Population Viability Analysis/Biology Work Group Meeting

September 29-30, 2011

Meeting Materials:

Meeting Minutes

River Drying Data Middle Rio Grande (1996-2011) [presentation]

PVA Biology Work Group Meeting
September 29th and 30th, 2011
US Bureau of Reclamation
555 Broadway Blvd. NE, Albuquerque, NM 87102
San Juan Conference Room

Actions

- Tetra Tech will check and correct the spelling of "RAMAS" throughout the May 2011 meeting notes.
- For the next PVA meeting (tentatively December 12th and 13th) Dave Campbell will arrange a presentation on the flycatcher PVA completed by the Arizona.
- Dave Campbell will find out if Jason Remshardt will be available to attend the next PVA meeting (tentatively December 12th and 13th).
- Rick Billings will add a joint HRW/PVA Habitat session or workshop to the October HRW agenda; he will also continue to coordinate a joint meeting with the PVA co-chairs.
- Dave Campbell and David Gensler will work with Jericho Lewis to discuss the potential of purchasing a copy of their field notes and datasheets and work with ASIR to determine what the cost might be.
- At the next PVA meeting, Reclamation (Gary Dean) will report back on when the population monitoring contract (and other pertinent contracts) are expected for RFP.
- Dave Campbell and David Gensler will seek guidelines and recommendations from Jericho Lewis on how to include expert contractor (ex. ASIR) participation in regular PVA meetings while also being sensitive to the potential conflict of interest concerns.
- Dr. Goodman will email a written request of what data is needed from Jason Remshardt.
- Dave Campbell will coordinate with Jason Remshardt's supervisors for any additional data requested/needed.
- Dr. Goodman and Rich Valdez will provide the PVA work group with a detailed description of the genetics data needs.
- Mick Porter will do a trial workflow on the available genetics data to determine effort level (how feasible) it would be to determine sample sites from the IDs.
- Dr. Goodman will post the calculation interpretation controversy papers to his website (Palstra and Ruzzante, *Molecular Ecology*, 2008).
- David Gensler will determine what raw paleo data he already has and will begin to gather what is missing.
- Reclamation (Gary Dean) will compile the egg collection datasheets/spreadsheets from J. Remshardt and SWCA's egg monitoring work at the ABCWUA's diversions.
- David Gensler to fill in the depth and flow information on the egg monitoring/collection data once compiled and provided by Reclamation.
- David Gensler, Gary Dean, and Jason Remshardt will develop baseline monitoring protocols for establishing minnow use and crude food assessment for the 240 wasteway and other sites in which flow can be easily manipulated.
- David Gensler will contact Brad Griggs about using the SLURP Rio Grande Model as a starting place for hydrologic modeling.
- Mick Porter will enquire if the USGS is using the AFS habitat classifications in their mesohabitat mapping projects.
- Rich Valdez and Mick Porter will organize a subgroup brainstorming session to discuss how to expand the mesohabitat mapping studies to reach or river-wide scale; how the studies could be used to ground-truth the remote sensed information (to get to probabilities of water depth and flow); and food supply assessment.

- Before the USGS begins mapping the MRG mesohabitat in November/December, Dr. Goodman, Jason Remshardt, and Mick Porter will do a power analysis on the fish sampling data from Big Bend.
- Rich Valdez will contact Grace Haggerty or David Gensler to obtain the photos of the significant drying that occurred in 1996-1998.
- Rich Valdez will confirm the length of the Albuquerque Reach (closer to 40 miles long).
- Dagmar L. will confirm if the River Eyes data is publically available now (or who owns the rights).
- Yvette Paroz will determine if the by-seine haul spreadsheet can be updated to include a larval seine field, isolated pool field, mesohabitat code for each, and VIE field.
- Yvette Paroz will confirm with ASIR how the preserved larval fish data becomes part of the record and if the information is included in their database.
- Dave Campbell will request that Jason Remshardt attend the next PVA meeting, depending on the confirmed meeting date.
- David Gensler will pursue the answer on how the URGWOM model makes a prehistoric year look like an historic year (in other words what does URGWOM use to reconstruct a year to match some paleo record?).
- Dave Campbell and David Gensler will continue discussing the consensus data process and develop recommended timelines for each step.
- Yvette Paroz will look into getting the updated population estimation data.
- Stacey Kopitsch will check with Jericho Lewis if the age/length study draft report can distributed to the work group (contractors excluded).
- Rich Valdez will try to contact Jude Smith (FWS MuleShoe Refuge in TX) for additional drying information for 1998-1999.

