

**Biology Committee Meeting
Feb 10-11, 2005
Crystal Inn, Denver, Colorado**

Biology Committee: Tom Chart, Tom Nesler, Tom Pitts (Friday only), John Hawkins, Melissa Trammell, Kevin Gelwicks, Dave Speas, Gary Burton (Friday only), and Bill Davis via phone for portions of the meeting. Kevin Christopherson attempted to participate by phone, but the connection was inadequate.

Other participants: Kevin Bestgen, Chuck McAda, Dave Irving, Pat Nelson, Bob Muth, and Angela Kantola.

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

February 10, 2005

Convene: 10:30 a.m.

1. Review January 21, 2005, meeting summary - Add to item 7.a., “Bill Davis raised the issue of why we’re not addressing brown trout in Lodore Canyon; the Committee agreed that remains to be discussed.” Item #9, changed “weighted up to 80%” to “weighted heavily.” Under the second sentence of SOW #110, change “continuing to translocate catfish” to “translocating catfish.” >Angela Kantola will revise the meeting summary and post it to the listserver. Bob Muth said he has a draft response to Tim Modde’s stocking questions, and will send that out soon. Tom Nesler said CDOW understands that it was agreed through the nonnative fish stocking procedures to translocate catfish from Yampa to Kenney Reservoir; therefore, CDOW wants to do this at least once, but if it proves to be too inefficient or mortality is too high, they are willing to reconsider. **[NOTE: This was later changed to Rio Blanco Reservoir, and only catfish >10” will be translocated.]** >Tom Nesler will confirm the size of fish to be moved. If the Committee were to strongly oppose this, they could recommend to the states that this needs to be revisited. >Dave Irving will have Mark Fuller add to his trip report the number of fish removed for translocation, who they were given to, etc. All translocated fish will be marked by fin-clip. Tom Chart said nonnative fish control language is a reasonable and prudent alternative in the Duchesne biological opinion addendum (it cites whatever is included in the RIPRAP, and changes if the RIPRAP changes). Melissa Trammell said Gordon Mueller provided ~6 citations regarding his claim that removal of 90% of nonnatives is required to see a native fish response; >Melissa said the conclusions in these citations are somewhat mixed and she’ll provide a summary to the Biology Committee.
2. Re-elect vice-chair - Kevin Gelwicks cannot serve this year (although he can serve next year), so the Committee elected Dave Speas as vice-chair (pending approval of his supervisor).

3. Review reports list - >Angela Kantola will post a revised reports list to the listserver. >The PD's office will ask PI's for nonnative fish annual reports to submit final, revised reports that include all the information they provided in their presentations at the nonnative fish management workshop. John Hawkins asked if we shouldn't have some review of these reports if they're going to serve as the record as what was found; the group agreed the 3-year summary reports will be reviewed. Annual reports should note that they are annual progress reports and include the date when the 3-year summary report will be provided. >Tom Nesler will see that the finalized aquatic management plans for the Colorado, Gunnison, and San Juan rivers are provided to the Biology Committee and Program Director's office. The Yampa plan will be revised sometime after Tom Nesler provides his summary of CDOW's nonnative fish management strategy for the Yampa.

4. Update on revised scopes of work - Pat Nelson reviewed changes made to the scopes of work. After consulting with the Tribe and others, it doesn't appear that focusing on the mouth of the Duchesne River or going up from the mouth would be particularly effective managing nonnative fishes, so the PI's revised the scope of work to provide options for 1-3 removal passes moving downstream. Dave Speas asked about possible impacts to endangered fish in the mouth of the Duchesne River when sampling during high flows in the spring; Dave Irving replied that they don't plan to go in right at peak flows. The Committee endorsed the 3-pass removal in the Duchesne River. >Tom Nesler will get revisions to the Yampa River northern pike sources scope of work to reflect CDOW's contribution, budget details, etc. Melissa noted that 98a has two options: 4 removal passes, or 1 marking pass and 3 removal passes. Melissa asked how a removal estimate could be made with the mixed effort from CDOW & LFL. The Committee agreed to the second option (one marking pass followed by 3 removal passes) in order to determine percentage of fish removed (with LFL following up with concentrated removal in specific areas). Melissa asked if we're not going to tag bass that are not removed outside of the treatment reach; and John said that is the planned strategy because they don't want to divert attention from northern pike removal. >John Hawkins will set up a nonnative fish management coordination conference call to discuss tag types, tag color, etc. >Pat Nelson will make sure that FY 06-07 scopes of work contain language about working up endangered fish. >The Program Director's office will remind all PI's about working up every endangered fish encountered. Dave Speas asked for clarification about the term "movement" in the sources of northern pike scope of work. Dave Speas asked how the sites in the entrainment scope of work were selected and Kevin Bestgen said they tried to select high-priority sites with some geographic separation. The budget for this scope of work (C-6-rz) needs to be reviewed (it was later determined that the bottom line is accurate; >corrected SOW to be submitted by Kevins Christopherson and Bestgen). Gary Burton (on Friday) asked about incorporating a hydrological component (determining what is the aerial extent of inundation at various flow levels) in this scope of work, or in separate Program guidance. Tom Pitts said he would support that. Pat Nelson said they've wanted to evaluate physical response as a function of flow for several years and have \$58,100 earmarked under C-6-hyd for FY 05 to examine sites and determine connection, sediment deposition and erosion. Collecting aerial photos is

