Agenda Item
Grand Canyon National Park Science and Resource Management Program

Action Requested
√ Information item only; we will answer questions but no action is requested.

Presenters
Steve Martin, Superintendent, Grand Canyon National Park

Previous Action Taken
√ N/A

Relevant Science
√ The following describes the relevant research or monitoring on this subject:

The following documents can be found at www.nps.gov/grca/parkmgmt/planning.htm:
  ▪ 1995 General Management Plan
  ▪ 1997 Resource Management Plan
  ▪ 2006 Colorado River Management Plan


Background Information
Grand Canyon National Park Superintendent Steve Martin will present the National Park Service responsibilities in the area of research, resource management, and monitoring for resource values along the Colorado River. He will describe ongoing research and monitoring in relation to those responsibilities. Finally, he will discuss his recommendation for a shift in responsibility to the National Park Service for certain areas of GCDAMP research and monitoring.
Science and Resource Management
(Stewardship Responsibilities)

Leadership & Management
- Oversight
- Tribal Consultation
- Interagency Coordination
- Critical Park Issues

Natural Resources
- Air Quality
- Earth Sciences
- Vegetation
- Wildlife

Socio-Cultural Resources
- Archaeology
- Wilderness
- Historic Preservation
- Visitor Experience
- Soundscape

Science Information & Education Services
- GIS/Data Mgmt
- Mapping
- Research/Permits
- Museum Collection
- Archives
- Outreach
Grand Canyon National Monument, 1908
NPS Organic Act, 1916
Grand Canyon National Park, 1919
National Environmental Policy Act, 1969
Grand Canyon Enlargement Act, 1975
Redwoods Act, 1978
*Grand Canyon Protection Act, 1992

Mandated Management Responsibilities
NPS Management Policies 2006
GCNP General Management Plan 1995
*GCPA 1992 -- GCD AMP 1996
Colorado River Management Plan 2006
*Where AMP Goals align with GCNP Resource Management
NPS Mandated Responsibilities

NPS Organic Act of 1916

“The Service such established shall promote and regulate...to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such a manner and by such means as will leave them unimpaired for the enjoyment of future generations.”

Redwoods Act of 1978

“Congress further reaffirms, declares, and directs the promotion and regulation of the various areas of the National Park System...of the United States. The authorization of activities shall be construed and the protection, management, and administration of these areas shall be conducted in light of the high public value and integrity of the National Park System and shall not be exercised in derogation of the values and purposes for which these various areas have been established...directly and specifically provided by Congress.”

NPS Management Policies 2006

“The Secretary has an absolute duty, which is not to be compromised, to fulfill the mandate of the NPS Organic Act of 1916 to take whatever actions and seek whatever relief as will safeguard the units of the national park system.”
Historical Examples of GCNP Research: 1880-1960

Shelby, Bo and Joyce M. Nielson • Design and Method of the Sociological Research in Grand Canyon
• Motors and Oars in the Grand Canyon • Use Levels and Crowding in the Grand Canyon • Private and Commercial Trips in the Grand Canyon

Suttkus, Royal D., Glenn H. Clemmer, Clyde Jones, and C. Robert Shoop • Survey of Fishes, Mammals and Heretoauna of the Colorado River in Grand Canyon

Czarnecki, David B., Dean W. Blinn, and Terrill Tompkins • Periphytic Microflora Analysis of the Colorado River and Major Tributarries in Grand Canyon and Vicinity

Howard, Alan D. and Robert Dolan • Alterations of Terrace Deposits and Beaches of the Colorado River in Grand Canyon

Cole, Gerald and Dennis M. Kubly • Limnologic Studies on the Colorado River from Lees Ferry to Diamond Creek

F. Yates Borden • User Carrying Capacity for River-Running the Colorado River in the Grand Canyon

Steven W. Carothers and others • An Ecological Survey of the Riparian Zone of the Colorado River Between Lees Ferry and Grand Wash Cliffs

Phillips, Robert A. and Cynthia S. Lych • Human Waste Disposal on Beaches of the Colorado River in Grand Canyon