Decisions

- The next tentative PVA workgroup meeting was scheduled for December 12th and 13th.
- Conceptually, all members present at the September 29th 2011 meeting were in agreement with developing a rigid, stepped process for establishing a consensus data to be used in the PVA models.
- All members present at the September 29th, 2011 meeting were in agreement that the 600 year paleo reconstruction was acceptable at face value for this iteration of the model.

Suggestions/Recommendations

- It was suggested that pit tag data might be a small enough dataset to easily reformat into the data template for the Program's Database Management System (DBMS) so it can be easily included in the database and made readily available.
- It was suggested that a minnow movement into refugial winter habitat study/project is needed.
- PVA work group would like to have the data "templates" for the database be included in all new contracts and contract modifications in order to ensure database compatibility; this will also assist with ensuring the database is as up-to-date and current as possible.
- Members suggested that workshops on basic statistical analyses, techniques, and assumptions could be beneficial.
- Proposed studies: (1) Fish Movement Task A – a pit tag study for upstream movement during summary drying; and Task B – a well designed sampling study in the pools to check the "bookkeeping" on the density of fish in remaining pools compared to the total of all fish assumed to be in the river; (2) over winter habitat or minnow movement into refugial winter habitats.
- It was suggested that adaptive management could test the affects of "pulses" of water (flow for 8 hours once a week) on pools and fish recovery during times of drying. This could also be tested in one of the longer wasteway channels (¼ to ½ mile channels) where the flow can be easily controlled.

  - Another option could be to evaluate fish health and recovery in isolated pools using the BioPark facility. Collecting blood chemistry in order to evaluate "recovery" would be easier at the BioPark. Although it is acknowledged that getting blood work is an additional stressor.
- It was suggested that Adaptive Management group consider (1) adding several new, additional monitoring sites to the monitoring program to be sampled every month regardless of water conditions; (2) add some sites with a high probability/frequency of drying; and (3) add adaptive sampling to the monitoring program to accommodate water recession and rewetting to attempt to get at fish movement and utilization after rewetting. It was acknowledged that the monitoring work was specific to the population monitoring and estimation and additional work is not in the original mission or contract. But the addition of sites would be valuable in determining how fish refill after a rewetting and how fast they refill. It may be more appropriate to include additional monitoring sites in the Service's rescue/salvage work

Requests

- The PVA would like to request that after the peer review results are available, the Science (ScW) work group discuss whether or not the population estimation work should continue in the future; this will partially inform the data needs for the PVA.
- The PVA work group would like to request that HRW review the data templates or schema to determine completeness and what else might be needed.

Meeting Summary

- The meeting was brought to order and introductions were made. Participants were briefed on the reason that the PVA group has not met in a while – mainly due to contracting issues with Dr. Miller that prevented his continued participation. Work group members were hesitant to continue to meet without a RAMAS modeler with the concern that all decisions and discussions would have to be revisited once Dr. Miller was available to participate again. PVA is expected to become increasingly important part of the Middle Rio Grande Endangered Species Collaborative Program (Program); it is also expected to be integral to habitat restoration planning as well as adaptive management (AM). The agenda was approved with a slight reordering of topics to accommodate participation on Friday.
- Attendees then completed work group business. The May action items were reviewed; all actions were completed as assigned. It was shared that Reclamation is currently revisiting the RAMAS Modeler contract and it is hoped that Dr. Miller or a comparable modeler will be able to participate as early as next month.
  - The inventory of "missing" data sets included: (1) population monitoring data *by seine haul* – needed to determine the habitat ; (2) population estimation data - remaining 2010 and all of 2011; (3) any updated data to J. Remshardt's work; (4) detailed and complete genetics data; (5) data for this paleo reconstruction; (6) salvage data from diversion works; (7) egg monitoring data;
    - Possible options to obtain ASIR data included: (a) a contract modification that specifies receipt of data *by seine haul* and any other needed information (ex. egg monitoring data) – this would require agreement on appropriate compensation; or (b) approach ASIR to purchase a copy of their field notes/field datasheets and then pay someone else (administrative) to enter the data.
  - The work group was then updated on the Fall 2011 Water Ops and Drying/River Losses. Attendees then discussed possibilities for the hydrologic modeling.
    - As everyone is aware, it has been a very dry year. The spring runoff did last a bit longer than predicted – probably due to high elevation snow. The runoff thus continued through June and even into July. The expected summer thunderstorms didn't occur; the rain events that did happen were southern and localized.

