June 29-30, 2010

Documents:

Meeting Minutes

Read Aheads and Presentations

Yearly Inundation of the Middle Rio Grande (1990-2009)

PVA Biology Work Group Meeting

March 3-4, 2010; AAO, US Bureau of Reclamation

Meeting Objectives

• Information exchange	• Identify schedule for development of PVAs
• Discuss assumptions/hypotheses/issues regarding minnow management factors and categories	• Develop consensus regarding minnow management factors and categories for use in PVAs
• Data and analysis discussion	• Discuss future interaction for PVAs and PHVA

Actions

Jim Wilber will communicate the PVA-biology request for a map to the Program website to Yvette McKenna

Rich Valdez will send a link to the SWCA library housing genetics studies on the Rio Grande Silvery Minnow (RGSM) to Tetra Tech for posting on the Program website. Tetra Tech will post the link to the website and will send the link to the PVA/Biology workgroup via email.

Dave Gensler will translate the URGWOM output from the pre-ESA water management scenario into ASCII and send to Dr. Goodman.

Dave Gensler will organize an in person meeting between PVA/Biology, PHVA/Hydrology, and Jesse Roach to discuss the possibilities of incorporating use of the longer term, more stochastic monthly time-step model developed by Jesse Roach for use with the PVA.

Jason Remshardt will forward an email from Rich Valdez containing fish salvage data to Dr. Goodman and Phil Miller.

Jason Remshardt will attempt to locate a FWS study from the mid 1990's that studied large pools in stretches of drying. Jason will send the report to Dr. Goodman, Phil Miller, and to Tetra Tech for posting to the Program website.

Tetra Tech will locate the "Experimental Activities Report" for 2007 on the Program website and email a link to the PVA workgroup.

Rich Valdez will send SWCA data from the "Experimental Activities Report" for 2007 and RiverEyes to Dr. Goodman and Phil Miller so that they may begin to build it into their models.

Rich Valdez will do a modal progression on the 12-24 month and possibly the 24-36 month age classes.

Rich Valdez will send the data he used in the Age and Growth presentation to Dr. Goodman and Phil Miller. Dr. Goodman and Phil Miller will do sensitivity analyses on the data presented in Rich Valdez's Age and Growth presentation.

Dave Propst will send the papers on the rheotaxic nature of the species to Tetra Tech for posting to the Program website.

Jim Wilber will follow up with Tom Turner and Megan Osborne about their attendance at the next PVA-Biology meeting.

Next Steps

The PVA-Biology workgroup agreed to meet with the BA/BO consultation team and with Jesse Roach to determine what the consultation team needs from PVA in order to move forward.

Dr. Goodman and Phil Miller will use SWCA data from RiverEyes and the Experimental Activities Report to begin building river drying into their models.

Meeting Summary

Day 1:

- Jim Wilber called the meeting to order and reviewed the agenda. The agenda was revised so that the workgroup would discuss EC direction for the PVA, PVA/PHVA issues, and How the PVA will be used during the morning session.
- The workgroup conducted an action item review. Most actions are complete or in process. Those that weren't were reassigned. There was confusion regarding an action item to forward a link to an ISC database. It was suggested that the action may be in reference to RiverEyes, as the PVA workgroup was considering using RiverEyes to help determine the relationship between drying and survival. A spreadsheet was distributed detailing river drying in 2009 by reach in ½ mile increments. It was suggested that for comparison, there were approximately 25 days of salvage efforts during 2009. Salvaging occurred on less days then RiverEyes would show drying since the salvage effort would only work in one area, if it was still dry the following day they wouldn't go back to it. An area would be salvaged again only if it had rewetted and then dried again.
- Jim Wilber gave an overview of EC direction for the PVA. As PVA-Biology co-chair Jim updated the EC on PVA/biology and PHVA/Hydrology progress. The URGWOM and PVA models are two different processes at different points in development. URGWOM is complete; but the PVA process still has integral pieces to work through. It was stated that an attempt by the Program to force the URGWOM and PVA models to work together at this time may be unwise; and suggested that the URGWOM team move ahead with BA/BO consultation and for the PVA team to continue developing the models. Historically, the URGWOM model was not complete at the time of the 2003 BA/BO consultation and therefore was not used. A similar situation is currently unfolding regarding the 2010 BA/BO and the PVA models. The PVA models are a tool that can be used towards adaptive management and should continue to be developed, while the BA/BO process can move ahead using URGWOM. The EC agreed that the PVA-Biology workgroup should continue to focus on developing the PVA models. The PHVA/Hydrology will work with URGWOM to develop model runs to support the BA/BO process.
    - The PVA-Biology workgroup expressed concerns about the EC direction. When the PVA was first discussed in the Program, it was presented to be used as an intrinsic part of development of adaptive management. A significant investment of time, effort and money to get a good PVA; if a consultation is completed without the use of PVA, the Program may be in a similar situation to that of now.
    - One opinion was that the PVA process keeps getting stalled because the workgroup is discussing each data set in detail before deciding if it is something that can be used towards the model. The model is nearly complete in structure, if these discussions were not occurring to the depth that they are the model may be ready in time to use for the BA (September 30, 2010).
    - Another opinion was that the PVA needs to be as strong as it can possibly be, with the best available science in order to be defensible in court.
    - A brief explanation of how the PVA models would be used in consultation was described. A Biological Assessment (BA) considers a series of water management actions that result different conditions on the river; and shows a predicted condition on the river as a result of those actions (i.e. peak flows, timing of runoff). It also considers how these things are influencing recruitment and survival of the species. The PVA model is not necessary for the process to take place, rather the consultation team will analyze the qualitative assessments based on expert opinion of spawning, recruitment, and survival. The team will come to a conclusion of no affect, likely to affect, adversely affect, or not adversely affect the species. The PVA model would be a tool to help analyze the affects of actions to the species; but is not crucial. As the BA will be non-front loaded, it will conclude affects from one scenario, compared to the baseline.

  - The environmental baseline is the historic changes in the habitat over time. The status of the species is how the species is faring now. A jeopardy/non-jeopardy opinion rendered by the Fish and Wildlife Service (FWS) will be based on the proposed action as it applies to both the status of the species and the environmental baseline. The FWS will also consider actions happening elsewhere on the river so that a cumulative view of the river is used when rendering an opinion.
  - It was stated that there are two options if the PVA models are to be used in conjunction with the BA/BO development. 1) Delay the BA/BO – this is not a decision the PVA team can make, only the executives can. 2) Change the trajectory of the PVA development. It was also stated that discussions regarding how URGWOM outputs will be used as PVA inputs have been held since approximately 2008, and are still unresolved. The FORTRAN PVA model can use URGWOM outputs as long as they are in ASCII format. It was suggested to consider using a longer term, more stochastic monthly river model that is being developed by Jesse Roach with Sandia Labs. Another suggestion was that the PVA-Biology team meets with the BA/BO consultation team to determine what, exactly the consultation team needs from PVA to move forward. The meeting should include Jesse Roach.

- A brief update on salvage data occurred. There are three sets of data, one from 2003 to 2004, one from 2005-2006, and another of 2007-2009. The data are in different formats and reconciling them has been difficult. Jason Remshardt will send the data to both Phil Miller and Dr. Goodman.
- Mick Porter gave an update on using HECRAS to estimate a relationship between spring flow and inundation. A single peak is very difficult to model accurately, so a 4 or 5 day bracket around that peak is necessary in order to give confidence in the model. It is suggested to take the flow at 2 days before and 2 days after the peak flow and average all 5 days. The PVA workgroup was asked they preferred to use the average flow for those days or the low flow. The workgroup agreed that the average would be more stable.
- PVA re-visited the RiverEyes drying spreadsheet as it pertains to river drying. It was explained that the spreadsheet is in half mile increments, by reach. Red blocks on the spreadsheet indicate that that particular increment is dry. There is also information regarding pumping, green lines on the spreadsheet show if a particular pump was on, and if so the approximate discharge it was outputting. RiverEyes uses people in the field checking the river daily to determine drying. If a particular portion of the river seemed to be drying at a faster rate; there were times it was checked twice in one day to estimate the amount of drying. There is only RiverEyes data for 2007 and 2009; the river was in a wet year status and therefore did not dry in 2008. ISC has additional data for 2001-2006, but it is in a different format and will need to be reconciled.
  - It was clarified that blocks of red on the spreadsheet could have been completely dry or dry with pools. Some of the pools are large enough that they are not salvaged. The SWCA "Experimental Activities Report for 2007" monitored the water quality, temperature, did fish counts and monitored outflow in these pools; until it either dried up, the fish in the pool went to extinction, or the pool was reconnected to the river.
  - There was a FWS study in the mid 1990's that also looked at fish survivability in these pools.
  - On occasion (approximately 1 in 20), pools other than the largest ones are not salvaged for water quality or general fish health reasons. If a pool is over 35 degrees it is not salvaged, since the fish are not expected to live anyway. Something that seems to contribute to fish health is the density of fish in a pool. If there are more fish, the less likely they seem to live.
  - In general, the group agreed that the shorter time drying occurs the more likely fish are to survive a drying event.
  - Some possible data gaps regarding pools is 1) fish survival when the river rewets, 2) fish redistribution when the river rewets, and 3) relationship between size of the pool and fish density in the pool.

- The workgroup briefly discussed the assignment of workgroup co-chairs. Jim Wilber will be stepping down from the co-chairship immediately following this meeting. The workgroup charter specifies that a co-chair will be from each of three agencies: Reclamation, FWS, and the Middle Rio Grande Conservancy District (MRGCD). FWS did not have enough manpower to replace Jennifer Norris as co-chair when she moved out of state. Reclamation will not be replacing Jim in the position, as the agency also does not currently have the manpower. It was suggested that the workgroup resume the conversation during the next session of the meeting on the following day.

Day Two

- Jim Wilber called the meeting to order and reviewed the remainder of the agenda. The workgroup decided to review the PVA annual work plan and workgroup charter and make comments via email. Volunteers/recommendations for co-chair will also take place via email.
- Rich Valdez gave an updated Age, Growth, and Survival of RGSM presentation incorporating comments he received since the last meeting. Primarily, topics included: 1) Revised $L\infty$ and K for the Von Bertalanfy analysis (VBGF); 2) Proportions of Brood Stock by Age; and 3) Survival for Months 12-24. The PowerPoint presentation is attached; please direct questions/comments to Rich Valdez (valdezra@aol.com).
    - During discussion of the presentation, it was stated that there are several different analyses that may be useful for the RGSM other than VBGF. Some data gaps were identified by the workgroup:
        - Fecundity of older fish
        - Viability of eggs from fish of different ages
        - Survival during "blind spots" in data (May – June)
    - It was suggested that a sensitivity analysis be completed on the data presented by Rich. Dr. Goodman and Phil Miller will complete.
- The PVA workgroup discussed fish passage. It was suggested to begin thinking of fish passage in terms of how it would be considered in a risk assessment context or a modeling context. Inherently, the models would probably consider fish passage as a way in which different reaches are connected. It is important to remember that the models *will not* consider the particular size or extent of fish passage; only that it exists. The models *could* consider whether different age classes or different sizes of fish use the passage.
    - There was a suggestion to consider the different hypotheses surrounding fish passage. A concern was that the term "hypothesis" was being loosely used. It was then clarified that the workgroup will not be proposing any hypotheses; the process is geared more towards discussing any relationships that the workgroup feels is important.
    - It was stated that there are three sets of data that have potential to help the workgroup when deciding whether to incorporate fish passage into the model, and if so, to what extent.
        - The 2003 movement study
        - Recapture data
        - Monitoring data
    - Some data gaps about fish passage are
        - Will the fish will be able to find it, and if so, will they use it.
        - Recapture data is typically biased towards hatchery fish and older fish.
        - If the minnow used the fish passage, would be only during certain times of year or year round.
        - Does the ability of the fish to move up and downstream at will really affect the sustainability of the species.
        - Will fish passage affect egg drift
    - It was stated that the models can give estimates of much effective fish movement would be needed to achieve certain results in the population, but the model can't tell you if the fish will use it.

