris, however, its invariant and plesiomorphic pelvic ray count of 6 is unknown in Ictaluridae, and the pelvic girdle also appears plesiomorphic. A now-large suite of osteological and other internal anatomical autapomorphic characters differentiates it from Ictalurids and other all other families. Our preliminary analyses of a large morphological data set scored across most known Siluriform families indicate it to be a monotypic representative of a very deep clade with unresolved relationships to other families. Preliminary analysis of mtDNA sequences across a similarly broad representation of siluriforms of the world gives the same result. We considered placing this unusual critter in its own, new, monotypic family, but for now leave familial status as "incertae sedis." We discuss conservation and biogeographic issues brought to light by this new discovery, and comment on ecology of the species, which has long been known to, and is occasionally eaten by, indigenous human populations of the region.

11/13/2004 10:15AM - Hector P. Espinosa*[1], Gustavo Casas[1] (Instituto de Biología, UNAM) **The fishes of the Malespina expedition (1789-1794) in New Spain** - The fish of the Malespina expedition (1789-1794) in New Spain. Until recent dates it is known that it was one of the more ambitious, better projected and equipped expeditions among the developed by the Spanish during the colony, under the responsibility of the King Carlos III and soon countersigned by Carlos IV. The call "Malaspina Expedition" driven by Alejandro Malaspina, born in Italy, together with José de Bustamante, commanded the Descubierta and the Atrevida corvettes. They carried out this political-scientific expedition, to visit to most of the possessions of Spain in America and Asia. In the expedition they should be carried out astronomical calculations of utility in geography and different scientific observations in the points of their trip. There were several naturalists and designers that had the responsibility to collect and describe plants, animals and minerals, one of them, Antonio Pineda was the first that developed studies of this type in the New Spain. In Acapulco the first thing that he studied were the coastal fish of that place, then they traveled to the Mexico City during the recognition of Nutka and Alaska by Malaspinta. In the Naval Museum of Madrid there are several drawings and watercolors of 124 of fish, even lacking to study other documents of this expedition.

11/13/2004 10:30AM - Anthony A. Echelle*[1], Alice F. Echelle[1] (Oklahoma State University, Department of Zoology) **Tempo of diversification in southwestern pupfishes** - Robert R. Miller, with Carl Hubbs, pioneered the study of rates of speciation in the southwestern ichthyofauna. Early on, a major theme was that the dessication of Late Pleistocene (Wisconsinan) lakes was a primary impetus for speciation. Subsequently, Miller provided estimates of the ages of individual species of *Cyprinodon* based on his knowledge of the genus, paleo-environments, and geological history, with most species originating in the Pleistocene. We used a molecular clock based on the mitochondrial ND2 gene in an analysis of rates of diversification in *Cyprinodon*. Estimated ages indicate that few, if any, speciation events were Post-pluvial.

This is in agreement with Miller's viewpoint, although most popular interpretations based on his work would suggest otherwise. Also in agreement with Miller, plots of lineages through time and maximum-likelihood estimates of rates of diversification favor a model in which the Pleistocene rate of diversification (0.68 +/- 0.17 per million yrs) was about 4 times greater than the pre-Pleistocene rate (0.18 +/- 0.02 species/million yrs). The latter rate is very rapid compared with estimates for other radiations. Complications for our estimates, including effects of hybridization and extinction, will be explored.

11/13/2004 10:45AM - Jeremy B. Voeltz*[1] (Arizona Game and Fish Department) **The San Pedro River – historical composition of native fishes, observations by Hubbs and Miller in the 1950s, conditions in 2004, and plans for the future** - Robert Rush Miller's 1961 paper "Man and the changing fish fauna of the American Southwest" was one of the first papers to describe the changes in native fish communities in the Southwest as a result of human factors. The Arizona Game and Fish Department is currently monitoring the San Pedro River, through funding provided by the U.S. Bureau of Reclamation and the Department. We will take a look back at the historic fish fauna of the San Pedro River, discuss the changes over time and the plausible reasons for those changes, and discuss potential native fish restoration projects within the San Pedro River basin.

