PVA Biology Work Group Meeting
August 25-26, 2010; AAO, U.S. Bureau of Reclamation

555 Broadway Blvd. NE, Albuquerque, NM 87102

Actions

Jeanne Dye will email the 2009 - present Population Monitoring data to the PVA workgroup.

Jeanne Dye will check when the report for the Age Determination study is due.

Phil Miller and Dan Goodman were tasked with looking at the Recovery Plan and translating critical habitat standards and recovery standards into PVA language.

David Gensler will formally request ASCII output from the URGWOM models.

Decisions

The June 2010 PVA workgroup meeting minutes were approved with no changes.

The PVA workgroup scheduled a workshop for March of 2011 to view PVA model output from pre-ESA Water Management.

Future Meetings

December 6th – 7th, 2010

March 2011

Meeting Summary

Day 1: Morning

- Dave Campbell brought the meeting to order. A discussion on the Population Viability Analysis (PVA) workgroup Work Plan was added to the agenda.

- The June 2010 PVA workgroup meeting minutes were approved with no changes.

- Representatives from the Consultation Team distributed a handout, *Using PVA in the MRG*, which outlined Regulatory and Action Agency expectations from the PVA models during the Biological Assessment (BA) consultation process. Currently BAs from both the Corps and Reclamation are not scheduled to be submitted to the U.S. Fish and Wildlife Service (the Service) until early 2011; initial BAs will focus on pre-ESA water management. For consistency the Service would like to use the PVA models for first and subsequent iterations of review of the BO(s); though use of the PVA models is not mandatory in reviewing the BO(s). The review of the BO(s) would not only consist of an analysis of potential jeopardy to the Rio Grande Silvery Minnow (the minnow) but an assessment of potential destruction and adverse modification to critical habitat.

- The PVA workgroup discussed the ability of the PVA models to address the questions provided by the Consultation Team based on the availability of data; the elements with the least amount of available data will be the most difficult to address. The Consultation Team was urged to formulate the bullet points into full hypotheses containing as much detail as possible. The PVA workgroup was shown an example of what the output from the PVA models would look like. Output from a scenario would be a graph, with the x axis being "time to population threshold" and the vertical axis being "probability". A view was expressed that in the near future the Service will need to pick a time horizon and population threshold level and decide what probability does or doesn't qualify for elevating jeopardy. Deciding upon a population threshold is in the domain of those interpreting the product created by the PVA models; this revolves around the level of risk that regulators are willing to have. The PVA discussed that before scenarios can be run through the PVA

models there needs to be agreement on baseline survivor and fecundity data that are consistent on findings and understandings of age structure; parameters need to be defined before there can be output from the models.

Day 1: Afternoon

- A second set of questions from the Consultation Team *Using PVA in the MRG – Part 2* was distributed to the PVA workgroup. The document discusses questions that the Consultation Team would like addressed during the jeopardy analysis, destruction or adverse modification analysis, second submittal of BAs, recovery, and adaptive management. The second page of the document lists operational tools or operational activities that the Consultation Team would like information on in terms of their benefits or adverse effects. Unease was expressed with some of the wording of the questions; discussion from the morning session should give the Consultation Team and others a more clear understanding of how modelers have to translate the description of management scenarios into numerical PVA input.

- The PVA workgroup was advised to be prepared that the different PVA models may give different quantitative output and the meaning of those differences will need to be determined by the interpreter. It was said that once scenarios have been run through the PVA models it would be good to have a workshop where the outputs are walked through and compared. The PVA workgroup scheduled a workshop for March of 2011 to view PVA model output from pre-ESA Water Management.

- The real power of the PVA in the analyses will be the ability to analyze what combination and what level of the possible management actions will achieve alleviation of jeopardy at the lowest cost; for this there will need to be some understanding of what the cost functions are. It was mentioned that the PVA model analyses should not only assess jeopardy but should also measure if actions will preclude recovery. Recovery will need to be defined for the PVA models; Phil Miller and Dan Goodman were tasked with looking at the Recovery Plan and translating critical habitat standards and recovery standards into PVA language.

- There was discussion on how individuals lost to Incidental Take (IT) are accounted for. The impact of individuals lost to IT is accounted for in the biological base line. Estimates from the annual IT reports will need to be included in the PVA models. It needs to be ensured that individuals lost to IT are not being accounted for elsewhere (i.e. accounted for in IT and accounted for in river drying).

- The PVA workgroup reviewed the PVA Annual Work Plan to see if any adjustments need to be made. All due dates for tasks related to the PVA models were changed to "Ongoing." with exception to "Develop a working prototype of the FORTRAN PVA model" and "Inclusion of spatial structure in both PVA model prototypes"; these deadlines were changed to March of 2011.

