

October 31, 2008

Biology Committee Web Conference Draft Summary
October 30-31, 2008

Biology Committee: Dave Irving, Melissa Trammell, Pete Cavalli, Krissy Wilson, Dave Speas, Shane Capron, Bill Davis, Tom Pitts, and Tom Nesler. The environmental groups were not represented at the meeting.

Other participants: Tom Chart, Angela Kantola, Bob Muth, Tom Czapla, Sherman Hebein, Cassie Mellon, Leisa Monroe, and Trina Hedrick.

Assignments are indicated by “>” and at the end of the document.

Thursday, October 30

CONVENE 1:00 p. m.

1. Review/modify agenda – The agenda was modified as it appears below. Krissy Wilson said that Quent has been replaced by Zane Olsen (zaneolsen@utah.gov).
2. Approve Biology Committee meeting summary for [August 18, 2008](#) meeting – The summary was approved as written.
3. Review assignments from August meeting – See assignment list at end.
4. Review reports due list – The list was discussed and minor changes made; >Angela will send out the revised list.
5. Nonnative Fish & Subcommittee updates
 - a. Prioritization of recommendations from previous workshops – Tom Chart referred to the draft he e-mailed October 3rd and said the intent is for this to feed into an overall upper basin strategy patterned closely after the Yampa River strategy. Trina asked why investigation of pikeminnow recruitment failure was ranked fairly low. Tom Chart said because it seems to be more of a research framework issue rather than a nonnative-specific issue. Tom Nesler suggested that Biology Committee members (and their agencies) may want to rank these items using the prioritization scheme the NNFSC developed. Melissa and Tom Chart said they believe the prioritization represents fairly good consensus among the group. Sherm said there were some areas of discrepancy, but overall there was pretty good agreement. Tom Chart suggested that if the Biology Committee wants to review rankings, it might be more helpful to work with Table 3 (second column, “cost not considered”) rather than Table 2. >Biology Committee members will provide comments on this document by December 1 (and the NNFSC can discuss this as part of their December 12 meeting).
 - b. Dec. 9-10 nonnative fish workshop content/format – Tom Chart sent last year’s guidance and workshop agenda to the PI’s. This year will be more of a working

session among PI's to craft joint presentations for the January researchers meeting. Kevin Bestgen, Paul Badame, and (probably) Boyd Wright will be the lead PI's for these presentations. >Tom Chart will provide last year's presentations to the BC and PI's (either on an FTP site or on a website). >Tom also will work with the PI's to draft a workshop agenda, and then send that to the Biology Committee for review. >Angela Kantola will add Sherm Hebein to the Biology Committee e-mail list.

- c. Researchers meeting content/format – Tom Chart suggests a half-day for the three nonnative fish presentations and discussion of recommended changes for FY 09 work (including potential changes to the native fish response work). Dave Irving said Michelle Morgan, Chief of Recovery and Delisting in the Service's Washington Office will attend the workshop in his stead.
- d. Second level synthesis outline/RFP – The NNFSC believes that our exploitation efforts via mechanical removal (and the effects on population dynamics) should be a focus of this synthesis. The Program will need to provide considerable background information (e.g., distribution and abundance maps, etc.) and the NNFSC will start working on that on December 12. NNFSC members are preparing a list of high priority questions / expectations of the 2nd level synthesis; >Biology Committee members are invited to do likewise by November 28. The product of the synthesis will go through external peer review. The NNFSC will have a conference call at 8:30 a.m. on December 1 to further discuss the RFP. Dave Speas said he expects the RFP would be issued in early 2009.

6. Floodplain update

- a. Stirrup – Trina said she's been making monthly site visits to check water depth and quality and everything looks good so far. Krissy said a 3,004 razorback were stocked in the Stirrup this year. Trina will continue monthly site visits throughout the winter, and then they'll be prepared to pump water in the spring when needed. Trina said they will construct two more antennae and test the system over-winter, so hopefully everything will work as expected in the spring. Melissa suggested that Trina test the system at the Stirrup this winter before it snows, if possible. Tom Czapl said someone from the Service's Grand Junction office may want to come out to Vernal to learn more about this system for possible application at the Price Stubb fish passage.
- b. Baeser – Dave Irving said water was pumped into Baeser in late May and ~ 43,500 larval razorbacks were stocked. Continued pumping was required to maintain water levels. In mid-September, 28 161mm razorback were captured using nets. A fin-clip mark-recapture effort gave a population estimate of 3,840 razorbacks. Some small nonnative fishes were present which must have been pumped in as larvae. An additional 24,000 ~100mm razorback were stocked October 8. The cost to maintain the 5' water depth via pumping has been ~\$20K; Dave suggested that the Program may want to purchase a pump that can be shared among sites. Melissa asked about plans for next year and Dave said they will provide a draft plan to the Biology Committee by late May (the FY 09 work plan has a \$25K placeholder for Baeser).

7. Recovery goals update – Tom Czapla sent copies of all the comments received to the Biology and Management committees. Tom and Bob and Rich have begun to discuss and categorize the comments. Rich and Tom will be working to address the comments and get revised goals to the Service core group for review. The probable next steps will be peer review (by the end of December), then public review (via the Federal Register).

ADJOURN 4:00 p.m.

Friday, October 31

CONVENE 8:30 a. m.

8. Report review (All; 1.5 hours)
 - a. 123 (sent to BC by Tom Chart on 9/5/08) – Tom Chart noted that he'd included some additional comments when he sent out the report. Some of these will need to be addressed by Dave Irving's shop, others Leisa will address. Melissa asked about data integration; Leisa said each investigator analyzed their data somewhat differently making it difficult to fully integrate. Dave Speas expressed concern about awkward positioning of tables and figures (perhaps it would be best to move them to the end). Font size and type among figures should be consistent. A y-axis label is missing from one figure (check all figures). A better-quality map also would be helpful. With regard to the conclusions, Dave noted the first sentence is superfluous and the word "certain" is overused. What do the numbers refer to in line 1238? The last conclusion refers to direct and indirect effects, but doesn't specify what those effects were. Shane asked where the report provides evidence for the sentence at the end of the discussion section: "One similarity between the Ouray reach and the Desolation reach is that both of these lower reaches saw the loss of the 2005 year class of smallmouth bass." Leisa will check on this and correct as appropriate. Shane noted that there may have just been less recruitment, rather than year-class failure. Shane noted that the first line of the introduction that says "While no one introduction or diversion structure can necessarily be identified as the direct cause ..." probably mean "primary" not "direct" cause. Tom Chart said Tom Nesler asked if there were data to support the second to last recommendation regarding cover. Leisa suggested that if the Committee would like more integration in this report, she is willing to work with Paul Badame and Tildon Jones to accomplish that. Tom Chart and the Committee agreed it would be worthwhile for Leisa to spend some time with those co-investigators and polish the report some more (although they should complete their annual reports first). Melissa Trammell suggested it would be helpful if the authors could better relate the effects of flow and temperature riverwide (the temperature analysis Tom Chart provided may be helpful). >Leisa will work with Tildon and Paul to revise the report fairly quickly (and will give Tom Chart a due date – hopefully that date will be no later than December 1).
 - b. 125 (sent to BC 10/20/08) – Shane Capron asked about the sentence beginning on line 660; John will clarify. Melissa asked about including more information about movement between control and treatment reaches. John said additional discussion is difficult because sampling effort/intensity was low in non-treatment/control reaches.

