Glen Canyon Dam Adaptive Management Work Group
Agenda Item Information
February 9-10, 2011

Agenda Item

Non-Native Fish Control Environmental Assessment

Action Requested

✓ Information item.

Presenters

Glen Knowles, Chief, Adaptive Management Group, Bureau of Reclamation
John Halliday, Native American Tribal Liaison, Glen Canyon Dam Adaptive Management Program, Office of the Assistant Secretary for Water and Science

Previous Action Taken

N/A

Relevant Science

✓ The following describes the relevant research or monitoring on this subject:

Coggins LG, Yard MD. 2010. Mechanical removal of non-native fish in the Colorado River within Grand Canyon. Pages 227-234 in Melis TS, Hamill JF, Coggins LG, Bennett GE, Grams PE, Kennedy TA, Kubly DM, Ralston BE, eds. Proceedings of the Colorado River Basin Science and Resource Management Symposium, November 18-20, 2008, Scottsdale, Arizona. U.S. Geological Survey Scientific Investigations Report 2010-5135.

Grand Canyon Monitoring and Research Center, 2008, USGS workshop on scientific aspects of a long-term experimental plan for Glen Canyon Dam, April 10–11, 2007, Flagstaff, Arizona: U.S. Geological Survey Open-File Report 2008–1153, 79 p.

Hilwig, K.D., Andersen, M.E., Coggins, L.E., Jr., 2009, Nonnative fish management plan for Grand Canyon—a comprehensive approach to management and research of nonnative fish species: U.S. Geological Survey Planning Document, 79 p.

Korman, J., Kaplinski, M, and Melis, T.S., 2010, Effects of high-flow experiments from Glen Canyon Dam on abundance, growth, and survival rates of early life stages of rainbow trout in the Lees Ferry reach of the Colorado River: U.S. Geological Survey Open-File Report 2010–1034, 31 p.

Runge, M.C., Bean, Ellen, Smith, D.R., and Kokos, Sonja, 2011, Non-native fish control below Glen Canyon Dam—Report from a structured decision-making project: U.S. Geological Survey Open-File Report 2011–1012, 74 p., at http://pubs.usgs.gov/of/2011/1012/.

Background Information

Report on Environmental Assessment – Glen Knowles

The Bureau of Reclamation (Reclamation) began the process to develop an Environmental Assessment (EA) for National Environmental Policy Act (NEPA) compliance for non-native fish

control in March 2010, when it was determined that, due to tribal concerns over the taking of life in a sacred place, mechanical removal of nonnative fishes in FY 2010 would be cancelled. Reclamation began development of the Non-native Fish Control EA and reinitiated consultation with the U.S. Fish and Wildlife Service on cancelling mechanical removal. Since that time, Reclamation has invited the AMP federal agencies (Bureau of Indian Affairs, National Park Service, U.S. Fish and Wildlife Service, and U.S. Geological Survey), the Arizona Game and Fish Department (AGFD), and the AMP Tribes (Hopi Tribe, Hualapai Tribe, Navajo Nation, Southern Paiute Consortium, and the Pueblo of Zuni) to be cooperating agencies. All of the Federal agencies, AGFD, the Zuni Tribe, and the Hualapai Tribe are cooperating agencies and completed memorandums of understanding with Reclamation.

In development of the EA, Reclamation has conducted a Non-native Fish Control Workshop (March 29-30, 2010), as well as numerous Cooperating Agencies conference calls to discuss purpose and need as well as elements of potential alternatives. Reclamation also served on a panel entitled "Non-native Fish Removal in the Grand Canyon: Cultural Considerations and Fish Management" at the July 29, 2010, Native American Fish and Wildlife Society Southwest Region 2010 Conference in Scottsdale, Arizona, to discuss the issues surrounding the use of mechanical removal to control nonnative fish species and the cultural concerns of AMP Tribes over this practice.

Reclamation partnered with the U.S. Geological Survey (USGS) Patuxent Wildlife Research Center to conduct a structured decision making (SDM) project on non-native fish management below Glen Canyon Dam (SDM Project) as part of the NEPA process. The purpose of the SDM Project was to use a structured approach to develop and provide substantive input from the cooperating agencies and tribes to Reclamation in the NEPA process concerning management of non-native fish below Glen Canyon Dam. This project provided a forum for the diverse cooperating agencies and Tribes to discuss, expand, and articulate their respective values, to develop and evaluate a broad set of potential management alternatives, and to indicate how they would individually prefer to manage the inherent trade-offs in this management problem.