- About 2 weeks ago, the District stopped releasing water from storage in order to save toward next year which is expected to be very dry as well. The natural flow of river is being accepted as the supply. In general, flow is around 425 cfs total release – with 250 cfs from natural flow and the remainder from Reclamation releases for the minnow.
- For PVA consideration and in terms of modeling the river drying, there are significant losses that occur in the Albuquerque Reach. The range is about 80 ft^3/sec to 160 ft^3/sec. The loss of water is attributed to: (1) surface evaporation; (2) seepage loss; and (3) bosque/riparian use.
- Attendees then briefly discussed the prediction that this will be another La Nina winter; the only other time in recent history that 2 La Nina winters occurred back-to-back was in 2002-2003. Thinking about the next year and expected conditions, participants brainstormed the following list of potential studies: (1) Fish Movement Task A – a pit tag study for upstream movement during summary drying; and Task B – a well designed sampling study in the pools to check the "bookkeeping" on the density of fish in remaining pools compared to the total of all fish assumed to be in the river; (2) over winter habitat or minnow movement into refugial winter habitats.
- Some attendees proposed the PVA work group just take on the hydrologic modeling in order to have the necessary 50+ year sequences. It was suggested that the Rio Grande Model (using the SLURP model) be pursued as a starting place. This model is not a competitor of URGWOM. The Rio Grande model needs to be extended northward but is missing the detailed operating rules and conditions.

- The PVA then discussed the San Acacia Diversion Dam (SADD) Fish Passage peer review recommendation for synthesis of all known data and information. While the Program has begun to compile all its data, there is never the discussion or analysis and then consensus agreement on what it means. The peer review panel was not impressed with the distance between arguments over the life history – specifically reproduction.
  - The combining of all research and data leads to the need for accurate interpretation and understanding. While each individual study, by itself, may be statistically "strong" in order to correctly interpret the collective information, meta-analysis must be done. In general, meta-analysis is aimed at more powerfully estimating the true size of effect regarding the variability introduced as opposed to a smaller "effect size" derived in a single study under a given single set of assumptions and conditions.
    - Eventually, the Program wants to be able to say: X% of recruitment in the river is owing to inchannel spawning and remainder is owing to floodplain spawning. There needs to be confidence limits established for that X value statement. Meta-analysis is that statistical machinery that puts the confidence limit on the *entire set of all the data* versus individual studies.

DAY 2: Friday, September 30th

- Mick Porter opened the meeting with a presentation on *Mapping River Habitat at Different Flow in the Big Bend of the Rio Grande*. This is a condensed version of the USGS mesohabitat project that has been presented to the Science and Habitat Restoration work groups. The Corps is pursing a similar project in the Middle Rio Grande with the intent of comparison of habitat in Big Bend to here. There will be approximately 15 to 20 sites mapped in the MRG (J. Remshardt & P. Tashjian sites and some URGWOM sites). The current schedule is to have the low flow mesohabitat mapped this fall (November/December). The spring high flow would then be measured next year; however, if the spring flow is poor like this year, then the Corps will consider postponing the high flow mapping until the next year in order to have useable data.
- Rich Valdez then presented *River Drying on the Middle Rio Grande (1996-2011).* The main objectives were to: 1) try to relate drying to gaged flows at certain points in the river; and 2) to see if

there is a reasonable, doable action that an be undertaken or promoted to enable the fish to persist in certain areas during events.

- Rich expanded the July 2008 PHVA Drying report. When discussing drying conditions there are 4 points that need to be considered/understood in order to determine what might be done to mitigate drying events: (1) timing – when does the drying occur; (2) location – where does the drying occur; (3) duration – how long does a site remain dry; and (4) how drying in the reaches might relate to a gage (gage predictability).
- Rich then updated the work group on SWCA's project work on Isolated Pools. SWCA has identified certain characteristics that might be indicators of pool success as refugia. Modeling these characteristics might enable the Program to create, duplicate, or maintain pools during extreme dry periods. (In other words, determine and then create/maintain those pool criteria that are most advantageous to survivorship/recovery of minnow once rewetting occurs).
  - In general, there needs to be access from the river to the pool. There also needs to be close proximity to a reliable water source for refreshing. The pools do not have to be deep (0.3 to 0.5 m) but the larger the pool, the longer it might persist. There should be a food source (abundance of diatoms, algal forms, etc.) and low numbers or absence of large predators. Chemically, the pool water should be no greater than 35oC, no less than 1.5 mg/L DO, and no greater than 15 mg/L ammonia.
- Attendees then discussed "surviving" versus "thriving" or the minnow's ability to live through a drying period (in a pool) but remain healthy and strong enough to recovery completely when the river rewets. Several future projects and studies were brainstormed.

