Scientific Review Of
The Glen Canyon Dam Modifications to Control Downstream Temperatures Plan and Draft Environmental Assessment, January 1999, and Supporting Documentation.

April 1, 1999

Introduction

The Bureau of Reclamation asked the U.S. Geological Survey for assistance in an independent review of the Glen Canyon Dam Modifications to Control Downstream Temperatures Plan and Draft Environmental Assessment (EA) and supporting documentation. A scientific committee was convened to examine existing scientific data and review the conclusions drawn in the EA. A compilation list of nominees were provided by the Adaptive Management Work Group (AMWG). Gordon Mueller was asked to serve as committee chair and he selected panelists based on their expertise and dissociation with the EA or supporting documentation. Findings were to be supported by citation (or logic) and provided to the Regional Director by April 2, 1999.

The EA presents the proposed action as an "experiment." It acknowledges, and rightly so, that the outcome of warming releases cannot be accurately predicted. Modification to intake structures is presented as the precursor to a series of tests which would be designed to examine the hypothesis that warmer releases from Glen Canyon Dam would enhance humpback chub in the mainstem Colorado River. Specific experimental designs and testing along with a monitoring program would be developed at a later date by the AMWG and Glen Canyon Monitoring and Research Center (GCMRC).

A scientific review of an EA is an unusual request. An EA is an environmental disclosure document that describes and summarizes existing conditions, the proposed actions, other alternatives, and the predicted impacts. It is written and directed toward a public, rather than a scientific audience. The document, in itself, is not designed nor intended for scientific scrutiny. however, this was the charge given to the panel. The analysis and supporting documentation used in EA's often undergo scientific scrutiny prior to use. This needs to be taken into consideration when reviewing the following comments.

Reviewers were asked to review the EA and other supporting documentation and develop their own, individual comments. They were only given 3-weeks for the review. A meeting was held March 24, 1999, in Denver, Colorado, to discuss and summarize their findings. The following report provides a generalized summary of those discussions and includes an appendix containing comments from each panelist. There was no effort to reach consensus on any of the issues.

Comments

Discussions were focussed on the following comments:

1. Is there scientific support for the need of a temperature modification (experiment)? Yes.

There is substantial documentation and evidence that hypolimnetic releases from Lake Powell limit or restrict mainstem spawning by humpback chub and other native fishes in the Grand Canyon. However, the hypothesis that thermal enhancement would disproportionately benefit native fishes is based on extremely naive assumptions. Even if warmer temperatures result in mainstem chub spawning there are no assurances that young would survive. Chub populations in the upper basin appear to be severely depressed by other factors such as habitat degradation and predation.

The fact is, we simply do not have the modeling capabilities to accurately predict what might happen. There are countless unknowns. It's doubtful that anything short of a focussed, well designed "operational experiment," and monitoring plan would provide the information needed.

We support the option of thermal enhancement in the Grand Canyon, however, there isn't enough information presented in the EA to determine if the proposed action (intake modifications) would have the operational flexibility required to enhance native fishes. Also, without a specific and detailed description of the experimental process, it is not possible to determine if objectives can be achieved or impacts avoided or mitigated.

2. Does scientific evidence support the EA's descriptions of potential impacts? Poorly, from the panel's perspective. The description of potential biological impacts was severely limited in scope, detail and supporting documentation. The hypothesis that thermal enhancement would benefit both trout and native fishes is based on extremely naive assumptions. There are several potentially serious threats that were either missing or dismissed that should be included in the discussion.

Young tributary fish entering colder waters of the mainstem Colorado River are subjected to thermal stress and possibly shock. Higher mainstem temperatures would reduce thermal stress, however, they may not increase survival. Mainstem predators would also benefit from increased metabolic rates (higher feeding rates) and swimming efficiency. It cannot be assumed that warmer mainstem temperatures will lead to higher survival rates for young native fish enterring from tributaries.

Even though the primary goal is to enhance mainstem spawning of the humpback chub the EA takes a "hands-off" approach to the rainbow trout fishery. Undoubtedly the recreational fishery is economically important to the region; however, its biological function is misrepresented.