- The PVA workgroup discussed data needs for the modelers. Data that is still needed for the PVA models are Genetics raw data, ASIR Movement Study, ASIR Population Monitoring post October 2008, ASIR Population Monitoring data by seine haul, Service monitoring data post 2007, hatchery release data, fish origin for hatchery releases, salvage pick up and release information, drying data, and results of age determination studies. The Genetics raw data and the ASIR Movement Study raw data have been requested; as the contracts did not require the data as deliverables they will not be provided. Jeanne Dye will email the 2009 - present Population Monitoring data to the PVA workgroup. Robert Dudley and ASIR staff have declined to participate in PVA workgroup meetings; participating in PVA workgroup meetings could make them unable to compete for future RFPs. The Age Determination study is still ongoing; Jeanne Dye will check when the report for the Age Determination study is due.

- The discussion on Hydrology Translation scheduled for the next morning was tabled for a future PVA workgroup meeting; it was thought to be non substantive to the content of this meeting. A discussion on potential variables for use in the PVA was scheduled for the following morning.

- Instead of the Consultation Team reformulating the questions they provided to include parameters that will be used, the modelers will develop their platforms and when certain pieces are developed they will describe what parameters were used and why.

Day 2: Morning

- Dave Campbell brought the meeting to order.

- The document *Schedule for Review of Potential Variables for Use in Analysis* was distributed to help guide discussion.

- There was discussion on age-specific survivorship. There was concern that the Age Determination study will not be of a big enough sample size to be useful. The purpose of the Age Determination study is to determine the size of minnow at certain ages and not to determine the age distribution.

- The PVA workgroup discussed how survival rates will be determined. Modelers will assume population trend as determined by the CPUE data and back calculate a life table that is consistent with the observed population trend. The assignment of the survivor and maternity values is emergent of the population trend. There may also be enough data from the catch curves to come up with the survival rate of age 1 fish. Concern was expressed about the direct use of CPUE to determine survivorship. The effective recruitment rate will be the first rate in the models. The second rate will be the empirical survival rates of those fish till about 1 -2 years old. Since older fish are not found in samples the 2nd year survival rate will be extrapolated to the older fish.

- The PVA workgroup revisited outstanding data needs. The Egg Drift data has been received but has not yet been analyzed. There are some loose ends with the tagging data; there are tag groups that cannot be matched to a release. This could be due to an incorrect assignment of tag color. Jason Remshardt will distribute origin information for fish that were augmented. Jason will also be distributing fish salvage data that was previously not available.

- There was discussion on adding Cochiti Reach to the PVA models. The PVA models currently include Angostura, Isleta, and San Acacia reaches. Fish stocking in Cochiti Reach would require safe harbor agreements. Since Cochiti Reach is considered critical habitat there will be a need to add it to the models in the future. Analyses on Cochiti Reach would require assumptions that would build a scenario that describes the habitat availability and the associated opportunities for minnows in that reach.

- The next PVA workgroup meeting was scheduled for December 6th and 7th, 2010. The modelers will finalize a collective understanding of data available to parameterize and then present preliminary model results in December. Not all of the URGWOM model runs are expected to be completed by for December. David Gensler will formally request ASCII output from the URGWOM models.

PVA Biology Work Group Meeting

August 25-26, 2010; AAO, U.S. Bureau of Reclamation

555 Broadway Blvd. NE, Albuquerque, NM 87102

Meeting Minutes

Day 1: Morning

Introductions/Review agenda

- Dave Campbell brought the meeting to order.

- It was asked what the agenda item Hydrology Translations was.

  o Hydrology translation will be discussion on how output from Population Habitat Viability Analysis (PHVA) will be translated for the different models.

- A discussion on the Population Viability Analysis (PVA) workgroup Work Plan was added to the agenda. The Executive Committee (EC) needs to be informed if there are any deadline changes.

Work group business

- **Review/Finalize past meeting minutes**

Decision: The June 2010 PVA workgroup meeting minutes were approved with no changes.

Reclamation, Corps, and Service perspectives on PVA model use

- Representatives from the Consultation Team distributed a handout, *Using PVA in the MRG*, which outlined Regulatory and Action Agency expectations from the PVA models during the Biological Opinion (BO) consultation process. The document focuses on questions that the Consultation Team will be looking at in the initial phases of BO development. It was said that this document does not address fitting the URGWOM modeling to the PVA models; this issues has yet to be reconciled. The U.S. Fish and Wildlife Service (the Service) will first review pre-ESA water management Biological Assessments (BAs) and develop a draft BO(s) and then use the Long Term Plan (LTP), Adaptive Management, and negotiations to pull together a final BO that avoids jeopardy and moves toward recovery. The U.S. Army Corp of Engineers (the Corps) is currently doing an analysis on their BA and Bureau of Reclamation (Reclamation) will be analyzing their BA in the fall of 2010. Both BAs should be submitted to the Service for analysis by early 2011.

- It was said that the Service doesn't require the use of the PVA models to assist in the development of the BO(s) but the PVA models would be useful tools. For consistency the Service wants to use the PVA models for first and second rounds of BO analysis.

  o The Service plans to use the PVA models to assess not only potential jeopardy to the Rio Grande Silvery Minnow (the Minnow) but also to assess potential adverse modification to critical habitat. Adverse modification is found to be just as profound as jeopardy.