11/13/2004 11:00AM - Robert C. Cashner*[1] (University of New Orleans) **The natural history of Robert Rush Miller and other life history traits** - Robert Rush Miller, 1916-2003, is best known as an ichthyologist and conservationist, primarily due to his work on fishes and aquatic habitats in the southwestern U.S. and Mexico. Several papers in this session to honor Bob Miller will detail his research career and his significant contributions to the field. I would like to focus on Bob's early life history and the influences that helped shape him and his career. I would also like to present some other aspects of his life, such as his love and talent for classical music, ability to whistle entire compositions by Tchaikovsky, fanatic devotion to University of Michigan athletics, and a few personal, definable idiosyncrasies.

11/13/2004 11:15AM - Steven Norris*[1] (Biology Program, California State University Channel Islands) **Robert Rush Miller and his life work, Freshwater Fishes of Mexico** - In August 1904, Seth Eugene Meek published his seminal Freshwater Fishes of Mexico north of the Isthmus of Tehuantepec. Sometime in the late 1940s, Bob Miller had his ichthyologcial vision directed southward. Always working in close collaboration with his wife, Frances Hubbs Miller, Bob began the long task of producing a guide to the ichthyofauna of Mexico. By the 1980s a great deal had been accomplished and the book had begun to take form. Fran's death in 1986 was a crushing setback to Bob and the project. The effort later regained direction when W. L. Minckley offered to take charge of editorial matters, which he did so with characteristic efficiency and style. The book was completed for review in late 2001, not long after Mink's passing. It was reviewed and revised in 2002-2003 and is now (Fall 2004) very near to publication; it should be available in early 2005. I would like to present a preview of Bob's book, the effort it took to produce it, and a look into his later years as an ichthyologist and author. Finally, I would like offer a few minutes for DFC members to remember Dr. Bob with their own anecdotes or stories.

11/13/2004 11:30AM - Steven Norris*[1] (Biology Program, California State University Channel Islands) **Meek/Miller Session - Closing remarks**

11/13/2004 12:00PM - LUNCH

11/13/2004 1:30PM - Tom Busiahn[1], Jason Goldberg[2], Hannibal Bolton[3], Stewart Jacks*[4] (1 U.S. Fish & Wildlife Service, 2 U.S. Fish & Wildlife Service, 3 U.S. Fish & Wildlife Service, 4 U.S. Fish & Wildlife Service) **Coming together for conservation: The National Fish Habitat Initiative** - Loss and alteration of aquatic habitat are the primary reason for the alarming decline in many of America's fish and other aquatic resources. Since 1900, 95% of the aquatic habitat in the U.S. has been altered, degraded, or destroyed. More than 50% of the 221 million acres of wetlands that existed in the late 1700s have disappeared. In the southwest, nearly 900,000 acres of riparian habitat has been destroyed since the 1940s. In Region 2, 41-57% of all threatened and endangered species are dependent on riparian and in-stream habitat. In response to this need, the Sport Fishing and Boating Partnership Council recommended in its January 2002 report "A Partnership Agenda for Fisheries Conservation" that the U.S. Fish and Wildlife Service (Service) initiate a partnership effort directed at fish habitat conservation modeled after the highly effective North American Waterfowl Management Plan. In response, the Service's Fisheries Program recognized aquatic habitat as one of its seven focus areas in its December 2002 Fisheries Program Vision for the Future. In doing so, it made a commitment to "work with Federal, State, Tribal, and other partners to

explore the benefits of a National Aquatic Habitat Plan and determine the appropriate FWS role in its development and implementation." The ultimate goal of the Initiative is to work closely with partners and stakeholders to build a future that ensures Healthy Fish, Healthy Habitats, Healthy Economies, and Healthy People. As the lead federal partner, the Service has begun bringing partners and stakeholders together to develop a National Fish Habitat Plan. The Plan will foster geographically-focused, locally driven, and scientifically based partnerships that will work together to protect, restore, and enhance aquatic habitats and reverse the decline of fish and aquatic species. Another key partner in this effort, the International Association of Fish and Wildlife Agencies, will help take the lead in developing a comprehensive plan and action strategy. This plan will establish a national framework to prioritize, coordinate and support existing and new fish habitat actions at local, regional and national scales. The professionals that make up the Desert Fishes Council can play a vital role in the development and implementation of this National Fish Habitat Initative.