expensive (\$20,000 - \$30,000 per flow) and they must be ground-truthed because floodplains can appear connected in the photos when they're not. We have photos at 20,000-25,000 cfs, but not at the lower flows that WAPA has in mind (although Bob Muth said he thinks some data are available). John Hawkins and others agreed and suggested that there is likely other work that should be considered to address uncertainties in the Flaming Gorge flow recommendations. Dave Speas noted that the larval drift entrainment project, C-6-hyd, and the work in Lodore all are related to this concern. The Committee acknowledged that uncertainties addressed in the Flaming Gorge Biological Opinion will be addressed in changes in the RIPRAP next year. Dave Speas (and Bob Muth) noted that many of these scopes of work were originally set up for FY 04-05, some now go out to FY 06-07; need to be sure that's consistent with Program guidance. Bob Muth said he's concerned about continuing work beyond final report dates (without the final report first being reviewed and considered). Pat Nelson noted Doug Osmundson reviewed a report on smallmouth bass modeling (Peterson), and encouraged everyone to inform him and the Committee if they know experts we can consult on smallmouth bass management, etc. Dave Speas noted the potential to impact bass with flow management.

5. Review draft RIPRAP assessment (All)

- 23, IIIA2c Tom Nesler asked about the citation of 8-97% effectiveness for smallmouth bass removal (estimates varied considerably). John Hawkins recommended using 69% percent effectiveness from the 12-mile treatment reach as the top number (~70%). The Committee agreed. Melissa suggested this item should have both an exclamation point and an X since we haven't reached the needed reduction yet. Bob Muth disagreed, saying that these are still *accomplishments*. Bill Davis suggested changing the term "sampling efficiency" to "capture efficiency." The Committee agreed. Bill also noted the need to emphasize that success will be measured by native fish response. Dave Speas recommended adding a sentence about fish being translocated to ponds where they're accessible to anglers. The Committee agreed (use language from the nonnative fish policy).
- 28, IIA3c Bill Davis asked for clarification on whether this refers to experimental or natural floodplains. Pat Nelson said it's some of both.
- 29, IVA1c Clarify Grand Valley *Hatchery* and Ouray *NFH*. >The Program Director's Office and Chuck McAda will provide the Biology Committee with a summary of numbers, sizes, and locations of fish stocked from each hatchery. Part of this needs to be a standard reporting requirement from the hatcheries. Discussion of propagation will be on a future Biology Committee meeting agenda. >Dave Irving also will provide Mike Montagne's summary of effectiveness of grow-out ponds.

- 30,31 Tom Chart suggested it's not appropriate to have an exclamation point for the Elkhead 404 permit and temporary spillway screen, since these haven't been completed yet; Bob Muth agreed those items should be neutral.
- 31, IA5I3 Clarify that Grand Valley water Management checks were put in place and fully automated in previous years.
- 31, IIA2a John Hawkins noted that the Duffey Tunnel ditch is smaller, but does have native fish ; Pat said we want to evaluate Maybell first (the Committee will discuss this under Program Guidance).
- 37, ID1 Should read Colorado and Green river flows *below* the confluence.
- 39, IVA4b Tom Chart said he believes we should not stock fish above unscreened
43, IVA2b canals (put them in the San Juan River, instead). The Committee needs to make a decision on the stocking disposition of any CPM in our hatchery system that could/should be put out in 2005.
- 42, IIB1c Clarify that nonnative fish are not passed over the Redlands fish ladder.
- Appendix The critical habitat analysis is not updated, thus a date needs to be added.

6. Review draft RIPRAP revisions (All)

- 6 Section 2.2: at the end of 2nd paragraph Bill Davis recommended rounding out current understanding of benefit of floodplain sites by putting in context of problems with nonnative fishes. >Bill will send his suggested language to Bob Muth and the Biology Committee.
- 8,15 Need to note Yampa River diversion canals.
- 8 Strike “not including salmonids” from the first paragraph under Section 2.3.
- 9 Section 2.4: at the end of the 2nd paragraph, Bill Davis suggested addressing humpback chub by adding something like “the Recovery Program continues to evaluate the need for implementing an integrated stocking plan for humpback chub...” >Bill also will send this suggested language (although Bob Muth noted that the term “genetic stock” isn't appropriate. >The Program Director's Office will review the use of the term “genetic stock” in the RIPRAP.
- 12 Paragraph before Section 3.1.2 Add “*wild* bonytail.”
- 15 6th para under 3.2.2, also note that pike are known to prey on flannelmouth and bluehead suckers and adult Colorado pikeminnow. Also, next paragraph about Little Snake River flow recommendations should be moved up two paragraphs.

Whole paragraph needs to be updated with current management actions. Move background information to Section 2.2. Cite Crowl study for 5% reference.