- Other data sets that could help determine the effects of fish passage are genetics and the swimming study. There are papers available on the rheotaxic nature of the RGSM, meaning that the fish swim upstream as drying begins.
- It was suggested to bring either Tom Turner or Megan Osborne, or both to the next PVA-Biology meeting to help the team better understand RGSM genetics; and to decide if and how to include genetics in the model. Other experts in fish genetics were named as possibly presenting, those individuals are: Alendorf, Hedrick, Dowling, and Gold.

Next PVA-Biology Meeting May 4 (all day) and May 5 (half day), 2010

PVA-Biology Meeting Minutes

Day One: Morning

Introductions, Review Agenda

- Jim Wilber called the meeting to order and reviewed the agenda
  - The age structure presentation from the January 2010 meeting has been updated based on comments received; the presentation will be given during this meeting.
  - A conversation on workgroup co-chair designations was added to the agenda.
  - It was suggested to re-arrange the agenda so that the discussion on how the PVA will be used is held near the PVA and PHVA integration segment.
  - The workgroup briefly discussed the order of agenda items and decided to first review action items, second hear on update on EC directions for the PVA, and third to discuss how the PVA will be used. The age structure presentation can be heard after the lunch break.

PVA Review

Review action items from 1/26-27 PVA meeting

✓ Dan Goodman will send his presentation from the 11/10/09 PVA/EC meeting to Cassie Brown for posting to the Program website. *Complete*

- Tetra Tech will post the presentations from the 11/10/09 PVA/EC meeting to the Program website. *Unknown; Tetra Tech will double check for the posting*

✓ PVA members will respond formally with notes or written documentation (including comments and suggestions) to Rich Valdez to help formalize and improve his RGSM Growth and Survival work. *Complete*

- Phil Miller and Dan Goodman will draft a sensitivity analysis of the relationship between age and growth for their models, and will coordinate on a possible interim process while results from the latest Dudley and Platania age/length project are pending. *Incomplete/Ongoing*

✓ Jim Wilber will investigate the opportunities for modifications to the existing age and length contract. In particular, adding a bigger sample set possibly using salvaged fish. *Complete; the existing age and length contract is a Program contract held by ASIR for performing work, but there is not an avenue for adding salvage fish to it. It is still unknown if the contract can be added to by other means.*

- Jeanne Dye will initiate an email exchange between Jason Remshardt and Dan Goodman regarding salvage data. *Incomplete/Ongoing*

✓ Tetra Tech will post the updated RGSM Growth and Survival presentation to the PVA page of the Program website. *Complete*

✓ Jeanne Dye will inquire on the status of the Program DBMS. *Complete*

- ✓ PVA members will send any salvage or construction related information to Rich Valdez. Rich will attempt to reconcile the data and present at the next PVA/Biology meeting. *Semi-complete; Rich received data and consolidated some; he and Jason Remshardt will forward the data to Tetra Tech for posting to the Program website.*
    - *It was commented that the organizational structure of the Program website is not user-friendly or intuitive. There was a suggestion that a map for the website be posted. Jim Wilber will inquire with Yvette McKenna about the possibility of developing and posting a Program website map.*
- ✓ Jim Wilber will search the Program website for any documents regarding RGSM genetics and forward to the PVA. *Complete*
    - *SWCA has a library of genetics related papers on the Rio Grande Silvery Minnow (RGSM) that could be made available to the PVA workgroup.*
    - *Rich Valdez will send the genetics papers to Tetra Tech for posting to the Program website.*
- Grace Haggerty will send the link to the NMISC database. *Unknown*
    - *There was confusion regarding the context of this action item. It was suggested that the action was referring to the RiverEyes data since the workgroup had discussed merging the RiverEyes data with some of the other river drying information to sensitive URGWOM.*
        - *How will URGWOM be running that data if the tech team doesn't have all the information?*
            - *The tech team does have all the information through 2007, it is not in a format that is useful for the PVA, but the information they used is in the complete spreadsheets.*
            - *In the last URGWOM presentation it was stated that it will be using the flow model and the groundwater/surface water interaction model if the flow is below a certain point. A calibration run was done for 2003 to 2006; the run was compared to figures in the model.*
            - *There was an assumption made on river drying based on flows and didn't account for groundwater returns or river returns, so the second set of runs from 2003 to 2007 are being ground truthed with observed water flows?*
                - *They are compared with the observed level that URGWOM gets to – which is about an 8 mile resolution. For example if there were an 8 mile reach with on mile dry, URGWOM will show the entire reach as dry. The point of RiverEyes is to rectify this situation.*
            - *The initial information from RiverEyes in 2009 was distributed. The spreadsheet lists river drying in half mile increments by day and by reach. It also lists low flow pumping activities.*
            - *The spreadsheet was briefly compared to the salvage summary from 2009; there were approximately 25 different days of salvage between July 15 and October 21 of 2009. Quickly scanning the RiverEyes spreadsheet indicates more than 25 days.*
            - *It was clarified that RiverEyes data only means that the half mile increments shaded red to indicate dry only means that it is disconnected. The red blocks do not mean that there were no isolated pools within that increment.*
            - *The best data to give that information would probably be the salvage data; although when considering pools, the team will salvage a pool on the first day but if it stays disconnected, it won't be salvaged again unless it is rewetted and then dries again.*
- ✓ Jim Wilber will forward the PVA group documentation of the calibration of drying for URGWOM, along with the data inputs that were used in the calibration. *Complete*
- ✓ Tetra Tech will contact Megan Osborne for permission to add her PowerPoint presentation from the State of the Science workshop to the 1/26-27/10 PVA/Biology minutes. *Complete*

Current EC Direction for PVA Development

- The Executive Committee (EC) asks that the chair reports back at their meetings. A report was given at the February 18, 2010 EC meeting. There is an ESA consultation team that is trying to determine the whats and the hows for the consultation schedule; but there are also broader milestones the team is working under.
- The Biological Assessment (BA) is to be to the Fish and Wildlife Service (FWS) by Sept. 30, 2010. The current plan is to develop a Corps and Reclamation BA for all the actions; the consultation team is still working on the strategy of how to proceed from there. The team will work with the Program to bring together the broader, negotiated strategy of adaptive management not only to avoid jeopardy but to work towards recovery. The Biological Opinion (BO) will be done by March 1. 2011. September 30th is deadline is the day to have all the models developed. Presently, the PHVA team has already run the pre-ESA water management scenario through URGWOM; and is waiting on news from the PVA team. It was presented to the EC that the processes are in two different stages of development. The consultation team needs to work with the PHVA team to get the non-frontloaded BA's finalized by the deadline. Historically, when the 2003 BO was being developed, URGWOM wasn't ready to use; so it wasn't. It can be used for this BO, but the PVA models aren't ready. Rushing the development of the PVA models would be unwise because crucial elements could be missed. The PVA models will still be useful for things like adaptive management, so the EC was advised to proceed with the PVA development on its own track, but to shift the track of the PHVA development solely towards support of the BA/BO effort.
    - **Question**: Where in this process do you see adaptive management being documented? It isn't just a concept; it's a series of when-ifs. Is it part of the BA or part of the BO? Having a struggle seeing where it's actually being worked on
        - **Response:** Probably both. We don't know exactly how the BA and BO will come together, but it will be documented in sufficient detail before we have the BA/BO.
    - It was commented that when PVA was first discussed amongst the Program, it was presented to be an intrinsic part of developing adaptive management, among other things. There has been a significant investment of time, effort, and money to get a good PVA model. There was a concern that *not* using the PVA model for the 2010 BA/BO would be a mistake and put the Program in a similar situation as the 2003 BO.
    - The Long Term Plan (LTP) bringing in the concepts of adaptive management based on the recovery plan is the long term objective. One opinion was that the Program will be much better off then it was in 2003. It would be wonderful if the consultation process was in sync with the PVA, but the PVA is not ready and probably will not be ready in time to be used with the BA. These timeframes are crucial.
    - It was stated that the Federal government should not move along knowing full well that they don't have all the information or tools they could have.
    - It seems that we need to analyze those paths for moving forward, there may be a more critical place down the road where it would be good to have the models in place. The pre-ESA water management run will be put in place. It is unlikely that the PVA's will be ready by they September 30th, 2010 deadline. The development of the non-front loaded BA's by Sept. 30th is firm.
        - It is unfortunate to say that we won't have perfect PVA's in time to do these BA/BO's. It may be worthwhile to think about defining what a useful PVA is against what an ideal PVA is. A criticism against the original PVA exercise was that it wasn't detailed enough or using every data point that was available. So the process was lengthened and delayed and elongated so that we could amass all the available data so that we would be using all the best available science, which equated to all the data. We've put this process on hold so that we could begin again – so that we could amass another set of data, which in reality was already being used to develop a model that was set up close to a year and half ago. We've been putting the brakes on the PVA analysis so that we can amass all the data, these processes need to move forward and decisions need to be made in the absence of discussions of what is perfect. We need to discuss what the PVA can tell us in the timeframe under the presumed BA/BO process. The original model is

essentially intact and structurally complete. Final agreement is needed on some of the data that needs to be put in to it.