11/13/2004 1:45PM - William E. Werner*[1] (Arizona Department of Water Resources) **The development and status of the Lower Colorado River Multi-Species Conservation Program** - Native fish and wildlife in the Southwest face many stressors from development and use of natural resources. The hydrology of many streams is different from pre-development conditions. Water and power providers face regulatory challenges as species are listed under the Endangered Species Act and critical habitat designated. Parties responsible for water, power, and use of natural resources, are seeking regulatory assurances through habitat conservation plans and similar mechanisms. The Colorado River is a major source of water for upwards of 20 million people. The Lower Colorado River Multi-Species Conservation Program is an effort involving parties from Arizona, California, Nevada, the Federal government, and several tribal governments to develop a conservation plan for threatened and endangered species along the Colorado River from the lower Grand Canyon to the southerly border with Mexico. Included in the effort are *Xyrauchen texanus* (razorback sucker), *Gila elegans* (bonytail), *Gila cypha* (humpback chub), and *Catostomus latipinnis* (flannelmouth sucker). The development, contents, and status of the Lower Colorado River Multi-Species Conservation Program will be described, including the approach to conservation for fish and associated research and adaptive management.

11/13/2004 2:00PM - Paul B. Holden*[1], Tim L. Welker[1], Kirk S. Dahle[1], Jim Heinrich[2] (1 BIO-WEST, Inc., 2 Nevada Department of Wildlife) **The Influence of reservoir fluctuations on recruitment and spawning characteristics of razorback sucker in Lake Mead** - An ongoing razorback sucker (*Xyrauchen texanus*) research project on Lake Mead, Arizona and Nevada, has been funded by the Southern Nevada Water Authority and the U.S. Bureau of Reclamation for the past 8 years. Two primary populations at Echo Bay and Las Vegas Bay were followed during the first 7 years. A major emphasis of this research has been to locate spawning sites at these two areas and to use aging information to identify patterns of recruitment for both populations. Ages calculated nonlethally for more than 60 individual razorback sucker (4 to 35 years of age) indicated that these were young populations that potentially recruited under specific reservoir conditions. An additional 8 razorback sucker were aged during the 2003-2004 study year, including one sub-adult fish from Las Vegas Bay that was aged at 5 years. Comparing the years all aged razorback sucker were spawned with historical Lake Mead water elevations provides some evidence that a combination of small, annual lake-level fluctuations and larger, multi-year changes in lake elevation may influence razorback sucker recruitment. The long-term lake-level changes promote growth of terrestrial vegetation that may provide increased protective cover for larval and juvenile razorback sucker, resulting in the limited recruitment documented in Lake Mead. This theory is generally supported by the fact that the 9 sub-adult fish aged during the last two years were apparently spawned in 1997 and 1998, at a time when large amounts of protective cover were inundated at Las Vegas Bay.

The precipitous drop in the elevation of Lake Mead over the last 4 years has affected razorback sucker spawning sites at Echo Bay. The spawning area used by the Las Vegas Bay population at Blackbird Point appeared to remain unaffected by the declining lake elevation until 2004. During the last three spawning periods (2002-2004), declining lake levels have caused the Echo Bay fish to relocate their spawning site within the bay each year. This phenomenon indicates that razorback sucker at Echo Bay exhibit spawning site fidelity but possess enough flexibility in their spawning behavior that they can spawn at alternate locations. Although the exact location of the spawning site at Las Vegas Bay was unknown, it was believed to be somewhere off the west shore of Blackbird Point. Larval captures during 2003 and 2004 continued to indicate that the spawning site was along this portion of Blackbird Point. As lake levels continued to decline during the 2004 spawning season, the Las Vegas Wash delta moved further out into Las Vegas Bay. This resulted in sediment from the wash covering the entire presumptive spawning area at Blackbird Point.

