

Biology Committee Webinar Draft Agenda
8:30 a.m. - 2 p.m., Friday, September 30, 2011

To join the meeting, please follow the directions below. If you have not previously used Verizon Web Ex conferencing software, please test it prior to the meeting. Contact Angela Kantola (angela_kantola@fws.gov) if you want to do a trial run (~5 min.). This will help us start our meeting promptly at 8:30 a.m. with no delays.

Meeting Time: 8:30 AM - 2:00 PM MOUNTAIN DAYLIGHT TIME (With a short break for lunch). Angela will start the web portion of the meeting by 8:15 a.m. so that everyone can get connected and work through any technical difficulties before the 8:30 a.m. start time.

Web Conference Details:

Meeting Number: 742936817

Meeting Passcode: (None)

Meeting Host: ANGELA T KANTOLA

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Phone Conference Details:

Please dial in using the toll-free number: 866-762-0576, Participant Passcode: 2759325# (NOTE: THIS IS A DIFFERENT NUMBER THAN THE ONE TYPICALLY USED FOR PHONE-ONLY CONFERENCES)

CONVENE: 8:30 a.m.

1. Review/modify agenda (Trammell; 5 min)
2. Review previous meeting assignments and discuss ways to manage (consolidate) the assignments list (see Attachment 1) (All; 30 min)
3. Reports
 - a. Review of draft final report: Price River (Chart; 30 min) – *Draft sent to the Committee by Tom Chart on 6/22/11; review deferred from July 12 meeting to allow more time for review.*
 - b. Update on White River flow recommendations report (Mohrman; 15 min) – *Jana will provide a summary of comments received on this report (some of which are conflicting).*
 - c. Review reports due list (All; 10 min) – *Angela Kantola will e-mail the Committee an updated list in advance of the meeting.*

10:00 a.m. BREAK (10 min.)

4. How to approach the required review of the Flaming Gorge flow and temperature recommendations and identifying which recommendations are most in need of review/reconsideration in light of new scientific findings (Chart; 45 min) – *Tom Pitts suggested that Program staff first identify a proposed process/plan/schedule for completion by the Biology Committee. This would include the tasks that need to be completed, the roles*

and responsibilities of the Service, Program staff, Biology Committee, and the time frame for conducting the review, as well as the scope and objectives. Tom Chart agrees and thinks the Recovery Program's primary task will be to evaluate the technical information to determine if refinement of the flow recommendations is necessary at this time. Hopefully, those same efforts will assist Reclamation (and the Service and WAPA) in an evaluation of how current Flaming Gorge operations are meeting the intent of the recommendations. Both pieces will be needed to fully evaluate progress on this recovery action (providing flows to assist in the recovery of the endangered fish) and could have bearing on the State's and Reclamation's current Green River modeling efforts. The PD's office will provide information in advance to begin Committee review of two issues: 1) How to apply the findings of Bestgen et al. 2011 to the annual Flaming Gorge spring flow requests (this will build largely on Reclamation's questions which were presented by Dave Speas to the Committee and which formed the basis of Bev Heffernan's presentation to the Management Committee); and 2) timing/content of a Recovery Program RFP to evaluate the Flaming Gorge flow recommendations (with timing being critical in light of current limited funds and still-missing critical (e.g. backwater synthesis and CSU's analysis of smallmouth bass early life history as affected by environmental conditions).