How Will the PVA Be Used

- It was the hope that the PVA would be used for the BA; the thinking that the more analyses the better. The less tools there are the more uncertainty there will be in the future. The more uncertainty in the future, the more conservative the BO.
    - Concerns were raised in the original PVA process in late 2007; specifically about the modeling process. If we could use real data that has only recently been available to the process, it shouldn't be couched as a delaying tactic or as reaching for perfection. The models need to be validated in some way and having the best possible science is part of the validation process. Security and predictability should be the long term goal for all Program participants, with models that will stand up in court. The workgroup was cautioned that decisions they are making have impacts that reach into other peoples lives; and were asked to proceed while considering those people.
- It was stated that the workgroup needs a way forward. Discussion can happen over and over on the same data sets; but the reality is that the data often just isn't available. It was suggested to create a structure and then insert data as needed.
- 2012 is the last irrigation season covered under the existing BO. The goal is to get something together before the 10 year term runs out; there isn't any more time in the consultation process, so to delay it is not an option that can be made within this group. How does the PVA-Biology group move forward in a way that would allow the models to be used in the consultation without delaying it?
    - It was suggested to define the structure of the model and all of the elements that are important in the BA process. The problem is not that PVA is not going to be ready; it is that the group keeps getting sidetracked. We can build a model that is flexible enough to incorporate all the elements and opinions of how many age classes might be out there. We can get a structural model that is large enough to incorporate all the uncertainties that we can agree upon. Even if the model isn't perfect; we need to get through them, and focus on what we can.
    - It seems like the old model is there, we should be able to go through and run some various scenarios without data but with best guesses, for example doing 3 age classes versus 5, and looking at how it affects the runs. If it doesn't really change the end run those are not what we need to be putting the effort in to.
    - One opinion was that the group needs to have a clear understanding of exactly how Reclamation and the FWS could or would use these models, provided they were ready to use.
        - Traditionally in the BA perspective, Reclamation doesn't make a jeopardy call, whether its a front loaded or a non front loaded BA. The agency considers a series of actions such as water management actions that result in different conditions on the river. Then considering what a predicted condition on the river for that set of actions, peak of flows, timing of runoff, spawning, and other things that are influencing recruitment and survival; and considering what set of actions will be used for an URGWOM run, and whatever qualitative assessment and then looking at the outcomes of spring runoff and summer drying and how the relate to SWFL and RGSM spawning, recruitment and survival. If there are runoff flows and drying the jeopardy/non jeopardy decision will be made by FWS. Reclamation and the Corps, for the BA will be assessing these things for no affect, unlikely to affect, likely to adversely affect or not likely to adversely affect the species. The intent of the PVA models was to help analyze for those, but the PVA models do not appear to be ready for it.
        - ***Question:*** Does non-frontloaded mean that there is only one scenario?
            - ***Response:*** Yes
        - ***Question:*** How do the agencies conclude the effect from one scenario when compared to the baseline? Is the non-frontloaded action the baseline?

- ***Response:*** The non-frontloaded is the proposed action. The baseline is 2010 to date and the status of the species
    - The environmental baseline is not necessarily the status of the species – the environmental baseline is the historic changes in the habitat over time. The status of the species is what's going on with the fish right now. The jeopardy-non jeopardy opinion that the FWS will render is based on the proposed action, so the service will respond to Reclamation and the Corps, after they tell the FWS what the proposed action is. Based on that, the FWS will look at the status of the species and the environmental baseline, and analyze the affects, including cumulative ones like what else is going on in the river. Then look at the interrelated and interdependent action – all of that is wrapped in and becomes the jeopardy or non-jeopardy opinion.
    - It was stated that the process always seems so subjective. This has been the first real effort to introduce an objective set of tools. How can a BA be evaluated for a BO without a standard set of tools?

- When the group discussed what URGWOM needs from PVA to move forward, it was not stressed that the URGWOM run is very important. It was suggested that the PVA team request a retrospective run of URGWOM from 1992 (or whenever the data starts) to the present. The PVA team actually needs two runs using URGWOM as it stands in its existing parameters. One with the inputs being the actual water management implemented during those years, the other duplicating the non-frontloaded water management scenario.
    - The PHVA/hydrology team did some pre-ESA water management runs and provided outputs of some fashion; that wasn't in a format the PVA team could use. It was suggested that the PVA team determine what to do with the information they already have before asking for more.
    - We need day by day and reach by reach water management from URGWOM, it can be organized into an ASCII file.
    - Dating back to November of 2008, when we first began talking about linking URGWOM to the PVA exercise there was the concern that the two models don't speak the same language. URGWOM is a deterministic model that gives 10 year projections based on water management and actions by various entities. It is still unclear how the models will mesh and is something the PVA-Biology and PHVA-Hydrology workgroups need to talk about in depth. It would be interesting to use these retrospective runs for stochastic, but how well URGWOM fits into PVA is perplexing.
- Typically PVA's haven't been used in these types of situations (i.e. BA/BO consultations with data uncertainties). It will provide a level of ambiguity that doesn't mesh well with how well informed the BA/BO needs to be. These types of tools will not give detailed outputs, they will be rougher.
    - The original intent of the PVA models was to take the data, analyze as best we could, and then come to consensus to provide a model structure. It is not perfect, but it is a formal way to put together what the data intended.
    - It took URGWOM a decade to get where it is now. The PVA has been in development for 2 or 3 years; it is unlikely to be finished, or at a point that it could confidently used in the BA/BO within the next 6 months. It was not stated to the EC that the PVA isn't critically important and meaningful, just that the current trajectory will get us there in the next year. If we want to plug in more with the BA/BO, there are two options. One is to delay the BA/BO; which is a decision that can only be made at the executive level. The second one is to shift our trajectory somehow.
- Regarding how the PVA will be used in the BA/BO process, one question is how URGWOM will be brought in to the PVA. It can be very detailed or much simplified in terms of taking URGWOM outputs and plug that

into the PVA model, or do we take the specificity in URGWOM and try and ferret that out into what we can use. The consultation process looks at the current process and also at what can be affected over time.

- Need to take a much closer look at the data – it can still be useful – part of it is management expectation too.
- It was suggested to take stock of where the workgroup is before launching discussion on how to move forward. The new PVA process has been in place for under a year and a half. It's worth assessing what the accomplishments are in that amount of time. We have a data set that is for flow and population monitoring, including length data within that. We have one for population estimation, and the tag releases and recapture. That makes a huge difference to our ability to actually test hypotheses as they come up. We are close to having a salvage data set, would think that once we get the salvage data set in the same kind of form available to us right now for exploration, and the drying dataset, from the data standpoint, we'll have the data surrounded.
    - When discussing flow, population estimates, tagging, and salvage data, it is important to remember that there are data gaps that need to be filled in.
    - There was general agreement that there are data gaps that won't be filled in for 6 or more months. There was disagreement regarding the quality of the other data available.
    - It was stated that anything is possible; even with the short timeframe for completing the models. It is only a matter of sitting down with the people in the room that have authority to make decisions. The people developing the BA and those that will write the BO. At some point the two groups need to come together during a technical session and set aside the politics and process questions.
    - The group agreed that the way to move forward is to have a technical session with BA/BO developers in the room to discuss next steps.
        - Additionally, the group should discuss where they are able to go. Things like the floodplain and inundation of flows won't be ready until July 2010. Data of that sort won't be incorporated into the model. Should the group round off some corners, make best guesses and move forward?
        - It was suggested that the workgroup move ahead, and when the additional data under development is ready, it can be incorporated.
    - Each individual involved has their own perspective regarding the question of what is needed for the BA/BO. The consultation team meets regularly, that team may be able to answer those types of questions. The PVA team could request that the consultation team provide feedback on what type of analysis needs the Program is looking for.
    - The PVA models will give a probability of the minnow persisting into the future, because we know what we're getting out of the BA/BO. Alls the PVA workgroup is doing is preparing probabilities.
    - The output of the PVA will be a probability of extinction, or population size in the future. What links this to everything that is going on in the BA/BO is that this type of probability is conditional. It depends on the specifications of the future scenario. The PVA will have an option for inputs, some of which are out of human control, such as meteorology. But also those that are in our control like water management. The way can use the PVA in the BA/BO process is by deliberately changing those inputs of interventions in the population to see how that changes the probabilities.
        - If we're trying to prepare a BA, and we want to know the affect maximum river drying of 22 miles, and we need to know the effect of that drying on the minnow; the PVA won't help.
            - If want to know the effect of river drying, we need to know what it's compared to. So a defined baseline is needed. The baseline would be used to compare against future river drying scenarios. Ideally, the recovery plan and the criteria within the recovery plan should be tweaked into a terminology that speaks the PVA language; so that uplisting or delisting the species will be a result of the probability of extinction being high or low. Eventually, the regulatory framework uses the terminology of the PVA.

- The September 30, 2010 timeframe may be realistic, because an initial pass through of the first non-frontloaded BA isn't a comparative step. It could be more the non-comparative step in the absence of a PVA; with the comparative step happening later after the PVA models have been developed.
- ***Question:*** If we go down the path that suggested of determining which data is most useful and gain consensus on it, how long will it take for the models to be ready or near ready?
  - ***Response:*** The difference now is that we're still trying to fill in the information gaps we had the first time. The group is attempting to get more resolution into the model; a long and difficult process. Determining which of the data sets we have the ability and the expertise to dig into and which ones we don't is also difficult, but we can set them aside and make preliminary assumptions of what we have to date.
- Thinking that maybe can decouple the BA from the BO context, please double check with agency, not sure you can do a BA in which you conclude effect or no effect without having found compared to what.
- There has to be some kind of status quo no action, which if a proposed action is not developed a set thing will happen; and develop a PVA model for that scenario.
- It was suggested for a subgroup of the PVA committee meet with the consultation team. There are three questions the PVA can give answers to 1) If Reclamation and the Corps do what they have always done, 2) the non-frontloaded consultation, and 3) what comes of adaptive management and the LTP.

- The workgroup briefly discussed agenda items for the afternoon. An updated age and length presentation is to take place. The workgroup was reminded that they had agreed to designate approximately 5 people to work with the consultation team and report back to PVA.
  - It was stated that the workgroup needs to finish discussing the PVA/PHVA issues. The PVA team needs to understand exactly what a water management scenario is.
  - Considering the request for runs and flat ASCII file, the PHVA group has many different scenarios that could be done. The PHVA team provided PVA with the outputs of the test scenario. Before PVHA will look into doing scenarios slightly different, they will decide what is and isn't useful, and what doesn't apply for the pre-ESA water management run.
  - An output provided by PHVA is daily flow for 10 years at a variety of places on the river
    - URGWOM provided PVA with daily flow for 10 years in 8 mile sections of the river; along with reservoir storage and flow output. The PHVA team has also done post processing based on recruitment. Post processing was based on 3000 cfs for seven days. URGWOM analyzes for every day for 10 years, then post processing for spawning and river drying.
    - It was stated that the Program could be headed down a dangerous path since URGWOM doesn't separate meteorology from water management. When adaptive management is at the forefront, there will be a demand to explore many different angles. Separating water management from meteorology helps with this.
  - There is 600 years of paleo data, there currently is not the capability to downscale the future and predictive, but it doesn't lend itself to daily tweaks.
  - There was a suggestion to table the conversation until a different meeting when time can be allotted for it on the agenda.
  - There could be other tools for the use of the PVA process besides URGWOM. Each tool has its pros and cons.
  - Currently, URGWOM is not capable of doing straight 40 or 50 year runs; that capability is expected within the next few years. In the mean time, there have been attempts to run outputs of one scenario as inputs into another, to chain a 40 or 50 year run.
  - It seems that the group will want to look at what the impact of three or four bad years sequentially would be to the species. The wet or dry years are determined essentially by developing these types of statistical distributions and randomly picking. So that they may be able to keep up.