11/13/2004 2:15PM - Cynthia Tech*[1], Astrid Kodric-Brown[1] (University of New Mexico, Department of Biology) **Conspecific males are sexiest: female mate choice generates strong assortative mating between the Comanche Springs pupfish and sheepshead minnow -** We examined the influence of female mate preferences and male-male competition on hybridization between the Comanche Springs pupfish, *Cyprinodon elegans*, and the sheepshead minnow, *C. variegatus*. In visual choice trials, females spent significantly more time inspecting conspecific males than heterospecifics. Females of both species exhibited conspecific mate preference, despite the fact that sheepshead males were more active and courted more than the Comanche Springs males. Furthermore, female mate preferences reflect actual mating patterns in naturalistic settings: ~90% of spawnings in outdoor, experimental ponds occurred between conspecifics. Sheepshead minnows from allopatric populations show the same degree of assortative mating with Comanche Springs pupfish as those from hybridizing populations, suggesting that conspecific mate preference evolved prior to the introduction of sheepshead minnow. Reproductive isolation breaks down when hybrids are present, however, as females do not discriminate between hybrid and conspecific males. Nevertheless, the degree of assortative mating between these species is greater than has been observed between the sheepshead minnow and other west Texas pupfishes.

11/13/2004 2:30PM - Dennis M. Stone*[1] (U.S. Fish and Wildlife Service) **Effect of turbidity on miniature hoop net catch rates of humpback chub and other fishes in the Little Colorado River, Arizona -** The influences posed by turbidity on miniature hoop net catch rates of various fishes were examined from data collected September 15-24 and October 20-29, 2003 in the lower 13.6 km of Little Colorado River, Arizona. Both sampling trips occurred just after the river ceased flooding, baseflow discharge levels were resumed, and high turbidity was dissipating. The mean daily catch rates of 2,128 humpback chub *Gila cypha* were similar among nets deployed under turbiditities descending from 61,696 to 190 nephelometric turbidity units (NTUs), then tripled between 190 and 82 NTUs, and quintupled between 59 and 54 NTUs. Catch rates of 135 flannelmouth suckers *Catostomus latipinnis*, 157 speckled dace *Rhinichthys osculus*, and 99 fathead minnows *Pimephales promelas* followed very similar patterns. All 9 plains killifish *Fundulus zebrinus* were captured when turbidity fell below 79 NTUs. Conversely, catch rates of 135 bluehead suckers *C. discobolus*, 150 common carp *Cyprinus carpio*, 31 channel catfish *Ictalurus punctatus*, and 32 black bullheads *Ameiurus melas* did not appear to be influenced by turbidity, but this needs further scrutiny. Catch rate-turbidity profiles from data collected the following spring corroborated these findings. This information provides fishery biologists valuable insight into the biases posed on catch rates by turbidity and where to stratify data to avoid erroneous conclusions of capture trends.