Two workshops were held at Saguaro Lake Ranch near Phoenix, Arizona, on October 18-20 and on November 8-10, 2010. At these workshops, a diverse set of objectives for the project were defined, a set of alternatives ("hybrid portfolios") was developed, and participants assessed alternatives against the array of objectives. Multi-criteria decision analysis methods were then employed to examine the trade-offs inherent in the problem, and allowed the participating agencies and Tribes to express their individual judgments about how those trade-offs should best be managed in selecting a preferred alternative. The project served to enlist the cooperating agencies in alternative development and analysis. The final report has been published as a USGS open file report (see *Relevant Science* above) and will be provided as an appendix to the EA.

Reclamation and the Department of the Interior continue to meet with each of the AMP Tribes to conduct tribal consultation on the EA. Reclamation continues to work with the cooperating agencies to develop the EA and expects to provide the EA for public review in late January 2011.

Report on Tribal Consultations – John Halliday

By the time of the AMWG meeting, for the purpose of formal tribal consultations, the Tribal Liaison, John Halliday, will have visited with the Hualapai Tribe, the Havasupai Tribe, the Hopi Tribe, the Navajo Nation, and the Kaibab Paiute Tribe and the Paiute Tribe of Utah, both of which are part of the Southern Paiute Consortium. In these meetings, he represented the office of the

Assistant Secretary for Water and Science (ASWS) in consultation with top policy makers within the tribes, creating a connection between the ASWS and the tribal government. He explained the proposed action by federal government agency and received feedback from the tribe. In particular, he discussed any concerns about adverse impacts on the tribe due to the action, and what could be done to mitigate those impacts.

He has also visited informally with the Pueblo of Zuni, whose leadership was not yet prepared to meet in formal consultations because of a transition in leadership.

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Managing Water in the West

Non-native Fish Control Environmental Assessment

Bureau of Reclamation
Glen Canyon Dam
Adaptive Management Program
Adaptive Management Work Group
February 10, 2011

U.S. Department of the Interior
Bureau of Reclamation

History

- Some tribes first expressed concern during the 2003-2006 removal experiment, resulting in a removal and mitigation program using fish emulsion as fertilizer in the Hualapai tribal gardens.
- Later, non-native fish control was added as an important conservation measure of several U.S. Fish and Wildlife biological opinions on operations of Glen Canyon Dam.
- As part of the Annual Work Plan of the Glen Canyon Dam Adaptive Management Program for Fiscal Year 2010-2011, up to two river trips to mechanically remove non-native fish were included and tentatively scheduled for May-June 2010 and 2011.
- The Pueblo of Zuni sent Reclamation a letter on June 30, 2009 in which Zuni Governor Norman Cooeyate expressed the Zuni Tribe's concerns with the "taking of life" associated with mechanical removal, and the failure of Reclamation and FWS to consult with the Zuni Tribe concerning this management action.
- In response DOI representatives attended a meeting with Zuni tribal leaders to hear their concerns on September 15, 2009. In response, DOI cancelled the two planned removal trips in March 2010, reinitiated consultation with the U.S. Fish and Wildlife Service on cancelling removal, and later in 2010 began work on the EA.

Cooperating agencies

Federal:

- National Park Service, Intermountain Region
- Bureau of Indian Affairs
- U.S. Fish and Wildlife Service
- U.S. Geological Survey, Pacific Southwest Area
- Western Area Power Administration

State:

- Arizona Game and Fish Department

American Indian Tribes:

- Hualapai Tribe
- Pueblo of Zuni

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Purpose and Need
Tribal Consultation