Melissa said that since we expanded the removal effort each year based on movement outside of control/treatment reaches, Colorado might find it helpful if the report clearly documented that movement. John said he removed some of this information for clarity's sake, but will put a few sentences back in to appropriately document the movement that was observed. Melissa suggested the report should state that we wouldn't expect strong removal effects from this study over the period covered by this report since the work began with a small study area and slowly expanded (e.g., three years of the removal efforts weren't as intensive as our current efforts). Sherm agreed that documenting the expansion of the control/treatment and how we adapted to new information in this report is a good idea. Shane asked about the sentence beginning "Removals in excess of abundance" on line 746 as it relates to Tables 4 and 5. This relates to an over-arching concern that our depletion levels may only be increasing productivity. The sentence needs to be re-written so that we first discuss annual removal, then if removal over the study period is discussed, productivity also should be addressed. The sentence seems to be understating the results; John will revise it. Shane clarified that we're manipulating numbers, but we're not "overcoming" unmeasured levels of recruitment and immigration (as stated in the sentence beginning on line 756). This issue is especially pertinent to the second-level synthesis. Dave Speas pointed out that since we haven't measured recruitment, we don't know if our removal efforts were high enough (perhaps "removal rates *appeared* high enough..."). Sherm Hebein asked about "possibly high numbers of escapees from Elkhead..." in line 759; John said it seemed high to him and it seemed appropriate to document the 2005 screen failure. John will change the "possibly high" part, but document and quantify the tagged smallmouth bass that escaped from Elkhead in 2005. John also will add information about the Elkhead outlet screens (Ray Tenney has details). Tom Chart said Tom Nesler asked that the number of fish marked at the beginning of each year be included on Table 4. John will add that information, but it may not work to put it into Table 4. Tom Nesler also asked about consistency of numbers of fish that went into Elkhead Reservoir as reported in Tables 5 and 12. Dave Speas asked how John concluded in the first sentence of the discussion "abundance of ... smallmouth bass declined..." John said this is based on his point estimates. Dave said that if there are other things in the data that suggest this, that first sentence in the discussion should lead with that (e.g., "... in the face of this uncertainty, we believe..."). John will write an appropriate introductory sentence. Dave added that it would be helpful to include some explanation of the use of recapture rates as surrogate for removal rates (if this is already discussed earlier in the report, that's fine). Dave pointed out that the fourth conclusion references other environmental factors, but those factors are not addressed in the report. The Committee discussed the need to be sure we have accurate age/length information (we should collect age and growth information every year). Tom Chart said that with regard to the first conclusion, Tom Nesler asked what in 2003-2005 data demonstrates this. As related to the next-to-last conclusion on line 870, Nesler also thinks recruitment issue is larger than immigration issue and asks if anything more can be done to draw this out in the report. Sherm asked >John to talk to Grant Wilcox in CDOW's Fort Collins office to see if smallmouth bass movement data can be mapped. >John Hawkins will revise the report (in discussion with the commenters), and provide a copy to the Committee by January 5 so they can review and approve it at their January 15 meeting.

9. FY 09 Work Plan

- a. 123b SOW – Leisa said the costs have increased, primarily due to more careful accounting at the end of one 5-year funding agreement and the beginning of the next. (Angela noted that several hundred thousand dollars will be deobligated from UDWR and returned to the Program as Reclamation completes the close-out of the previous agreement over the next few months.) Tom Chart noted that there's more effort in task 1 from previous years since it won't be covered by other population estimate work (and that white sucker removal is not part of this budget). (On a side note, >Krissy agreed to work with Zane to make sure that Wahweap's budget for FY 09 is accurate.). The Committee approved the revised scope of work for 123b.
- b. Update on proposal to remove small nonnative fishes from Green River backwaters – Tom Chart said he and Tom Czapla discussed with UDWR and FWS folks in Vernal potential follow-up to the pilot effort to remove fish from 11 backwaters this past July. Components would include determining if larval pikeminnow are entering Reach 2 in similar numbers as in the past, and repeating the pilot removal effort followed by some block netting just before larval pikeminnow enter the backwaters. Tom Chart said we might want to mesh this with validating the modeling effort that Argonne has been working on. Trina said they're still discussing this to hone in on the best methods. Reach-wide, they saw an overall decrease in the numbers of red and sand shiners from last year, but can't attribute that to the pilot removal effort. >The PI's will prepare a rough draft SOW in advance of the nonnative fish workshop.

10. Upcoming events/meetings:

- Annual reports are due November 14th. Tom Chart noted that at the workshop last year, it was decided that we need to be consistent and decided that the break between adults and juvenile smallmouth bass would be 200 mm (which will require PI's to redo previous year population estimates); >Tom will remind the PI's of this for their 2008 annual reports. (Tom added that there's a disconnect with the Yampa strategy which used 150mm as the basis for the 30 adult smallmouth bass per mile target.)
- DFC is November 12-16th in Cuatro Ciénegas, Mexico.
- The [Colorado River Basin Science & Resource Management Symposium](#) is November 18-20th in Scottsdale.
- The principal investigator's nonnative fish workshop will be December 9th & 10th in Grand Junction (open to anyone interested). The Management Committee meets December 11. (Both at the Holiday Inn.) NNFSC on December 12 (probably at the FWS office).
- The annual researchers meeting will be hosted by CDOW in Grand Junction at the Doubletree hotel on January 13th & 14th followed by a Biology Committee meeting on January 15th (when Dave Irving assumes chairmanship).

The Committee thanked Krissy for her excellent work as Committee chair.

ADJOURN: 10:50 a.m.

Attachment 1

Assignments carried over or modified from previous meetings:

1. Shane Capron will get a firm commitment from Clayton Palmer and Kirk LaGory re: Western's contribution for additional report costs for this project 85f (sediment monitoring) in FY 2009. 10/31: Program Director's office has verbal commitment; will seek firm commitment. 1/17: Bob Muth will check with George Smith re: his conversation with Clayton Palmer. 1/29: Program Director's office e-mailed Clayton, et al requesting confirmation; 2/15: Shane said we should have confirmation within a couple of weeks. 4/14: Western has indicated they are committed to providing \$32,600 in FY 09; e-mail confirmation requested; follow-up e-mail sent to Clayton 8/7/08 and 9/19/08. This is now a Management Committee issue and will be removed from this list.
2. Tom Czaplá will work to get the questions regarding what hatchery repairs are needed at Grand Valley resolved as soon as possible. 10/31: Grand Junction working to get cost estimates; \$44.4K funds placeheld. 1/17: Chuck said that a larger de-humidifier would be too costly; their current plan is to repair the walls so they can withstand the humidity. The Biology Committee expressed interest in a full solution. >Chuck will provide the full estimate to Tom Czaplá. >Bob Muth will discuss the possibility of using capital funds with Brent Uilenberg. 2/15: Reclamation & FWS working on getting this contracted; dehumidifier will be installed first, then walls will be repaired. 3/31: Reclamation waiting for report from an HVAC mechanical engineer on what's needed for dehumidification. Due to oil and gas activity in the Valley, they've had difficulty getting anyone to work on this relatively small project. 6/13: Contractor visited site June 5; appraisal study pending. 7/22: Report and initial cost estimate provided mid-July; BOR & USFWS discussing construction and contracting options. Tom Czaplá said Reclamation likely will contract the planned building refurbishment (insulation, dehumidifiers, etc.) with assistance from FWS Engineering; with the goal of getting bids by the end of the calendar year.
3. Tom Nesler will see if CDOW can provide a report on Billy Atkinson's work on pike in Catamount and the river below. Update provided at nonnative fish workshop; workshop participants recommended CDOW provide some kind of management plan. 1/17: Billy will provide a Catamount pike removal document/strategy by the end of February. 4/15: Nesler will provide update at BC. 4/28: Tom has reminded Billy that this is overdue and will try to get it to the BC as soon as possible. 6/13: Nesler just received the draft today and will provide it to the BC by the end of July. 8/18: Tom Nesler will provide Billy Atkinson's upper Yampa "strategy" report to the Biology Committee by September 18 (Nesler's and Chart's birthday). 10/30: Tom Nesler and Sherm Hebein will revise Billy's report and provide that to the Recovery Program (Biology Committee, NNFSC, PI's, etc.) along with an outline of CDOW's strategy for nonnative fish management in the Yampa River above the diversions for discussion as part of the nonnative fish workshop. Tom Chart said it would be very helpful to have that outline before the December. 9-10 workshop. Sherm noted that Billy removed >2,000 np from Catamount this year (>4,000 np total).
4. The Program Director's office will work with CDOW and Sam Finney on the potential for designing a permeable, hydrologically-stable (gravel?) berm to prevent northern pike access to the oxbow slough, and then clean it out once and for all. 2/15, 4/15: Pending. 4/28: Chart