11/13/2004 2:45PM - Craig Paukert*[1], David Ward[2], Pamela Sponholtz[3], Kara Hilwig[4] (1 Kansas Cooperative Fish & Wildlife Research Unit, Kansas State University, 2 Arizona Game and Fish Department, 3 US Fish and Wildlife Service, 4 SWCA Environmental Consultants) **Effects of repeated handling on bonytail chub -** We evaluated the effects of repeated hoop-net sampling and subsequent handling on bonytail (*Gila elegans*) to determine the effects of non-lethal sampling on growth and mortality of this desert fish. This sampling was done in an experimental setting in Flagstaff, Arizona, but handling procedure simulated standardized spring and fall sampling procedures used in Little Colorado River, Grand Canyon for humpback chub (*Gila cypha*). Repeated capture and handling of fish during these monitoring activities may cause stress leading to reduced growth or condition and eventual mortality. A total of 328 PIT-tagged bonytail chub were placed in a 0.10-acre pond in August 2003 and these fish were sampled by hoop nets during four, 3-day sampling events, two in the fall (September-October 2003) and two in the spring (June 2004). We measured fish length and weight and recorded the time required to complete all steps for processing individual fish. Individual fish were handled from 1 to 8 times during the study. With each additional handling event, there was a mean decrease in growth in fork length (FL) of 10% and a mean decrease in growth in weight of 24.8%. Fish handled 7 times grew an average of 4.8 mm FL and increased in weight by an average of 0.5 grams as compared with fish handled only once, which grew on average 10.9 mm FL and 4.8 grams, over an 11 month period. Fish were handled for a mean total time of 8.1 minutes, of which 7.1 minutes was fish being lifted from nets and held in the bucket. Measurement of length, weight, scanning for tags, and insertion of PIT tags accounted for about 1 minute of total processing time. Although handling fish is essential in understanding population dynamics, researchers should seek to understand the effects of handling on fish and minimize harmful sampling practices.

11/13/2004 3:00PM - Michael E. Golden*[1], Paul B. Holden[1], S. Kirk Dahle[1], David L. Propst[2], Robert Larson[2], W. Howard Brandenburg[3], Michael A. Farrington[3], Julie K. Jackson[4] (1 BIO-WEST, Inc., 2 New Mexico Department of Game and Fish, 3 University of New Mexico, Museum of

Southwestern Biology, 4 Utah Division of Wildlife Resources) **Can we increase stocking success of hatchery-reared endangered fish? Trials with Colorado pikeminnow in the San Juan River** - As populations of threatened and imperiled fishes of the southwestern United States continue to decline, the recovery goals for these species become more dependent on successful supplementation of populations with hatchery-reared fish. Unfortunately, while biologists and managers may be able to increase the number of stocked fish, they are frequently unable to enhance the recruitment of these fish to the adult population in the wild. Colorado pikeminnow (*Ptychochelius lucius*) have been stocked throughout their historic range at a variety of sizes. The majority of these stockings have been plagued by poor retention and survival. The San Juan River Basin Recovery Implementation Program (SJRIP) drafted a Colorado Pikeminnow Augmentation Plan (Plan) that calls for stocking 200,000 - 300,000 young-of-the-year (YOY) Colorado pikeminnow over a 8-9 year period. The goal of the Plan is to produce a population of greater than 800 adult (age 7 +) Colorado pikeminnow in the San Juan River. In October 2002, over 210,000 YOY Colorado pikeminnow were stocked as the Plan took effect. Follow-up monitoring indicated that retention of the Colorado pikeminnow stocked in 2002 was poor, especially in reaches of the upper San Juan River, an area believed critical to achieving recovery goals. To increase post-stocking retention and survival for approximately 180,000 YOY Colorado pikeminnow stocked in 2003, the SJRIP authorized and funded changes in stocking protocols, acclimation studies, and a habitat manipulation study. Acclimation studies showed substantial mortality of YOY Colorado pikeminnow within the first 36-72 hours following stocking. Despite this apparent large amount of post-stocking mortality, monitoring efforts indicate that the YOY Colorado pikeminnow stocked in 2003 had higher retention and survival than the YOY Colorado pikeminnow stocked in 2002. Acclimation and habitat manipulation experiments will be repeated during the 2004 stocking effort to try to duplicate the apparent increased success of the 2003 stocking effort. Additionally, an experiment examining the impact of stocking the fish during periods of warmer water temperatures will be attempted. The changes in stocking protocol instituted in 2003 will be continued in 2004, and additional changes designed to reduce handling stress will be implemented.