- At the last PVA/Biology meeting, the workgroup agreed to have conference calls with the PHVA/Hydrology workgroup. Is that still necessary?
    - Face top face meetings were suggested rather than conference calls.
    - Dave Gensler will translate the URGWOM output from the pre-ESA water management scenario into ASCII and send to Dr. Goodman.
    - It was stated that a commitment to drive the meeting sooner, rather than later is necessary since the communication was tasked last meeting but did not get completed.
- One opinion was that the group is talking about next steps, and yet there are past steps that still have not been addressed completely, such as the tree ring data, the salvage data, and RiverEyes.
    - All of the salvage data was recently reviewed, although the quality of the data, and what the data is saying, is debatable. From 2003 to 2004 3,000 fish were salvaged on the river. There is a lot of confusion of what those numbers actually mean. The 2004-2006 data sets is a little more detailed, but there are some from outside the river, and a lot o f younger fish were salvaged. The 2007-2009 is also different from the other two; there is much work needed to get the data into something useful. URGWOM and RiverEyes may be more useful than the salvage data.
        - There is another perspective, and that is what information we can get from future salvage work.
            - Earlier in the meeting, during discussion of the connection between the salvage and RiverEyes data, it's not a disconnect, more so that if the river is dry for 20 days straight, the salvage team only goes to a location once.
            - The observation was that even if RiverEyes marked a half mile increment dry, there could still be pools. There could be something useful in the data regarding those pools.
            - Understanding that the data is not reconciled, and that it takes time to do that; and knowing that a certain number of fish were salvaged from a reach in a given year will be helpful, however crude the data may be. It will bear on a lower bound of how many fish were there, and will bear on how frequently those fish will seem to merit. The PVA will have to meet a standard if it reproduces behavior that is similar to what we know happened. These data are a window to what we know happened even though it's imperfect. Some data may be bad enough to throw out, but we can't do that until we've seen it.
            - The salvage data is in Excel and access databases.
            - It was suggested to distribute the data sets but that time should be spent determining whether or not it would be useful.
                - If the salvage data set is actually 3 separate data sets that aren't something that can be merged, then it is still data.

Day One: Afternoon

- Reese Fullerton reviewed progress from the morning session and went over action items from the morning. Reese specifically asked who from the PVA would be attending the about the meeting between the PVA and the consultation team.
    - It was stated that the group isn't ready to assign attendees, only to begin considering the conceptual framework. There are internal discussions in the works at Reclamation and the Corps, which are yet unresolved because where the PVA is going to plug in to the BA/BO is undetermined.
    - It was suggested to insert the item as a standing request until the team is ready to discuss.
- Dave Gensler will translate the URGWOM output from the pre-ESA water management scenario into ASCII and send to Dr. Goodman.

- Dave Gensler will organize an in person meeting between PVA/Biology, PHVA/Hydrology, and Jesse Roach to discuss the possibilities of incorporating use of the longer term, more stochastic monthly time-step model developed by Jesse Roach for use with the PVA.
- Jason Remshardt will forward an email from Rich Valdez containing fish salvage data to Dr. Goodman and Phil Miller.

HECRAS Update

- A peak is difficult to model accurately, so a 4 or 5 day bracket around that peak is needed to have confidence in the model. The HECRAS modelers have been provided the peak flow and 2 days before and 2 days after the peak and have been asked to take an average over those 5 days to give them that bracket. The PVA team was asked if they prefer to use the average over the days or the low flow for those days to average a peak bracket.
    - An average would be more meaningful and stable
    - From Cochiti to Elephant Butte it takes about 3-4 days or even 5 days for water to travel. Taking the average of those 4 or 5 days to have that steady state flow.
    - ***Question:*** Will things be missed if we treat as if it were a constant?
        - ***Response:*** It was also requested to do changes in estimates of 500 cfs increments, so yes a little accuracy is lost; although it isn't much because that level of precision isn't available for any method.
    - ***Question:*** Would it matter if there was a 7 day window rather than a 5 day window?
        - ***Response:*** We're just telling them what value we consider the max, so whether its three days, seven days shouldn't be an issue for the modelers.

River Drying

- The workgroup revisited the RiverEyes spreadsheet that was distributed earlier in the meeting.
- The spreadsheet is on the website and posted as a pdf file, there is also an access database but it is unknown if it is posted. The red blocks of drying indicate drying in half mile increments; with added gage data recorded while the contractor was doing observations. The spreadsheet also indicates when low flow pumping was in operation at three locations. 2009 was an average year, so a target of 100 cfs at Isleta was pursued, and met. The flow target for an average year at San Acacia is 50 cfs. Pumps were on to slow the rate of drying in the San Acacia Reach. The south pumping station is typically left on throughout the irrigation season. Over the course of four months, there were about six separate drying episodes. The maximum extent of drying was 19.25 miles.
    - ***Question:*** Are the half mile increments a premade GIS database?
        - ***Response:*** Currently its in Excel and Access, the coordinates are in Access
    - ***Question:*** The numbers in each cell are numbers rates?
        - ***Response:*** Numbers or estimated. Estimated by visual estimates, most of these for the pumping example. They are number of pumps running, doing about 7 cfs per pump. In some cases there was one pump running and trying to get them to come up.
    - A red block indicates dry, with a person on the ground checking the river. In some cases, if the rate of drying is high, the person will go out to the area twice in one day to determine if it dried that day or not.
    - ***Question:*** RiverEyes seems extremely labor intensive. How many years has it been done?
        - ***Response:*** 2007 was the first year. 2008 was a wet year so the river was kept complete, and then 2009. The ISC database is for years 2001-2006 but needs to be compiled.
    - ***Question:*** What are the rules for when to turn pumps on and off?
        - ***Response:*** There are BO requirements that regulate when to pump. One requirement is to keep south boundary online all year. The other pumps are used to help slow the rate

of drying, because the BO allows for only 8 miles to dry per day, or 4 miles per reach per day. Pumps are turned on depending on where drying is occurring.
    - So there could be fish in stretches of these reaches that are shaded red because there are pools in the squares. Some only last 5 or 6 days, and then they reconnect. There are some big pools that are in the red shaded areas; which aren't salvaged.
    - There was monitoring of these large pools in the Experimental Activities Report from 2007 in which things like water quality, fish counts, outflow, temperature, and turbidity were monitored through the life of the pools.
    - The geographic location of the pools is somewhat predictable. Of the three that occurred in 2009, one was in the same place that it formed in 2007, but another was in a completely new place because a sediment plug formed. Generally, if a pool is approximately 1,000 square meters it isn't salvaged, until it drops lower in area. Water quality of the pool is monitored, though.
  - The workgroup was asked if they had any requests for data that could be added in to the RiverEyes scope of work for 2011.
    - It was suggested that the contractor note how many residual pools are present in each of the half-mile dried increments; and if so, how long they lasted.
      - That information should be in the salvage data; not each day of drying since the salvage team would only go to a geographic location once during each drying event, but the size and numbers of pools sampled.
- It was suggested that the group identify the pathways of this model by finding out how many steps there are what still needs to be developed, and then identify which data is needed to develop it.
- It seems like if the group follow these sequentially it can be finished, but should the data be prioritized or should they just discuss the data as it comes up.
  - If the group goes through this process, at some point everything has to be related to the biology of the fish. We have to try and quantify how many fish are in the pool and how many survive when it's rewets Some of these questions are important but we just can't quantify it yet
    - One opinion was that all information needs to be shared; another opinion was that the data is being shared, it is just in different formats.
    - It was suggested to move ahead with the data that the group already has, the end of the process will never be seen unless data gaps are identified. Identification of data is important, but determining how to use it difficult.
    - Should the Science Workgroup (ScW) be informed of the data gaps that PVA is identifying? It seems that if the two teams work together then the ScW can write scopes intended to fill in some of the data gaps. Communication between ScW and PVA should be just as critical as communication between PVA and PHVA.
- All of the tables are in the same scale; and river drying generally occurs in the same 10-12 miles of river. Could PVA begin to consider the relationship of San Acacia flows to river drying?
  - URGWOM already uses San Acacia flows as triggers, at half mile increments. Subreaches are between 8 and 9 miles, and the flow trigger is 50 cfs. If flows drop below 50 cfs, pumps are turned on to delay drying.
- Is it possible to develop a probability function for when it's reported that the subreach dries? It is understood that there is not a lot of information here, but there seems to be a linkage or relationship somewhere upstream. As the flows are higher, the drying is less and vice versa, with some target up above.
  - There will be a huge data gap, such as what does that mean for the fish in terms of water quality, salvage survivorship, survivorship of the minnows that go back when it rewets. The Program started collecting that data and pass on salvaging some fish because the water quality is so bad they won't make it anyway.

- So a data gap is whether fish survive after a pool rewets. It is only known that they were alive when in the pool.
  - Would it be conservative to consider a red block on the RiverEyes spreadsheet as any fish in that increment are dead?
    - Need to look at the duration of drying
      - Duration is not the key, water quality is
      - Water quality is a function of duration. If the drying is one day, the fish will probably come out ok, but if it's two weeks they probably won't.
      - Even on a single day can find fish that get stranded, if it dries for 6 hours it will be a better chance then if for 6 days.
    - During salvage, what percentage of pools are not salvaged due to water quality issues?
      - Very few; because the team makes every attempt to get there on the day it dries. As a result, water quality is measured within 24-48 hours after the pool forms. Probably 1 in 20 pools are not salvaged due to poor water quality, or if those pools persist for more than three days, and if they are small, the water temperature gets over 35 degrees will write them off.
        - This could be the beginning of a relationship between survival and drying.

- The group is trying to create a model that can represent major life history, so we need to try to find a way of how to agree on what data is sufficient. What simplifying assumptions should be made, and how do we identify at which point those assumptions should be made.
  - Data is never a road block; at the end of the day we need to have enough certainty in it to trust that the model will fill in information gaps. If we cause more uncertainty then more adaptive management will be needed.
  - The group should follow discussions on data to their endpoint. Due to timing constraints and trying to get a model developed within them; the group should up front, during discussion, follow each of those threads to the very end. If it does not, there will be much uncertainty.
    - Another opinion was to follow the threads until data gaps are identified rather than all the way to the end of the data.
- Considering river drying then, how much further should the conversation go as far as modeling relationships? Can we answer a very basic question of how much drying as in bare bones drying has a detrimental effect on the fish? For example, four days 100% dry along 20 miles of river – will that much drying cause a population decline?
  - We can't make that decision until we have a better idea
  - If we build a model that is conservative then it would predict the minnow going extinct 5 years ago.
- From the water management side we are trying to decide how much drying is problematic. Having those types of gross drying is very helpful on the management side
  - Very quickly, a rough estimation was made using the same numbers used in the RAMAS model for catch rates converted to number of fish per Reach. An estimate of drying a 5 mile reach equates to about 18,000 fish dead, a 10 mile reach is about 34,000 and so on. This is assuming complete drying in the reach and that there are 165,000 fish in angostura, 192,000 in Isleta, and 234,000 in San Acacia.
    - The reason did this to see if just not arguing small potatoes. It depends; a graph of the estimated population size year by year from 1993-2007 states that maximum year the population estimate was 13 million, and the minimum was 9,000 fish. So a drying event with 13,000 dead could have killed them all or been a drop in the bucket.