- Government-to-government tribal consultation meetings were held with the Zuni Tribe at the Pueblo of Zuni at Zuni, New Mexico, on September 15, 2009, and on March 24 and June 4, 2010; with the Hopi Tribe (March 4 and April 22 2010, January 27, 2011), Navajo Nation (June 9, 2010, and January 26, 2011), Hualapai (March 6, 2010, and January 8, 2011), Havasupai (March 15, 2010), Kaibab Pauite Tribe (March 18, 2010, and January 20, 2011), and the Paiute Indian Tribe of Utah (December 13, 2010);
- Reclamation served on a discussion panel about this issue at the 2010 Native American Fish and Wildlife Society Southwest Conference;
- Assistant Secretary Anne Castle and DOI representatives met with the Zuni Governor and Tribal Council, Zuni Cultural Resource Advisory Team, and the Zuni public at Zuni, New Mexico, on August 5, 2010.
- The Pueblo of Zuni sent Reclamation the Zuni Tribal Council Resolution No. M70-2010-C086 regarding their concerns with mechanical removal and the request that Grand Canyon be included as a TCP eligible for listing on the National Register. This resolution was given to Assistant Secretary Castle at the August 5, 2010 meeting.
- A CA and tribal meeting was held in Flagstaff on August 20, 2010; and,
- CA conference calls were conducted on September 2, 9, 16, 23, 30, and November 4 and 21, 2010, and on January 5, 2011. These often included the tribes that participated as cooperating agencies, the Pueblo of Zuni and Hualapai Tribe.
- Tribes participated in SDM Workshops, October 18-20, and November 8-10.
- A tribal consultation meeting with the Pueblo of Zuni was held on January 25, 2011, during which the tribe indicated that they would prefer, if fish are to be killed, to be used for human consumption as a beneficial use.

Purpose and Need - ESA

September 1, 2010 FWS revised incidental take statement:

"If a decline below 6,000 is documented, such effects exceed the authorized level of take and represent effects not previously considered in this Opinion and reinitiation of consultation should be requested by Reclamation."

November 9, 2010 Biological Opinion on cancelling 2010 non-native removal trips, included terms and conditions:

"Resume nonnative control at the mouth of the LCR in 2011. Attempt to implement the program in a manner compatible with the interests of Tribes and other interested stakeholders.

AND/OR

Work with interested Tribes and other parties, expeditiously, to develop options that would move nonnative removal outside of LCR confluence tribal sacred areas in 2011, with the goal that nonnative removal of trout in sacred areas will be reserved for use only to ensure the upper incidental take level is not exceeded."

Purpose and Need

Purpose of the action is to reduce the negative impacts of competition and predation by rainbow trout and brown trout on the endangered humpback chub (*Gila cypha*) and its critical habitat in Grand Canyon.

The need for this action is to fulfill the conservation measures and terms and conditions of several U.S. Fish and Wildlife Service (USFWS) biological opinions, to contribute to the recovery of humpback chub by helping to maintain high juvenile survival and recruitment rates resulting in an increasing adult population, and to address concerns expressed by American Indian Tribes over the killing of trout in the Grand Canyon, a location of cultural, religious, and historical importance to the tribes.

Structured Decision Making Project

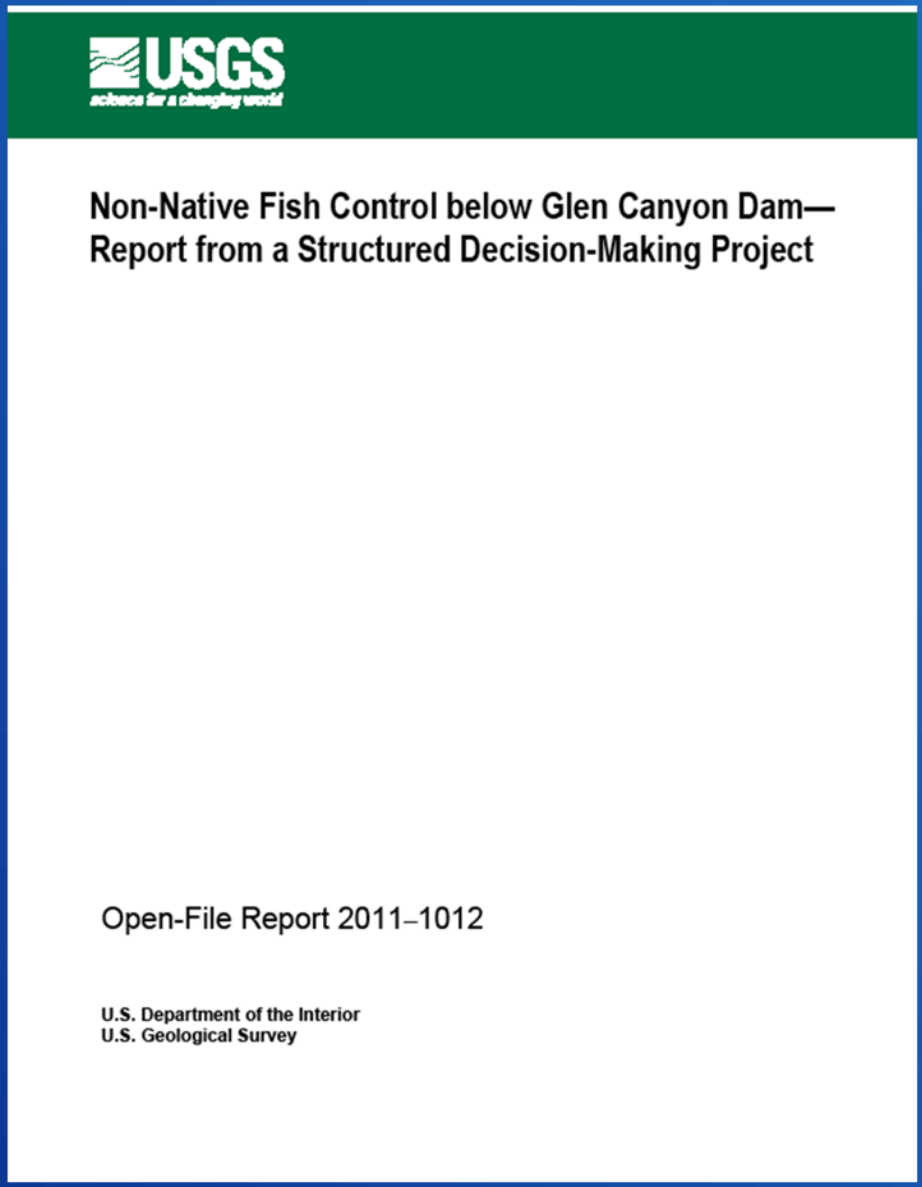
- ASWS Anne Castle's requested that Reclamation partner with USGS Patuxent Wildlife Research Center (Dr. Mike Runge) to conduct a Structured Decision Making (SDM) Project as part of the EA process as a structured approach to develop and provide substantive input from the cooperating agencies and tribes to Reclamation.