11/13/2004 3:15PM - Patti Clinton*[1] (Bureau of Reclamation, Lower Colorado River) **Culture methods of the endangered razorback sucker, *Xyrauchen texanus*, at Willow Beach National Fish Hatchery for 2004** - A repatriation program for the endangered razorback sucker began in 1991 for Lake Mohave that uses wild-caught larvae reared in captivity and returned to the lake after reaching a size less susceptible to predation. Laval razorback suckers are captured by the Native Fish Work Group, delivered to Willow Beach NFH, reared until they reach greater than 325 mm, and returned to Lake Mohave. Aquaculture technology exists for commercially valuable fishes. Culture methods and protocols are needed for the breeding and rearing requirements of many rare, threatened and endangered fishes. This presentation will cover culture methods and protocols used at Willow Beach NFH for rearing larval razorback suckers.

11/13/2004 3:30PM - Pamela Sponholtz*[1], Dennis Stone[1] (U.S. Fish and Wildlife Service) **Monitoring efforts for humpback chub (*Gila cypha*) above Chute Falls, Little Colorado River** - A conservation measure to relocate small humpback chubs (HBC) to upstream areas of the Little Colorado River (LCR) was identified in the December 2002 Biological Opinion on the proposed experimental releases from Glen Canyon Dam and removal of nonnative fish. It was hoped that this translocation effort will increase HBC recruitment to adulthood by allowing them an opportunity to exploit the abundant food resources, warmer water temperatures, and reduced competition/predation by fewer large-bodied fishes associated with this area. In July 2004, the U.S. Fish and Wildlife Service translocated 299 small (between 50-100mm) HBC above Chute Falls in the Little Colorado River. This is the second translocation above the falls, resulting in a total of 582 HBC being released above Chute Falls since 2003. Monitoring efforts began in October 2003, and (42) HBC were captured from river kilometer 14.5 to 16.8. All HBC captured were implanted with a 134.2Khz PIT tag and released back into the LCR. Subsequent monitoring efforts in April 2004, captured (34) HBC. Of the captures, (16) HBC had received a pit tag during the previous monitoring effort in October 2003. Significant ($T=8.28$, $p<0.05$) growth occurred between the October 2003 and April 2004 monitoring periods. HBC captured in April 2004 were nearly 30% bigger (mean size increase = 43.1mm, range 18-83mm) and corresponded to an average of 7.2mm of growth per month. The growth rates and retention of HBC suggests that survival above Chute Falls is possible and may contribute to a demographic expansion of the species range. Monitoring efforts will continue in November 2004 and May 2005.

11/13/2004 3:45PM - David R. Van Haverbeke*[1] (U.S. Fish and Wildlife Service) **Closed population estimates of humpback chub (*Gila cypha*) in the Little Colorado River, Grand Canyon, Arizona -** From 2000 to 2004, closed two-pass mark-recapture efforts were conducted in the Little Colorado River to determine the abundance of humpback chub (*Gila cypha*). Since 2001, the annual spring abundance estimates of humpback chub >= 150 mm have ranged from 2,082 (SE = 242) to 3,419 (SE = 480). Spring spawning abundance estimates for humpback chub &gt= 200 (age-4+ adults) have ranged from 1,421 (SE = 209) to 2,002 (SE = 463). Since 2000, the annual fall abundance estimates for humpback chub &gt= 150 mm have ranged from 1,064 (SE = 33) to 2,774 (SE = 209). Annual fall abundance estimates for humpback chub &gt= 200 mm have ranged from 483 (SE = 48) to 897(SE = 105). These efforts indicate that humpback chub have declined in abundance since mark-recapture efforts conducted in the early 1990s. The mechanism causing the decline in this endangered population is believed to be recruitment failure, related to a myriad of potential factors, including habitat loss, predation and parasites. Several projects have been discussed or proposed to rectify this decline in abundance (e.g., predator removals, translocations, captive broodstocks, supplemental stockings, etc.). Some of these efforts may prove to be productive and ultimately necessary. However, since mass habitat loss is the primary factor causing decline in most endangered species, the single most important and productive strategy might be to implement construction of a fully functioning thermal control device in Glen Canyon Dam.