- 20 Tom Chart asked about the last sentence under the Dolores River about legal protection of inflows. Melissa suggested we may want to look at stocked fish (esp. bonytail) use of the Dolores River at some point. >Melissa and Tom Chart will provide recommended language.
- 24, IVB2 Melissa asked about the integrated stocking plan vs. the previous annual propagation operational plan. Melissa distributed suggestions for better communication and analysis of stocking program; which >she will post to the Biology Committee and the Committee will discuss it at a future meeting.
- 25, IVE1 Assessing monitoring needed to evaluate contribution to recovery of endangered fish stocking should be ongoing (can mention the 2002 workshop, but assessment isn't complete).
- 29, VC&1 Explain 3 years on, 2 off and why there are X's in every year (report write-up).
- 34, IIIA1 Melissa emphasized that the RIPRAP requires monitoring escapement if nonnative fishes are stocked into Kenney Reservoir. (And translocation of fish into Kenney Reservoir would likely be considerably less cost effective if the cost of monitoring is considered.) This item should not be highlighted, because it is not complete.
- 34, IIIB1a >Tom Nesler will provide Colorado's report (and citation for the RIPRAP) on assessment of Kenney Reservoir black crappie escapement to the Biology Committee. *Done*. Tom Nesler suggested that the Committee may need to discuss the White River further during a future meeting.
- 40, VDCheck years for Colorado pikeminnow population estimate. Tom Chart noted that Osmundson has recommended considering continuation of population estimate in FY 06, since FY 03 estimate was not as precise in FY 04 and 05. Doug has noted that the FY 05 results should be considered in this decision, however.
- 42, IIIA1 Move this item to increase law enforcement activity to decrease angling mortality to the General Action Plan. >Tom Nesler will discuss the status of law enforcement with CDOW. (>Utah and Wyoming should make similar inquiries.) John Hawkins added that it would be very valuable to get information out to fly-fishing guides on the Yampa River and suggested that Debbie consider them a target audience.

42, IIIA2 Move this item to develop control of small nonnative cyprinids in backwaters, etc. (on hold) to the General Action Plan.

43, VA2 Due date is 8/06, not 8/05.

Gunnison Add x's in FY 09 for ongoing items.

7. Review draft FY 06-07 Program guidance (continued on Friday, as well)

Instream Flows

#FR-115 Additional funds would be needed to continue sampling into FY 06 (\$62.8K) and 07 (\$65K).

Following on the discussion about larval drift entrainment under revised FY 05 scopes of work, item #4, Gary Burton (on Friday) suggested that perhaps there needs to be a general placeholder for addressing uncertainties in the Flaming Gorge flow recommendations. Tom Chart said he'd like to see the floodplain white paper come back to the Biology Committee for approval. Bob Muth said he thinks the pilot larval drift entrainment work shed considerable doubt on the assumptions in the larval drift model, and noted that Argonne's hypotheses about inundation in the floodplain white paper relied on heavily on those assumptions. Therefore, a few more years of the entrainment study may provide very valuable information. Tom Pitts emphasized that we not only need to assess entrainment, but also habitat changes from flow modifications; Bob Muth noted that's why we're doing the USGS sediment monitoring.

Habitat Restoration

(See also discussion under instream flows, above, and larval drift entrainment revised scope of work, item 4.)

C-3 Move above C-4 and note this O&M is done by Redlands Power Co.

C-6-em The Biology Committee would like the Management Committee to more closely evaluate the amount of funds needed for easement management.

Dave Speas and others asked about O&M on various Grand Valley capital projects and expressed interest in a tour of those capital projects the next time the Committee meets in Grand Junction. >Dave Speas will compile questions folks would like to ask.

Yampa entr. The Committee suggested making this guidance for Maybell and/or Duffey, and clarify that what's envisioned is basically just a salvage operation at the end of the season to determine if fish are entrained.

Adjourn 5:00 p.m.

February 11, 2005

Convene: 8:00 a.m.

Nonnative Fish Management

Bob Muth commented that he treats the nonnative fish projects more as placeholders than ongoing/revised because we evaluate nonnative fish management projects every year, and some may have higher priority than others.

Melissa asked if we should have a placeholder for upper Yampa pike removal (pending outcome of current work), and Tom Nesler said he thinks we should wait and see the data from the current work. Tom Chart noted that 98b could be extended to the upper reaches if that was deemed necessary. Tom Nesler said he's working on a nonnative fish management strategy for the upper Yampa, which could include this as a contingency.

Dave Speas asked if we might want to include a placeholder to investigate the potential for using dam operations to negatively affect smallmouth bass. Tom Chart agreed we need to pursue this angle, but first get the Peterson paper out to the Biology Committee and involve Pat Martinez in the discussion. Tom Nesler agreed that we're looking for the "Achille's heel" in smallmouth bass management. We've already seen that one possibility is getting male smallmouth bass off the nests; flow management may be another angle. >Tom Nesler will ask Pat Martinez to look into this and perhaps provide a synthesis of control avenues for smallmouth bass at the next nonnative fish workshop. >Pat Nelson will work with Pat Martinez to develop a list of potential limiting factors for Nelson to present at a Biology Committee meeting in the near future. Bob Muth noted that existing Program reports contain a wide-range of potential limiting factors. Tom Pitts expressed concern about putting more pressure on Flaming Gorge and Aspinall given the current impacts to power generation. Bob Muth pointed out that we haven't yet implemented the flows that the endangered fish need, and now we're contemplating targeting flows to negatively impact smallmouth bass. Melissa added that the smallmouth bass work we're already doing in the Green and the work we're doing in Lodore position us to test flow hypotheses.

Bill Davis suggested having someone provide an annual update on emerging technology for controlling nonnative fish. Pat Nelson said we don't have a specific project for that, but that we are working on it. Bill Davis said he doesn't see how the Program can sustain the current method/level of control. Bob Muth said Pat Nelson has been reviewing the literature and >will provide an update at a future Biology Committee meeting. Bill Davis recommended a pilot study to test new methods we come up with. Pat Nelson said we're doing that to some extent (e.g., electric seines, low-flow electrofishing equipment).