- At Saguaro Lake Ranch workshops, October 18-20 and November 8-10, 2010, a diverse array of objectives for the project were defined, a set of alternatives was developed, and participants assessed alternatives against the array of objectives. Multi-criteria decision analysis methods were then employed to examine trade-offs with the cooperating agencies and tribes and assess the performance of alternatives against the objectives.

- The SDM process analysis resulted in a ranking of alternatives. The proposed action was selected using this ranking. In this way, the SDM Project was utilized as an integral part of this EA process in the identification and evaluation of various approaches to address the proposed action. Final report has been published as a USGS Open File Report.

http://pubs.usgs.gov/of/2011/1012/

http://www.usbr.gov/uc/envdocs/ea/gc/nnfc/Appdx-A-SDMreport.pdf



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SDM Results

Hybrid portfolio	AZGF	BoR	FWS	Hopi	Navajo	NPS	WAPA	Zuni	Average
A	0.598	0.527	0.497	0.563	0.498	0.647	0.432	0.462	0.501
C_2	0.505	0.418	0.418	0.450	0.428	0.474	0.308	0.314	0.402
C_3	0.427	0.380	0.373	0.419	0.397	0.443	0.280	0.267	0.361
C_4	0.478	0.440	0.428	0.545	0.458	0.512	0.353	0.370	0.437
C_5	0.444	0.404	0.397	0.527	0.433	0.483	0.326	0.366	0.411
D_1	0.672	0.589	0.649	0.571	0.648	0.629	0.557	0.504	0.606
D_2	0.584	0.538	0.596	0.525	0.610	0.598	0.519	0.457	0.554
D_3	0.610	0.578	0.623	0.618	0.645	0.651	0.565	0.558	0.603
J_1	0.522	0.496	0.567	0.586	0.553	0.503	0.501	0.519	0.539
J_1'	0.610	0.525	0.583	0.528	0.537	0.508	0.523	0.481	0.545
J_2	0.439	0.452	0.519	0.559	0.522	0.474	0.472	0.471	0.497
J_2'	0.524	0.479	0.532	0.497	0.503	0.473	0.491	0.433	0.500
K	0.365	0.387	0.426	0.459	0.436	0.472	0.293	0.346	0.390
Rank									
1	D_1	D_1	D_1	D_3	D_1	D_3	D_3	D_3	D_1
2	J_1'	D_3	D_3	J_1	D_3	A	D_1	J_1	D_3
3	D_3	D_2	D_2	D_1	D_2	D_1	J_1'	D_1	D_2
4	A	A	J_1'	A	J_1	D_2	D_2	J_1'	J_1'
5	D_2	J_1'	J_1	J_2	J_1'	C_4	J_1	J_2	J_1

D1 – Removal curtain – includes PBR Removal to test limiting emigration of trout from Lees Ferry to reduce trout numbers at LCR, and LCR removal as a means to directly address the threat of predation and competition if needed. Mitigation of freezing fish removed for beneficial use to address tribal concerns.