has discussed with Nesler and with the Partners for Wildlife Program, also. Will focus on this summer/fall. 6/13: CDOW will be contacting the landowner regarding access, if they are amenable, then CDOW and Program will determine a feasible solution (before the end of spring runoff). 8/18: Tom Chart said Sherm will try to get someone from CDOW on this as soon as possible. The Biology Committee would like a date certain on this; >Sherm Hebein will accelerate this. 10/30 said 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 of berm (more permanent configurations could be very expensive). The funding source would need to be determined, with Partners for Fish and Wildlife, lottery funds, grant funds, etc. as possible sources to be explored.

5. Tom Chart will review the latest draft of the nonnative fish stocking procedures and get comments back to the States no later than February 15, then Krissy, Kevin, Tom, and the Service will submit it for agency review (one month review time). 2/15: Dates need to be modified. 4/14: Group discussing a few more revisions before seeking agency approval. 4/28: Krissy said a bill passed in Utah's latest legislative session (the Aquaculture Revitalization Act) took away Utah's ability to issue a COR to anyone with a private pond; Krissy will provide language incorporating that within two weeks. Kevin Gelwicks should have comments back from Wyoming by early June, but doesn't expect anything substantive, and will try to expedite their comments. Tom Chart said Tom Nesler realized we may have missed stipulations that would apply to private pond owners within critical habitat outside the 100-year floodplain. Krissy will review that; she thought that a private pond outside the 100-year floodplain would still be covered if it had the potential to connect. Melissa suggested including language regarding extending and revising the document; Tom Nesler said we're on a 5-year revision schedule. 6/13: A subgroup met yesterday, Wyoming has reviewed and provided comments, and Utah also has reviewed it. Further streamlining is underway. 7/11: Utah and Wyoming have reviewed; Colorado and FWS reviewing (FWS comments due 9/5/08). Colorado has shared the draft Procedures with their legal counsel and expects to provide any comments within two weeks. Krissy said Utah's legal counsel still needs to review this. 10/16: The PD's office is responding to Wyoming's recent comments, then will send these revisions to the States and Service for review, with the goal of beginning the surnaming process in November. 10/30: Tom said Bob Muth sent the revised stocking procedures to the States and the Service on October 22. Krissy said Utah has some new concerns about moving fish from one body to another and potentially spreading quagga mussels. >UDWR will provide draft language for review. Dave Irving said we also need to be sure we're not transferring mussels on equipment. Colorado and Utah have equipment-cleaning protocol in place. Sherm said they're using Sparquat for disinfection and Krissy said UDWR is using Quat128. Tom Nesler added that where the draft Procedures suggest certain stocking may become routine, we need to consider potential mussel transfer.
6. Researchers are to submit all their nonnative fish data to Chuck McAda by April 1 (the Program Director's office will sent out an e-mail notification on this). 4/28: Tom Chart said Chuck had only received data from Tim Modde ten days ago. Trina said they're making sure their data is in the right format. Tom Chart said that at a minimum, he would like the data sent to Chuck even if it's in the old format. >Tom Nesler will check on Lori's data; >Krissy will check on Moab's data. All the data on captured nonnative fish should be submitted, not just data on tagged fish; >Chuck will make sure the correct data are submitted and work

with principal investigators if anything is missing. 6/13: Krissy said Utah has submitted their data. Tom Chart said Tim Modde submitted Vernal's data; Tom will get with Chuck to determine what data are still needed and e-mail the PI's. Tom Nesler will check on Lori's data. Sherm suggested cross-checking with CDOW's data system to be sure all data is in both places (Chuck's database and CDOW's). 7/11: Data have been submitted by Vernal CRFP, Badame, Hedrick, Hawkins, Bestgen, Bestgen/Zelasko and Burdick. 4 August 2008: Harry Vermillion submitted an extract from ADAMAS in the appropriate format to Chuck McAda on August 4th. The extract included Colorado River data from 2003 and 2007; Gunnison River data from 2007; and Yampa River data from years 2004 - 2007. 8/18: >Chuck will send the most recent version of the database to the NNFSC; and the NNFSC will review status of the data with Chuck and Travis after the Biology Committee meeting. 10/30: Tom Chart said the NNFSC will follow-up on this at the workshop, most of the data are in; we need to determine how quickly we can get the 2008 data added.

7. The Program Director's office will modify Rich Valdez' technical assistance scope of work as needed to accommodate the initial work on the second-level nonnative fish management synthesis. 4/14, 6/13, 7/25, 8/18: Pending.
8. Tom Nesler will check on the status of revision of the Yampa River Aquatic Management Plan. 4/14: Colorado's new completion date is May 1, 2009. (In the interim, CDOW will need to produce an Upper Yampa River strategy to assist the Program in our prioritization of 2009 field activities. This strategy should ultimately be incorporated into the Aquatic Wildlife Management Plan for the Yampa River Basin. 4/28: Tom Nesler said they don't plan to provide a formal strategy, but will describe what they [primarily Billy Atkinson] are doing down through Steamboat and with regard to isolating sloughs in Sam Finney's reach. See #3, above.)
9. The PD's office needs to schedule a humpback chub population monitoring workshop. Pending (the Program Director's office will discuss this with Rich Valdez); a workshop might also include discussion of humpback chub broodstock. 10/30: Tom Czaplá said this is still pending. He would like to see the workshop address the issue of first acceptable population estimates.
10. The Program Director's office and CDOW will send letters of thanks to Sherriff Tim Jantz for the use of the Craig Justice Center Ponds for nonnative fish translocation. Pending.
11. 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. The Program Director's office will use the information currently available to >develop a position paper on Price River flow recommendations for Committee review. 10/16 Pending; out by the end of November.
12. Dave Irving will call the Mantle Ranch landowner to give him an update on work to raise *Gila* in captivity (since the Ranch's cooperation made it possible for the Service to get the fish out to the hatchery quickly). 10/30: Dave Irving sent him a letter. CDOW and the Park

need to discuss the future of the captive *Gila* in light of plans for those fish as broodstock under Three Species conservation and Colorado's Management Use agreement with the Park (Tom Nesler and Melissa will work on this). *10/30: Pending.* The Program Director's office will move forward to establish a Yampa River humpback chub broodstock using young fish. Tom Czapla will work with Melissa on a letter to the Park. *10/30: Pending. Tom Czapla said he's been drafting a refuge/broodstock plan for discussion within the Service, then for sharing with the Park Service and the Recovery Program. Tom Nesler and Krissy Wilson also are working on related roundtail plans.*

13. Tom Czapla will work with Krissy Wilson and Paul Badame to finalize the Cataract humpback chub scope of work and include some seining during this work to look for bonytail reproduction. Krissy will ask Paul to review the "probable violations of modeling assumptions" language, which may be incorrect. *10/30: Krissy re-sent Paul's 8/28 e-mail which has the revised version of the scope of work; the Program Director's office will post that version to the website.*

New Assignments:

1. Angela Kantola will send out a revised reports due list.
2. Biology Committee members will provide comments on the nonnative fish priorities document by December 1 (and the NNFSC can discuss this as part of their December 12 meeting).
3. Tom Chart will provide last year's presentations to the BC and PI's (either on an FTP site or on a website). Tom also will work with the PI's to draft a workshop agenda, and then send that to the Biology Committee for review.
4. Angela Kantola will add Sherm Hebein, Tildon Jones, Aaron Webber, and Zane Olsen to the Biology Committee e-mail list. *Done.*
5. Biology Committee members are invited to provide questions/expectations for the 2nd level synthesis to Tom Chart by November 28. The NNFSC will have a conference call at 8:30 a.m. on December 1 to further discuss the RFP.
6. Leisa Monroe will work with Tildon Jones and Paul Badame to revise the #123 report fairly quickly (and will give Tom Chart a due date – hopefully that date will be no later than December 1).
7. John Hawkins will talk to Grant Wilcox in CDOW's Fort Collins office to see if smallmouth bass movement data can be mapped.
8. John Hawkins will revise the #125 report (in discussion with the commenters), and provide a copy to the Committee by January 5 so they can review and approve it at their January 15 meeting.
9. Krissy Wilson will work with Zane Olsen to make sure that Wahweap's budget for FY 09 is accurate.

10. Trina Hedrick, Dave Irving, et al. will prepare a rough draft SOW for removal of small nonnative fishes in the Green River in advance of the nonnative fish workshop.
11. At last year's nonnative fish workshop, it was decided that we need to be consistent and decided that the break between adults and juvenile smallmouth bass would be 200 mm (which will require PI's to re-do previous year population estimates); Tom Chart will remind the PI's of this for their 2008 annual reports. *Done.*

Memorandum

To: Biology Committee (BC)

From: Nonnative Fish Sub-Committee (NNFSC; Dave Speas, Melissa Trammell, Krissy Wilson and Cassie Mellon, Sherman Hebein, and Tom Chart)

Subject: Prioritized Recommendations from past Nonnative Fish Workshops

Date: October 3, 2008

Introduction: At the BC meeting in Salt Lake City, on August 18-19, 2008, the NNFSC was tasked with a second attempt at ranking the recommendations generated by Program participants at past Nonnative Fish Workshops. The NNFSC suggested and the BC agreed that when prioritized, these recommendations would ultimately serve as the foundation for an Upper Basin-wide Nonnative Fish Management Strategy, which would be patterned closely after the recently approved Yampa River Strategy.

Therefore with regard to the specific task at hand, the BC directed the NNFSC to use the following criteria to prioritize the recommendations: technical feasibility; time to implement; cost; and effectiveness. We were also instructed to identify which recommendations were: a) ongoing; b) already scheduled into current work plans; or c) new recovery actions (Table 1). The BC determined it was only necessary to prioritize recommendations for future recovery actions

Methods: The recommendations for future recovery actions were compiled into a spreadsheet to facilitate ranking using the aforementioned criteria. Each member scored the major recommendations (large text items in Table 1). Individual scores were compiled onto a summary spreadsheet which were then reviewed via web conference on September 24, 2008. During that meeting it became apparent that the NNFSC was still interpreting some of the ranking criteria and a couple of the recommendations differently. More specifically, we reached consensus on the following:

- Prioritization Criteria – “Time to Implement” was clarified to mean when implementation of a specific recommendation would begin. Criteria changed to “Time to Start” (a score of 0 = immediate implementation is not necessary or feasible – these recovery actions may not start for as much as 10 years; 5 = should start immediately).
- Prioritization Criteria – “Effectiveness” was clarified to mean how effective a recommended action would be at reducing the threat of nonnative fish (0 = ineffective; 5 = very effective).
- Recommendation – “Remove all threatening NNF (all centrarchids)” was clarified to mean that we should not miss opportunities to remove nonnative centrarchids (primarily smallmouth bass) whenever conducting nonnative fish control sampling trips. This was in specific reference to the fact that there have been and continue to be reaches on the Yampa River where smallmouth bass are caught and released multiple times each year. The only exception should be for marking passes.

- Recommendation – “Explore the feasibility of controlling crayfish” was changed to read Control Crayfish populations – the former was confusing and not action oriented.

The NNFSC reviewed their individual scores with these clarifications in mind and made adjustments as needed. The individual scores were then averaged for each recommendation and each criteria. The average scores were summed as follows:

- Avg scores for Technical Feasibility + Avg scores for Time to Start = Sum Scores for Ease of Implementation
- Avg scores for Cost + Avg scores for Effectiveness = Sum Scores for Cost Effectiveness

The Sum Scores were then used in a bivariate comparison of each of the recommendations. Please refer to Table 2 for a summary of individual NNFSC member scores, average scores, and the bivariate Sum Scores.

The bivariate scores were plotted (Figure 1) to assist in the interpretation of our ranking results. In these graphical analyses the bivariate scores could be grouped by quadrant, which generally describe how each recommendation fared when considering Ease of Implementation and Effectiveness. The quadrants represented recommendation for recovery actions that could be categorized as follows:

- Recovery Actions that should be considered easy and effective and should be started as soon as possible – Hi Priority
- Recovery Actions that may be easy to accomplish but would have a questionable outcome – Require more information; perhaps should be considered a Medium Priority at this time.
- Recovery Actions that may be difficult to accomplish, but could be very effective at reducing the threat of nonnatives - Require more information; perhaps should be considered a Medium Priority at this time.
- Recovery Actions that may be difficult to accomplish and would have a questionable outcome – considered Low Priority.

The BC was also interested in a prioritization exercise that did not consider Costs. For Figure 2, the Cost criteria scores were dropped and the Effectiveness scores were doubled to generate the bivariate (albeit a weighted version).

Results: The graphical analyses in Figs. 1 and 2 are summarized in Table 3 where each recommendation is listed according to its plotted quadrant category. Recommendations are prioritized generally as Hi, Medium or Low (see above). Within each of those general priorities we can draw some sense of “within category” priority, (eg. the Highest of the Hi priority recommendations), because the “higher priority” recommendations were plotted in the upper right corner; “lower priority” are found in the lower left. The recommendations in Table 3 are ordered with this in mind.

Table1. A complete list of nonnative fish management Recommendations / Recovery Actions and associated tasks generated by Recovery Program participants at Nonnative Fish Management Workshops. Ongoing Recovery Actions are heavily shaded; actions that are currently scheduled for implementation are lightly shaded; future actions are not shaded. Only future actions were prioritized in this exercise.

	Prevention
P1	Increase PR, including public meetings
P1a	Have PR message reflecting the value of nonnative sport-fishing in the proper setting and it's incompatibility with native fish recovery in other areas
P1b	Id & promote alternative nonnative sport fisheries that do not impact endangered fish recovery. Craig, Colorado local anglers appreciate the sportfishing opportunity that results from the Program's smallmouth bass translocation efforts at the Craig Justice Center pond - there are opportunities there to promote the Program's message.
P1c	TV / internet is an important medium that has an established fishing audience--focus on NNF impacts to all resources and programs
P2	Increase communication between I&E and BC committees.
P3	Educate children/anglers about native fish conservation
P4	Implement the Nonnative Fish Stocking Procedures
P4a	Revise Nonnative Fish Stocking Procedures immediately; review and revise as needed every 5 yrs
P5	Reduce / eliminate illicit introductions of nonnative fish throughout the Upper Colorado River basin.
P5a	Placard agency tailgates with Operation Game Thief numbers to report illicit stocking. "Report illicit stocking to Operation Game Thief at 1-800..."
P5b	Contribute \$20K to Operation Game Thief (CO/UT/WY)
P5c	Identify process to make reward money available and address other logistical considerations.
P5d	Make reward money available.
P5e	Place/maintain signs to inform public why we are tagging fish and what they should do when a tagged fish is caught.
P6	Finalize Aquatic Mgmt Plan for the Yampa River Basin (CDOW has committed to completing by May 2009)
P6a	To assist with Program work planning in FY09, CDOW will submit an Upper Yampa management strategy (northern pike management in Catamount Res and main channel / trout fishery restoration) by September 30, 2008. This strategy will be incorporated into the Aquatic Management Plan for the Yampa River Basin.
P6b	Evaluate escapement of NOP from known and suspected spawning areas (e.g. seasonally flooded or connected habitats; upper Yampa River drainage reservoirs)
P6c	Substantially reduce pike from Catamount Reservoir
P6d	Manipulate habitat to disadvantage northern pike spawning throughout the upper Yampa River drainage (eg. Chuck Lewis State Wildlife Area)
P6e	Translocate nonnatives from habitats where they impact endangered and native fish recovery to "safe sites".
P6f	Seek cooperation with landowners to conduct nonnative fish management options on private lands--obtain access, easements, permission
P6g	Identify problem areas (no access)