- PVA members then discussed the consensus data sets for the PVA models. Dr. Goodman suggested pursue the data consensus issues in "chunks" instead of trying to agree on everything all at once. For the purposes of the next version of the PVA within the next year, his perspective was that the essential issue is population monitoring and maybe flow meteorology.
  - Attendees offered suggestions on a consensus process or "recipe" that would be the guidance and steps to be followed for how data is acquired and how it becomes approved data. After discussion, attendees agreed on the conceptual consensus process that Dr. Goodman presented during the May 2011 meeting. Participants did "fill out" the details of Step 2.d - *the group verifies usability (documenting its conclusions):*
    - 1. agree on data categories for models
    - 2. identify/procure data sets
    - 3. evaluate/organize data
    - 4. reconcile inconsistencies w/ collectors
    - 5. perform "filter analysis"
    - 6. reach consensus for 1-year datasets
  - Attendees briefly discussed the possible data categories and created the following list:
    - Hydrology;
    - Paleo;
    - Population Monitoring;
    - Population Estimation;
    - Genetics;
    - Egg Drift; and
    - Habitat.

Next Meeting: December 12th and 13th (tentatively)

- Tentative Agenda Items Include: (1) Flycatcher PVA presentation (Arizona); (2) Contract and expected RFP updates from Reclamation – Gary Dean; (3) Report back on Feasibility/Work Effort to use determine sample sites from the Genetics Data IDs – Mick Porter; (4) SLURP model presentation? Updates? – David Gensler; (5) Confirm/Approve Consensus Data Process (steps) that were developed via email and (5a) use meeting time to trial run the consensus process with Dudley

and Remshardt present; (6) Discussion on electrofishing and how the samples differ (ex. issue with not being able to do a second pass for a depletion);

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Meeting Notes

Introductions, Review Agenda

- Dave Gensler brought the meeting to order and introductions were made. John Caldwell, the new Pecos River Biologist for the NMDGF, was welcomed.
- In an opening introduction, David Gensler provided a brief explanation for why the group hasn't met recently and importance of PVA.
    - In December 2007, Population Viability Analysis (PVA) was introduced to the Program through Dr. Miller (CBSG group). The idea behind PVA is to apply an orderly, mathematical process to known data in order simulate (understand) possible population trajectories (response to conditions). Dr. Miller worked with the Program to develop his RAMAS model for a year. At that point, since it was recognized that PVA was going to such an important component to the Program, the District contracted Dr. Goodman (Montana State University) to contribute to the discussions and develop a second PVA model. ISC brought in Rich Valdez. There are 3 well known, credentialed experts in PVA regularly participating and guiding these discussions. A great collaborative process has developed over the last few years with interesting scientific debate.
    - Then last spring, the Program decided to fund Dr. Miller's contract through Reclamation (Program funds) instead of the Service. Reclamation was to make the necessary arrangements to contract with Dr. Miller but unfortunately delays happened. The RFP for RAMAS modeling work was issued as a "small business set-aside" which unfortunately, excluded Dr. Miller from bidding. The work group has not met since May 2011 since it was agreed that discussion should not be continued without a RAMAS modeler present and participating.
    - Reclamation is revisiting the contract with a different approach so hopefully Dr. Miller (or a comparable RAMAS modeler) will be able to participate within the next month or so. With this expectation, the PVA co-chairs agreed that the work group needed a "jump start" so that discussions could resume as soon as Dr. Miller is available.
    - PVA is expected to be an increasingly important part of the Program. In the time that the work group has not met, Reclamation has released its Draft Biological Assessment (BA) for review and comment.
    - The purpose of today's meeting is to reengage and be prepared for the next meeting with a RAMAS modeler present.
- The agenda was approved with a reordering to accommodate presenter's availability. Rich Valdez's presentation on River Drying Data was moved to Day 2; and the discussion on Hydrologic Issues was moved to Day1.
- In a brief announcement, it was shared that the Habitat Restoration (HRW) work group committed to continuing discussions on PVA usage and having both groups working together. HRW is very interested to explore how the PVA process can inform and help habitat restoration and vice versa. HRW will be presenting on the Evolution of Habitat Restoration at the Program's Technical Sessions on October 21st.