Propagation & Genetics

Melissa asked if other hatchery budgets contained the level of contingency found in the Wahweap budget and Bob Muth said Tom Czaplá reviewed the budgets and did not find excessive contingency.

>Chuck McAda will check to see if the lease on one Grand Valley pond needs to be renewed in FY 06. Bill Davis said he believes we need to put more effort into meeting our stocking goals. Gary Burton suggested we might need to report on how well we are complying with the genetics management plan. Bob Muth said we are complying and he has a draft report on that topic that he'll send to the Committee soon.

Research & Monitoring

121 Field work was extended into FY 05, so final report will be written in FY 06 (move to "ongoing"). Kevin Bestgen said more larval samples were collected than anticipated, and the FY 04 funds they received may not be adequate to cover them. Some adjustments may need to be made in the sampling to avoid this problem in FY 05. Also, LFL wasn't reimbursed \$8,600 for processing the Green River larval drift samples collected through Kevin Christopherson's larval entrainment work.

16 Chuck said we'll need to require researchers to submit data in a more rigid format. Due to the size of the files, we need to migrate from Excel to Access to manage the overall dataset.

22f Tom Chart said he thinks the larval razorback and pikeminnow information is being used to some extent in timing Flaming Gorge releases. Kevin Bestgen said this work also provides a good indication of reproductive success of the two species every year. The data are used in a real-time fashion in some, but not all years. Another example of real-time use was a few years ago when Reclamation wanted to release higher summer base flows, and this work provided information on whether larval fish were present in the system (temperature concern). Bob Muth said he thinks this information will be used more once Flaming Gorge is being operated to meet the flow recommendations. Gary Burton asked if this could be coupled with the native fish response study in the Yampa and/or Green rivers, and Kevin Bestgen said he thinks it already is. Tom Nesler pointed out that it would be good to present these long-term data from time to time. Tom Chart said there hasn't been a good administrative record on how these data are used and how the Gorge is operated each year and Reclamation should report this each year (this requirement is included in the draft Flaming Gorge EIS).

Melissa recommended a placeholder for monitoring stocked fish, noting that Kevin Christopherson's 2004 scope of work could be used for that. Chuck McAda or Bob Muth or Tom Nesler (?) noted that the protocol/directive for working up all endangered fish (pending from the Program Director's office) is intended to get at part of this. Tom Nesler emphasized the need to get Czaplá's evaluation of stocked fish data as soon as

possible (>Bob Muth committed to have that report to the Committee in advance of their April 7 meeting).

127 Should be three years on, *two* years off.

John Hawkins raised concern about the status of humpback chub in Yampa Canyon and pikeminnow in the Green River system and whether we're responding appropriately. John suggested we may need a focus group to review the data and make sure we're doing everything we can to respond appropriately. Bob Muth said we have a \$30,000 placeholder in FY 05 and \$60,000 in FY 06 to address this concern. Bob added that Rich Valdez is still waiting for the responses from some of the ad hoc group. The workshop summary will lay out a number of response options. With regard to a need to take humpback chub out of Yampa Canyon, Bob Muth said we believe humpback chub are panmictic and we've thus far managed them as a species.

Cyprinid key - Dave Speas said there might be an opportunity for Reclamation to cost share this with the Upper Colorado River and San Juan River recovery programs.

Information & Education

Committee members inquired about the interactive basinwide map and working with the public regarding upper Yampa nonnative fish management. Tom Nesler said it has occurred to him that a self-guided Powerpoint presentation might be useful for the district wildlife managers (for their own information and for them to use with interest groups). >Angela will suggest this to the I&E Committee.

8. Review Hawkins Yampa pike removal report - John Hawkins said he addressed most of the concerns of two of the three reviewers, but did not address all of Ed Wick's concerns (e.g., including new information and expressing urgency). The Committee had no comments on the report as revised and accepted the report as final. >John Hawkins will finalize the report, distribute it, and provide an electronic copy to the Program Director's office to post to the website. Many of the report recommendations already are being implemented. Gary Burton asked about bioenergetics investigations and Tom Nesler said those are being done in Colorado. Melissa noted that she's working on with John Hawkins and others to get Park Service and Reclamation (non-Program) funding for a Yampa riverwide seine (and electric seine) survey in September of this year to look at sources of northern pike and smallmouth bass and fish community data and comparing that with data from the early 1980's. >Melissa will share the proposal with the Biology Committee.
9. Update on Reclamation procurement policy - Dave Speas (on Thursday) said scopes of work for projects currently envisioned to continue in outyears (according to Program guidance, etc.) most definitely need to identify those outyears. Dave reviewed the outcome of the conference call on Wednesday, noting that Reclamation will look at the list of questions and projects that Angela prepared and review the work plan line-by-line.