11/13/2004 4:00PM - Kevin R. Bestgen[1], Robert I. Compton*[1], Koreen A. Zelasko[1], John Alves[2] (1 Colorado State University, Larval Fish Laboratory, Department of Fishery and Wildlife Biology, 2 Colorado Division of Wildlife) **Distribution and staus of Rio Grande chub, *Gila pandora*, in Colorado -** The few early records available described Rio Grande chub in the Rio Grande Basin, Colorado, as widespread and abundant, but the present status of the species has not been assessed. We used museum records, literature, and sampling sites throughout its historical range to describe changes in status of Rio Grande chub in Colorado. Distribution and abundance of Rio Grande chub in the Rio Grande drainage, Colorado, has declined dramatically. Formerly abundant populations in the main stem Rio Grande may be extirpated. Rio Grande chub populations can be considered stable in two streams, threatened by water diversion and drought in two other streams, and declining in two additional water bodies. Rio Grande chubs occurred most often in cool water streams up to 2500 m in elevation at sites that had permanent flow, sand and gravel substrate, deep water, and cover. Chubs were most abundant at sites where brown trout were rare or absent. Possible reasons for decline varied by stream system and included habitat loss via drought and water diversion, negative interactions with introduced species including brown trout, acute and chronic effects of heavy metal pollutants, and high water temperatures induced by low flows. Research and management recommendations may enhance the status of Rio Grande chub in Colorado.

11/13/2004 4:15PM - Paul V. Badame[1], J. Michael Hudson[1], Julie A. Jackson[1], David W. Speas*[2] (1 Utah Division of Wildlife Resources-Moab Field Station, 1165 S. Hwy. 191-Suite 4, Moab, UT 84532, 2 Utah Division of Wildlife Resources, 1594 W. North Temple Ste. 2110, PO Box 146301, Salt Lake City, UT 84114-6301) **Population trends and distribution of flannelmouth and bluehead sucker in the lower Green River, Utah 2001-2003 -** We obtained baseline abundance, size structure, distribution and movement information on flannelmouth sucker *Catostomus latipinnis* and bluehead sucker *C. discobolus* during 2001 through 2003 in the lower Green River, Utah. We electrofished shoreline habitats between Green River State Park (RM 120) and the confluence of the Colorado River (RM 0). Flannelmouth sucker represented 17-34% of the total electrofishing catch. Flannelmouth sucker were found throughout the lower Green River but were most abundant in the upper section (RM 120-90) of the study reach. Catch-per-effort and capture probabilities of flannelmouth sucker varied similarly among years and survival rates were relatively high, suggesting that population size was stable over the study period. Few bluehead sucker were recaptured over the study period, which precluded calculation of population parameters. Bluehead sucker distribution was similar to that of flannelmouth sucker in that most were captured in the upper 30 miles of the reach. Bluehead sucker represented 3-5% of the total electrofishing catch in the lower Green River. To increase precision of future population assessments, we recommend increasing tagging effort in areas of high sucker abundance, including expansion of the upper limit of the study reach to RM 128. In accordance with the range-wide, multi-agency conservation agreement for flannelmouth and bluehead sucker and roundtail chub *Gila robusta*, we plan to continue monitoring these fish in the Green River basin in the coming years.