- It was asked if the new BO(s) still needs to be in place by 2013.

  o Yes.

- It was said that the habitat component adds a level of complexity to the models that's not currently there; a habitat component will require additional discussion.

- It was asked what the Service means by consistent use of the PVA models.

- It is the preference that the PVA models be used in both the first and seconds rounds of BO(s) analysis and that the models have the same capabilities for both rounds. However it is expected that the models will improve as the data improves.

- The Service was advised that the data and models may give different answers year to year.

- It's ok to update the analysis as it progresses, provided that there is clear articulation of the input methods used, what the outputs were, and there is an explanation of why changes were made.

- It was noticed that there is not mention for a second population reflected in the document.

  - This document focuses on the first submittal it does not get into LTP, mitigation, recovery, or Cochiti reach issues; it's focused on pre ESA water management. There is a second handout *Using PVA in the MRG – Part 2* that describes questions for later in the BO analysis that looks at those issues. *Using PVA in the MRG – Part 2* will be distributed later in today's meeting; presently the Consultation Team would like to focus on what the PVA models need to be useful for first round analyses.

Framing and refining the consultation questions for PVA analysis

- The PVA workgroup discussed the ability of the PVA models to address the questions provided by the Consultation Team based on the availability of data; the elements with the least amount of available data will be the most difficult to address. The Consultation Team was urged to formulate the bullet points into full hypotheses containing as much detail as possible.

- An example of what output from the PVA models would look like was drawn for meeting attendees. Output from a scenario would be a graph with the x axis being "time to population threshold" and the vertical axis being "probability". One view expressed that in the near future the Service will need to pick a time horizon and population threshold level and decide on a level of probability that qualifies for alleviating jeopardy.

- Deciding upon a population threshold is in the domain of those interpreting the product created by the PVA models; this revolves around the level of risk that regulators are willing to have. The PVA discussed that before scenarios can be run through the PVA models there needs to be agreement on baseline survivor and fecundity data that are consistent on findings and understandings of age structure; parameters need to be defined before there can be output from the models.

- The PVA workgroup discussed the ability of the PVA models to address the questions provided by the Consultation Team based on the availability of data; the elements with the least amount of available data will be the most difficult to address. The questions pertaining to population level effects will be relatively straightforward to address. The questions with a need to relate to hydrologic processes will be more difficult to address due to the hydrologic translation not being perfected. The questions involving Primary Constituent Elements (PCEs) of critical habitat will be the most difficult to address because the least is known about these.

  - It was said that from an ESA perspective PCEs are equivalent to a species; this is why proposed actions need to be analyzed in PCE context.

  - Structurally there shouldn't be an issue with the models addressing the questions; the amount of information available will be the issue.

  - The Consultation Team was urged to formulate the bullet points into full hypotheses with as much detail as possible.

- The proposed action for the first submittal is pre-ESA water management; a comparison of where the population is today and what would happen if water management was stopped.

  - The Corps' deviations will be a separate consultation.

  - The Service would prefer that the LTP and Adaptive Management Plan be front loaded into the second round of analyses; currently the plan is to have them as RPA components.

- o In the second round there will be analyses on mitigative actions. There may be multiple iterations of the analysis.

- o There is not a scientific definition of viability. It was suggested that the Consultation Team and the Service will have to define viability for the species. The level of management will need to be adjusted to maintain the population level above that threshold.

- o Different criteria are used to establish risk, actually conducting a PVA and getting a quantitative analysis of being endangered or not being endangered will be hard to do without data for the numbers of individuals and rate of decline of breeding individuals. Proxies can be used to determine the probability of extinction if the proxies used are something that can be monitored and observed in the field and if they are something that direct management intervention can be applied towards.

- o In ESA context there are four states for a species; extinction, endangered, threatened, and viable. The population threshold would be somewhere between extinction and endangered, but in the end the goal is recovery; the analyses need to be lined up with this goal.

- o The Recovery Plan states that there must be a certain number of fish per square foot and there needs to be 3 self sustaining populations.

- o Biological information should be used to develop the population threshold. Generation time is something that should be considered. Genetic components can also be used to develop a time horizon. If components like climate impacts or other events with long periodicity want to be analyzed there will need to be a longer time horizon.

- o It was said that it will need to be determined what percentage the population threshold would need to be exceeded to determine there is not jeopardy; this will not be needed in order to produce model output, but will something that the Consultation Team and the Service will need to know when searching for RPAs. These criteria need to be available when the PVA models are searching through all the possibilities of various management conditions that will be adequate in relieving jeopardy.

- It was asked if there is a process for getting input from others on the draft BO.

  - o In the actual ESA process the action agencies will give stake holders the opportunity to become applicants. Stake holders will agree that they are a consultation applicant; by regulation applicants get the opportunity to comment on the draft BO. Applicants have to agree to any extension to the consultation time line. Applicant comments need to be channeled through an action agency as part of the action agency's response to the draft BO.

- It was asked if either model is at state where the sensitivity of various inputs could be determined.

  - o Some of that work has been done with the RAMAS model.