Dave said that some of the agreements currently in place are good for several more years and projects under those agreements do not have to be competed at this point. Projects directed to operation and maintenance aren't expected to be required to undergo competition, either. If agencies believe they should be exempt (e.g., because only the state or Service or someone they designate will be allowed to do certain work on endangered or nonnative sportfish, for example), they will need to provide adequate justification for that. Angela said she compiled a list of anticipated FY 06 projects for which it seems unclear how competition could be applied. The total of those projects is ~\$4.7M and Reclamation is only expected to provide ~\$4.4M in FY 06. Tom Pitts said he believes RFP's will be appropriate for certain types of new projects or research in the Program, and we should seek to identify those as they come up. Some of the issues on the San Juan are a little different. Tom Chart said Reclamation may need to consult the States and the Service regarding permitting as they are developing any RFP's.

10. Discuss nonnative gamefish control criteria

Northern Pike

The Committee previously agreed that the interim target pikeminnow density (criteria) should be equal or below that of Colorado pikeminnow. The Committee discussed what number to use as a Colorado pikeminnow density estimate (the last two years of Colorado pikeminnow population estimate data on the Yampa River were based on considerably fewer captures, and there has been debate about whether to use the mid-point or lower confidence limit). >Tom Nesler will work with Kevin Bestgen to review the pikeminnow data and propose a density over the 74-mile reach. The proposed target pike density could later be decreased, but not increased. Pat Nelson suggested that to avoid a need to make a pike population estimate every year, perhaps catch rates could be compared.

Smallmouth Bass

The ultimate test is native fish response (which also will need to be defined). Comparison of relative abundance (with pre-1990's data) is a possible approach. Kevin Bestgen recommended a metric based on small fish (we have more data on small fish and they may have the greatest factor in limiting endangered fish recruitment). >Tom Nesler will work with Sherm Hebein to propose a specific criteria (such as relative abundance by species composition). Melissa pointed out that this doesn't get to the question of a threshold for escapement of smallmouth bass from Elkhead. Also, we need to remember that our concern is escapement of *all* fish, not just escapement of *tagged* fish.

11. Confirm date and review agenda items for next meeting(s) - The next meeting will be April 7th & 8th, starting at 8:00 a.m. on Thursday, April 7 and adjourning no later than noon on Friday, April 8. >The Program Director's office will arrange a meeting room (at the Holiday Inn, if possible). Agenda items will include review of propagation efforts, a discussion of White River issues, the Elkhead escapement report, the Anderson report, a review of FY 04 final annual reports (final annual reports to be posted to the website by the end of March, see discussion below), and at least an update on potential new techniques for smallmouth bass and other nonnative fish control. A future meeting agenda will include a tour of Grand Valley facilities (later during the irrigation season). Melissa Trammell suggested the Biology Committee should reinstate its practice of reviewing annual reports. Tom Nesler recommended a time on the agenda where the Committee reviews reports that Committee members have indicated in advance that they want to discuss. >For FY 05, the PD's office will post the *draft* annual reports by the second week in December, then the Biology Committee can add a day to discuss these after the researchers meeting or in conjunction with their February meeting (discussing only reports that Committee members have particular questions/concerns about). For FY 04 annual reports, the Committee will wait until the final FY 04 annual reports have been posted (by the end of March, in light of the revisions that need to be made to nonnative fish annual reports).

Adjourn 1 p.m.

ASSIGNMENTS

1. Angela Kantola will revise the January 21, 2005, meeting summary and post it to the listserv. *Done.*
2. Bob Muth said he has a draft response to Tim Modde's stocking questions, and will send that out soon.
3. Bob Muth has a draft report on how well we are complying with the genetics management plan that he'll send to the Committee soon.
4. Tom Nesler will confirm the size of catfish to be moved from the Yampa River to Kenney Reservoir [**Note: later changed to Rio Blanco; fish >10'**].
5. Dave Irving will have Mark Fuller add to his trip report the number of fish removed for translocation, who they were given to, etc.
6. Melissa Trammell will provide a summary of the citations Gordon Mueller provided to her regarding his claim that removal of 90% of nonnatives is required to see a native fish response. (*Now attached to this summary.*)
7. Angela Kantola will post a revised reports list to the listserv.
8. The Program Director's office will ask PI's for nonnative fish annual reports to submit final, revised reports that include all the information they provided in their presentations at the nonnative fish management workshop. *Request made.*
9. Tom Nesler will see that that the finalized aquatic management plans for the Colorado, Gunnison, and San Juan rivers are provided to the Biology Committee and Program Director's office.
10. Tom Nesler will provide revisions to the Yampa River northern pike sources scope of work that reflect CDOW's contribution, budget details, etc. *Done.*
11. John Hawkins will set up a nonnative fish management coordination conference call to discuss tag types, tag color, etc. (*John talked to researchers individually.*)
12. Pat Nelson will make sure that FY 06-07 scopes of work contain language about working up endangered fish.
13. The Program Director's office will remind all PI's about working up every endangered fish encountered.
14. Kevins Christopherson and Bestgen will submit a corrected scope of work for razorback entrainment.