P6h	Identify institutional constraints/preliminary steps to take
P6i	Expand removal into problem areas.
P6j	ID \$\$\$ sources/partners to fund conservation easements and perpetuate access for fish control
P7	Risk assessment (basin-wide) of escapement from reservoirs (non-translocated)
P7a	Conduct studies (eg. isotopic signatures) to identify NP and SMB sources.
P7b	Prioritize locations where actions are needed to prevent escapement of nonnative fish basin wide
P7c	Implement management actions to prevent escapement (eg. eliminate reservoir populations, modify reservoir operations to minimize unscreened releases, control fish escapement (eg. Strobe lights, sound, nets, screens, etc.))
P8	If required by a State agency, translocate nonnatives removed from the river only to off-channel sites that are compatible with endangered fish recovery (i.e. safe sites). Discontinue translocation to off-channel places where there is significant escapement or control escapement (eg. berming, screening, etc.)
P8a	Tag translocated SMB to measure escapement rates.
P8b	Tag translocated NOP to measure escapement rates.
P8c	Evaluate consistency of translocation efforts with NNF Stocking Procedures (FWS/state)
P8d	Evaluate escapement rate and establish thresholds to: a) trigger a rapid response to a specific escapement event, and/or b) determine if translocation to a particular site should be continued.
P8e	Identify and implement means to substantially reduce escapement of translocated fish (stop translocation, strobe lights, sound , nets, screens etc)
	Research
R1	Finalize level 1 synthesis reports
R2	Programmatic synthesis (peer reviewed)
R2a	1. Assimilate database--Develop a a database of nonnative fish control and management activities. Consider all available options (eg. CDOW's Jake-o-matic)
R2b	2. Develop an outline and approach for developing the synthesis report
R2c	3. Develop defensible evaluation strategy to determine effectiveness of NNFC
R2d	4. Determine necessary effort (e.g. through the use of exploitation models) to reduce SMB to target density; parameterize exploitation model with best available information.
R2e	5. Exploitation rate as metric--evaluate exploitation rate (tags capture / total tags released) as metric for evaluating efficiency of nonnative fish removal. SMB exploitation rate should be 60-85%
R2f	6. Evaluate options available (are we doing the right thing)
R2g	7. Standardize metrics--establish standard system of metrics including lengths for juveniles and adults; size for marking fish
R2h	8. Evaluate the current "buffer zone" approach on the Yampa River and recommend an alternative strategy if necessary.
R2i	9. Cost-benefit analysis to reallocate effort--conduct cost-benefit analysis for reallocating increased effort on the Yampa upstream from Craig.
R2j	10. Adjust for movement--use movement data to adjust for mark-recapture estimates
R3	Reliable marking system--establish and implement a reliable marking system for nonnative fish. Floy tag FD-67 tag losses have been estimated as high as 27% and introduce error in to abundance estimates
R3a	Estimate current tag loss.
R3b	Modify tagging effort, as needed.

R4	Causes for Colorado Pikeminnow Recruitment Failure.—Further investigate causes for lack of Colorado pikeminnow recruitment; reproduction is occurring larvae are detected drifting from Yampa River into Green River and backwaters are available
R5	Implement experimental study to release water from impoundments to affect temperature, turbidity and/or flow regimes at inopportune times for SMB reproduction, recruitment and survival.
R5a	Develop study plan to design flow/temperature / turbidity (?) manipulation study to disadvantage SMB, begin planning process to implement experimental flows
R5b	Investigate SMB spawning periodicity relative to flows and temperature to serve as basis for flow / temp / turbidity (?) manipulation experiments.
R5c	Identify political obstacles and develop political support for flow/temperature manipulations
R5d	Conduct experiment
R5e	Evaluate results/report
R5f	If successful, repeat
R6	Continue Native Fish Response investigations in the Yampa and Green Rivers.
R6a	Consider expanding native fish response into the Colorado River
R6b	Monitor (sub-sample) the fish community during removal efforts.
R6c	Evaluate results/report
R7	Explore alternative electrofishing gear as more efficient way of removing SMB (eg. test new Smith Root "VVP" type)
R7a	Evaluate existing data
R7b	test/implement
R8	Understand SMB ecology (habitat, recruitment, sources, competition, interactions)
R8a	complete 2nd level
R8b	Complete 115/otolith-spawning info
R8c	Revisit existing movement data
R8d	Revisit Martinez bioenergetics study
R8e	estimate local SMB predation rates
R8f	Radio-telemetry movement study (origin, distance travelled, etc.--Judas fish)
R9	Investigate effects of increased sampling on native fishes
R10	Control crayfish populations
R10a	Review USGS/AZ and CDOW's research on distribution, abundance and control options
R10b	Evaluate, recommend, and implement (if deemed necessary) a feasible control strategy
R11	Identify and remedy channel modification in Yampa River (elsewhere if appropriate) to advantage native fish reprod. / recruit. and to disadvantage nonnatives (primarily northern pike)
R12	Seek outside expertise
R12a	Complete literature review
R12b	Obtain consultation
R12c	Seek assistance from someone commercially successful on similar fish to increase our exploitation rates.

R12d	Evaluate, recommend, and implement innovative approaches
	Mechanical
M1	Maximize Efficiency
M1a	See 2 nd level synthesis and investigations into life history of SMB.
M1b	Optimize efficiency of electrofishing gear (and other gear). Fully train crews in how to measure and optimize gear.* should be fully implemented by end of phase II
M1c	Focus efforts on concentration areas (following population estimation where conducted).
M1d	Reallocate effort from other areas of river if necessary (based on 2nd level)
M1e	Flexibility of timing of sampling, gear types, etc
M1f	Target large bass in spring/summer, and small bass summer /autumn
M2	Use multiple methods/gears including new methods discovered and increased usage of fyke nets, baits, large passive weirs, electric seines, etc.
M2a	Rapid removal -Tandem electrofishing
M2b	Investigate nighttime electrofishing
M2c	Electric seine (river-wide, where possible)
M2d	Fyke nets
M2e	investigate other gear types (large river weirs)
M2f	Use attractants to concentrate fish for capture.
M2g	Evaluate, report, and adapt.
M3	Concentrate on areas where T&E are vulnerable
M4	Disrupt nesting behavior (e.g. mechanically; spot treatments with chemicals; dam operations)
M5	Apply piscicides-- spot treatments; selective mainstem, shoreline or isolated rotenone treatments
M5a	Identify criteria, institutional constraints/preliminary steps: NEPA, permitting, agency jurisdiction, etc
M5b	Implement if feasible or necessary
M6	Large scale piscicide treatments (on the river reach scale)
M6a	Identify criteria institutional constraints/preliminary steps: NEPA, permitting, agency jurisdiction, etc
M6b	Implement if feasible or necessary
M7	Bio-controls, including genetic bullets, stocking native predators
M7a	Identify criteria, institutional constraints, preliminary steps, and regulatory requirements.
M7b	Implement if feasible or necessary
M8	Increase number of removal passes (up to 15, until modeling suggest change)
M8a	Complete 2nd level Haines/Modde
M8b	Adjust effort as needed via adaptive mgmt
M9	Coordinate reservoir operations to buy or lease water for higher flows in fall to allow use of electrofishing boats
M9a	If feasible or necessary, Identify, recommend and implement