Trout occupy the most productive habitat and represent the greatest fish biomass in the Canyon. It's estimated that rainbow and brown trout feed on nearly 250,000 chub a year. That is a substantial loss considering the Little Colorado River population is less than 8,000 fish. Any action that would benefit trout also should be viewed as a potentially detrimental impact to native fishes.

There is nothing to suggest that the river isn't already at carrying capacity. Experimentation will not create new habitat. The experiment must include options to control or reduce trout and other nonnative fishes. Historical temperatures reached 25°C and there is no scientific reason to limit experimentation to 15°C. It's quite conceivable that the only chance we have to expand the native fishes will be at the expense of the nonnatives.

Serious Threats The threat of increased predation by nonnatives on chub and other native fishes is minimized in the discussion. Literature (published and gray) suggests there is a high probability that predation could increase from an expansion of existing predators or through the introduction of new ones. Striped bass and walleye have recently invaded 160 miles upstream into the San Juan River where attempts are being made to reintroduce native species. Striped bass have essentially replaced trout below Hoover Dam. It's believed these fish were introduced in mass by spillway (surface) releases from Hoover Dam in the mid-1980's.

There is a high probability fish would survive passage through the GC dam and turbines. Acoustic surveys conducted in front of the dam indicate that in highly productive years, small fish could be entrained at a rate of 230,000 fish (@10,000 cfs) per week. Survival rates for small fish would be substantially higher than for larger fish. Species would include threadfin shad, striped bass, carp, sunfish, largemouth and smallmouth bass. Smallmouth bass and walleye may become even more formidable predators than channel catfish. Both species spawn in cold water and smallmouth bass has decimated native fish populations elsewhere in the basin.

Surface withdrawals also could reduce primary production and increase outbreaks of disease and parasitism. Increased detritus/algal inputs from Lake Powell may actually affect light penetration and reduce benthos and periphyton (fish food) biomass in the canyon. Increased temperatures and additional stressors could increase the likelihood of *Learnea* outbreaks (all fish) and whirling disease (in trout).

3. Is additional information and analysis needed in the EA? YES. The preferred alternative appears to have been chosen on the basis of economics and its ability to warm releases. It appears that little or no consideration was given to biological criteria and timing. These factors need to be presented in the comparison and alternative selection process. The proposed alternative may be the cheapest; however, it may not provide the flexibility (timing) needed for native fish enhancement.

Life history information suggests that the timing of warm releases could be critical. While our ability to release warmer waters during March, April, and May might be reduced, such a plan

might be more beneficial to natives than warmer releases during the summer. Earlier releases would coincide with larval drift and may help improve survival. Increased temperatures in June, July, and August would undoubtedly improve fish growth and might reduce thermal shock; however, it could also amplify predation by increasing nonnative fish passage and predator recruitment within the Canyon.

Reservoir elevations greater than 3,670 are needed for surface withdrawals. Reservoir elevations are reported to exceed that elevation 85% of the time; however, reservoirs normally fill in June and July. Informtion regarding the availability of surface waters in March, April, or May needs to be presented.

4. Is there adequate information to insure that negative impacts can be avoided, mitigated or reversed? NO. The panel was unanimous on this issue. The proposed experiment is being presented piecemeal. We feel the EA is incomplete and it doesn't describe the experimental, monitoring, and mitigation processes needed to assure that appropriate steps will be taken to reduce negative or irreversible impacts. With the limited information at hand, we feel there is a significant chance that irreversable impacts would occur.

The EA had several statements that troubled the panel. The statement that the experiment and associated impacts can be stopped at any time fails to recognize that ecological responses will play out on several time lines. While physical impacts might be reversed, biological communities may take years to restabilize. Biological communities often respond dramatically with environmental changes. A single warming experiment could dramatically increase predator recruitment (e.g., channel catfish and brown trout) which would increase predation for the life expectancy (5-10+ years) of those fish. Such predators could remain even though operations would be returned to hypolimnetic releases.

The EA also neglected to discuss the possible role of flow magnitude and duration in conjuction with proposed thermal enhancements. Thermal warming must be influenced by reservoir elevation and release magnitude. These issues should be considered in the experiemental design.