        - It depends on population size and what is really there, but the exercise was quickly done to see if 8 mile reaches for URGWOM is relevant; although it seems to be quite a bit more.
- Do we have enough data that would tell us generally how many fish are in a pool as a reach begins to dry?
    - One observation during salvage efforts is that if a reach dries one time or 8 times, there will be completely different numbers of fish salvaged. Every time a reach dries, rewets, and dries again fish are lost. The highest fish salvage numbers always come from the first drying event.
- It is important to determine if drying is a significant problem, and if so then how does it impact the fish. Getting a sense of those types of relationships and how it affects population is what really helps water mangers know. For example in the pre-ESA water management scenario, there is drying in the Albuquerque reach when MRGCD is out of water, which would've happened in 2003 and 2004, but supplemental water was used to alleviate it. So is it relative to the use of supplemental water as a trade off to get water in the San acacia reach.
    - Wouldn't know the answer until get there depending on the distribution of the species. It may not have had as large of an affect as it would now
- FWS did the same sort of study in 1996 and 1997 where pools in the drying reach were studied. A person would go out every day and count fish or take water quality parameters.
    - Jason Remshardt will attempt to locate a FWS study from the mid 1990's that studied large pools in stretches of drying. Jason will send the report to Dr. Goodman, Phil Miller, and to Tetra Tech for posting to the Program website.
- ***Question:*** Is the RiverEyes data used to parameterize URGWOM?
    - ***Response:*** It's not to parameterize, it's used as a filter by going down the river to see if there's drying
    - So are there GPS coordinates on the pools?
        - Yes
    - The relationship could be that if there is an additive piece of drying it could be related to the fish. For every half mile sequential drying then its related to the survival, starting over if rewets and then dries again.
- It was suggested to do a sensitivity analysis on river drying to parameterize the model.
    - The data should be converted to a more usable format before attempting a sensitivity analysis on it.
- Is there data for how many fish were there and how many died when a pool dried?
    - Yes – in the Experimental Activities Report from 2007 the contractor did daily monitoring through the life of the pool.
    - Think getting at how many fish were in the pool before it formed. In the instant it disconnected
    - If we know how many fish were in a pool at some point during its life, we might have a starting point. There is some data that shows when the pool reconnected, to think about the possible health when it reconnected
    - The contractor actually went through the pool, captured all the fish and released them again to monitor the fish population throughout the life of the pool.
- Has there ever been consideration of developing a relationship of the size of the pool and the fish in it?
    - Presumably the density of the fish in that pool effects survivorship and water quality.
    - If there is a series of time specific densities or total numbers it's a very simple survival curve within the pool. And it would be possible to do a size of pool to number of fish, making assumptions about the amount of fish in the reach before drying occurred.
        - What kind of error bars would we get?

        - There could be an r^2 squared on the slope of an analysis of the fish caught over time
    - There were 4 or 5 pools monitored in the Experimental Activities Report that were evaluated.
- Will there be an assumption that different survivorship rates apply?
    - The data will likely show that the first drying event is usually the most severe; then it will drop off significantly. Considering a 5 mile stretch of river, the first time through the salvage team might get 2000 fish. If the river wets and then dries again, there may be 20 fish salvaged, and so on.
    - Could the mortality rate be that the number of fish there are different, or that the fish isn't going back to that particular location because it dried?
- The model structure is already given; it is about the birth rates, reproduction rates, and mortality rates for a given species. The structure of the model is not an obstacle, the purpose of these meetings is to determine the linkages between these things for the RGSM.
- It was stated that the workgroup still needs to consider the redistribution of fish after the river rewets.
- There is another aspect to the drying issue; that of return flow areas and their role of refugia. The places where the fish can go to when the river dries. In terms of where might they be and the conditions that we would expect fish to be there. Are they additional pools or return current areas that already exist.
    - The main issue with refugial areas would be in the Isleta Reach but there was no drying there last year. There are no return flows further down the river where it dries more.
    - They're not quite the same thing but could look at the pump channels as something similar, because when turn those off need to look at them in the pump channels.
        - We know the locations of these already, and the capacity?
            - Would look forward in the future for evaluating it's not too much engineering and construction; we could probably deliver water anywhere we want.
            - Are we in a position to be able to describe these – to incorporate these in the models – right now in URGWOM, there are waste ways that are aggregated.

Chair Person

- Reclamation is stepping down from the co-chair position; the charter designates that a co-chair be from the FWS, Reclamation, and MRGCD. The FWS seat was not filled due to lack of manpower after its co-chair changed positions. The Reclamation co-chair is now in a new position, and will no longer be able to fill the role. Reclamation is not able to offer another co-chair at this time; also do to lack of manpower internally.
- It was suggested that the remainder of this discussion be held during the morning session.

DAY 2

- Jim Wilber called the meeting to order and reviewed the remaining agenda items. The workgroup will first discuss workgroup business (i.e. charter, annual workplan, and co-chair). A presentation on Age and Growth will occur and then the group can discuss next meeting date.

Workgroup Business

- It was decided that all workgroup business will take place via email.
    - It was unknown if the chair person needs to be from an entity on the committee. It was suggested to bring a suggestion for a different chair configuration to the next EC meeting.

Age Structure and Survival Information (Rich V.)

Rich Valdez presented on the Age, Growth, and Survival of the RGSM; revised after receiving comments at the January 2010 PVA meeting. The analysis was primarily done on the 1993-1999 data since it had sufficient numbers of length that was done on a monthly basis. The following is discussion that occurred after his presentation. Please refer to the attached PowerPoint for specifics or contact Rich Valdez (valdezra@aol.com) with questions.

- ***Question:*** programs like ELEFAN will do age assignments for you assuming normal distributions, is that what you did?
  - ***Response:*** Yes
- ***Question:*** So you didn't do hard age cutoffs?
  - ***Response:*** It doesn't assign ages, so bounded that with Bins, midway between the determined lengths at age
- ***Question:*** So you forced age assignments based on figures rather than letting the program assign?
  - ***Response:*** Yes, the problem with ELEFAN is that it puts the starting points on the modes wherever it wants, so had to re-teach it to put the starting points where wanted it. So it's bounded and then age assignments within those bounds
- ***Question:*** what's going on between 1996 and 1997, is that statistical noise or an environmental conditions that would make an observable difference
  - ***Response:*** Dudley and Platania took different peaks for the modes at times of capture – followed that cohort as if same group of fish growing. So there is a different growth rate in different years
- At the last meeting, it was stated that observations indicate that larger fish in the hatchery do not have the expected level of maternity. These are known older fish, but comparing the minnow to the plains minnow may not be best since the plains minnow is known to spawn multiple times in one season, where the best evidence for the RGSM is that it spawns only once per season.
  - It was suggested to set up parameters to do a sensitivity analysis; so that survivorship of the older fish and their fecundity will be within reach. Another one could be done on differential survival with the eggs.
    - Another opinion was that survival of the older fishes eggs may go up because they are larger and better conditions.
    - There has been documentation that shows older fish eggs is less than that of the younger fish. An explanation was not known for the diminished viability of the eggs, but that is why brood stock is gone after 2 years of spawning or so, because egg viability declines.
      - Another thing to consider is the number of eggs layed versus the number within the female. Cutting open a female and counting the eggs is a different number then how many she may be laying.
- It is interesting to see the monthly survival rates, survival will vary from year to year so don't expect it to be the same.
  - It should be discussed if the reach specific monthly survival estimates are actually real, or just statistical noise and we'll assume that each reach has similar survivorships.
  - Can use it to help decide where to do more work. If there really are reach specific survival rates it could help the decision of where to do HR and so on
    - Interesting that the highest survival rate is in the San Acacia reach where the most drying is.
    - This is for 12-24 month fish, if we believe there are 3 year olds in here to, then we'll probably have to do something similar for them. It will involve age classes
    - Can look at the survival curve, it actually flattens quite a bit after the 3rd year. There is a large difference between the 2 and 3rd, but after the third will have to assume constant survival

  - There are several papers that suggest the VBGF isn't appropriate for modeling. The length distributions are pretty strongly overlapping. It isn't useful for assigning ages to fish, rather using a multi model approach might be better.
- So where are we with 12-24 month survival? We've got this range of survivorship here, and won't have to pick one or another, but at some point will have to reach some level of comfort or lack thereof. It is unclear where we're going to go with the analyses
  - We'll have to take into account the differences between methods. There is a blind spot and we don't know if they are the same for the blind spot. That blind spot includes a season that is different from the others, and begins in July.
  - There are assumptions that the spawning activity is stressful, so there could be a delayed mortality after spawning, which may be included here.
- It was suggested to wait until the age and length report is finished for comparison.
  - The report won't be available until fall 2010.
- It appears that the ability to propose a survival schedule, reach specific if needed, is there. The schedule should be 12-24 months, and may be able to do a 24-36 month using similar data. The 0-12 month fish could be considered using the quarterly analysis data; and then compared to see if they interweave with the 12-24 month and 24-36 month.
  - Should the survival schedules be reach specific? Originally it was thought that we may not be able to get to that level.
    - It is worth considering
  - There is the fecundity issue; the group needs to decide if the Plains Minnow will be used as a template, or how to approach the fecundity age class of the RGSM.

Fish Passage

- Want to start by thinking in terms of how fish passage – in a generic sense would be dealt with in a risk assessment context or a modeling context, so we can bound what data is valuable.
- Believe fish passage would be best simulated as a mechanism by which different reaches are connected. In the RAMAS model, non specifically, they are connected by structures, either man made or natural. Fish passage would allow upstream movement from one reach to the next. Structurally within a model it is easy to implement. It could be a rate, or the probability of different ages, or the probability of larger fish versus smaller fish using the passage.
- Right now the movement upstream and downstream is none, fish passage is a management tool to change that.
- Then there would be probabilities of fish moving upstream then, in a much simpler way
- That is a simpler problem then the one that the FORTRAN model will be faced with, since it is in ½ mile increments
  - The FORTRAN model will have the ability to analyze different things at different scales. There will be things happening at a half mile scale and other things happening at other scales.
- Before we go too deep into this factor – we need to think about what we mean when we say hypothesis; it's getting thrown around loosely. We need to discuss whether our curiosity is over whether this factor would make a difference about if we know the parameter value is.
  - Don't know that we have any hypotheses we're proposing right now, just trying to see what relationships might be important to this topic, and then discuss and see what we can come up with.
  - The inherent hypothesis is that the construction of fish passage will mobilize the movement of fish up and down the Rio Grande.
    - That's been stated in a form that doesn't need a model. What needs to be discussed is what has been done, what barriers are there, does it need to be modeled?
- There are three data sets that might be useful, 1) Platania's movement study, 2) Swimming performance study, and 3) Tag Recapture Study.