	Policy
Pol1	Ensure equipment redundancy (back up equipment, good relationships between agencies to share equipment, etc.) Resolve to maintain better contact among agencies,
Pol2	Prioritize NNF problem reaches
Pol3	Remove all threatening NNF (centrarchids) during NNF sampling trips.
Pol4	Designate YA, GR and UCR as native fish conservation areas (CO/UT)
Pol4a	States develop criteria and the desired future condition for native fish conservation areas (define geographical / biological scope, purpose of the designation, appropriate uses, etc)
Pol4b	Identify institutional constraints
Pol4c	Seek compatibility with existing management plans and habitat / institutional designations (State and Federal)
Pol4d	Identify partners, convene forum to plan/prioritize conservation reaches
Pol4e	Identify requisite documentation (existing plans/regulations)
Pol4f	Implement
Pol5	Increase regulatory penalties for illicit stocking
Pol5a	Identify institutional constraints/preliminary steps to take
Pol5b	Revise/evaluate stocking procedures
Pol5c	Implement, including NNF stocking policy
Pol5d	Encourage/implement/advertise regulations to prevent illicit stocking; used in combination with a rewards program for information leading to an arrest.
Pol5e	Management agencies develop an appropriate response to illicit introductions.
Pol6	Focus I&E efforts on the predatory threat of SMB/NOP
Pol6a	Identify threats in annual highlights doc
Pol6b	Consult with I/E experts to develop and disseminate an appropriate message that conveys the threat of these two species to the recovery of the endangered fish.
Pol7	Investigate alternative approaches to estimating initial population size or density on an annual basis.
Pol7a	Complete 2nd level synthesis; assess estimation requirements
Pol7b	Implement alternative approaches as deemed necessary.
Pol8	Seek cooperation with landowners--obtain access, easements, permission
Pol8a	Identify problem areas (no access)
Pol8b	Identify institutional constraints/preliminary steps to take
Pol8c	Implement
Pol8d	Expand removal into all concentration or sources areas, i.e. redefine the current "buffer zone" approach.
Pol8e	ID \$\$ sources/partners to fund conservation easements and perpetuate access for fish control
Pol9	Seek endorsement of recovery efforts from organized angling groups (Trout Unlimited, BassPro, etc)
Pol10	Evaluate the use of bounties to control undesirable species (eg. Colorado Water Conservancy District proposed actions @ Wolford Mtn Res)

Pol11	Strategy for transition of nonnative fish management actions to state control
Pol11a	Identify funding sources and institutional constraints
Pol11b	Implement
Pol12	Enlist other agencies (USDA, BLM, NRCS, etc) to work with State wildlife agencies on ways to control nonnative fish (a la Integrated Pest Management).
Pol12a	Review other approach to dealing with pests, genetically modified, etc
Pol12b	Enlist other agencies to assist in the development of innovative approaches to nonnative control (eg. Lethal genes, other bio-control, etc).
Pol12c	Implement
Pol13	Review crayfish stocking regulations and modify as needed
Pol13a	Review existing regulations (CO, UT, WY)
Pol13b	Modify if needed

Table 2. Priority rankings of Recommendations for future nonnative fish Recovery Actions. Table includes individual NNFSC member scores; NNFSC average scores and Sum Scores used in bivariate analyses (see Figures 1 & 2; as summarized in Table 3).

Task No.	Recommended Recovery Action	Ease of implementation										Cost-effectiveness										Sums: individual SubComm and sum of averages															
		Technical feasibility (0=hard, 5=easy)					averages	Time to start (0=later - at least 10 yrs out; 5=now)					averages	Cost (0=expensive, 5=cheap)					averages	Effectiveness (0=ineffective, 5=very effective)					averages	Ease (tech feas. + time to implem.)					sum of averages	C/E (cost + effect.)					sum of averages
		ds	mt	sh	kw	tc		ds	mt	sh	kw	tc		ds	mt	sh	kw	tc		ds	mt	sh	kw	tc		ds	mt	sh	kw	tc		ds	mt	sh	kw	tc	
P1	Increase PR, including public meetings	4	5	5	3	3	4	3	5	5	5	4	4.4	4	4	4	4	5	4.2	3	3	3	3	1	2.6	7	10	10	8	7	8.4	7	7	7	7	6	6.8
P2	Increase communication between I&E and BC committees.	5	5	5	5	5	5	5	5	5	5	5	5	4	4	5	5	4	4.4	3	4	5	3	3	3.6	10	10	10	10	10	10	7	8	10	8	7	8
P3	Educate children/anglers about native fish conservation	5	4	4	3	2	3.6	4	5	5	3	4	4.2	4	4	5	3	3	3.8	2	3	5	4	4	3.6	9	9	9	6	6	7.8	6	7	10	7	7	7.4
P5	Reduce / eliminate illicit introductions of nonnative fish throughout the Upper Colorado River basin.	2	1	0	3	1	1.4	4	4	5	5	5	4.6	1	0	0	1	3	1	5	4	4	3	5	4.2	6	5	5	8	6	6	6	4	4	4	8	5.2
R4	Causes for Colorado Pikeminnow Recruitment Failure.—Further investigate causes for lack of Colorado pikeminnow recruitment; reproduction is occurring larvae are detected drifting from Yampa River into Green River and backwaters are available	3	3	1	3	2	2.4	3	5	5	4	3	4	3	3	2	3	3	2.8	3	2	3	1	1	2	6	8	6	7	5	6.4	6	5	5	4	4	4.8
R5	Implement experimental study to release water from impoundments to affect temperature, turbidity and/or flow regimes at inopportune times for SMB reproduction, recruitment and survival.	3	3	4	2	4	3.2	4	4	4	4	5	4.2	3	3	2	2	4	2.8	5	4	2	4	4	3.8	7	7	8	6	9	7.4	8	7	4	6	8	6.6
R7	Explore alternative electrofishing gear as more efficient way of removing SMB (eg. test new Smith Root "VVP" type)	5	5	5	4	4	4.6	4	5	3	4	4	4	5	4	1	4	3	3.4	3	4	3	4	3	3.4	9	10	8	8	8	8.6	8	8	4	8	6	6.8
R9	Investigate effects of increased sampling on native fishes	4	4	2	4	1	3	3	5	5	4	2	3.8	3	4	3	3	2	3	0	2	3	4	0	1.8	7	9	7	8	3	6.8	3	6	6	7	2	4.8
R10	Control crayfish population	1	1	0	0	0	0.4	1	1	1	1	1	1	1	1	1	1	1	1	1	2	3	3	4	2.6	2	2	1	1	1	1.4	2	3	4	4	5	3.6
R12	Seek outside expertise	4	5	5	5	4	4.6	4	5	5	4	4	4.4	3	4	3	3	3	3.2	2	4	3	3	2	2.8	8	10	10	9	8	9	5	8	6	6	5	6
M2	Use multiple methods/gears including new methods discovered and increased usage of fyke nets, baits, large passive weirs, electric seines, etc.	3	3	5	4	3	3.6	3	5	5	4	4	4.2	3	3	4	4	3	3.4	3	3	4	4	2	3.2	6	8	10	8	7	7.8	6	6	8	8	5	6.6
M4	Disrupt nesting behavior (e.g. mechanically; spot treatments with chemicals)	5	4	3	4	3	3.8	3	4	3	4	3	3.4	5	3	3	4	3	3.6	5	4	2	3	3	3.4	8	8	6	8	6	7.2	10	7	5	7	6	7