15. The Program Director's Office and Chuck McAda will provide the Biology Committee with a summary of numbers, sizes, and locations of fish stocked from each hatchery. Part of this needs to be a standard reporting requirement from the hatcheries. Discussion of propagation will be on a future Biology Committee meeting agenda.
16. Dave Irving will provide Mike Montagne's summary of effectiveness of grow-out ponds.
17. (Section 2.2, end of 2nd paragraph in RIPRAP text) Bill Davis will send to Bob Muth and the Biology Committee suggested language regarding rounding out current understanding of benefit of floodplain sites by putting it in context of problems with nonnative fishes.
18. (Section 2.4: at the end of 2nd paragraph in RIPRAP text) Bill Davis also will send language addressing humpback chub, something like "the Recovery Program continues to evaluate the need for implementing an integrated stocking plan for humpback chub.
19. The Program Director's Office will review the use of the term "genetic stock" in the RIPRAP.
20. Melissa and Tom Chart will provide recommended language regarding assessing stocked fish (esp. bonytail) use of the Dolores River at some point. (*Addressed at Management Committee meeting.*)
21. Melissa distributed suggestions for better communication and analysis of the stocking program and will post that to the Biology Committee for discussion at a future meeting.
22. Tom Nesler will provide Colorado's report (and citation for the RIPRAP) on assessment of Kenney Reservoir black crappie escapement to the Biology Committee. *Done.*
23. Tom Nesler will discuss with CDOW the status of law enforcement activity to decrease angling mortality. Utah and Wyoming should make similar inquiries.
24. Dave Speas will compile questions folks would like to ask about O&M on various Grand Valley capital projects in preparation for a tour of those capital projects the next time the Committee meets in Grand Junction.
25. Tom Nesler will ask Pat Martinez to look into smallmouth bass limiting factors and provide some synthesis of control avenues for smallmouth bass at a future Biology Committee meeting and at the next nonnative fish workshop.
26. Pat Nelson will work with Pat Martinez to develop a list of potential limiting factors and will provide an update on possible new techniques at a future Biology Committee meeting.
27. Chuck McAda will check to see if the lease on one Grand Valley pond needs to be

renewed in FY 06.

28. The Program Director's office will provide the evaluation of stocked fish report in advance of the Committee's April 7-8 meeting.
29. Angela will suggest to the I&E Committee a "self-guided" Powerpoint presentation on nonnative fish management for the district wildlife managers (for their own use and for them to use with interest groups).
30. John Hawkins will finalize the Yampa pike removal report, distribute it, and provide an electronic copy to the Program Director's office to post to the website.
31. Melissa will send the Biology Committee the proposal she's working on with John Hawkins and others to get Park Service and Reclamation (non-Program) funding for a Yampa riverwide seine (and electric seine) survey in September of this year to look at sources of northern pike and smallmouth bass and fish community data and comparing that with data from the early 1980's. (*Proposal deferred a year.*)
32. Tom Nesler will work with Kevin Bestgen to review the pikeminnow data and propose a density over the 74-mile reach. Tom also will work with Sherm Hebein to propose a specific smallmouth bass criteria (different than relative abundance).
33. The Program Director's office will get the final FY 04 annual reports posted to the website by March 31, 2005.
34. The Program Director's office will arrange a meeting room for the April 7th & 8th meeting in Grand Junction (at the Holiday Inn, if possible).

MEMORANDUM

March 7, 2005

TO: BC, Interested parties

FROM: Melissa Trammell NPS

RE: Summary of references suggested by Dr. Gordon Mueller to support the statement that a 90% reduction in nonnative fish abundance is necessary to induce a positive population response by native fishes.

At the Upper Colorado River Basin Recovery Program Nonnative Fish Removal Workshop held in December 2004, Gordon Mueller stated that a 90% reduction in nonnative fish abundance is necessary to induce a positive population response by native fishes. The workshop was followed by a Biology Committee meeting where achieving target densities of nonnative fishes was discussed as a possible criterion for successful nonnative removal efforts. Before a target density is established, more data are needed to support the chosen target. On request, Gordon Mueller provided several citations to support his suggested target of a 90% reduction. I have summarized those citations here.

In response, six citations were provided. Two were general discussions of recovery programs with no specific information on target nonnative densities (Boersma et al. 2001, Brower et al. 2001). One citation discussed predator removal in a decision matrix format, and also stated that 10-20% of northern pikeminnow must be removed to benefit salmon smolts (Beamesderfer 2000). Two citations were actual removal studies with empirical data having one positive and one negative response; Dudley and Matter (2000) concluded that removing 90% of green sunfish from a small creek did not result in a positive response by Gila chub. Dudley and Matter (2000) is the only experiment conducted in a riverine environment. Weidel et al. (2002) showed that removing 43 to 88% of smallmouth bass from a lake in the Adirondacks did result in a positive response by other littoral species. An additional reference as cited in Weidel et al. (2002) states that "...in large ecosystems, small changes in predator density can improve prey survival." (Post et al. 2000). The sixth citation was a comprehensive review of resource use by razorback sucker and bonytail (Pacey and Marsh 1998).

Pacey and Marsh (1998) included a discussion of 10 case studies illustrating survival, reproduction, and growth of bonytail and razorback sucker in a variety of pond habitats with and without nonnative predators. Few of these accounts have been published elsewhere. Six studies were examples of successful survival and reproduction in predator-free pond habitats. Two studies indicated no survival in predator-free habitats, due to environmental conditions. One study, citing unpublished data from Dexter National Fish Hatchery (J.E. Brooks) described an experiment with razorback sucker larvae and green sunfish in production ponds at high (874/acre), medium (175/acre), and low (35/acre) predator densities which showed 0 % survival at high density, 72 to 78% survival at medium density and 90-97 % survival at low density.