5. Elkhead summer releases update (Chart; 15 min) – *The Program called for high flow releases from Elkhead for a few days in August to support a sustained flow of ~1000 cfs in the Yampa River at Maybell. Releases were made through the screened dam outlets to prevent nonnative fish escapement. The purpose of these releases was to allow researchers to capitalize on the wet conditions to more effectively manage the nonnative smallmouth bass and northern pike.*
6. Thunder Ranch (Speas or Uilenberg, 10 min) – *The high runoff damaged floodplain management structures at Thunder Ranch. Of the three breaches in the riverside levee and the setback levee we constructed there, flows overwhelmed the armored notch and damaged ~350' of levee. Tom Chart and Brent are working with Dan Schaad to determine the cost of repair (which we're required to make under the terms of our flood easement with the owners of the Ranch), and to estimate the cost of a water control structure that would retain water to maintain entrained larval razorback through the winter and allow the site to be re-set. (The Biology Committee identified a water control structure at Thunder Ranch as a very high priority after last year's floodplain tour.) Brent will provide the Management Committee a cost estimate and will need the Committee's approval via conference call or e-mail to spend capital project funds on the repair and potentially the additional water control structure (the latter of which would need Biology Committee approval).*
7. Tusher Wash (Czapla; 20 min) – *Please see item #7 in the assignments list (Attachment 1). No progress to date; the Committee will discuss how to move forward with this work.*
8. Basinwide nonnative fish management strategy (Martinez; 15 min) – *The Committee will receive the draft strategy in early September. Pat will provide a brief update on the strategy and comments received to date. The Committee will discuss review process (e.g., Nonnative Fish Ad Hoc Group, agenda item for December 7-8, 2011, Nonnative Fish workshop.*

12:00 p.m. LUNCH BREAK (30 min)

9. Ad hoc group work to revise the Program's integrated stocking plan (Czapla; 10 min) – *The group is primarily discussing size at stocking and conditioning. By September 30, they may have held three conference calls (7/20; 8/31 and late September).*
10. Humpback chub genetics management plan ad hoc group (Czapla, all; 35 min). *At the recent Management Committee meeting, Tom Pitts recommended the Biology Committee develop an action plan for establishing refugia for humpback chub and avoid getting bogged down in genetic analysis. Dave Speas suggested asking Manuel Ulibarri to provide a summary of the recent hatchery meeting at Dexter that touches on this topic. Mike Roberts recommended also building in limiting factor/life history studies to better understand what's going on in the system that's affecting humpback chub populations.*
11. PIT tags and equipment options (Speas; 20 min)
12. Research framework (Czapla, all; 15 min) – *Committee members had an assignment to review the [Research Framework](#) recommendations in advance of reviewing the FY 12-13 work plan in July. Those recommendations are shown in Attachment 2. Does the committee see items that should be captured in contingency projects or the next round of Program Guidance?*
13. Schedule next meeting/webinar/or conference call (All; 5 min) – *Agenda items may include:*
 - Final report reviews:
 - Review of White River flow recommendations
 - Westwater humpback chub population estimate
 - Razorback emigration from Stirrup
 - Native fish response to nonnative fish management in the middle Green
 - Process for review of the Flaming Gorge flow and temperature recommendations
 - Humpback chub action plan
 - Basinwide nonnative fish management strategy
 - Review of 2012-2013 contingency list and cuts to nonnative fish management budgets (this review will be most timely after the 2012 budget picture becomes more clear and the Committee reviews recommendations from the December 7-8, 2011, nonnative fish workshop)
14. Consent items: Review and approve July 11-12, 2011, meeting summary: *A revised summary (correcting the spelling of Fontenelle and information on the Roots Reservoir screen) was distributed with this agenda. As **this is a consent item, Committee members are to communicate any items of concern to Angela Kantola in advance of the meeting.***

ADJOURN by 2:00 p.m.

Attachment 1: Assignments
(Asterisked items also on meeting agenda)

Note: the order of some assignments has been changed to group similar items together.