- Data is being collected from the fish passage installed at the diversion dam.
  - Do these data mean that only the fish within the given distance from the structure are likely to use the structure, and does that affect the population of the whole reach?
    - The assumption is that if there is this limited movement, the fish closest to structure would use it.
  - Would the movement be only during certain times of the year?
    - That is a question to parameterize. If there is a strong directional movement
  - This can work both ways in this system; upstream movement can provide re colonization, but it also moves eggs downstream.
- The initial thinking was that it would be for when flow was to pass over the dam, and is sufficient volume to run through the fish passage, and there would be low flow periods, so it wouldn't be year round.
- From a practical perspective, if moving fish is necessary to prevent extinction; the Program might consider trucking some fish upstream versus fish passage.
  - Fish passage is a current requirement of the BO at San Acacia and Isleta, and will probably be in the new BO. This group is not the place to consider the economics of it.
- The PVA models don't care if it's a fancy structure or if it's a bucket. If there is a local, high risk then what level of movement or extent of upstream movement is necessary to make long term of that reach for movement. The model doesn't care about what it is, just that it's happening

- The model can tell you how mush effective fish movement you would need to achieve certain results in the population, but the model can't tell you if the fish will use it.
  - Would the model also tell you what size of the population you would have in each reach to achieve those affects?
    - It only comes into play if there are local extinctions, its effect on the population as a whole is imperceptible otherwise.
- There are two data sets that would help determine whether there is a directed level of movement of fish upstream. One is the monitoring data, the second is genetics data.
  - There is no separation between the populations between the reaches, but there is a downstream diversity; there is more diversity downstream. This suggests that over generations we've seen a net downstream movement. It may not be visible from year to year, but a net downstream movement of fish over generations
- There was also found to be a difference in the movement of swimming ability by size, so that should be analyzed.
  - It has also been found that difference in hatchery versus wild fish exists.
  - Bigger fish swim further, or have the potential of swimming longer; although there is no information of the monitoring data.
  - It is known how old they were from when they were introduced to when they were next captured – some were in there for well over 1000 days.
    - A few tags have been recycled; there is a handful of tag combinations, but the combinations are recycled no sooner than 5 or 6 years after the previous use.
  - The monitoring data might give some indication about whether there was a net downstream movement
    - There is a distribution from the mark recapture efforts, although its skewed downstream, is that the data set that is of meaning here? Or do we need to mine the monitoring data more?
      - There is sufficient anecdotal data that says they will go up an outflow
      - Not sure about that – we worked with that at other locations, really have to make a lot of modifications to tease the fish to find the slots.
      - Why would they use it? There has to be some benefit to doing it if they swim upstream. Could it be genetics?

- The RGSM is rheotaxic, meaning the tendency is that as soon as the river starts drying they move upstream. It has demographic and genetic benefits. It's a mechanism to put them up there, which is how they survive in a system that is hugely dynamic. We know that they move upstream, the argument is how far they have to move upstream to maintain a demographic and genetic diversity to persist. So if there is something there in the way, it could be impeding survival.

- Can the model address the issue of what will happen if there is not a genetic movement of fish upstream?
  - Not currently
  - There is a study underway now that will provide insight into what happens when there is no barrier to movement.
- Is it a stumbling block for the model if it's glossed over at this point?
  - It depends on if the population is getting down to numbers where inbreeding is significant.
  - There are populations that have a low genetic diversity that are doing fine, but also some in big trouble, low genetic diversity at times can be bad for a population, with the numbers of individuals we're seeing, wouldn't think that it is significant now
  - One of the genetics studies indicates that the low population size, in general, is related to the level of risk for the RGSM; so a much higher population size is desired.
    - There are other ways to determine that; the Program should be made aware of them now.
    - It was suggested to have this type of discussion with genetics experts.
    - Another suggestion is to do inbreeding studies at the hatchery, to get information to how the species responds to inbreeding. We have no information on it to make parameterization that whole component.
- Should genetics be built in to the model?
  - Pursuing a line of analysis that is premised on effective reproduction and that there is a survival rate that says they're fine, but another that says they're not. Or an evolutionary process, there is a process that can remove it from a population to persist; sort of a purging of the bad genes in a population. The ones with the bad genes die and the ones that don't have it survive without the bad genes. It appears bad from the genetic data, but it may not be bad if there is no inbreeding depression. Would have to force fish to inbreed and then look at the viability of their offspring.

- The ScW will be having presentations on the genetics studies in the near future, it was suggested that PVA members attend.
  - Another suggestion was for presentations to be held at both committees, since PVA would like to hear about N_e, and if there is data available to address the inbreeding issue.
  - There are other geneticists that may be able to help the PVA work through some of these issues: Fred Allendorf, Phil Hendrick, Gould, and Dowling were suggested.

Next Meeting

- The workgroup decided that they're next meeting would be May 4 (all day) and May 5 (morning only), 2010.

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Age, Growth, and Survival of Rio Grande Silvery Minnow

Topics in This Presentation

I. Revised L_∞ and K for VBGF
II. Proportions of Brood Stock by Age
III. Survival for Months 12-24

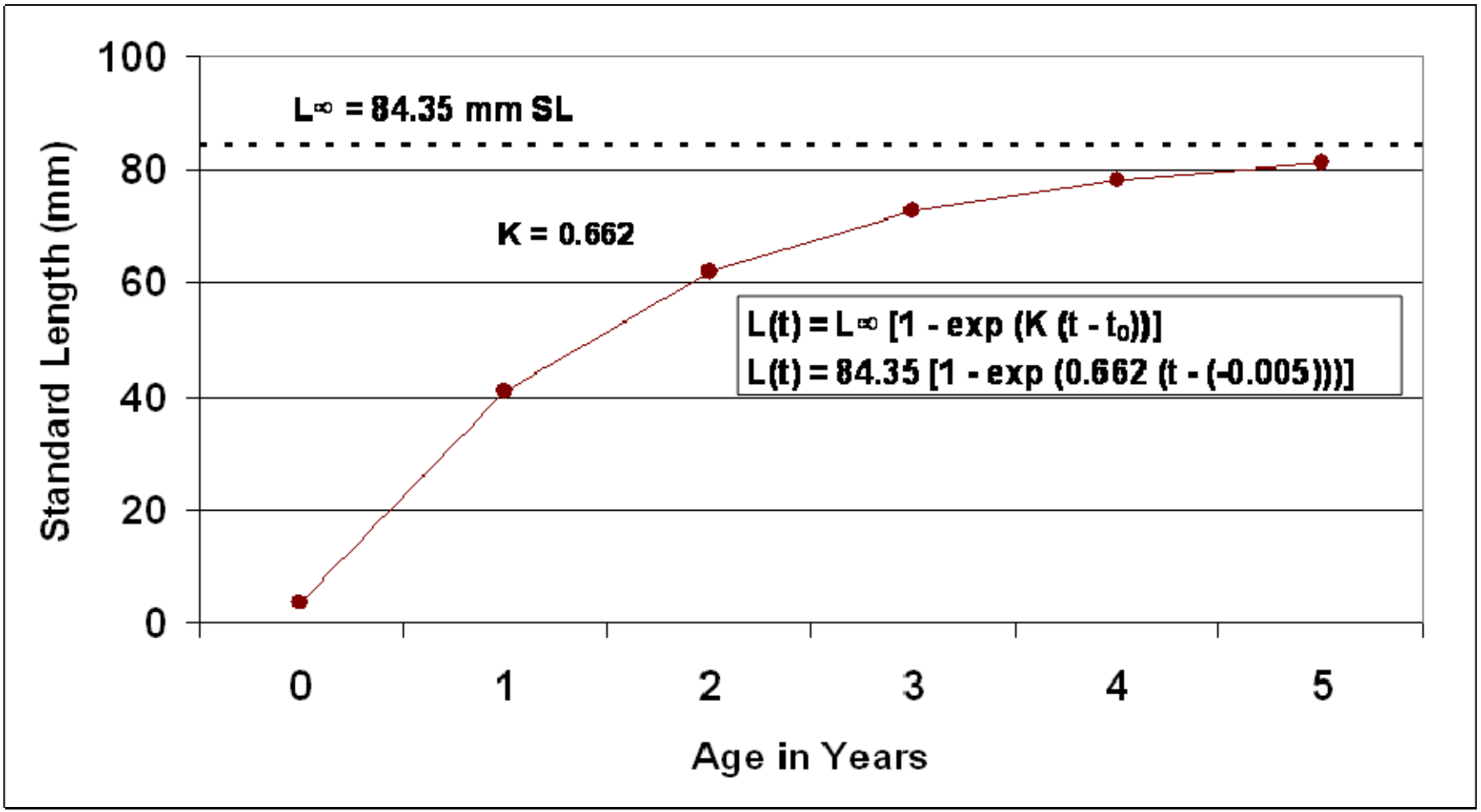
I. Revised L∞ and K for VBGF (Shepherd's Method of ELEFAN I)

Year Class	Linf	K	RSA*
1993	80.85	0.64	0.990
1994	80.85	0.62	0.729
1995	82.95	0.71	0.885
1996	80.85	0.74	0.827
1997	91.35	0.54	0.830
1999	89.25	0.72	0.819
Average:	84.35	0.662	

*RSA = Response Surface Analysis; $R_n = 10^{ESP/ASP}/10$

(Explained Sum of Peaks/Available Sum of Peaks)

Rio Grande Silvery Minnow
VBGF from Modal Progression Analysis
(For Average L∞ and K; 1993-1997, 1999)
NEW



Rio Grande Silvery Minnow
Predicted Length at Age from VBGF

Year Class	No. Fish	Age in Years					
		0	1	2	3	4	5
1993	6278	3.7	38.35	58.44	69.03	74.62	77.56
1994	5820	3.7	37.49	57.53	68.30	74.10	77.22
1995	5408	3.7	42.31	62.97	73.13	78.12	80.58
1996	2580	3.7	42.42	62.51	72.10	76.68	78.86
1997	2203	3.7	38.26	60.41	73.32	80.84	85.23
1999	7291	3.7	45.96	68.18	78.99	84.26	86.82
From Ave Linf & K	29,580	3.7	40.97	61.97	72.80	78.39	81.27

II. Proportions of Brood Stock by Age

(Numbers and Percent of Sampled Fish in Predicted Length Bins*)

Year	1	2	3	4	5	6	Totals
1993	6	193	12	2	1	0	214
Feb, Mar, May	3%	90%	5.61%	0.93%	0.47%	0.00%	100%
1994	580	211	10	3	1	1	806
Feb, Mar, May	72%	26%	1.24%	0.37%	0.12%	0.12%	100%
1995	551	179	52	8	4	1	795
Feb, May	69%	23%	6.54%	1.01%	0.50%	0.13%	100%
1996	1000	101	3	2	0	1	1107
Feb	90%	9%	0.27%	0.18%	0.00%	0.09%	100%
1997	214	22	49	1	0	0	286
Mar	75%	8%	17.13%	0.35%	0.00%	0.00%	100%
1999	554	149	2	1	0	0	706
Feb, Apr	78%	21%	0.28%	0.14%	0.00%	0.00%	100%
Average	65%	29%	5.18%	0.50%	0.18%	0.06%	