11/13/2004 4:30PM - Kevin R. Bestgen*[1], John A. Hawkins[1], Gary C. White[2], Kevin Christopherson[3], Michael Hudson[4], Mark Fuller[5], Chris Kitcheyan[5], And Others (1 Larval Fish Laboratory, Fishery and Wildlife Biology, Colorado State University, 2 Fishery and Wildlife Biology, Colorado State University, 3 Utah Division of Wildlife Resources, Vernal, Utah, 4 Utah Division of Wildlife Resources, Moab, Utah, 5 U. S. Fish and Wildlife Service, Vernal, Utah) **Status of Colorado pikeminnow *Ptychocheilus lucius* in the Green River basin, Utah and Colorado, 2000 to 2003** - Range of endemic and endangered Colorado pikeminnow, a large-bodied, migratory, and piscivorous cyprinid, has been reduced to the upper Colorado River Basin in the San Juan, Colorado, and Green rivers and their tributaries. To enhance understanding of conservation status of Colorado pikeminnow, multiple-pass, capture-recapture sampling was conducted in the Green River Basin (about 850 river km), Utah and Colorado, from 2000 to 2003. Data collected were used to estimate demographic parameters for recruit-sized (400 to 449-mm total length, TL) and adult (> 450-mm TL) Colorado pikeminnow. Data analysis suggested a decline in abundance of Colorado pikeminnow in the Green River Basin over the study period from 3,338 (95% CI, 2815 to 3861) animals in 2001 to 2,324 (95% CI, 1395 to 3252) in 2003. Reductions were noted for all river reaches but were most severe in the middle Green River and the White River, reaches that supported the highest number of Colorado pikeminnow in the Green River Basin. Survival rates for adult Colorado pikeminnow from 2000 to 2003 were 0.62 (95% CI, 0.46 to 0.76) to 0.78 (95% CI, 0.31 to 0.97) and were lower than the 0.80 (95% CI, 0.71 to 0.87) survival rate estimated for Colorado pikeminnow from 1991 to 1999. Lower survival rates from 2000 to 2003 were responsible, in part, for apparent declines in abundance of adult Colorado pikeminnow in the same period. There was no support for the hypothesis that reduced survival of adult Colorado pikeminnow was due to sampling mortality. Recruit-sized fish captured in the Green River Basin during 2000 to 2003 sampling represented 4.9 to 12.7% of the estimated abundance of adult Colorado pikeminnow. Recruitment rates that were lower than mortality rates may also be responsible for apparent declines in abundance of adult Colorado pikeminnow in the Green River Basin from 2000 to 2003. Reduced abundance of recruit-sized Colorado pikeminnow noted during this study may be due to weak year-classes of age-0 Colorado pikeminnow produced in the past several years. Apparent reductions in abundance of adult and recruit-sized Colorado pikeminnow in the Green River Basin may be due to low, drought-related base flows that mostly coincided with investigation. A better understanding of factors that influence adult survival rates and the link between abundance dynamics of early life stages of Colorado pikeminnow and recruitment to later life stages would assist managers tasked with conservation and recovery of Colorado pikeminnow. Demographic parameters gathered in this study will be useful to determine progress to meet recovery goals for endangered Colorado pikeminnow. Additional authors: Ronald Brunson 3; Paul Badame 4; G. Bruce Haines 5; Julie Jackson 4, Cameron Walford 1; T. A. Sorensen 1; and T. Ben Williams 3.

11/13/2004 4:45PM - Linda Manning*[1], John Wullschleger[2] (1 National Park Service, Death Valley National Park, 2 National Park Service, Water Resource Division) **Devils Hole update** - Both the landmark 1976 Supreme Court decision that protected water level in Devils Hole and the creation of Ash Meadows National Wildlife Refuge in 1984 are seen as key victories in the effort to preserve the Devils Hole ecosystem and the pupfish (*Cyprinodon diabolis*) which is its best known inhabitant. Water level has been monitored continuously since 1962 and fish counts have been conducted at least annually and often seasonally since 1972. While both water level and fish numbers exhibited positive responses in the years immediately following the Court decision, more recent data suggest that Devils Hole remains at risk: water level has been declining gradually but consistently since 1988; pupfish numbers, as represented by standardized counts, appear to have been declining since 1995. We will provide an update on some recently completed and ongoing investigations into factors affecting the pupfish and identify management actions that are under consideration by the reconstituted Ash Meadows Recovery Team. In addition we will report on a September 2004 flash flood that altered habitat on the shallow shelf and, indirectly, resulted in the mortality of at least 72 pupfish. Although the loss of individuals from this small population is regrettable, the incident and its aftermath have stimulated a reexamination of research and management protocols that should eventually benefit the pupfish by reducing impacts associated with human activity.