The last study discussed was the long term experiment and production with razorback suckers conducted in Lake Mohave backwaters and coves, which has been presented to the Recovery Program at several Annual Researcher Meetings by Tom Burke. Here were several examples of successful survival and reproduction in predator-free habitats, while "survival is dramatically reduced where non-natives are present (in part, Marsh and Langhorst 1988, Minckley et al. 1991, Mueller et al. 1993, Mueller 1995, and unpublished data)." Also, "Young bonytail and razorback suckers...have survived and grown, often to sexual maturity, in every instance when they have been placed into backwater habitat free of non-native predatory fishes at Lake Mohave. In striking contrast, results have been dismal when non-native fishes were present." In each of these experiments the goal was complete removal and exclusion of nonnative fishes. There were no reports of 90 % removal; it was either all, or nothing. Each of these 10 case studies was conducted in ponds or other enclosures. No experiments were conducted in riverine environments.

A literature review on nonnative fish removal conducted for the June Sucker Recovery Program (SWCA 2002) included a few more supporting citations, including Harding et al. (2001) with a non-aquatic model showing that 70-75% of predators must be removed to benefit prey species, and Friesen and Ward (1999) showing little positive response of salmon smolts to 12 % reduction in northern pikeminnow.

Review of these citations suggests the reduction in predator abundance required to induce a positive species response is variable, and is likely dependent on the specific environment and species being studied. Predator reductions that resulted in a positive species response varied from 12% to 100%, while similar ranges in reductions failed to induce a positive response. The preponderance of evidence supports the assertion that a very large proportion of nonnative predators must be removed to benefit the native species; however the precise reduction required is unknown, and will likely be determined from *in situ* removal studies.

Annotated list of citations

Beamesderfer, Raymond C. P. 2000. Managing Fish Predators and Competitors: Deciding when intervention is effective and appropriate. Fisheries Vol 25, No. 6. pp 18-23.

Quotes Beamesderfer (1996) showing 10-20% of northern pikeminnow must be removed to benefit salmon smolts, but higher proportions of other species (walleye and smallmouth bass) must be removed to have similar effect based on predation rates.

Discusses decision matrix for deciding to apply control to undesired fishes. Includes Rule of thumb #3: Intervention benefits will be small unless many or most of the problem animals can be affected. Also that 'smallmouth bass are similar to walleye in that most predation occurs by bass too small to be affected by fishing (Beamesderfer and Ward 1994, Zimmerman 1999)'. Makes point that predation rates and interactions should be well understood before deciding on if and how to implement intervention.

Boersma, P.D., P. Kareiva, W.F. Fagan, J.A. Clark, and J.M. Hoekstra. 2001. How good are endangered species recovery plans? BioScience 51:643-649.

Nothing specific about % removal needed to be effective.

Emphasizes need for diversity in partners (non-federal) and importance of monitoring to effectively adaptively manage – can't make informed decision on effectiveness of actions, if not monitored adequately. Also that plans must be regularly updated and revised, and include biological linkages whenever possible.

'...although revised plans included more information on species biology and threats, they did not show improvements in how that information informed management actions, monitoring protocols, or recovery criteria...' and '...the expected benefits of plan revisions are not being realized in practice'

Brower, A., C. Reedy, and J. Yelin-Kefer. 2001. Consensus versus conservation in the Upper Colorado River Basin Recovery Implementation Program. *Conservation Biology* 15:1001-1007.

No new facts on what percentage of removal is required to be effective.

Abstract:

We examined consensus-based management through the lens of the Colorado River Recovery Implementation Program, a consensus-based plan that attempts to develop the Colorado River's water while protecting its endangered fishes. Because this management model has been touted as a preferred substitute to government-imposed regulation, we analyzed the recovery implementation program to determine its strengths and weaknesses. By reviewing secondary information and interviewing members of the diverse groups involved in the program, we gathered detailed information about the program's history, implementation, and progress. Our investigation revealed that the recovery implementation program has allowed development of the Colorado River's water and incorporated more voices into the decision-making process. But the program circumvented federal authority over endangered species conservation, which has proved detrimental to the fishes. Furthermore, we learned that the consensus-based model is vulnerable to control by special-interests and may be driven by bureaucratic procedural goals rather than species recovery. To ameliorate these concerns, (1) program success should be judged by species recovery, rather than political achievements, (2) the federal government should retain the power of issuing statutory sanctions in the event of continued population decline, and (3) funding should be provided by an agency with a clear species-protection agenda to reduce the disproportionate power of utilitarian interest groups. By incorporating these recommendations, conservation programs can better realize the benefits of a consensus-based approach without sacrificing species recovery.

Dudley, R.K., and W.J. Matter. 2000. Effects of small green sunfish (*Lepomis cyanellus*) on recruitment of Gila chub (*Gila intermedia*) in Sabino Creek, Arizona. *Southwestern Naturalist* 45:24-29

Actual empirical evidence that removing more than 90% of green sunfish in isolated sections of Sabino Creek, AZ, did not result in improved recruitment of Gila chub. Sabino Creek is a small steep creek near

Tucson. Avg flow for March is 17 cfs. This was the only riverine example.

Pacey, C.A., and P.C. Marsh. 1998. Resources used by native and non-native fishes of the lower Colorado River: Literature review, summary, and assessment of relative roles of biotic and abiotic factors in management of imperiled indigenous ichthyofauna. Submitted to BOR, Boulder City, NV, Agreement Number 7-MT-30-R0012 by Arizona State University, Tempe.