1. The **Program Director's office** will work with **CDOW** and **Aaron Webber** on the potential for designing a permeable, hydrologically-stable (gravel?) berm to prevent northern pike access to the oxbow slough at RM 151 on the Yampa, and then clean it out once and for all.
 - 10/30/08: *CDOW has contacted the property owners of the RM 151 backwater, but hasn't been able to meet with them yet. Mark Wernke from Reclamation is willing to take a look at the property with CDOW. A fairly long berm would be required (>3,000') and we'll need to determine the best type (more permanent configurations could be very expensive).*
 - 1/15/09: *Tom Nesler said they plan to get engineers develop specs/estimates this spring for something like a 10-year berm structure; the next step will be to find funding (perhaps as a habitat project through GOCO). This would be the first of three or four such projects. Tom Pitts suggested that if the Program provides some matching funds (annual or capital), it might improve the probability of getting GOCO money. Tom also suggested that if we have a project in the hopper, we might be able to compete for end-of-year Reclamation funds.*
 - 2/10/09: *the Program Director's office considers this a high priority and will contribute funds, if available (see revised FY09 budget).*
 - 2/20/09: *Recovery Program funds likely available; CDOW working to get engineers on the ground; Nesler considering different approaches (berm, fill the oxbow, etc.).*
 - 4/20/09: *Tom Nesler said they've met with the landowner and Reclamation engineers will do an onsite survey as soon as the snow melts.*
 - 1/5/10: *Project deferred indefinitely; Reclamation cautions that the lesson from the Butch Craig floodplain site is to be very careful before considering modifying habitats. Based on the channel dynamics in this area of the Yampa River, it would be unwise to construct an impervious dike at the mouth of this backwater.*
 - 1/14/10: *The Committee discussed other options to eliminate spawning in this area; the **Program Director's office** will provide Mark's trip report to the Committee and work with CDOW to outline options for Committee discussion at the next meeting (options could include: make the entrance too shallow for adults; a dike set back instead of right at the river; direct removal/net sets; piscicides, etc.)*
 - 2/22/10: *Program Director's office provided Mark's report.*
 - 3/10/10: *CDOW will work with Reclamation to flesh out their gravel proposal and review additional options (e.g., plant eradication, barriers, etc.). This will be on the May 6-7, 2010 Committee agenda.*
 - 5/6/10: *Sherm Hebein said **Reclamation** will conduct a site visit with **CDOW** in July 2010.*
 - 8/18/10: ***Sherm** hopes to schedule a visit after the landowner cuts the grass in ~2 weeks.*

2. 3/11/11: Harry Crockett provided a list of habitats CDOW would like to work on (attachment 3 to [March 1-2, 2011 BC meeting summary](#)). A rapidly eroding bank at the Yampa SWA is the highest priority, but CDOW can't access funds to stabilize it until July 1. **Harry** and **Dave Speas** will talk with Brent Uilenberg about the possibility of getting capital funds; **Harry** will follow up with CDOW to make sure they could move forward with the temporary fix this year. **CDOW** also will look to see if other funds might be available. Other items on the list may be considered after a synthesis of the northern pike data.

- *5/2/11: Sherm Hebein at CDOW found funding and the bank stabilization project at Yampa SWA was completed on April 13, 2011, just prior to rapidly-increasing flows. Billy Atkinson reported that he believes the project was successful and that we will not see further bank erosion in this particular stretch, and potentially alleviate connectivity to the adjacent pond system. See photos on next page. CDOW will do more permanent work on this Yampa SWA site later this year. Harry clarified that in an exceptionally high water year like this, there will still be sheetflow over the site from upstream, but hopefully the bank will hold so that the site doesn't connect in lower water years. CDOW will still be looking for funding for other items on their "bucket list."*
3. **Within the next month, >the **Service and Program Director's office** will provide the Committee a draft addendum to the White River report that will present the measured flow requirements in a historical hydrologic perspective. The Program Director's office also will research where we left Schmidt and Orchard's draft report on peak (channel maintenance) flows and recommend whether to have it reviewed by the geomorphology panel.*
 - *10/16/08 Pending; out by the end of ~~November~~ 1/5/09: February 2009.*
 - *2/20/09: Bob Muth said he's making good progress on this and he'll have a draft to the Committee by ~~early March~~ end of April. 7/8: Mohrman and Chart expect to provide drafts of this and Price River report by the end of August 2009.*
 - *9/21/09: Chart and Mohrman have made good progress on this, but other priorities have so far prevented completion.*
 - *1/14/10: still pending*
 - *5/6/10: The Program Director's office will complete the addendum to the White River report and provide a status update and recommendation on the draft Schmidt and Orchard report on peak (channel maintenance) flows for Biology Committee review by ~~December 31, 2010~~ March 15, July 1, 2011.*
 - *Sent to BC July 1, 2011; update on comments on 9/30/11 webinar agenda.*
 4. ****Program Director's office (Jana Mohrman and Tom Chart)** expect to provide a draft of the Price River report by the end of August 2009. 7/13/09: Dave Speas said the goal for the Narrows EIS is to get it out for public review in the fall, so the above schedule should work. The PD's office will keep the Service's SLC-ES shop in the loop on Price River.*
 - *1/14/10: PD's office will continue to communicate with Reclamation re: Narrows.*
 - *3/3/10: PD's office working with SLC-ES to determine how to move this forward.*
 - *5/6/10: The Program Director's office will complete a position paper (or similar construct) on Price River endangered fish flow needs and submit it for Biology Committee review by September 1, 2010.*
 - *12/12/10 Program Director's office will use the information currently available to >develop a position paper on Price River flow recommendations for Committee review. The Program Director's office will revise the draft Price River position paper and get it to the Biology Committee within the next week, with comments due a month later.*
 - *Price River position paper sent 12/30/10 with comments due Jan. 31/ 11. UDWR may submit a Price River PIT tag proposal for "activities to avoid jeopardy" funding.*
 - *3/11/11: **Tom Chart** will respond to comments and revise the report (in consultation with the Service) and bring it back to the Committee by July 1, 2011.*
 - *6/21/11: Sent to Biology Committee; on 7/12/11 agenda (7/12/11: review/approval deferred to 9/30/11 at Tom Pitt's request).*