Sommerfield, Milton R., Wayne M. Crayton, and Nancy L. Crane • Survey of Bacteria, Phytoplankton and Trace Chemistry of the Lower Colorado River and Tributaries in the Grand Canyon National Park

Laursen, Emmett M. and Elliot Silverson • Hydrology and Sedimentology of the Colorado River in Grand Canyon by Emmett M. Laursen and Elliot Silverston

Minckley, C.O. and Dean W. Blinn • Summer Distribution and Reproductive Status of Fish of the Colorado River and its Tributaries in Grand Canyon National Park and Vicinity During 1975

Deacon, James E. and John R. Baker • Aquatic Investigation on the Colorado River from Separation Canyon to the Grand Cliffs, Grand Canyon National Park

C.R. Michael Parent and F.E. Robeson • An Economic Analysis of the River Running Industry in Grand Canyon National Park

R. Roy Johnson • Synthesis and Management Implications of the Colorado River Research Program

D.N. Thompson, A.J. Rogers Jr., and F. Yates Borden • Sound-Level Evaluations of Motor Noise from Pontoon Rafts in the Grand Canyon
The Effect of Flows in the Colorado River on Reported and Observed Boating Accidents in Grand Canyon

Curtis A. Brown
US Bureau of Reclamation
Planning Technical Services
Engineering & Research Center
Denver, Colorado

Martha G. Hahn-O’Neill
National Park Service
Resources Management
Grand Canyon National Park
Grand Canyon, Arizona

January, 1987

The Glen Canyon Dam and current river-racing practices are adversely affecting the Colorado River ecosystem

Man’s impact on the Colorado River in the Grand Canyon

by B. Roy Espinola, Steven W. Carothers, Robert Dolan, Bruce F. Hayden & Associates

IN THE OCTOBER 1979 issue of National Parks and Conservation Magazine, the article "The Glen Canyon Dam" mentioned the controversy over the generation and storage of water by the Glen Canyon Dam in Arizona. The article also noted that the Colorado River was a crucial part of the American landscape, providing water to millions of people and supporting a vast array of wildlife.

In the 1980s, the Colorado River continued to be a vital resource for the region, with its water used for irrigation, hydroelectric power, and recreation. However, the construction of the Glen Canyon Dam in 1963 caused significant changes to the river’s flow and ecology, leading to concerns about the impact on the ecosystem.

The Glen Canyon Dam was completed in 1963, and it has since become a symbol of the impact of human development on natural resources. The dam has altered the flow of the river, affecting the downstream habitat and the health of the ecosystem.

1983
COLORADO RIVER
BEACH CAMPSITE INVENTORY

Grand Canyon National Park, Arizona

Nancy J. Brian
John R. Thomas
Division of Resources Management
Grand Canyon National Park, Arizona

May, 1984
Grand Canyon

1990-2000 (examples)

Grand Canyon National Park and Grand Canyon National Park Foundation

Fall 2006 Report
Management & Control of Tamarisk and Other Invasive Vegetation
at Backcountry Seeps, Springs and Tributaries
in Grand Canyon National Park
(Phase II-A, First Year of Phase II of Comprehensive Project)

Arizona Water Protection Fund Contract Number 05-131WPF

Prepared by:
Lori J. Makarick and Kate Watters
Backcountry Vegetation Program
Grand Canyon National Park
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Flagstaff, AZ 86001-3265
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Katherine_Watters@nps.gov

AERIAL PHOTOGRAPHS OF SOUTHWESTERN WILLOW FLYCATCHER NEST AND TERRITORY LOCATIONS ALONG THE VIRGIN AND LOWER COLORADO RIVER REGIONS, 2004

Contract # 63-CS-30-0693

Submitted to:
U.S. BUREAU OF RECLAMATION
Lower Colorado Region
400 Railroad Avenue
Boulder City, NV 89005

Submitted by:
Mary Anne McLeod
Thomas J. Kolenkiewicz
Bryan T. Brown
Steven W. Carethers