  - o Within the environment of collecting additional data and refining parameters some basic analyses can be done like seeing how models respond to changes in survivorship. Do we want to try to use the knowledge available to us to produce a credible and realistic projection of population extinction for any one given scenario? Or, alternatively, do we not have that information and knowledge and would we have to do a more comparative analysis and say we don't know what the real risk is, we don't have accurate understanding, but we can compare how risk changes based on certain management scenarios with an amount of uncertainty.

  - o It was said that it's probably the expectation to compare how risk changes based on certain management scenarios.

- The PVA workgroup would like to move forward with figuring out what pre ESA water management means to the PVA, and figure out what data is needed.

  - o The URGWOM model will be able to provide a hydrologic picture of pre ESA and 2003 BO water management.

- o There's the hydrology part and there's the underlying demographic characterization.

- o It was said that the hydrology part can be produced but there are still basic fish demographic issues that are not agreed upon. There is also the more difficult issue of aligning the hydrology information to the demographics of the fish.

- o It was asked what else is needed besides the hydrologic picture in order to define the 2003 scenario.

- o Regardless off what is simulated there needs to be a baseline understanding. A resolution needs to be reached on the baseline survivor and fecundity data that are consistent on findings and understandings of age structure.

- o It was said that fundamental data is still needed in order to make estimates for survivorship and fecundity. There is the underlying issue that not all of the raw data has been made available.

- o Some of the data is not going to become available.

- o The data may be needed for the PVA but the Service does not need the data for its evaluation. The Service can use peer reviewed reports and doesn't necessarily need raw data.

- o There are main parameters that are not available and it may not be possible to get appropriate estimates. It was asked if it would be informative to get output from best guesses and adjust the guesses up and down to see how long term outputs change. See how sensitive it is for a best guess to be a little wrong vs. being very wrong.

  - ▪ When the first PVA model was developed in late 2007 the PVA workgroup went through the process of developing an understanding of the sensitivity of model simulated populations and an understanding of changes due to different impacts. The PVA workgroup started looking at the impact of different management strategies. Reports and analyses from people in the Service, Reclamation, and a variety of organizations were used to parameterize the model. The workgroup stopped because there was concern that they were comparing flawed analyses, and now the PVA workgroup is trying to collect all raw data for purposes of refining and producing more robust parameters.

  - ▪ There are certain datasets that the refinement of the parameters is more important than others for model output. The sensitivity analysis would be informative for data requests.

- o It was thought that a sensitivity analysis would be relevant and reasonable. There was concern with trying to get a group decision on when there is enough data to do a meaningful and credible analysis.

- o A PVA is designed to deal with uncertainty and incomplete information is an aspect of uncertainty. An analysis could be done with the data that is available now and if it is done correctly it will be credible in living up to scientific standards.

- It was thought that it had been greatly clarified how scenarios will run on the PVA models. It was thought that the PVA workgroup should move into defining a population threshold. It was thought that this would help to define parameters.

  - o The decision of a population threshold is in the domain of those interpreting the product created by the PVA. The decision of threshold is independent of the data that is available and the data that is needed. A population threshold revolves around what the level of risk that is willing to be accepted is.

  - o Risk tolerance is a philosophy that underlies the type of risk that is willing to be accepted as the criterion for viability. It was thought that risk tolerance should be discussed in order to determine the level of viability that is being aimed for.

- It was asked how critical habitat will work into the PVA in terms of looking at overall viability of the population over time. Will there need to be a different PVA process to deal with destruction or adverse habitat modification?

- o For example, water quality and chemical input, those parameters and that PCE have different potential sources and outcomes than the population itself fluctuating over time. Those pieces are on the same level of analysis that the species is. One of the PCEs going afoul carries the same weight of jeopardy as the species being in jeopardy.

- o In the RAMAS model there is a way to incorporate habitat components in either long term relative small scale impact or for shorter term higher impact.

- o It will play into the FORTRAN model when it is found what constitutes good spawning conditions, this information will be translatable to habitat. These become functions that affect carrying capacity. Part of an Adaptive Management plan would be experiments to provide habitats on a large enough scale to provoke a population change that is noticeable. This could all be incorporated into the model provided there is biological information.

Day 1: Afternoon

Continue framing and refining the consultation questions for PVA analysis

- The handout *Using PVA in the MRG – Part 2* was distributed to meeting attendees. This is a second set of questions that focus on Consultation Team and action agency expectations in later phases of BO(s) development. The document provides questions that may be asked during the Jeopardy Analysis, Destruction or Adverse Modification Analysis, the Second Submittal of BAs, Recovery, and Adaptive Management. The top of the second page of the document lists operational tools and activities the Consultation Team would like information on in terms of their benefits or adverse effects.

- There was discomfort with the language in some of the questions in this document. The questions seem to be querying the value of the PVA as a tool in the analysis.

  - o There was reference to the question "How do PVA outputs inform demographic responses of the species and what does that mean for overall reproduction, numbers, and distribution?" The demographic responses are the biology; they are input into the models. A model is a way of synthesizing and integrating data that comes from elsewhere.