M5	Apply piscicides-- spot treatments in isolated or disconnected habitats	2	3	3	4	5	3.4	3	5	5	4	5	4.4	3	3	2	4	5	3.4	5	4	3	3	4	3.8	5	8	8	8	10	7.8	8	7	5	7	9	7.2
M6	Large scale piscicide treatments (on the river reach scale)	1	1	0	0	3	1	1	2	1	3	2	1.8	1	2	0	0	1	0.8	5	4	1	4	4	3.6	2	3	1	3	5	2.8	6	6	1	4	5	4.4
M7	Bio-controls, including genetic bullets, stocking native predators	0	1	0	1	0	0.4	3	4	2	4	2	3	3	2	2	3	1	2.2	5	4	3	5	4	4.2	3	5	2	5	2	3.4	8	6	5	8	5	6.4
M9	Coordinate reservoir operations to buy or lease water for higher flows in fall to allow use of electrofishing boats	2	3	3	2	3	2.6	3	4	3	3	3	3.2	2	2	2	2	2	2	1	3	2	2	1	1.8	5	7	6	5	6	5.8	3	5	4	4	3	3.8
Pol3	Remove all threatening NNF (all centrarchids) when sampling to remove nnf fish	4	5	4	5	5	4.6	4	4	0	5	5	3.6	4	5	5	5	5	4.8	3	5	3	2	3	3.2	8	9	4	10	10	8.2	7	10	8	7	8	8
Pol4	Designate YA, GR and UCR as native fish conservation areas (CO/UT)	1	3	2	3	3	2.4	4	4	2	4	5	3.8	5	4	3	4	4	4	5	3	0	3	3	2.8	5	7	4	7	8	6.2	10	7	3	7	7	6.8
Pol5	Increase regulatory penalties for illicit stocking	3	3	2	3	3	2.8	3	4	3	4	4	3.6	4	4	4	5	4	4.2	5	4	2	4	4	3.8	6	7	5	7	7	6.4	9	8	6	9	8	8
Pol6	Focus I&E efforts on the predatory threat of SMB/NOP	5	5	4	5	4	4.6	4	5	4	5	4	4.4	4	5	4	4	3	4	2	3	1	3	1	2	9	10	8	10	8	9	6	8	5	7	4	6
Pol8	Seek cooperation with landowners--obtain access, easements, permission	1	3	2	3	3	2.4	3	4	5	4	4	4	4	3	2	4	3	3.2	4	4	4	5	4	4.2	4	7	7	7	7	6.4	8	7	6	9	7	7.4
Pol9	Seek endorsement of recovery efforts from organized angling groups (Trout Unlimited, BassPro, etc)	3	3	4	3	5	3.6	4	4	5	5	5	4.6	5	4	5	5	5	4.8	3	4	3	4	5	3.8	7	7	9	8	10	8.2	8	8	8	9	10	8.6
Pol11	Strategy for transition of nonnative fish management actions to state control	2	2	2	4	4	2.8	2	1	3	3	1	2	3	2	2	3	3	2.6	2	3	3	4	3	3	4	3	5	7	5	4.8	5	5	5	7	6	5.6
Pol12	Enlist other agencies (USDA, BLM, NRCS, etc) to work with State wildlife agencies on ways to control nonnative fish (a la Integrated Pest Management).	4	3	3	3	3	3.2	1	3	2	3	2	2.2	4	3	3	3	3	3.2	3	3	1	3	2	2.4	5	6	5	6	5	5.4	7	6	4	6	5	5.6
Pol13	Review crayfish stocking regulations and modify as needed	4	4	4	5	4	4.2	3	4	4	3	4	3.6	4	4	2	5	4	3.8	0	2	0	0	0	0.4	7	8	8	8	8	7.8	4	6	2	5	4	4.2

Prioritization Chart

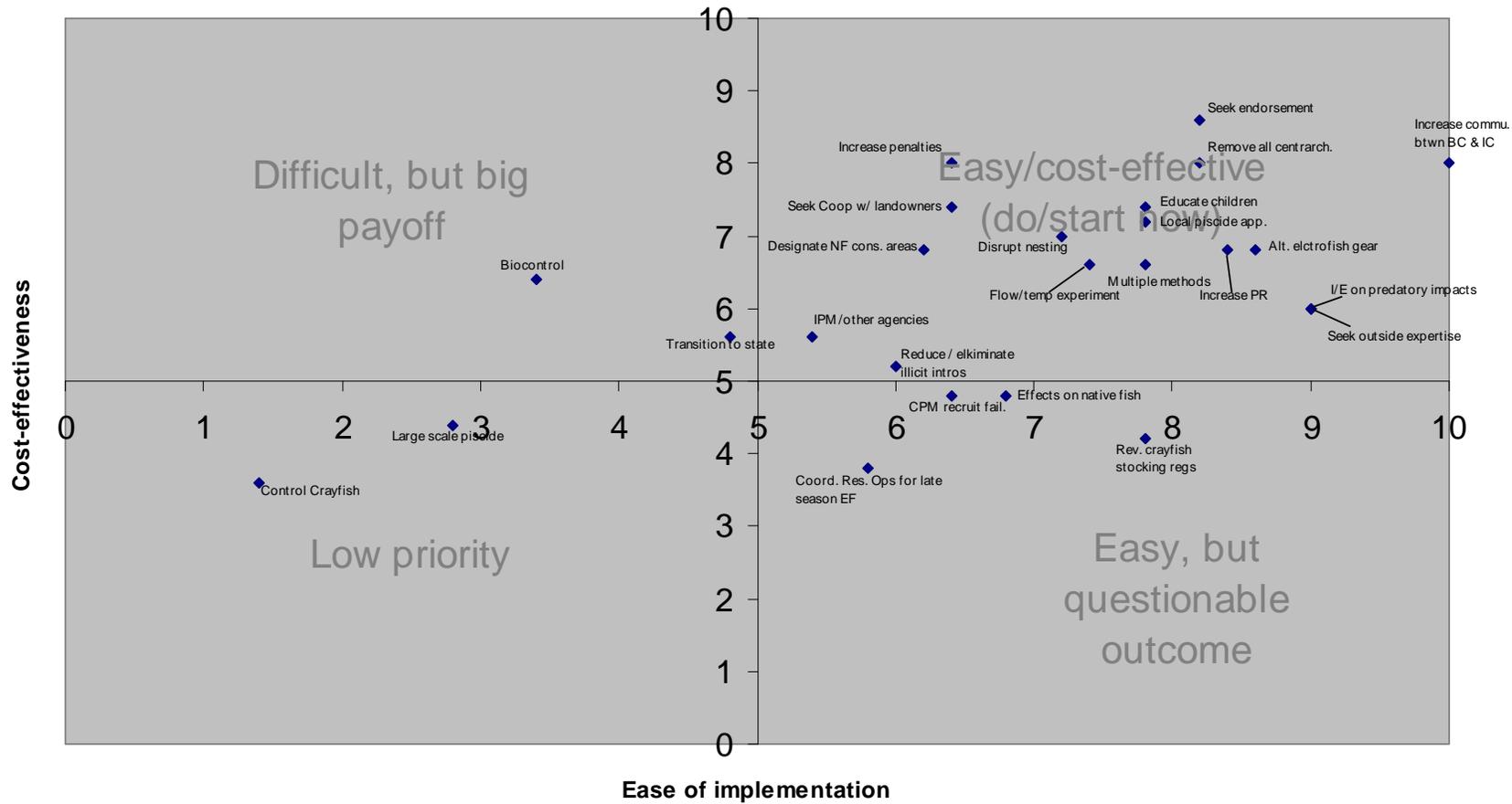


Figure 1. Prioritization Chart of nonnative fish management Recommendations / Recovery Actions. Bivariate Sum Scores generated in Table 2. Cost criteria ranking was included in this analysis. Refer to Table 3 for a summary of these results.