Included a discussion of 10 case studies illustrating survival, reproduction, and growth of bonytail and razorback sucker in a variety of pond habitats with and without nonnative predators. Survival was dramatically reduced where nonnative predators were present. No specific percentages. Target predator removal was 100%.

Mostly a literature review. Included 6" of tables with habitat requirements, life histories, and other information on native and nonnative fishes. Primary conclusion was there were no distinctions between habitat requirements and life histories of native and nonnative fishes that would allow environmental manipulation to favor native fishes. Thus, predator-free habitats must be provided to be used as refugia and production ponds for the native fishes.

Weidel, B.C., D.C. Josephson, and C.E. Kraft. 2002. Fish community response to removal of introduced smallmouth bass in an oligotrophic Adirondack lake. Department of Natural Resources, Cornell University, Ithaca, N.Y.

Available at: www.dnr.cornell.edu/facstf/kraft/publications/weidel_et_al_CJFAS.pdf.

**Actually not published yet, submitted to CJFAS in 2003 and 2004.
Contains empirical evidence that 43 to 88% reduction in SMB in a lake did result in a positive population response by other littoral fish species.**

Electrofishing, plus angling and gill netting in July and August (motors prohibited). Resulted in 88% reduction in yr 1, 43% in yr 2. This did result in positive native fish response, both sport fish (brook trout) and prey species (for brook trout). Measured by minnow trap cpe, and tethered fish attack rates. Spring electrofishing cpue significantly increased for the five common littoral prey species.

'We observed that a large reduction in smallmouth bass abundance produced both a decrease in prey fish predation risk and an increase in littoral fish abundance.'

Additional citation as referenced in Weidel et al. (2002)

Post, D.M., M.L. Pace, and N.G. Hairston Jr. 2000. Ecosystem size determines food-chain length in lakes. *Nature* 405: 1047-1049.

Cited in Weidel et al. 2002 [- in large ecosystems, small changes in predator density can improve prey survival]

Food-chain length is an important characteristic of ecological communities: it influences community structure, ecosystem functions and contaminant concentrations in top predators. Since Elton first noted that food-chain length was variable among natural systems, ecologists have considered many explanatory hypotheses, but few are supported by empirical evidence. Here we test three hypotheses that predict food-chain length to be determined by productivity alone (productivity hypothesis), ecosystem size alone (ecosystem-size hypothesis) or a combination of productivity and ecosystem size (productive-space hypothesis). The productivity and productive-space hypotheses propose that food-chain length should increase with increasing resource availability; however, the

productivity hypothesis does not include ecosystem size as a determinant of resource availability. The ecosystem-size hypothesis is based on the relationship between ecosystem size and species diversity, habitat availability and habitat heterogeneity. We find that food-chain length increases with ecosystem size, but that the length of the food chain is not related to productivity. Our results support the hypothesis that ecosystem size, and not resource availability, determines food-chain length in these natural ecosystems.

Additional citations as referenced in Pacey and Marsh (1998)

Marsh, P.C. and D.R. Langhorst. 1988. Feeding and fate of wild larval razorback sucker. *Environmental Biology of Fishes* 21: 59-67.

Minckley, W. L., P.C. Marsh, J.E. Brooks, J.E. Johnson, and B.L. Jensen. 1991. Management toward recovery of the razorback sucker. Chapter 17, pages 303-358 in W. L. Minckley and J.E. Deacon, editors. *Battle Against Extinction: Native Fish Management in the American West*. University of Arizona Press, Tucson.

Mueller, G., T. Burke, and M. Horn. 1993. A program to maintain the endangered razorback sucker in a highly modified riverine habitat. Pages 77-85 in W. O. Deason and S. S. Anderson, editors. *Environmental Enhancement of Water Projects*, U. S. Committee on Irrigation and Drainage, Denver, CO.

Mueller, G. 1995. A program for maintaining razorback sucker in Lake Mohave. *American Fisheries Society Symposium* 15: 127-135.

Additional citations as referenced in SWCA (2002)

SWCA. 2002. Nonnative fish control feasibility study to benefit June Sucker in Utah Lake. Final Report to the June Sucker Recovery Implementation Program and Utah Department of Natural Resources. SWCA Project Number 4989-014. SECA, Inc., Environmental Consultants, Salt Lake City, Utah. (primary authors were Valdez, R., M. Trammell, M. Petersen, C. Ellsworth, and J. Monks.)

Harding, Elaine K., D.F. Doak, and J.D. Albertson. 2001. Evaluating the effectiveness of predator control: the non-native red fox as a case study. *Conservation Biology*. 15(4): 1114-1122.

Not aquatic. Models effect of removing predators on the prey. Must remove large percentage of predators (50-70%). "Analytical approach potentially useful for evaluating current control programs aimed at reducing the effects of predators on native species".

Friesen, Thomas A. and D.L. Ward. 1999. Management of northern pikeminnow and implications for juvenile salmonid survival in the Lower Columbia and Snake Rivers. *North American Journal of Fisheries Management*. 19: 406-420.

“From 1990 to 1996, the bounty harvest of northern pikeminnow averaged 12% of population, and [modeled] predation on smolts decreased by 25%; thus, savings in salmon smolts not eaten = 3.8 million, representing 1.8% of the population of smolts.” This suggests to me that 100% eradication of northern pikeminnow would only save 8% of salmon smolts. Maybe they're not the problem.