- It was said that some of the questions posed in the document were addressed earlier today. Tthe Consultation Team and others should have a more clear understanding on how the descriptions of management scenarios need to be translated into numerical PVA input. Post processing will be required on the part of the agencies to interpret PVA model output; model practitioners will not be interpreting output. There may be variance in the results coming from the two PVA models and the meaning of those variances should be determined by the interpreter; this is something the Consultation Team and action agencies will have to be aware of.

- It was said that after some of the scenarios are run through the PVA models it would be good to have a workshop where the PVA workgroup walks through and compares model outputs.

- The PVA models can integrate and synthesize in ways other tools cannot. Part of the challenge for PVA model users is to learn how to use its real strengths. Looking at top of page 2, the PVA models could be used to analyze one action at a time, but the real power of the PVA models would be their ability to analyze what combination, of what level, of all these possible management actions will achieve alleviation of jeopardy at the lowest cost. The tool can allow for optimization and integration of information that can't be done with one dataset at a time. This could help in finding the most efficient RPA.

  - o The modelers were asked what their experience is with how that is achieved.

  - o Knowledgeable and insightful people provide a list and provide tradeoffs from experience and these are used to initiate a search. The search becomes a technical enterprise to look at millions of combinations; the computer can do this once there is an understanding of the space that is being explored. This works best when there is a consensus on what the goals are; what PVA output

corresponds to no jeopardy. There needs to be some understanding of what the cost of management actions are so there can be an understanding of what is trying to be minimized. There is also a need for staple scientific data that everyone has access to and has agreed that it is the information that will be used. When differences emerge it becomes the responsibility of the group to find out why there is a difference.

- One view expressed that that this would require for the regulators to give an example of a set of PVA outputs that would indicate jeopardy and a set of PVA outputs that would not indicate jeopardy. That then defines the target that all this optimization and consideration is aiming for.

- There has to be a common currency that relates the way jeopardy is defined on a policy level to what the PVA universe defines as a given level of risk. The definition of jeopardy can be translated into the way the models produce output in the rate of decline and risk of decline.

- It was said that the PVA models should also indicate whether an action would preclude reaching recovery.

  o To do this there would need to be a definition of recovery.

  o The Recovery plan defines recovery.

Action: Phil Miller and Dan Goodman were tasked with looking at the Recovery Plan and translating critical habitat standards and recovery standards into PVA language.

  o There would have to be agreement that what modelers pull out from the Recovery Plan is a correct definition.

- It was thought that the same level of rigor needs to be applied to analyses on constituent critical habitats.

- Regulatory agencies could give examples of model output that would point to jeopardy, but the final answer would be a result of multiple analyses not just output from the PVA model analyses.

  o In analyzing a management action the different life stages are considered; is this action precluding reproduction, and to what degree is the species being adversely affected? The PVA in and of itself would not alone decide jeopardy.

  o The PVA could provide information on net gain or net loss for a proposed management plan that would increase mortality but would also increase reproduction.

  o The entire analysis that the Service carries out will have a mathematical rationale.

  o The PVA should allow for consideration of lots of factors in a reasonably comprehensive way.

- It was asked if developing comfort levels with a probability should be done as a priority or if a probability should be decided on in the context of the model.

  o Both modelers were in agreement that a probability should be decided upon before there is output from the models.

- It was asked if "refugial habitat" should be included in the list provided on the page 2 of the *Using PVA in the MRG – Part 2* document.

  o Yes, that would be a part of habitat restoration. "Refugial habitat" was added to the list.

- It was asked if there is a connection between the questions in the 2 documents discussed today and the list of questions that was compiled by Rich Valdez.

  o It was said that the questions in the 2 documents were not connected to the questions compiled by Rich.

  o It was suggested that the questions in the 2 documents could be well enhanced or expanded on by looking at the verbiage in list questions compiled by Rich.

- It was asked if the PVA would be used to determine what the tolerable amount of Incidental Take (IT) would be.
    - If IT is occurring it needs to be built into the PVA models.
    - IT is occurring; that impact is accounted for in the biological base line as it currently exists.
    - IT has not yet been built into the PVA models; estimates of what the IT is year by year would be needed.
    - A report is produced annually.
    - Eventually modelers will need a data file of year by year ITs to run through the models.
    - Most IT is from drying. This could be through the building of a pedestrian bridge or habitat projects. There is an amount of IT that is allowed in habitat or construction projects.
    - It was said that monitoring occurs to make sure that more fish are not lost to IT than permitted for habitat or construction projects.
    - In the PVA models an individual that was lost to river drying might be counted elsewhere. This "double dipping" could be a problem in the PVA if an individual is counted as being removed through IT and counted as being removed through river drying. The mortality rate has to be counted independently of catastrophe.
    - It was said that Lori Robertson and Jen Bachus (not present for the discussion) would have more insight on how individuals lost to IT are accounted for.
    - A possible issue is that individuals lost to IT are counted using real numbers and the models are using estimates made from CPUE.