SWCA, INC., ENVIRONMENTAL CONSULTANTS
144 N. San Francisco St., Suite 100
Flagstaff, Arizona 86001
(928) 774-5500

February 24, 2005

BRIDGING THE GAP:
TRANSITION MONITORING OF RIPARIAN VEGETATION
FROM GLEN CANYON DAM TO PEARCE FERRY

Final Report
Cooperative Agreement CA-1425-96-FC-81-05006

Michael J.C. Kenney
Dept. of Biological Sciences
Northern Arizona University

John R. Spencer
National Park Service
Glen Canyon National Recreation Area

Tina J. Ayers
Dept. of Biological Sciences
Northern Arizona University

Kerry M. Christensen
Department of Natural Resources
Hualapai Tribe

Peter Rowlands
and
Nancy Brian
National Park Service
Grand Canyon National Park

Arthur M. Phillips
SWCA Environmental Consultants

Submitted to:
U.S. Department of Interior
Grand Canyon Monitoring and Research Center
Flagstaff, AZ

31 December 1996
Grand Canyon

Current Park-wide Research & Monitoring

- Archaeology
- Vanishing Treasures
- Natural Sounds
- Air Quality
- Water Quality
- Vegetation
- Fire Restoration
- Wildlife
- Visitor Experience
- Wilderness
- Backcountry
System-wide Archaeological Inventory Program

- NPS funded ($850K) FY03–FY07
- Inventory by Western Archaeological and Conservation Center
- FY03–FY04 → Inventories for Fire and backcountry management plans (4,500 ac, 85 new sites)
- FY05 → Backcountry trails (2,700 ac, 77 new sites)
- FY06 → River corridor and backcountry
Natural Ambient Sound Levels – Aircraft Overflights

**Acoustic Zone and dBA**
- Cold Desert Scrub, 18.5 dBA
- Warm Desert Scrub, 18.6 dBA
- Pinyon-Juniper Woodland, 20.7 dBA
- River Corridor, 25.0 to 65.9 dBA
- Ponderosa Pine, 29.0 dBA

[Map of Grand Canyon National Park with acoustic zones marked]
Air Quality Program

- Monitor air quality, establish trends, reduce air pollution impacts from:
  - Smoke
  - Regional Haze
  - Ozone

![Graph showing data over time](image-url)

Error bars on the official annual average points indicate the cleanest and haziest 20th percentiles.
Springs & Water Quality Research and Monitoring

West Central Grand Canyon Springs (Boucher to Mohawk)
Central Grand Canyon Springs (Red Canyon to Hermit)
Average South Rim Precipitation

Calcium
Magnesium
Sulfate
Chloride
Vegetation Classification from Digital Imagery
Grand Canyon

Tamarisk Management & Tributary Restoration

- Removed >134,000 trees from 70 areas
- 12% required follow-up treatment
- Volunteers donated >8,000 hours

Phase IIa (2003-2005)
- Removed >45,000 trees in 35 areas
- Found 15 new plant species
- Published outreach materials

Phase IIb (2006-2007)
- Volunteers donated >20,000 hours
- Removed >150,000 trees in 163 areas
GCNP Herbarium

- GCNP herbarium contains >10,000 specimens dating back to 1928

- First annual herbarium festival August 5-9, 2005 mounted over 1,100 specimens

- Staff is working with AZ botanists to get the park’s herbarium on-line

- Staff is updating NPSpecies and will publish additions to park flora
Grand Canyon

Mountain Lion Research

GPS locations of P5 crossing Grand Canyon in April 2005

P9 captured near Grandview in February 2006
Wildlife/Human Interactions - Puma

P3; Adult Female; GPS Points from 10/17/04 to 10/09/05

Legend

P3 GPS Points

<table>
<thead>
<tr>
<th>Vertex</th>
<th>Date</th>
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</thead>
<tbody>
<tr>
<td>South Bass Trail Head</td>
<td>Oct 2004</td>
</tr>
<tr>
<td>Village</td>
<td>Nov 2004</td>
</tr>
<tr>
<td>Capture Site</td>
<td>Dec 2004</td>
</tr>
<tr>
<td></td>
<td>Jan 2005</td>
</tr>
<tr>
<td></td>
<td>Feb 2005</td>
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<td>Mar 2005</td>
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<td>July 2005</td>
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<td>Aug 2005</td>
</tr>
<tr>
<td></td>
<td>Sep 2005</td>
</tr>
<tr>
<td></td>
<td>Oct 2005</td>
</tr>
</tbody>
</table>