5. *The **Program Director's office** will prepare a list of issues to be resolved regarding Tusher Wash screening (e.g., what levels of mortality are acceptable for what size classes, potential O&M costs, etc.) to help move this decision forward (and provide that to the Biology Committee and the Service). *Done.*
 - *5/6/10: A small group (Melissa, Kevin McAbee, Dave Speas, Tom Pitts, and Tom Czapla) will work with Kevin Bestgen to review/build on the risk assessment, focusing on understanding existing impacts and what could be gained by various screening options. Tentatively, it would seem the best choice would be fish friendly runners with a screen on the irrigation ditch (contingent on further analysis). BC to submit proposal to MC by 12/31/10.*
 - *11/23/10: Conference calls held 11/10 and 11/24 and scheduled for 12/2. 12/13 BC discussion: The Biology Committee recommended >starting with a literature review (there may be good information from low-head structures in the eastern U.S.); working on outlining what would be needed in a mortality study (including engineering considerations); and further investigating whether the owners would consider full or partial decommissioning.*
 - *1/24/11: Dave Speas will talk to Reclamation's Tech Center about working on this (done).*
 - *3/1/11 As Kevin McAbee gets engineering info from the irrigators, he will share it with the ad hoc group. Kevin also will inquire more about the purpose of the 9" (at riverbank) – 20" (at center) concrete cap, to determine whether it is to benefit the existing diversion, or both the existing diversion and the proposed diversion on river left.*
 - *5/13/11: Dave provided a list of questions from Juddson Sechrist; the Tusher ad hoc group reviewed and discussed these on April 4 (summary sent to BC 4/20/11), agreed to have another meeting (site visit) this summer, and re-iterated the need for an initial literature search/review focusing on fish mortality at other sites with small hydro-electric facilities and smaller hydraulic head differentials. Krissy Wilson would like to participate in the site visit. >Tom Czapla will schedule the site visit (and talk to Kevin McAbee to see if he can arrange for the group to tour the inside of the facility). The Program Director's office and Reclamation will discuss how to get the mortality study done after we determine the information needs and timeframe.*

6. Melissa believes an Environmental Assessment of the impacts of the humpback chub captivity management plan (also addresses how to deal with captured roundtail chub) will need to be written; **Krissy** will work with **Melissa** on the EA.
 - *7/13/10: Melissa needs to coordinate with the NPS if this is the case and she intends to do that in the next few weeks.*
 - *10/6/10: John Reber reported that Melissa Trammell will do the EA for this.*
 - *5/13/11: The humpback chub genetics ad hoc group will need to meet, then Melissa can prepare an EA. >Harry Crockett will check with CDOW to be sure the putative humpbacks at Mumma get moved to Ouray NFH – Randlett (will need an import permit from Utah Dept. of Agriculture). (Krissy noted that all states now require imports to have AIS certification (Krissy sent the criteria to the Committee on 7/7/11, as well as disease certification.) >Dale Ryden will also talk to Dave Schnoor.*