Annual Work Plan

- Meeting attendees reviewed the PVA Annual Work Plan to see if any adjustments needed to be made to the schedule.

- There was a question regarding the Documentation of PVA input parameters; it was asked how detail needs to be documented to make sure the record is clear and transparent.
    - Both of the modelers have been documenting aspects of their modeling as much as possible. From an organization and legal standpoint the agencies probably have specific requirements and the modelers will comply with whatever they require.

- The PVA workgroup discussed a new deadline for the "Integrated models".
    - There are two or three issues that are still unresolved for integrating hydrologic models with the PVA models. Discussions on how integration will be done still need to occur; there will need to be more meetings with the hydrologists to figure this out.
    - The deadline was changed to "Ongoing."
    - It would be strategically beneficial to have preliminary runs of pre ESA water management as benchmarks before the BO development process begins.

- The deadline for "Documentation of PVA input parameters" was changed to "Ongoing as models are developed."

- It was asked if the hydrology modelers have solved the problem of generating ASCII output from the hydrology models.
    - The issue has been discussed within PHVA but a decision has not yet been reached; the discussions seem to indicate that it can be done.

- The deadline for developing working FORTRAN and RAMAS PVA models was changed to March 2011.
  - BAs will be submitted by early 2011. March 2011 would be a good time to have a workshop to consider preliminary results from the PVA models.
- The deadline for "Both PVA model prototypes with spatial structure" was changed to March 2011.
- The deadline for "Draft set of questions to submit to CC" should be after the models are running. The deadline was changed to "March – May 2011."
- It was said that the March 2011 workshop needs to be committed to. It needs to be ensured that the right audience will be available for attendance.

Data Needs Discussion

- The PVA workgroup discussed data needs for the modelers.
- Dr. Goodman read a list a data that he had previously requested.
  - Genetics raw data
  - ASIR Movement study
  - ASIR Population Monitoring data post October of 2008
  - ASIR Population Monitoring data by seine haul.
    - Summaries need to be broken down by seine haul
  - Service monitoring data
    - The data that was provided ended in 2007; there should be 3 more years of data.
  - Hatchery release data
    - There are inconsistencies and holes in the hatchery release data that was provided. There are recoveries that cannot be paired to releases.
  - Fish origin for hatchery releases.
    - The files that were provided don't provide information on where the fish came from and whether or not they are first generation of hatchery stock.
    - It was said that data on that level exists at the individual hatcheries.
  - Salvage pick up and release information
    - Records of the number of fish that were picked up, where they were picked up from, and where they were released to have not been provided.
  - Drying data
    - Not all of the RiverEyes data has been received.
  - Results of the Age Determination Study
    - This study is still ongoing, so the data does not yet exist. A draft report will not be available until the end of the calendar year at the earliest.

Action: Jeanne Dye will check when the report for the Age Determination study is due.

    - The fish sampling has taken place; analysis of the otoliths was subcontracted.

- The genetics raw data has been requested. Providing the raw data to the Program would result in incurred costs to ASIR. Reclamation and the Service have declined to fund the additional work for ASIR to provide

the data. The offer to fund acquisition of the raw data has been made to the Middle Rio Grande Conservancy District (MRGCD).

- Excel spreadsheets of the Population Monitoring data from 2009 to present are available.

Action: Jeanne Dye will email the 2009 - present Population Monitoring data to the PVA workgroup.

- It was asked if ASIR provided an estimate on how much it would cost to provide raw data for the Movement Study.

    o The question has not been asked to ASIR because a determination was made that acquisition of the data would not be funded.

    o It is a Program funded study and the contracting is through Reclamation. The contract did not require the raw data as a deliverable. It takes time and money for contractors to go back and get that data.

    o The issue was raised to the EC and the determination was made that the Program would not fund the acquisition of that data.

    o It was asked if ASIR is being contracted to collect future data.

        ▪ Yes and the raw data is now a part of deliverables.

- There was discussion on the participation of Robert Dudley in PVA workgroup meetings.

    o Participation in PVA workgroup meetings could compromise the ability of ASIR to respond to future RFPs; being involved at that level within the workgroup would give them insider information. For this reason Robert Dudley and ASIR staff have declined to participate in PVA workgroup meetings.

    o It was one opinion that results should not be used in the absence of supporting data. It was felt that there could be the potential to be blindsided by the presentation of raw data during litigation.

        ▪ The issue was understood but there is not much that can be done; the administrative record shows that the information was officially requested and the request was denied.

- It was said that the inundated habitat tables should be available by the end of September 2010.

    o The table will give acres of inundated habitat at peak spring flow that is biologically relevant.

    o An issue that will probably need work is taking cfs and translating that into miles of dry river.

        ▪ It was said that the best way to handle that would be to use the RiverEyes data because a whole range of years would give a better understanding of drying under different years in different conditions.

    o Is acres of inundated habitat is very strongly linked to spring flow there is no way to decouple them.

    o The FLO-2D is the basis for the inundation then HECRAS is being used to evaluate how those flow levels are at an annual time stop. It's being seen that the variation from 1992 to 2008 is so small that FLO-2D can be used for those years. The inundation flow elevation hasn't changed that much but the channel has changed quite a bit. Flow elevation at the nearly 2000 range lines is within 5%.

    o The HECRAS models cross sections at every 500 feet.