**Fish length at capture adjusted to length at birth date with VBGF*

Proportions of Brood Stock by Age
(Applied to Numbers From Population Estimates)

With 1993	1	2	3	4	5	6
Pop Est	65%	29%	5.18%	0.50%	0.18%	0.06%
613,638*	396,514	180,821	31,783	3,053	1,119	348
2,283,790**	1,475,716	672,965	118,286	11,362	4,166	1,295
W/out 1993	**1**	**2**	**3**	**4**	**5**	**6**
Pop Est	77%	17%	5.09%	0.41%	0.13%	0.07%
613,638*	472,376	106,301	31,257	2,516	770	418
2,283,790**	1,758,053	395,622	116,330	9,366	2,865	1,554

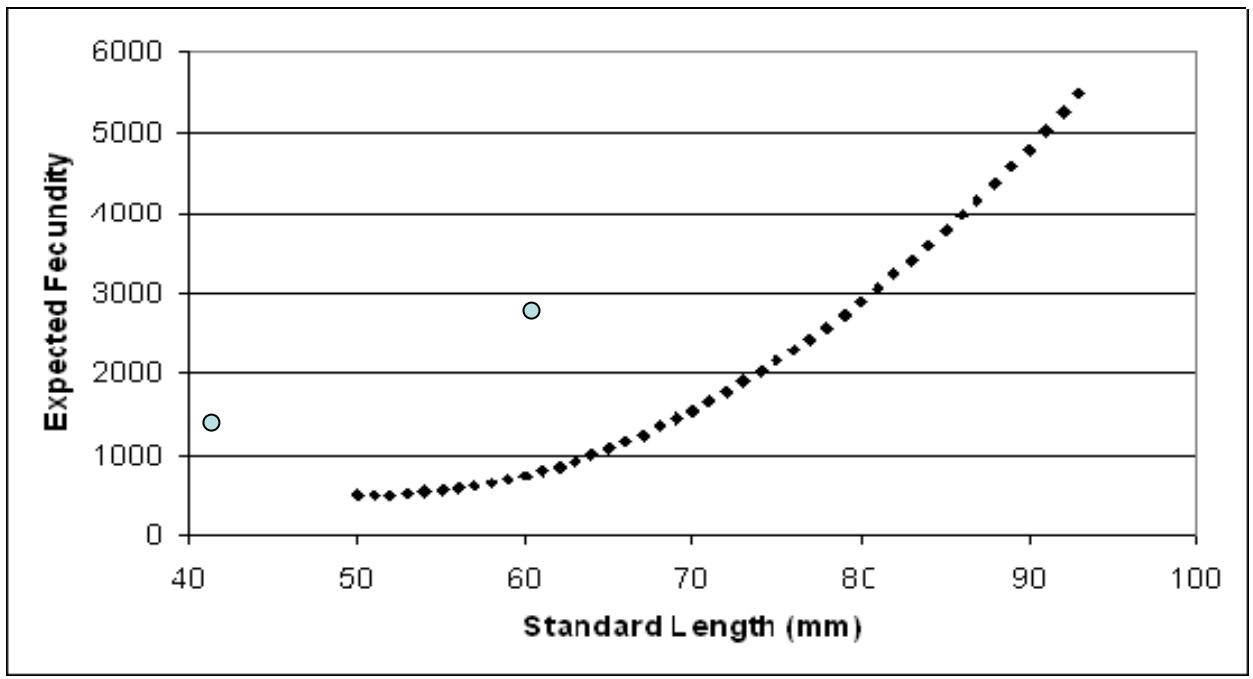
*Dudley and Platania (2008) **Dudley et al. (2009)

Age and Length-Specific Fecunity

Altenbach and Platania (1994) in Miller (2008) for RGMS

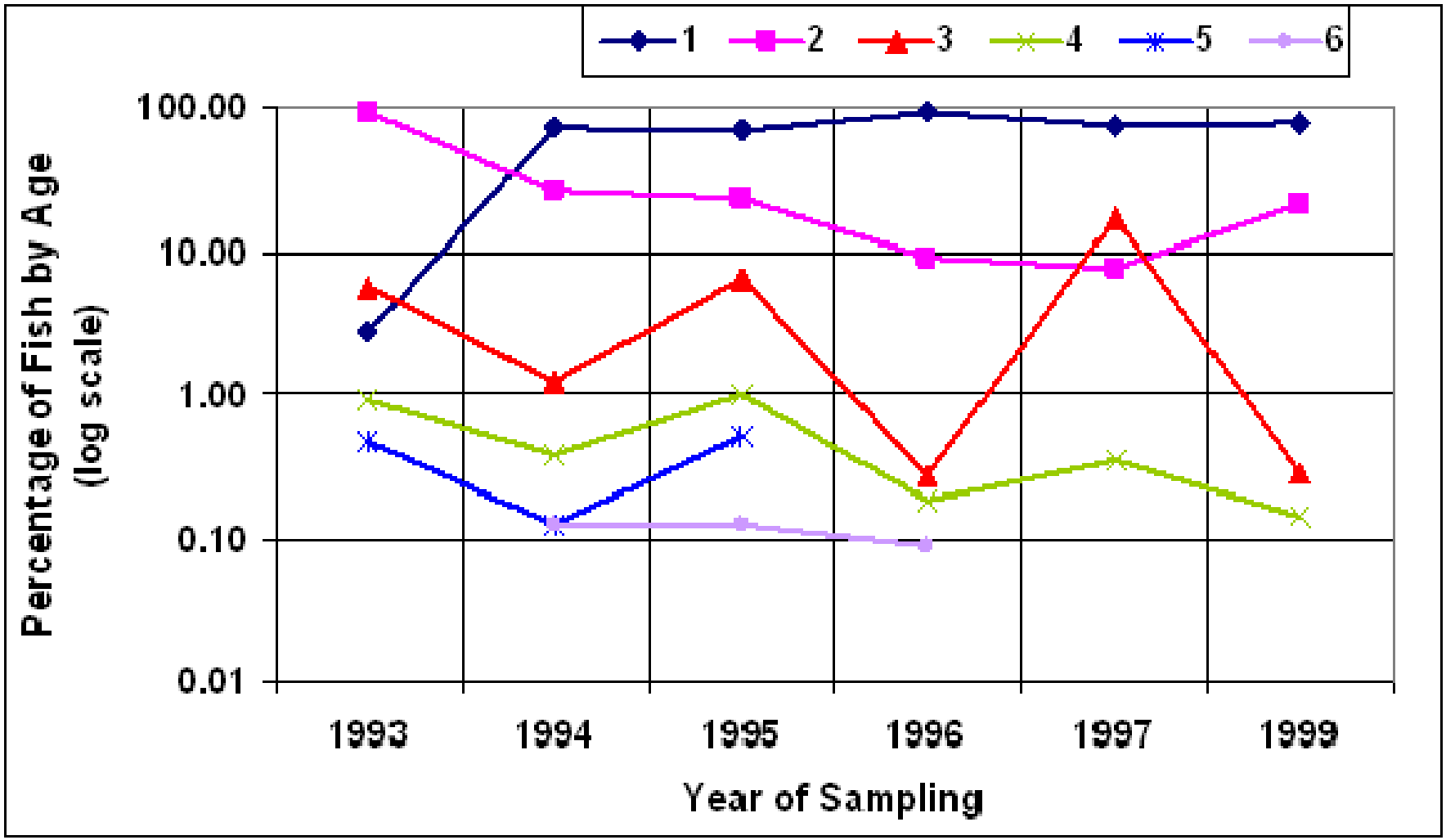
Age Class (x)	Mean # eggs (SD)	Females produced (m_x)
0	1316 (582)	658
1	2961 (826)	1480.5

Taylor and Miller(1990) for *Hybognathus placitus* (plains minnow)



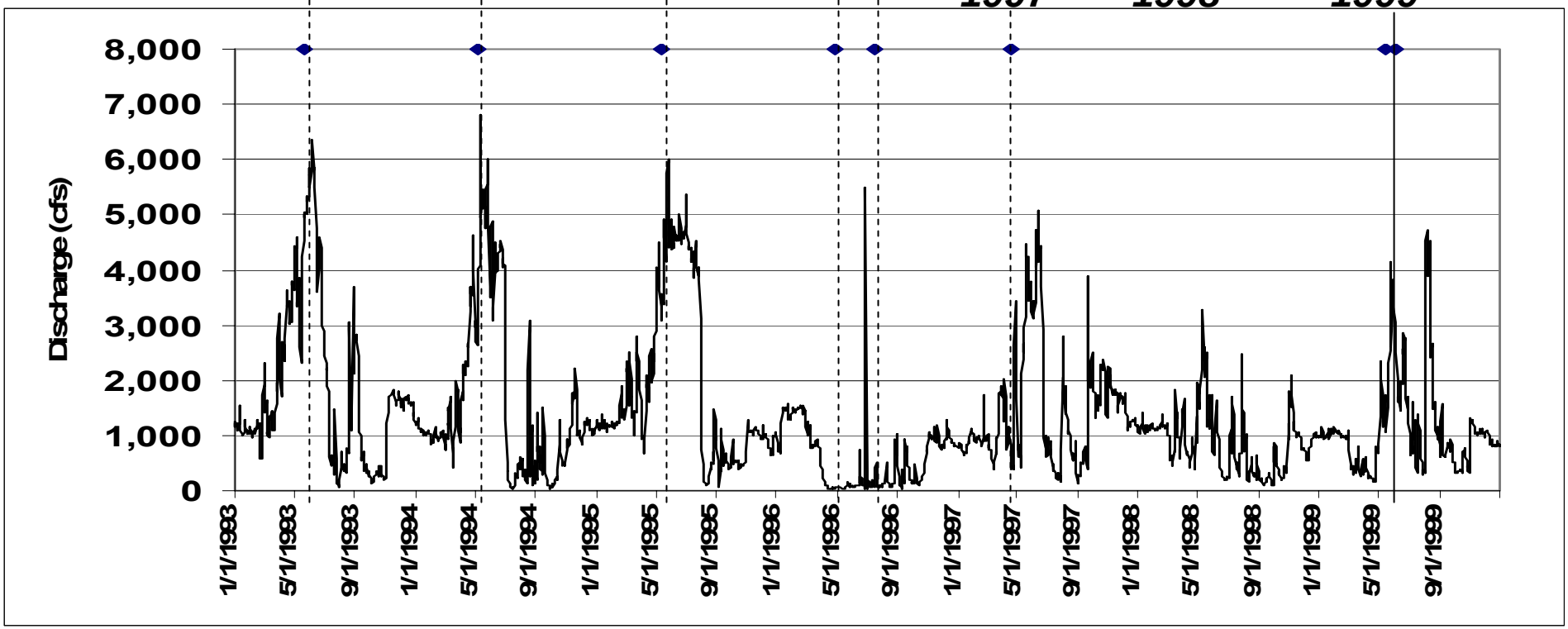
Ages of Brood Stock by Year of Sampling

In a given year, there may be fish of up to 6 ages in the population.