7. The **Program Director's office** will communicate with Gary White to determine how many and which of the questions from the HBC workshop to focus on. *Pending.* **Derek Elverud** will provide the database for Westwater for Gary White to combine with Black Rocks, which will require a separate SOW.
 - *10/6/10: Travis Francis said they plan to complete the reports, then revisit a SOW for*

- assistance from Gary White. 3/10: pending.
- 4/28/10: Derek Elverud has finished compiling the Westwater data to send to Gary White. Travis Francis is going to combine his Black Rocks data set with the Westwater data and his report (when he has time after he gets out of the field).
 - 5/13/11: Data have been transferred; **Program Director's office** will check to make sure we've got this analysis covered.
8. ***Tom Czapl**a will send out the briefing paper he received with the humpback chub genetic data to the Biology Committee (done). **Melissa Trammell** will review Dexter's new plan to see if it may impact this (also will talk to Tom Czapl).
- 3/11/11: **Melissa** will talk to the Park about what they want to do with the chubs in captivity at Ouray and Mumma (likely return them to the river after acclimation) if the Program does not want to keep them. Melissa suggested assessing morphology now that the fish have matured somewhat (Travis said he's seen the fish and they don't look like humpback to him). The Committee agreed to keep the fish in captivity for now.
 - 6/21/11: Pending outcome of discussion by humpback chub genetics ad hoc group (7/12/11: Czapl convening).
9. *The **Service (GJ-CRFP and the Program Director's office)** will make recommendations for how/where to manage the fish spawned this year at the Grand Valley facility and bring those back to the Biology Committee.
- 8/18/10: Will be discussed during the health condition profile meeting. The **Program Director's office** needs to schedule discussion//revision of the integrated stocking plan.
 - 9/30/10: >**The Program Director's office** will set up a work group for revising the propagation plan (Krissy and Michelle will assist).
 - 3/11/11 The Biology Committee directed Dave Schnoor to focus on size, not numbers, and not to try to harvest fish in the spring, since additional funds are not available.
 - 5/13/11: A meeting was held at Dexter and a summary will be out in the next few days. Results of the health condition profile meeting should be incorporated into the revised stocking plan. >**The Program Director's office** will convene a group to revise the integrated stocking plan (likely pretty much the same group to work on humpback chub genetics). Horsethief pond water may be whirling disease positive, but Krissy said that Utah can apply for a variance from their Fish Health Board since the fish will be stocked where whirling disease is present and razorback are not known to carry WD. The **Program** needs to move forward with an ad hoc group to revise the integrated stocking plan and to evaluate our stocking program (include cost-benefit analyses). Travis would like to be involved in that group. Dale suggested also including Dave Schnoor. Scott Durst has done considerable work on this in the San Juan and might be helpful; >**Tom Chart** will talk to Dave Campbell about this. Tom Chart said he thinks the **Program Director's office** can initiate the cost-benefit analysis.
 - 6/2/11: Core group identified: Harry Crockett, CDOW; Krissy Wilson, UDWR; and Pete Cavalli, WFG; Dale Ryden and/or Dave Schnoor, USFWS; Dave Campbell and Scott Durst, San Juan Recovery Program; and input from hatchery managers as needed (particularly as it pertains to space at facilities).
10. **Tom Czapl**a and **Krissy Wilson** will develop recommendations for where and when to stock the Wahweap bonytail (e.g., floodplains before spawning) and send those to the Committee.
- 5/4/11: ~6,780 bonytail were stocked at the Stirrup in early April 2011 (because movement

will be detectable by the remote antennae).