- The discussion on Hydrology Translation scheduled for the next morning was tabled for a future PVA workgroup meeting; it was thought to be non substantive to the content of this meeting.

- The workgroup discussed potential agenda items for the next day.

    o A suggestion was to work through the questions from the *Using PVA in the MRG* documents to provide more description and to work on the actual values that will be put into the parameters.

- o Instead of the Consultation Team reformulating the questions they provided to include parameters that will be used, the modelers will develop their platforms and when certain pieces are developed they will describe what parameters were used and why.
- o Tomorrow's meeting will include a discussion between modelers on potential variables for use in the PVA.

Day 2: Morning

- Dave Campbell brought the meeting to order.

- The document *Schedule for Review of Potential Variables for Use in Analysis* was distributed to help guide discussion.

- Age specific survivorship was briefly discussed yesterday. It was thought that the models will be built with the preliminary findings then refined when findings from the Age Determination Study are released.
  - o There was concern that the Age Determination Study will not have a big enough sample size; this might show that fish are living longer than 2 years.
  - o As part of the study 10 fish from each age class for all reaches are being sampled. The study is to show the size at age and not the age distribution.
  - o If the models can accommodate any number of age groups then the survival rates will work out according.
  - o It was asked if survival rates could be calculated from otoliths
    - ▪ No.
  - o It was said that the RAMAS model is prepared to extend age classes to the appropriate number. Figuring out how to appropriately assess variability due to natural process and due to measurement uncertainty will be a discussion for the modelers.

- It was asked how survival rates would be determined.
  - o Modelers will assume population trend as determined by the CPUE data and back calculate a life table that is consistent with the observed population trend. The assignment of the survivor and maternity values is emergent of the population trend.
  - o In this case is there enough data from the catch curves to come up with survival rate of stage 1 fish?
    - ▪ Yes. The survival rates might be a hybrid of each.
  - o To do this rigorously the fundamental underlying dataset has to be agreed upon and there needs to be an analysis that only uses that data once. The data that is available to work with for parameter estimating is Population Monitoring and the PIT tag data.

- There was more discussion on methods to calculate survivorship.
  - o CPUE trajectories could be used to adjust the survival rates the model is using so it fits the known past history of catches.
  - o Concern was expressed with the direct use of CPUE to determine survivorship. It was wondered how CPUE would be used as demographic rate calculation data versus using it as an imprecise proxy for abundance to develop trajectory to back-calculate abundance.
    - ▪ The trajectory of CPUE that is available is not a simple estimate of population abundance each year. The data set provides enough degrees of freedom to estimate parameters. The dynamics are volatile from one year to the next. The population never exhibits the mean in any year and

the generation time is very short, this might be why the population abundance fluctuates violently; that shows that birth and death rates are fluctuating.

- Survivorship for age class 1-2 can be estimated using a catch curve. It was asked how survivorship will be estimated for age class 2-3.
    - Extrapolating the estimation from age class 1-2 to the other age class is one way that has been discussed.
    - Fish over age 2 are seen a lot less often and there is a strong suspicion that the larger fish are escaping seines.
    - It was one opinion that if large individuals aren't being caught because they are rare then they may not be of biological importance.
    - Substantially larger fish are not found in salvage but fish from salvage are not measured; they get size classified into either age 0 or 1+.
    - It was said that in order to use that data, measuring needs to be a part of fish salvage.
    - Salvaged fish are not measured because of issues with enhancing stress; the fish are in a desiccating pool and are already stressed. There would need to be an objective of either saving them or measuring; every effort can't be all inclusive.
    - A suggestion was that sub samples of fish from each pool be risked additional stress in order to acquire measurements.
    - It was said that information gathering needs to be bolstered in the future as part of the Adaptive Management plan.
    - The key issue is to better understand survival. Even in the one and 2 year sized fish age can't be determined based on information from fish size.
    - The Age Determination study is designed to tell the year of a large fish. The numbers of old individuals may be so rare that they are hard to capture. Older fish may level out after 2 years or so and have a fairly constant survival rate.
        - It was thought that the Age Determination Study will show different growth rates for each reach.
        - It would seem that because of a highly variable system that the survival of 4 and 5 year old fish might be highly variable. Fish that survived that long had to have really good conditions; this is more than likely not the norm or they would be seen more frequently.
- It was asked if the survival rates of the 1-2 age class fish would be applied to 3-4 age class fish.
    - The recruitment rate is something to be considered, the fish don't show up in sampling till several weeks on and the survival from egg to that size is an unknown. The first rate in the FORTRAN model will be an effective recruitment rate. The second rate will be the empirical survival rates of those fish till they are about 1 -2 years old. The fish then disappear from the samples. Until there is a way to classify age all that can be done is to take the 2nd year survival rate and extrapolate it to the older fish.
    - 1+ will be used as a stage in the matrix model because there does not need to be 5 separate age classes.
    - It was asked if the maternities and egg production can increase with the larger fish.
        - This is not known. It is thought that maternities and egg production increase to a certain point but it is not known if it levels out or keeps climbing.