Roads

- Park Boundary

Puma Project Data Map for NPS Science Center Use Only. Not for Distribution
Produced by Emily Garding on 12/5/2005 at 5:13:56 PM
Mexican Spotted Owl Radio Tracking

Boucher Minimum Convex Polygon
2705 acres
# GCNP Research Permits
## Annual Average, 2002-2004

<table>
<thead>
<tr>
<th></th>
<th>GCMRC</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
</tr>
<tr>
<td>Research Permits</td>
<td>61</td>
<td>41</td>
</tr>
<tr>
<td>Investigators (principal and co-principal)</td>
<td>94</td>
<td>47</td>
</tr>
<tr>
<td>Trips (river, backcountry, overflights)</td>
<td>43</td>
<td>65</td>
</tr>
<tr>
<td>Participants</td>
<td>579</td>
<td>86</td>
</tr>
<tr>
<td>Minimum Requirement Analyses</td>
<td>34</td>
<td>87</td>
</tr>
<tr>
<td><strong>2008 Permits</strong></td>
<td><strong>13</strong></td>
<td><strong>48</strong></td>
</tr>
</tbody>
</table>
Integration of Tribal Perspectives and Values into NPS Management
How do administrative activities and river users affect park resources in the Colorado River Corridor?

(Natural Resources)
- Water Quality
- Wildlife
- Vegetation
- Air Quality
- Soils

(Visitor Experience)
- Quality of Recreation
- Range of Services

Effects
- Resource Damage
- Site Disturbance
- Quality Degradation
- Crowding & Congestion

(Cultural Resources)
- Historic Sites
- Prehistoric Sites
- Traditional Cultural Properties

(Wilderness Character)
- Primitive & Unconfined Recreation
- Non-Mechanized Use
- Solitude
Grand Canyon

GCNP Colorado River & Tributaries Research & Monitoring

• Trails Monitoring & Rehabilitation
• Vegetation Research, Monitoring, & Removal/Revegetation
• Campsite Monitoring
• Wildlife Research & Monitoring
• Cultural Resources Research, Inventory, Protection & Preservation (historic and prehistoric)
• Visitor Experience Research & Monitoring
# Changing Campsite Condition

**1973 -- 1991**

<table>
<thead>
<tr>
<th>Campsite Size</th>
<th>1973</th>
<th>1991</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMALL (up to 12 people)</td>
<td>100</td>
<td>50</td>
</tr>
<tr>
<td>MEDIUM (24 people)</td>
<td>150</td>
<td>100</td>
</tr>
<tr>
<td>LARGE (36 people)</td>
<td>150</td>
<td>250</td>
</tr>
<tr>
<td>TOTAL</td>
<td>400</td>
<td>500</td>
</tr>
</tbody>
</table>
Visitor Experience Monitoring Program

- Quality of visitor experience (temporal & spatial)
- On site impacts: River encounters, attraction site encounters, campsite competition, hiking exchanges, launch/take-out congestion, safety
- Off-site impacts: permit system, use statistics, etc
- Develop new baseline conditions for new CRMP
- Help determine management actions needed to address unacceptable social conditions
Grand Canyon

Campsite Monitoring -- Lower Tapeats Camp RM 133.7

1952

1995

Post 1996 BHBF

Post 2008 HFE

2006
Grand Canyon

Natural Resource Condition Assessments

- Determined through monitoring programs
- Impacts include: campsite proliferation in OHWZ, social trailing, vegetation damage, trail erosion, archeological site damage, etc.
- Treatments include: trail delineation & repair, revegetation of social trails and OHWZ campsites, archeological site mitigations, etc.
Grand Canyon