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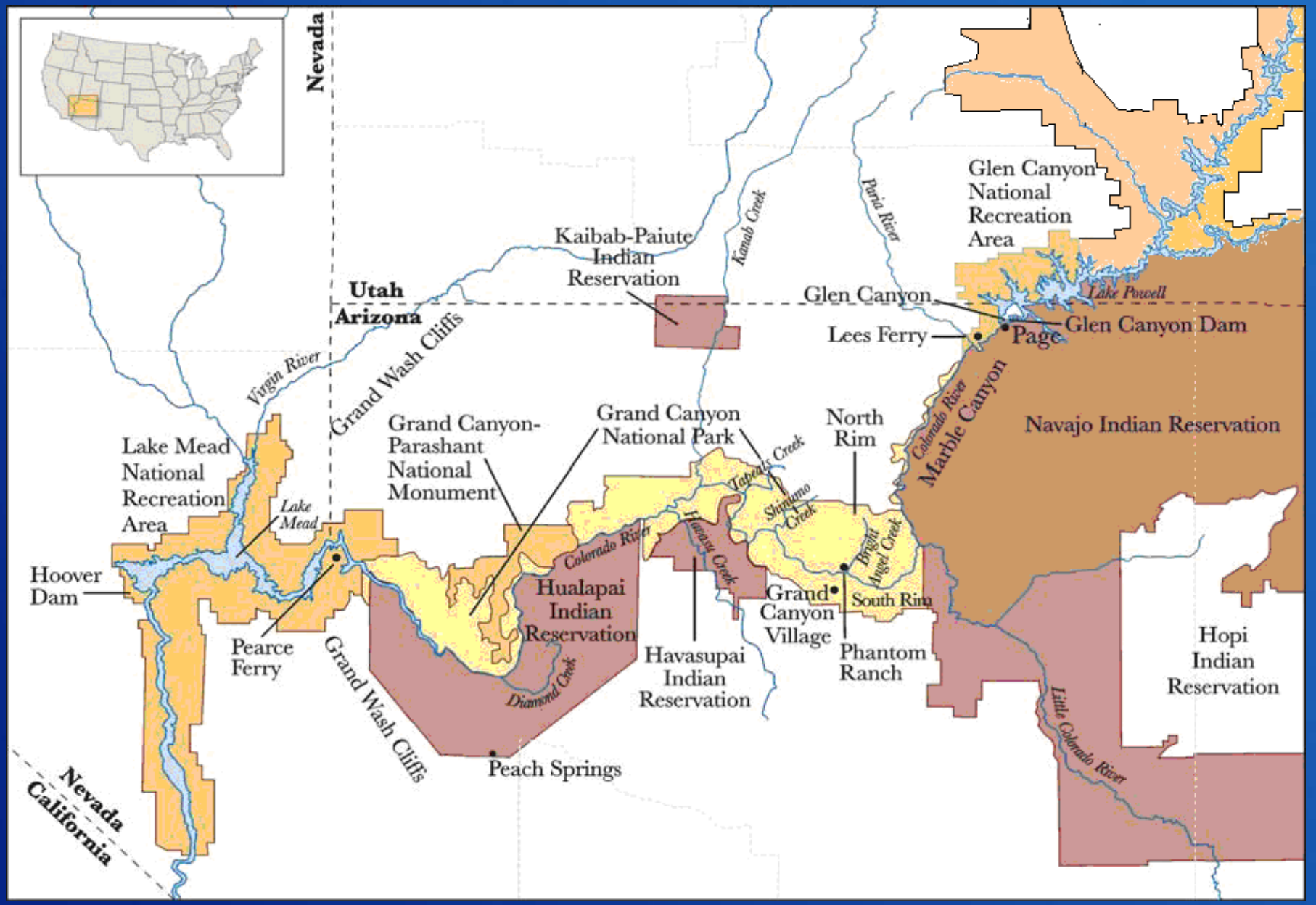