- *5/13/11: Krissy said they have an additional 13,000 fish that are not PIT-tagged yet that need to go out in the fall (and will convene a **group** to discuss where they should be stocked – may be discussed along with integrated stocking plan revisions).*
11. **Dale Ryden** and **Dave Schnoor** will write up the Ouray hatchery needs (water source for Randlett and generator for Grand Valley) and submit this to the Program via Tom Czapla. **Dale** also will seek Service funding for these needs. The report will include a discussion the relative risks of power outages at Grand Valley. Melissa suggested that for the long-term, we need a feasibility study for alternative water sources for Randlett.
 - *5/13/11: Dale said Reclamation says alternative water sources would have a \$10M price tag. The Service has been discussing the manganese problem and will convene a group to discuss (Program Director's office, hatchery folks, Reclamation, etc.). Dave Schnoor has been exploring the idea of a generator for the Grand Valley unit, but hasn't come up with anything yet. Dale said the **Service** should have a more comprehensive idea about these things in a few months.*
 - *7/6/11: Dale e-mailed write-up (discussed briefly at 7/10-11 BC meeting).*
 - *8/24/11: Service purchased Grand Valley Unit generator. Service/Reclamation met to discuss manganese; proposal to hire contractor and install additional filters pending.*
 12. The **Service's CRFP office** is working to salvage as many fish as possible from the soon-to-be-discontinued leased ponds this year. Analyses show fish stocked in the summer have the lowest survival rate, so the **Service** will recapture and stock the fish as soon as possible.
 13. The **Biology Committee** will work on prioritizing their list of potential additional capital projects at a future meeting. *Ongoing.* By September 22, 2010, **Committee members and others** who suggested capital project ideas will provide short explanatory/descriptive text (preferably just a paragraph), and then the **Committee** will decide when to take the next steps (individual ranking, group discussion of combined ranking, etc.). *UDWR comments submitted; next BC discussion on hold.*
 14. The **Program Director's office** will follow up on establishing a process to track percentages of hybrid suckers using standardized protocol for identification of hybridization at fish ladders and in monitoring reaches.
 15. Northern pike synthesis – 5/13/11 **Harry Crockett** will let Billy Atkinson know it will be helpful to compare the recruitment information to Billy's tag records from above Hayden (Harry will ask Billy to make his data available to Kevin Bestgen and Koreen Zelasko).
 16. ***Biology Committee members** will review the Research Framework recommendations in advance of reviewing the FY 12-13 work plan in July. *Not done; suggest review for FY 14-15 Program Guidance.* The **Program Director's office** will revise the Research Framework report on the web include a “last updated on” statement and a caveat that clarifies that this was incomplete and was a “point in time” database and direct users to the Program's laserfiche library and Program website. They also will correct the wording at the bottom of the second page of the report that suggests it is a “review draft.” *Pending.*
 17. Spring Flows 2011 – aerial photography - 7/10/11: *See Attachment 2 for reaches flown. The*

Program Director's office will look into potential partners to help fund stitching and georeferencing. 8/24/11: In progress.

18. **Krissy Wilson** will forward the Committee UDWR's plan for larval light trapping in Flaming Gorge Reservoir (looking for burbot) when she gets it.
19. The **Program Director's office** will make a recommendation regarding whether or not to password protect the PIT tag GIS site. *Pending.*
20. **Jana Mohrman** will parse the peak flow analysis into pre- and post-reservoir construction where applicable. *Pending.*
21. The **Program Director's office** will review indirect costs inconsistencies raised by UDWR and make a recommendation for how to address. *PD's office has been discussing with UDWR; nothing to report to the Committee at this time.*
22. As the FY12-13 budget situation becomes more clear, the **Biology Committee** will review and prioritize current contingency projects and the passes that were cut from nonnative fish projects. *8/25/11: Pending; it may be most efficient to defer this exercise until the 2012 budget picture becomes more clear and the Committee reviews recommendations from the December 7-8, 2011, nonnative fish workshop.*
23. **Kevin Bestgen** will revise and finalize the floodplain synthesis report. *Done.*

Attachment 2 Research Framework Recommendations

The following are recommended ongoing and new research activities that the Recovery Program should consider incorporating into the RIPRAP, based on the above evaluation of biotic and abiotic controlling factors. These recommendations were drawn from Tables 13-16. These research recommendations include only those activities that are not currently being addressed through existing or planned projects.