Another concern is whether adequate funding and time will be available to conduct scientifically sound experiments. Adaptive management involves planned comparisons between alternative treatments. The EA neither proposes a proper plan for making comparisons, nor defines what baseline would be used to estimate effects. There are no assurances that adequate funding necessary to provide appropriate monitoring and testing would be available. Testing and operational refinement may take a minimum of 20 years to accomplish. The EA identifies funding for a 5-year maintenance plan and that funding after that period would come from GCMRC. Is there adequate funding to continue this work?

There appears to be little appreciation for the gaps and weaknesses in the current monitoring programs. We recognize the logistical difficulties in sampling Grand Canyon and understand that monitoring is the responsibility of the GCMRC. Excellent research has been conducted, but

it has not replaced the need for a standardized monitoring program. This problem is highlighted by Valdez and Carothers (1998) who reported the absence of adequate baseline data prevented a biological evaluation of steady flow experiments. Without an adequate data base, there is little to suggest that impacts could be detected, measured, and used to avoid catastrophic impacts. At least 2 years of defensible baseline data should be collected for exotic predators before any treatments begin.

United States Department of the Interior

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APR 9 1999

MEMORANDUM

To: Adaptive Management Work Group

From: Charles A. Calhoun
Regional Director

Subject: Transmittal of the Scientific Panel Review of the Glen Canyon Dam Modifications to Control Downstream Temperatures Plan and Draft Environmental Assessment

Attached is a copy of the report of the scientific panel that the Bureau of Reclamation convened to review the draft Environmental Assessment (EA) of the proposed Glen Canyon Dam modifications for the purposes of controlling the downstream temperatures.

In providing the report to you, I also want to share several pertinent information items and an overview of the next steps which, as it now appears, will likely lead to either a Finding of No Significant Impact (FONSI) or the selection of the No Action alternative in the EA. The reason the likely decision choices are limited to two options is, if a FONSI is not possible, Reclamation would have no further reason to continue to study and analyze a project that may have significant negative impacts to downstream resources and would fail to meet our established objectives to remove jeopardy and recover endangered fish.

As you recall at the January 13, 1999, meeting of the Adaptive Management Work Group (AMWG) in Phoenix, four members of the AMWG requested that a peer review be conducted on the draft EA. That request lead to a discussion in which other AMWG members stated their reservations about the appropriateness of a scientific peer review of a National Environmental Policy Act (NEPA) document. Significant concerns were expressed that NEPA documents are summary documents, intended to explain the likely impacts of various actions to the public. They are not, by nature, scientific treatises and do not contain anywhere near the same level of detail as a scientific document. The scientific data is referenced, but is contained in Reclamation's files.

However, because of the nature of the proposed action and to recognize the interests of the requesting members, a scientific review was initiated. As you will see in the cover letter sent to me from the Review Committee Chairperson, Mr. Gordon Mueller of the U.S. Geological Survey, the committee also struggled with the challenge of providing peer review to a NEPA document. The committee did undertake the task and has provided a report that includes a short summary document and specific individual comments from each member.

Reclamation is grateful to the review committee for their work. We understand, as they stated, that they did not have time to fully review all the supporting documentation. The committee did review the draft EA and has provided to Reclamation some excellent questions and comments for our consideration in development of the final EA.

The answers to many of their questions, we believe, are in our supporting data and files. Furthermore, we are treating the peer review as a comment for the record on the draft EA, just as we are receiving and considering the comments of AMWG members, special interest groups, and the general public. This will ensure that the committee's comments and concerns are fully displayed and answered in the final EA.

The committee unanimously supported Reclamation's proposed action to test temperature controls. They found that scientific evidence supported such a test. However, they also stated their concerns relative to the lack of data to support some conclusions as presented in the EA. This was especially the case concerning the lack of specific information related to a monitoring and testing program for eventual operation of the temperature control devices. As the EA indicated, Reclamation's original intent was to develop the monitoring and testing plans within the Adaptive Management Program concurrent to construction of the devices over the next three years.