- Egg viability has been known to drop. The 5 year hatchery fish produce more eggs but the viability drops by 50%.
  - It was asked if the number of eggs that age 5 fish produce, even with their lower survivorship, outweigh the smaller fish.
    - No the younger fish produce more viable eggs. But it is not known if the lower viability in the older fish is due to males or females because age 5 males are mated with age 5 females.

Data Needs

- The PVA workgroup revisited outstanding data needs.
  - It was asked if the issue of carrying capacity was something that needed to be discussed.
    - Carrying capacity is an element of the models. Habitat availability, habitat quality and maximum density at those different types of habitat will need to be addressed.
  - It was asked if the egg drift data has been made available.
    - Dan Goodman has received the egg drift data but has not analyzed it yet. There is not yet a way to make the data useful in the modeling; the data doesn't plug the gap between adults and recruitment.
    - It was said that the number of larval fish caught per adult that was caught earlier on is an information need because there are years where there is spawning but those fish do not show up later on. In order to figure out which flow conditions allow for survival it needs to be known when fish are spawning and whether or not the spawning is successful.
  - It was asked if the augmentation data has been made available.
    - There are still loose ends with the tagging data. There are some tag groups that cannot be matched to a plausible release group.
      - There could have been a missed release or there could have been an incorrect assignment of tag color.
    - There is still an outstanding request for fish origin information for augmented fish.
      - Jason Remshardt has found the fish origin information and will make it available to the modelers and PVA workgroup.
      - It was said that the tagged fish have a higher expectation of survival than wild fish. The stocked fish are 10 to 12 months old; this is why they have a higher expectation of survival.
    - It was asked if there is age information for each release.
      - This information is available for most releases.
      - Fish are stocked in the spring and sometimes in the fall. The fish are stocked in mixed lots, so there are mixed ages of fish.
      - Dr. Goodman requested information on the ages and lengths of the released fish.
      - The fish lengths will be estimates.
  - Are there any outstanding salvage requests?
    - All of Mike Hatch's data from the Service has been made available.
    - Jason Remshardt will distribute fish salvage data that was previously not available.

- The RAMAS model has 3 river reaches incorporated; it was asked if Cochiti Reach would be added to the models.
  - Fish have not been stocked in Cochiti Reach because safe harbor agreements would be required.
  - Cochiti Reach is considered critical habitat so it is something that will be added to the models at some point.
  - It was asked if enough is known about the survival parameters to incorporate that upper reach in some analysis
    - It would have to be very conditional because if conditions were good there would be minnows in Cochiti Reach.
    - Fish have not been put into Cochiti Reach because there is no supporting data.
    - It was asked what the history of that area was.
      - Cochiti Dam makes the area sediment deficient; this is why there are no minnow there.
    - In order to add Cochiti Reach to the models a string of assumptions would have to be made to build a scenario that describes the habitat availability and the associated opportunities for minnows in that reach
    - The models are being started at Angostura Dam.
- It was asked what salvage data is available that would create a credible estimate of survivorship of salvaged fish.
  - There are good numbers from several different years, reaches, and conditions.
  - The fish were held in a cage and evaluated over the course of month to see their survivorship.
    - The methods used for the 2006 data are different from the methods used for the 2007 data. The methods for 2007 are what are currently being used.
    - Survivorship before 2006 could be assumed is the same as the 2006 survivorship and survivorship for 2007 can be assumed for 2007 and after.
  - So what we will have are estimates of the number of fish taken out of each reach by salvage and information of where they were released to and different survival rates should be applied to 2006 and earlier and 2007 and after. Then it can be seen if the number of fish involved do or do not show up as affecting population
  - It was asked how fish are counted in salvage?
    - There was on year where Mike Hatch estimated 400,000 fish in salvage. Mike has methodologies for preserving subsets of fish to count.
  - It was also said that Mike Hatch has data on the number of fish that died during transfer.
- The PVA workgroup will be meeting again on December 6th and 7th, 2010. The modelers should let Dave Campbell know if there are any further data needs.
  - The modelers will finalize a collective understanding of data available to parameterize and then present preliminary model results in December.
  - It was said that it would be good to have PHVA involved in the December meeting.
  - It would also be good to think about incorporating a 20 year run in future URGWOM model runs.

Action: David Gensler will formally request ASCII output from the URGWOM models
  - Not all of the URGWOM model runs are expected to be completed for December.

- o The most complicated concept for the audience for the March 2011 presentation will be parameter uncertainty. It was thought that it would be helpful to give a presentation on parameter uncertainty.
- o The March 2011 presentation is going to have to be for a more general audience. It should be an open meeting for anyone who wants to come.

PVA Meeting Attendees
August 25th – 26th, 2010

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