GRAND CANYON MONITORING AND RESEARCH CENTER

Protocols Evaluation Program
(Lee's Ferry Trout PEP)

"Final Report of the Lee's Ferry Rainbow Trout Monitoring Peer Review Panel"

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U.S. Geological Survey Field Center
Flagstaff, AZ

LEE'S FERRY TROUT MONITORING PROTOCOL EVALUATION PANEL:

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OUTLINE

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- Background
- Charge to the Lee's Ferry Trout PEP
- Procedures

FINDINGS AND RECOMMENDATIONS
- Develop study objectives w/ stakeholders
- Promote leadership by GCMRC & AGFD
- Develop collaboration among researchers
- Develop ecosystem study approach
- Improve protocol's statistical soundness
- Continue creel sampling
- Initiate monitoring of YOY fish
- Initiate monitoring for whirling disease

Charge to the Lee's Ferry Trout PEP

Evaluate monitoring program and statistical procedures relative to program objectives.

Provide recommendations for developing an effective monitoring program for the future.

Procedures

Information provided:

printed materials
oral presentations
field trip to the Lee's Ferry-Glen Canyon

Deliberations:

Held in Flagstaff 24-25 May 2000.
Completed outline of draft report 25 May

Report:

Panel members wrote individual sections.

D. Culver assembled and edited several drafts and the final report in consultation with the other panel members via email.

SPECIFIC FINDINGS AND RECOMENDATIONS

GCMRC should develop an explicit set of Study Objectives, developed in communication with stakeholders, that will drive all activities

Table 1. Stakeholders' management objectives for the Lee's Ferry rainbow trout fishery.

Management Objectives	Initial (1996)	Updated (2000)	Objective met (2000)
Proportion of population from natural reproduction	50%	>50%	Yes
Total population of Age 2+ rainbow trout	100,000	262,000	Yes
Total length by Age 3	15"	18"	No
Condition (relative weight) of Age 3 rainbow trout	>0.80	>0.90	No

SPECIFIC FINDINGS AND RECOMENDATIONS

GCMRC should promote and provide leadership for collaborative research that leads to integrative understanding of the Colorado River from Glen Canyon through the Grand Canyon

The leadership role of the GCMRC

Collaborative work and integrated understanding

The GCMRC and the new senior scientist

GCMRC outreach to other Grand Canyon researchers

The leadership role of GCMRC

Work with stakeholders to develop a consensus vision that provides for ecosystem-wide management objectives.

Hire a senior scientist with broad ecosystem experience who would bring together GCMRC staff and stakeholders to:

1) reach a consensus on the vision for the ecosystem,
2) define clear management objectives and resulting research objectives that encompass the whole ecosystem, and
3) develop a scientific basis for trade-off analysis between competing objectives (perhaps through research).

Collaborative work and integrated understanding will improve research and management effectiveness.

To understand the impact of dam manipulation on fishes, fishery biologists need to make connections with the physical resource group and other biological study (e.g., vegetation, native & endangered species).

Uncoordinated collection of data by different groups often leads to a data set comprised of incompatible component parts, which are thus of reduced value.

Make creative use of GCMRC research grant funds to achieve research objectives.

Management objectives, developed within an ecosystem framework, should drive research needs found in RFPs and be integrated across physical and biological components.

RFPs should encourage and facilitate coordinated or collaborative research among physical and cultural scientists, and terrestrial and aquatic biologists.

Short preproposals should be reviewed by a panel of scientists and graded for scientific merit, scientific coordination and collaboration and how well the research meets research objectives.

GCMRC should favor proposals that include matching funds to leverage additional research results from available funds.

Undergraduate and graduate student involvement in the research will train a pool of scientists familiar with the characteristics of the impounded Colorado River.

The GCMRC should promote outreach involving Grand Canyon researchers and other members of the scientific community.

Scientific exchange makes research results accessible, sparks interest in the available research opportunities, and potentially increases collaboration by increasing the size of the pool of scientists participating in Grand Canyon research.

GCMRC should organize symposia on the Grand Canyon at existing national meetings (e.g., American Fisheries Society, Ecological Society of America).

GCMRC should provide small grants and office/ laboratory space to bring visiting scientists and their students to GCMRC facilities to work on Grand Canyon research.

Leadership by the Arizona Game and Fish Department (AGFD) is needed to communicate to stakeholders what the management options are and which are optimal.

AGFD has many opportunities for information exchange with the public about fish, wildlife, boating, and hunting through published research reports, extensive websites, displays at boat shows, etc., and through fishing license sales, creel surveys, and fishery regulation enforcement.

AGFD obtains credibility for its knowledge of the Colorado River fishery by its regulation-making authority, so has the opportunity and obligation to communicate with the public about the management of the fishery.