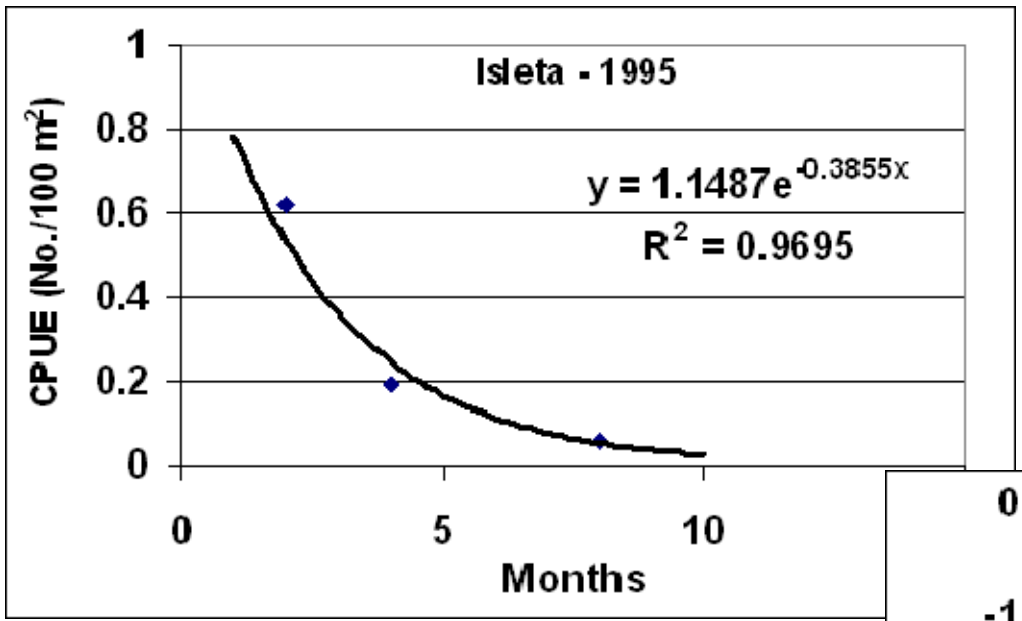
Predicted Lengths of RGSM for a Given Year at Time of Spawning

mm SL -→	38	58	69	75		
1993		37	58	68	74	
1994			42	63	73	78
1995				42	63	72
1996a				39	61	71
1996b					38	60
				1997	*1998*	*1999*

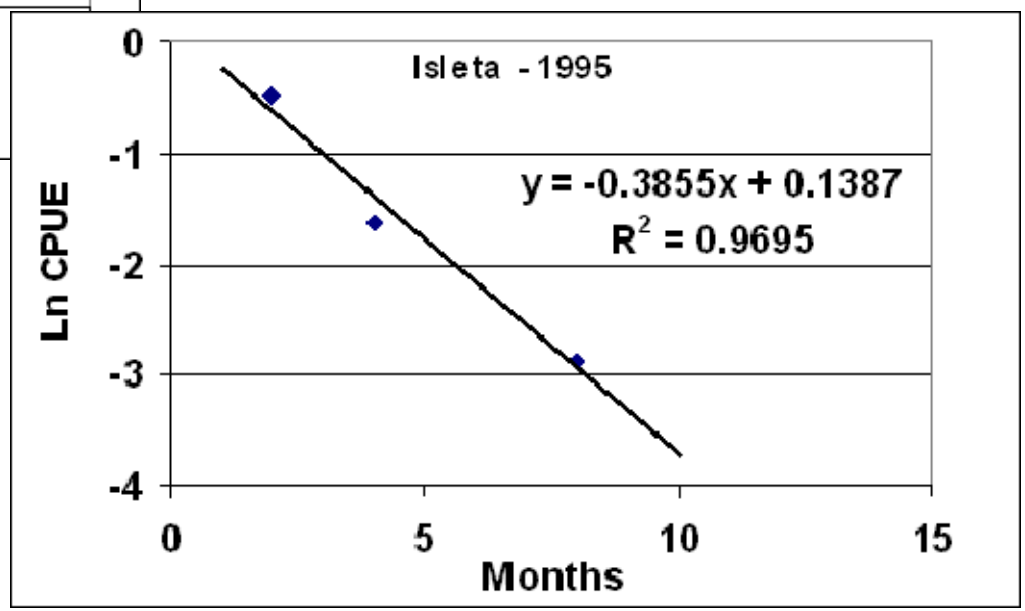


III. Monthly (S_m) and Annual (S_a) Survival (Based on Monthly CPUE for Months 12-24)

$S_a = 0.763^{12} = 0.039$



$S_m = \exp(-0.3855) = 0.680$



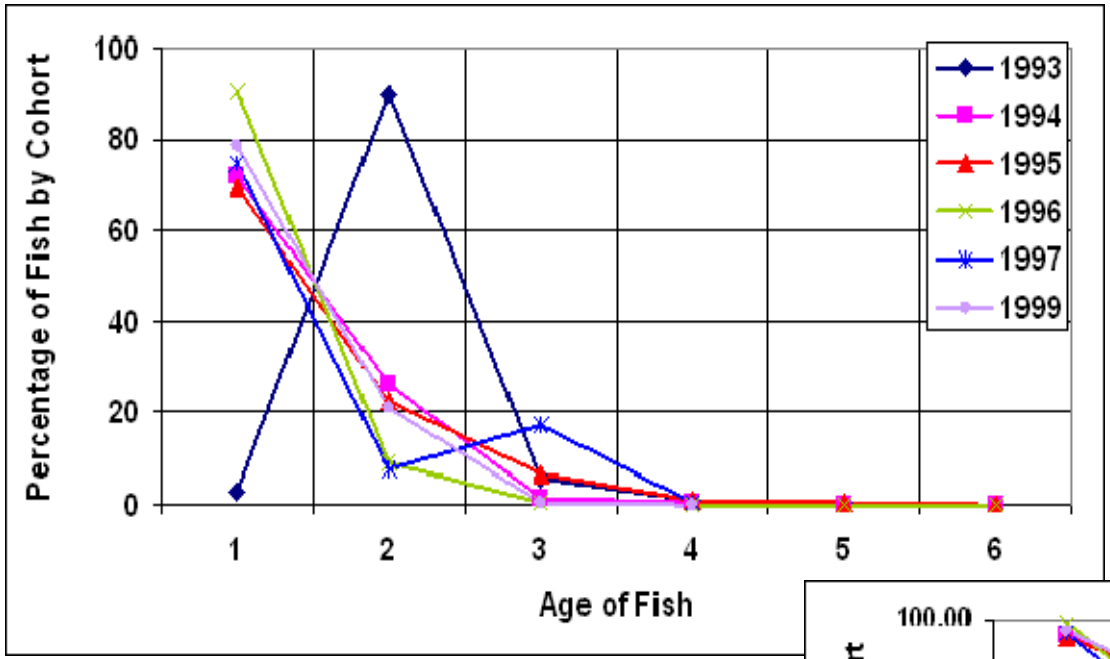
Survival of RGSM
Monthly (S_m) and Annual (S_a) Survival
(Based on Monthly CPUE for Months 12-24; $R^2 > 0.50$)

Reach	1993	1994	1995	1997	1999	2000	2001	2002	2004	2005	Av S_m
Ango	--	0.937	0.926	--	--	--	--	--	0.885	0.626	0.839
Isleta	0.748	0.486	0.680	0.797	--	--	--	--	0.686	0.620	0.670
San A	0.611	0.736	0.847	--	0.722	0.760	0.820	0.766	--	0.935	0.775
Av S_m	0.679	0.720	0.818	0.797	0.722	0.760	0.820	0.766	0.785	0.727	0.763
									S_a	=	0.039

Annual Survival for RGSM (for months 12-24)

- **0.007 (Miller 2008 from Remshardt)**
  - **Mark-Recap of Stocked Fish, 2004-2005 ($0.662^{12} = 0.007$)**
- **0.039 (Valdez 2010)**
  - **Monthly CPUE for Same Cohort, 1993-2005 ($0.763^{12} = 0.039$)**
- **0.09 (Hatch)**
  - **Numbers of Salvaged Fish from Multiple Year Classes**

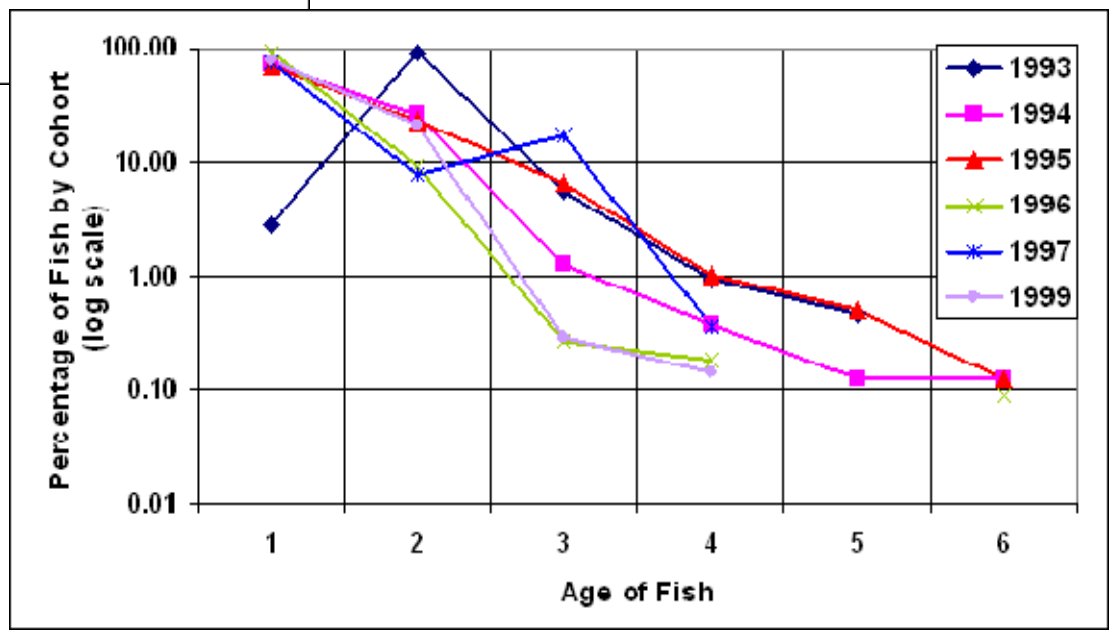
Proportions of Fish by Age



←-Arithmetic Scale

These are cross-year class catch curves.

Semi-Log Scale-→



Constant Annual Survival With MP and X-Year Class Catch Curves

	Modal Progression		Catch Curves	
Year Class	Z	S	Z	S
1993	-1.09	0.34	-0.82	0.44
1994	-0.92	0.40	-1.40	0.25
1995	-0.82	0.44	-1.28	0.28
1996	-1.04	0.35	-1.38	0.25
1997	-1.55	0.21	-1.53	0.22
1999	-1.12	0.32	-2.33	0.10
1993-99	-1.09	0.34	-1.46	0.26

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