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SDM Project Results

- Existing data indicate that removal is effective at limiting trout numbers and losses of humpback chub to predation.
- GCMRC reported about 6,000 juvenile hbc lost annually at high trout abundance in the absence of mechanical removal.
- In expert elicitation of biologists during the SDM Project, support was high for the hypothesis that rainbow trout limit recovery of humpback chub through predation and competition, averaged probability of certainty of 0.653 (0.463-0.780).
- Trout and chub models used in the SDM Project indicated that flows were less effective at meeting objectives (based on data, 2003-2005 trout suppression flows were ineffective due to compensatory survival).
- Trout and chub models used in the SDM Project indicated a strong effect of HFEs on trout abundance and related adverse effects to humpback chub. LCR and PBR removal provides the best opportunity for mitigating the potentially harmful effects of HFEs on the LCR chub population.

Proposed Action

- Remove non-native fish, mostly trout, to reduce non-native fish abundance at the confluence of the Colorado and Little Colorado rivers, from river mile (RM) 56 to 66, area of greatest humpback chub abundance in the mainstem Colorado River and so predation losses are greatest.

- In order to achieve this reduction, the proposed action, in coordination with related actions, includes reducing emigration of rainbow trout and brown trout from source populations in Glen and Grand canyons.

- Up to 10 boat-mounted electrofishing trips per year would occur in the Paria River to Badger Creek reach (PBR reach, RM 1 to RM 8) and up to 6 removal trips in the LCR reach (RM 56 to 66). Fish that are removed will be frozen for later beneficial use. The proposed action will take place from 2011-2020.

- Adaptive Management component: The EA proposes that determining the location (LCR or PBR) and extent of removal actions will based upon both numbers of rainbow trout in the LCR Confluence area and adult humpback chub abundance and other humpback chub population parameters, and that flow actions be tested.

Role of Adaptive Management in Non-Native Fish Control, GCMRC Science Plan

GCMRC Science Plan Science Questions:

- **Can a decrease in non-native fishes be linked to higher recruitment rate in humpback chub?**
- **Can PBR removal lower densities of trout in the LCR Reach?**
- **Can non-native fish control offset any increases in trout from HFEs?**

Removal will be conducted in conjunction with a science plan being developed by GCMRC. GCMRC has proposed 3 options:

1. **Postponing LCR Removal until hbc juvenile mainstem survival rates drop below 25%.**
2. **Postpone LCR Removal for one year.**
3. **Implement LCR Removal for six years.**

Important Considerations and the Role of Adaptive Management in Non-Native Fish Control

- Evidence indicates the effect of trout on humpback chub is substantial: “the weight of evidence indicates that rainbow trout are playing an important role; when rainbow trout populations are large, humpback chub populations generally decline, probably due to a combination of increased competition and predation.” (Wright and Kennedy 2011).

- HFEs may compound this. The 2008 HFE resulted in an 800 percent increase in rainbow trout in the LCR reach, although some of the increase may have been due to local recruitment (Wright and Kennedy 2011).

- More evidence of the direct effect of non-native fish on humpback chub is desired because many stakeholders in the GCDAMP remain skeptical that controlling non-native fishes is necessary for humpback chub recovery, so goal is to reduce uncertainty and address risk.

NATURAL RESOURCES	CULTURAL RESOURCES	SOCIOECONOMIC RESOURCES
Water Resources Water Quality Air Quality Sediment Vegetation Terrestrial Invertebrates and Herptofauna Aquatic Food Base **Fish** • **Humpback chub** • **Razorback sucker** • **Other native fishes** • **Trout** • **Other non-native fishes** • **Fish habitat** Birds Mammals	**Historic Properties** **Traditional Cultural Properties** **Sacred Sites**	Hydropower **Recreation (including Public Safety and Sport Fishing)**

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Compliance Process

Reclamation released the draft EA to the public on January 28, 2011 and requested concurrence from the U.S. Fish and Wildlife Service on a “may affect, but is not likely to adversely affect” determination for humpback chub and razorback sucker.

NHPA Section 106 compliance with the tribes is continuing. Reclamation has determined that the action would cause an adverse effect to tribal cultural properties and sacred sites, and is working on mitigation for the effects with the tribes. Reclamation plans to create a memorandum of understanding with NPS, the SHPO, THPOs, and tribes for the action.

This EA and action is also needed in part to address the adverse effects to native fish from implementation of the HFE Protocol.

Next Steps

The EA is available on the Reclamation website at:
http://www.usbr.gov/uc/envdocs/ea/gc/nnfc/index.html

Comments are due by February 28, 2011:

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