Integrated Bio-physical Monitoring Design

- Avifauna, Vegetation, Archeological Sites, Campsite Condition
- April (low use), September (high use)
- 45 sites per trip → 15 repeat + 30 rotation
- Develop new baseline conditions for new CRMP
- Help determine management actions needed to address unacceptable resource conditions
Monitoring Wilderness Character

- Involves a collective assessment of resource conditions (affects of human use)
- Quality of visitor experience – opportunities for solitude or an unconfined type of recreation
- Considers impacts of administrative use and activities

<table>
<thead>
<tr>
<th>Administrative River Trips</th>
<th>GCMRC</th>
<th>GCNP</th>
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</thead>
<tbody>
<tr>
<td>River Trips</td>
<td>43</td>
<td>19</td>
</tr>
<tr>
<td>User Days</td>
<td>6,695</td>
<td>4,315</td>
</tr>
<tr>
<td>Participants</td>
<td>579</td>
<td>327</td>
</tr>
</tbody>
</table>
NPS Management Policies 2006

1. Improving Resource Conditions within the Parks

“The Service will also strive to ensure that park resources and values are passed on to future generations in a condition that is as good, or better than, the conditions that exist today. In particular, the Service will strive to restore the integrity of park resources that have been damaged or compromised in the past.”
1. Improving Resource Conditions within the Parks

AMP Goals/GCNPS Desired Future Conditions

- Maintain or attain viable populations of existing native fish, and prevent adverse modification to their habitat (including critical habitat).
- Establish water temperature, quality and flow dynamics to achieve GCDAMP ecosystem goals.
- Protect or improve the aquatic food base so that it will support viable populations of desired species at higher trophic levels.
- Protect or improve the biotic riparian and spring communities within the Colorado River ecosystem, including threatened and endangered species and their habitat.
- Maintain or attain levels of sediment storage within the main channel and along the shorelines to achieve GCDAMP ecosystem goals.
2. Protection and Preservation of Cultural Resources

“The National Park Service will employ the most effective concepts, techniques, and equipment to protect cultural resources against theft, fire, vandalism, overuse, deterioration, environmental impacts, and other threats without compromising the integrity of the resources.”
2. Protection and Preservation of Cultural Resources

AMP Goals/GCNPS Desired Future Conditions

• Preserve, protect, manage and treat cultural resources for the inspiration and benefit of past, present, and future generations.
3. Wilderness Resource Management

“All management decisions affecting wilderness must be consistent with the minimum requirement concept. This concept is a documented process used to determine if administrative actions, projects, or programs undertaken by the Service or its agents and affecting wilderness character, resources, or the visitor experience are necessary, and if so how to minimize impacts.”
3. Wilderness Resource Management

AMP Goals/GCNPS Desired Future Conditions

- Maintain or improve the quality of recreational experiences for users of the Colorado River ecosystem, within the framework of GCDAMP ecosystem goals.
4. Management of Threatened or Endangered Plants and Animals

“The Service will survey for, protect, and strive to recover all species native to national park system units that are listed under the Endangered Species Act. The Service will fully meet its obligations under the NPS Organic Act and Endangered Species Act to both proactively conserve listed species and prevent detrimental effects on these species.”
4. Management of Threatened or Endangered Plants and Animals

AMP Goals/GCNP Desired Future Conditions

• Maintain or attain viable populations of the Kanab ambersnail.

• Restore viable populations of extirpated species.

• Protect or improve the biotic riparian and spring communities within the Colorado River ecosystem, including threatened and endangered species and their habitat.
5. Management of Recreation Use

“Superintendents will develop and implement visitor use management plans and take action, as appropriate, to ensure that recreational uses and activities in the park are consistent with its authorizing legislation or proclamation and do not cause unacceptable impacts on park resources or values.”
5. Management of Recreational Use

AMP Goals/GCNPS Desired Future Conditions

• Maintain recreational trout fishery at Lees Ferry.
The Mission of the National Park Service is to Conserve the Park Resources Unimpaired for Future Generations