Prioritization Chart

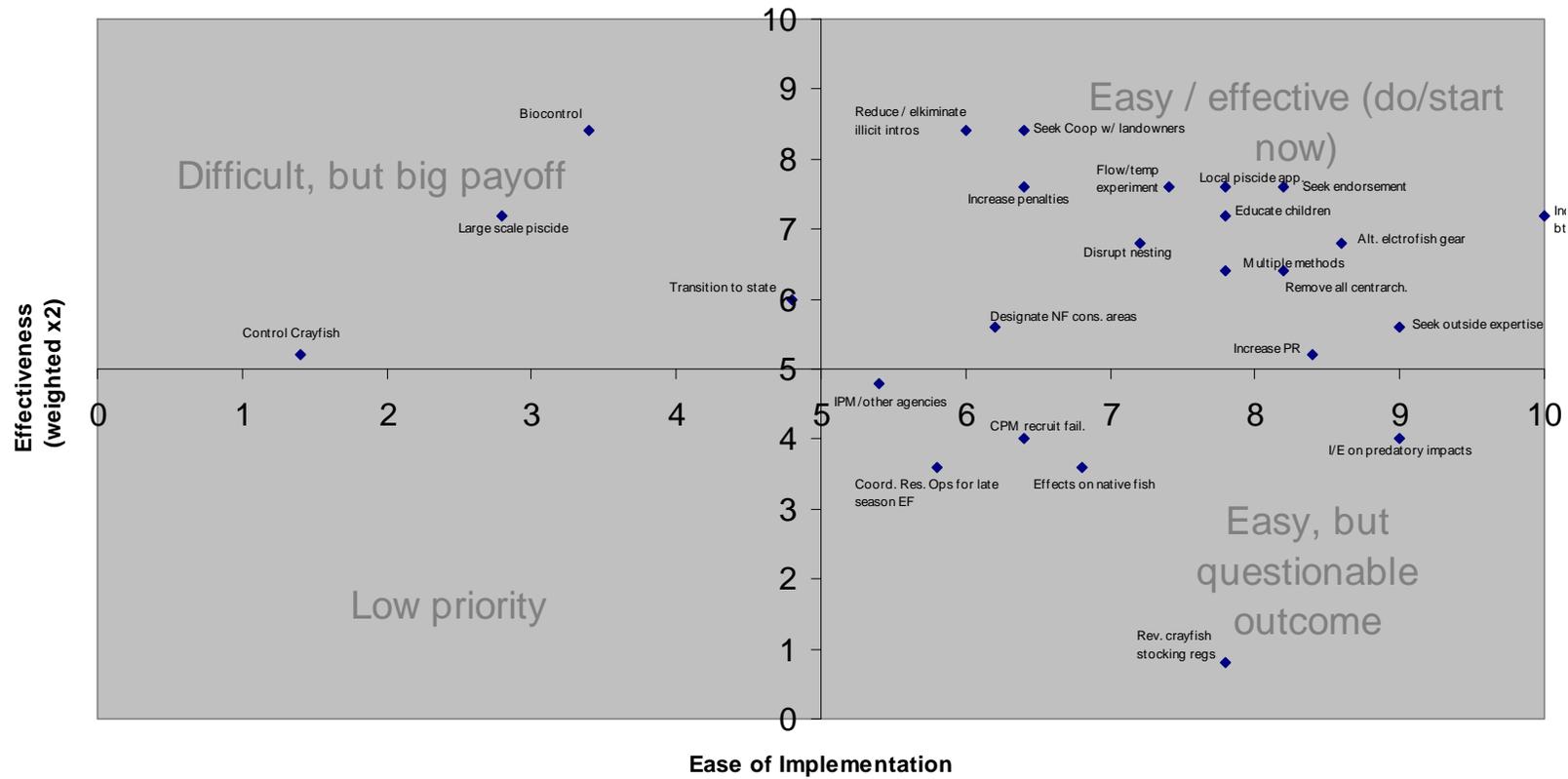


Figure 2. Prioritization Chart of nonnative fish management Recommendations / Recovery Actions. Bivariate Sum Scores generated in Table 2. Cost criteria ranking was **not** included in this analysis; the Effectiveness criteria score was doubled to compensate. Refer to Table 3 for a summary of these results.

Table 3. Summary of Recommendation / Recovery Action priority as depicted in Figures 1 and 2. Refer to Table 1 for a more complete description of the Recommendations and the associated tasks.

Category 1 – Recovery Actions that are Easy and Effective – Start ASAP			
General Priority		w/ Cost Considered	Costs Not Considered
HI	Within Category priority	P2. Increase Communication b/twn BC and IC	P2. Increase Communication b/twn BC and IC
HI		Pol9. Seek Endorsement of Angling Groups	Pol9. Seek Endorsement of Angling Groups
HI		Pol3. Remove all cetrarchids on all NNF sampling trips	R7. Explore alternative EF gears
HI		R7. Explore alternative EF gears	R12. Seek outside expertise
HI		Pol6. Increase the I&E message of the predatory impacts	M5. Small scale piscicide treatments
HI		R12. Seek outside expertise	P3. Educate children
HI		P3. Educate children	M2. Use multiple collection methods
HI		M5. Small scale piscicide treatments	Pol3. Remove all cetrarchids on all NNF sampling trips
HI		P1. Increase PR – importance of sportfish in settings compatible with native fish conservation	Pol8. Seek coop. w/landowners
HI		M2. Use multiple collection methods	R5. Flow / temp experiments to disadvantage NNF
HI		Pol5. Increase penalties for illicit introductions	M4. Disrupt nesting behavior / success
HI		M4. Disrupt nesting behavior / success	P1. Increase PR – importance of sportfish in settings compatible with native fish conservation
HI		R5. Flow / temp experiments to disadvantage NNF	P5. Reduce / eliminate illicit intros
HI		Pol8. Seek coop. w/landowners	Pol5. Increase penalties for illicit introductions
HI		Pol4. Designate native fish conservation areas	Pol4. Designate native fish conservation areas
HI		P5. Reduce / eliminate illicit intros	
HI		LO	Pol12. Enlist other agencies – (e.g. IPM approach)
Category 2 – Recovery Actions that are Easy but have a Questionable Outcome			
MEDIUM		Pol13. Review Crayfish Stock Regs	Pol6. Increase the I&E message of the predatory impacts
MEDIUM		R9. Effects on native fish	R9. Effects on native fish
MEDIUM		R4. CPM recruitment failure	R4. CPM recruitment failure
MEDIUM		M9. Coord Res ops for more sampling	Pol12. Enlist other agencies – (e.g. IPM approach)
MEDIUM			M9. Coord Res ops for more sampling
MEDIUM			Pol13. Review Crayfish Stock Regs
Category 3 – Recovery Actions that are Difficult but may be very effective			
MEDIUM		Pol11. Transition NNF control to State agency	Pol11. Transition NNF control to State agency
MEDIUM		M7. Biocontrol	M7. Biocontrol
MEDIUM			M6. Large scale piscicide treatments
MEDIUM			R10. Control Crayfish
Category 4 – Recovery Actions that are Difficult and have a Questionable Outcome			
LOW		M6. Large scale piscicide treatments	
LOW		R10. Control Crayfish	