Because of the importance the scientific review team placed upon monitoring and testing plans, and the fact that those plans are of an overarching relationship to most of the other comments provided by the team, Reclamation has requested that the Grand Canyon Monitoring and Research Center immediately begin developing the plans. The AMWG has already requested (January 1998) that the Center develop such a plan, so no additional action by the AMWG is necessary. The Center has been asked to develop a specific timetable and budget for completion of that task.

The monitoring and testing plans will be one of the primary subjects discussed at the upcoming AMWG river study trip through the Grand Canyon in May and will be a prime agenda topic at the July 20, 1999, AMWG meeting. The final EA will include monitoring and testing plans. Some specifics concerning details of the plans may be refined through the Adaptive Management Program, but the final EA will clearly display the nature of the testing and monitoring plans.

In conclusion, I believe it is important to continue to specifically focus on the subject of this EA. Reclamation is considering whether or not to modify Glen Canyon Dam to allow downstream river temperatures to be managed. As the EA states, it is believed by the U.S. Fish and Wildlife Service and Reclamation that year-round cold water releases from the dam are a constraint to native and endangered fish. The EA and the scientific peer review team recognized that there are other ecological interactions complicating the issue that cannot be conclusively resolved without physical testing.

Finally, I want to remind the AMWG that we have extended the comment period on the EA to April 30, 1999, to provide additional time to consider the attached peer review report and provide your input to us.

Attachment

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April 1, 1999

Mr. Charles Calhoun
Regional Director, Upper Colorado Region
Bureau of Reclamation
125 S. State St., Room 7423
Salt Lake City, UT 84138-1102

Subject: Scientific Panel Review of the Glen Canyon Dam Modifications to Control Downstream Temperatures, Plan and Draft Environmental Assessment (EA) Process.

Dear Director Calhoun:

At your request, an independent scientific review was conducted of the Glen Canyon Dam Modifications to Control Downstream Temperatures, Plan and Draft Environmental Assessment (EA) and associated scientific documentation. Panel members were selected on the basis of their expertise and dissociation with the EA and associated contracts. Several scientists identified by the Adaptive Management Work Group were unable to participate due to prior commitments or conflicts. Five scientists graciously accepted the invitation to review the scientific approach of the EA. These panel members included:

*__Dr. Carl Walters__ (AMWG nominee--University of British Columbia)
*__Dr. Paul Holden__ (Expert on Colorado River native fishes issues --Bio/West Inc.)
*__Mr. Pete Walker__ (AMWG nominee--Colorado Division of Wildlife)
*__Mr. Jerry Landye__ (Colorado River fish health expert--Fish and Wildlife Service)
*__Dr. Brett Johnson__ (Bioenergetics and modeling expert --Colorado State University)

The time available to conduct the review was limited. I instructed panelists to review the supporting documentation and EA and to draft their own specific comments. The committee met in Denver on March 24, 1999, to discuss their findings. All members attended with the exception of Dr. Walters who provided his comments to the committee prior to the meeting.

Discussions focused on whether temperature modifications were needed, whether impacts described in the EA were supported by scientific fact, and lastly if there were sufficient assurances or information to determine if impacts would be reversible. A summary report was

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drafted and submitted to panelists for review. The report was edited and panelist's comments were appended to the report in their entirety.

It became apparent in the review, that the description of the monitoring or testing program wasn't included in the EA. The document stated that appropriate monitoring and testing programs would be developed by the Adaptive Management Work Group and the Glen Canyon Monitoring and Research Center. Unfortunately, we felt a detailed description of the entire "experimental process" was necessary for a comprehensive scientific review. At this point in the planning process, a scientific review may have been inappropriate, or at least, premature.

The review committee went ahead and drafted a summary report based on the information at hand. This review should not be misinterpreted as representing a comprehensive evaluation of the proposed action.

We hope these comments are useful and satisfy your needs. We appreciate the opportunity to participate in this process. If you have any questions please contact me or any member of the review committee.

Sincerely,

Gordon Mueller

Gordon Mueller,
Review Committee Chairperson

Attachments

E-mail cc: Ischinger, Stendell, Moore