1. Continue to identify and address sources of mortality (e.g., predation and competition) for age-0 Colorado pikeminnow in nursery backwaters and develop strategies for reducing this threat. Activities related to this include non-native fish management, sampling under projects 22f, 138, the backwater data synthesis (FRBW synth), and joint USFWS and UDWR, Vernal (project 158) sampling in backwaters in the middle Green River.
2. Continue to determine the most suitable summer and fall flows for age-0 Colorado pikeminnow nursery backwater formation. Activities related to this include sampling under projects 22f, 138, the backwater and geomorphic data synthesis (FR-BW synth), and joint USFWS and UDWR, Vernal sampling in backwaters in the middle Green River (project 158).
3. Continue to identify and address sources of mortality (e.g., predation and competition) for late age-0 and age-1 Colorado pikeminnow after they leave the nursery backwaters and develop strategies for reducing this threat. Aspects of this are being investigated under projects 22f, 138, FR-BW, and pikeminnow abundance estimation efforts, which link recruitment and relative abundance at early life stages with juveniles, recruits, and adults. Other modeling tools are also available to investigate this further, including an individual-based recruitment model for Colorado pikeminnow.
4. Continue to implement innovative techniques to evaluate the effectiveness of nonnative fish management, such as recruitment models to help assess the necessary reduction levels of nonnative fishes, as well as the effectiveness of these actions on the endangered fishes. Aspects of this are being developed by ongoing non-native fish management workshops and work conducted under project 161, the smallmouth bass data synthesis, and recruitment analyses conducted in conjunction with abundance estimates. Additional intensive sampling to disrupt smallmouth bass reproduction is being conducted in the Yampa River in 2010 (projects 98 and 125, as are investigations of the most efficient electrofishing gear [project 147]). Ongoing investigations to assess timing of spawning and hatching of smallmouth bass in the Green and Yampa rivers (projects 115 and 140) may also assist with development of strategies to reduce their reproductive success via dam operations at Flaming Gorge.
5. Implement a climate change initiative that outlines a strategy for dealing with the effects of drought, reduced stream flow, and associated effects in the context of recovery of the four endangered fishes. Climate change initiatives should also

assess effects on invasive species, and their potential interactions with natives. . Such work is being considered under the Southern Rockies Landscape Conservation Cooperative (LCC) but other sources of support should also be investigated.

6. Continue to evaluate the effects of water pollutants, including selenium, mercury, and pharmaceuticals on the four endangered fish species. The Recovery Program continues to support activities associated with toxicant and pollutant studies (mercury, selenium, and pharmaceuticals) which is generally conducted by other agencies such as the Environmental Protection Agency, USGS, Reclamation (e.g., Selenium Management Plan in the Gunnison River subbasin), and the states under their respective water quality plans (e.g., Stewart Lake selenium remediation).

7. Identify and address sources of mortality (e.g., predation and competition) for age-0 humpback chub in nursery habitats. Aspects of this are being investigated via non-native fish management activities in reaches where chubs occur, projects 115 and 161, and through ongoing non-native fish workshops.

8. Identify and address sources of mortality (e.g., predation and competition) for age-1 humpback chub in rearing habitat. Aspects of this are being investigated via non-native fish management activities in reaches where chubs occur, projects 115 and 161, and through ongoing non-native fish workshops.

9. Develop a strategic plan for control and removal of white sucker from the upper basin. Ongoing studies include assessment of white sucker hybridization and abundance patterns related to flows and water temperatures (project 115), removal of white sucker from some reaches being conducted in an experimental framework (State of Utah's 3 spp. efforts, projects 115 and 125), and consideration of those effects in range-wide "3 species" investigations.

10. Continue to assimilate and assess information on all stocked endangered fish recaptured in the upper basin to better understand factors that affect survival, growth, and recruitment. Ongoing aspects of this include database management activities, assessment of survival rates of stocked and recaptured razorback sucker in the Upper Colorado River Basin (project 159).