Monitoring and research should be directed towards ecosystem understanding and should directly support adaptive management decisions

For Example:

Discharge water is cold, low in algae, relatively high in nutrients

River behaves like a **chemostat**, generating **gradients** with time and distance downstream in algal abundance and temperature (increasing), and dissolved nutrients (decreasing) with exposure to light.

Concentration at any location depends upon the speed of the river, the dynamics of planktonic algal growth and consumption by herbivores.

Attached algae (*Cladophora)* can be abundant throughout the reach, bathed in cold, nutrient-rich water, with high light during the day.

Yet the trout fishery is being monitored as a single, large population. Surely a trout's home location in the gradient is important.

Linkages between upstream and downstream areas and between aquatic and terrestrial habitats must be explicitly acknowledged.

e.g., relationships among dam release, chemical water quality, macrophytes, phytoplankton, macroinvertebrates, and rainbow trout

Effects of changes in Lake Powell could confound studies of discharge on Glen Canyon reach

Rainbow trout juvenile abundance and development of great blue heron population

Linkages will need to be forged between trout biologists and other groups responsible for studying the Grand Canyon reach

Monitoring protocols should be optimized to maximize statistical power while minimizing collection of unnecessary information

PROTOCOL:

3 samplings per year: April, August, and November

9 sites electrofished for 33.3 min spread over 3 nights

Fish measurements: TL, weight, sex, PIT/coded wire tags

PIT tags for mark-recapture estimates of population size

Trout home range behavior violates assumption that marked fish mix freely with unmarked population

Table 2. Progress to date on project objectives listed in the 1997 monitoring Request For Proposals (Garrett et al. 1997).

	Objective	Objective met
1	Synthesize existing information (published and unpublished) and determine the fishery's likely response (growth, reproduction, recruitment, population structure, size and distribution) to dam operations.	Yes
2	Monitoring to determine population size, structure, growth, distribution, reproductive success and overall recruitment in response to dam operations.	Ongoing
3	Development of methods for estimating needed natural reproductive success and stocking rates to obtain desired recruitment balanced against the carrying capacity for a range of dam operations.	Ongoing
4	Develop evaluation criteria for health and condition of the rainbow trout population.	Ongoing (health assessment discontinued)
5	Evaluate changing health and condition factors in relation to changes in the aquatic food base and nutrient levels determined in the food base RFP.	Ongoing

Monitoring protocols should be optimized to maximize statistical power while minimizing

collection of unnecessary information

STATISTICAL POWER:
Limited power to detect short-term changes in RT abundance (CPUE) e.g., from experimental manipulation of discharges from Glen Canyon Dam

Recommend return to 15 sites, sampling for 20 min
Benefit: Increase statistical power by 63% (Speas)

Recommend random approach to geomorphic reaches.
If original 15 sites were random, this achieves goal.
Current bias toward fishable reaches?

Recommend test whether number of fish weighed and measured can be reduced.
Benefits: Decrease sampling time, fish handling and stress.

Recommend: Compare effectiveness of other sampling techniques: snorkeling, hoop nets, minnow traps
Benefits: Daytime/night-time sampling, less fish handling and stress.
Continue creel sampling of Lee's Ferry fishery

Provides critical information about the trout population while providing opportunity for information exchange between AGFD and an important stakeholder group

Rainbow trout is the sole fish taken at this site, primarily via catch-and-release, one should abandon all other sampling before abandoning the creel.

Creel exploits vast fishing effort, providing statistically noisy estimates of CPUE and fish size composition.

The single access point for the Lee's Ferry fishery facilitates simultaneous collection of CPUE and fisherman opinion data.

Recommend analyzing existing data. How does number of days/mo and different covariates (weekend/ weekday, month, etc.) affect variance of CPUE, size structure, etc.? Adjust creel effort accordingly.

GCMRC remains responsible for determining the impacts of discharge management plans, and the creel provides more information on how discharge affects fishermen than on how it affects fish. Other sampling is still needed.

Initiate monitoring of YOY fish

Variation in discharge affects juvenile fish survival and growth because characteristics of gravel bars and the presence of backwaters are sensitive to discharge and water level

Reproduction and recruitment appear to be occurring year round, so the effects of discharge cannot be assessed through sampling at one or a few times per year

Electrofishing provides little information on recruitment.

Recommend analyzing how sensitive the population dynamics model is to changes in YOY values.

Recommend snorkel or minnow trap survey of the river bank

Monitor for whirling disease *Myxobolus cerebralis*

Rainbow trout in Colorado River upstream are positive

Disease can cause high mortality of infected juveniles

Can infect fish at 8° C and especially at 12-15°C

Methods:

Histological and/or PCR detection in electrofished trout
Biased toward larger fish, provides no early alarm

Histological and/or PCR detection in juvenile trout
Sick fish die early, so infection level is underestimate

Recommend that juvenile hatchery fish be held in **sentinel cages** 10 days in the river and 80 days in a holding facility and then examined histologically for mature spores in head cartilage