Workgroup Business: Approve May 2011 Draft Notes, Action Item Review, Discussion of RAMAS Modeler Status, Announcements

- *Approval of May 2011 Notes:* check for RAMAS not RAMUS;

- *May Action Item Review:*
  - ✓ Dave Campbell will keep Dr. Miller updated via email and verify that he is in agreement with conclusions from today's (5/24/11) meeting. – *complete;*
    - Dave has been keeping Dr. Miller updated on everything via email and phone. Dr. Miller expressed agreement with the content and decisions from the May 2011 meeting.
  - ✓ Dave Gensler will modify the PVA letter to the PHVA to incorporate requests for the paleo data, hydrology data from 1945 forward, and assistance from the PHVA work group in sequence development and review. – *complete;*
    - The letter was delivered at the EC meeting but no response has been received. Dr. Goodman requested the data so that he could do his own analysis. The PVA work group is open to their assistance, but will be moving forward on their own.
    - The PHVA group intents to meet soon; they have been "on hold" until the draft BA was issued. No meeting date has been scheduled yet.
  - ✓ Stacey Kopitsch will inform the PMT of the PVA workgroup's recommendation that the process for gaining consensus on data sets be applied to all Program data. – *complete;*
    - The Program is currently trying to determine a plan for addressing the synthesis of all minnow data and literature; this was a primary recommendation from the San Acacia Diversion Dam (SADD) Fish Passage peer review panel. Data set consensus is probably a next step to that work. The PMT and work groups are in the early stages of determine a process for synthesis.
  - ✓ Dave Campbell will check with Scott Durst to see what flycatcher data is available. – *complete;*
    - Scott Durst recommended Hira Walker as the best person to include as he most likely has the most current data. There is also a gentleman in Arizona who completed a flycatcher PVA as part of his academic studies. His results/information might be useful, if available.
    - Attendees discussed trying to schedule a presentation on the flycatcher PVA work.

Action: For the next PVA meeting (tentatively December 12th and 13th) Dave Campbell will arrange a presentation on the flycatcher PVA completed by the Arizona.

  - ✓ Dave Campbell will ask Jason Remshardt if there is a master list of all the pit tags in the Middle Rio Grande system. – *complete;*
    - Yes, Jason has a master list or database of all the pit tag information.

Action: Dave Campbell will find out if Jason Remshardt will be available to attend the next PVA meeting (tentatively December 12th and 13th).

Suggestion: It was suggested that pit tag data might be a small enough dataset to easily reformat into the data template for the Program's Database Management System (DBMS) so it can be easily included in the database and made readily available.

  - ✓ Dave Campbell will see if Brian Millsap can attend the July meeting as he has experience with adaptive management and PVA models. – *complete;*
    - Brian Millsap will be in attendance at tomorrow's session.
  - ✓ Rick Billings will have HRW begin development of a draft agenda for a joint HRW/PVA Habitat workshop. The draft agenda will be provided to PVA once available. – *complete;*
    - Rick will add this to the October HR meeting agenda. It was suggested that if a workshop was not feasible (due to conflicting schedules) then it might be best to incorporate a joint session into the agenda of a regular PVA meeting.
    - The co-chairs shared that the intent is to try to bet back into a regular monthly meeting schedule in order to get "back on track" and continue making progress toward the next PVA version. However, this schedule will be dependant on the availability of both modelers. Concern was expressed that the group should not

continue too far without a RAMAS modeler present or the discussions would have to be revisited.

Action: Rick Billings will add a joint HRW/PVA Habitat session or workshop to the October HRW agenda; he will also continue to coordinate a joint meeting with the PVA co-chairs.

- *RAMAS Modeler Status:* As discussed earlier in the meeting, Reclamation is in the process of revisiting Dr. Miller's or a similar/comparable RAMAS modeler contract. Originally, Dr. Miller was excluded from bidding on the RFP to continue his work. It is unknown when a RAMAS modeler will be available to attend and participate in PVA meetings.

- *Announcements:* The dates of several upcoming events were shared:
  - October 21st and 22nd: The Program's 10th Anniversary and Open House at the Rio Grande Nature Center; Friday, October 21st are the Technical Presentations and Saturday, October 22nd is the family fun/outreach;
  - November 15th is a joint work group appreciation and brunch at the Albuquerque Open Space – the agenda has not been drafted yet;
  - November 3rd and 4th: EC meeting at the Corps;
  - November 7th through 12th: Desert Fishes Council Meeting in Moab.

Inventory of "Missing" Data Sets

- The PVA work group has been building a list of all the information that would be ideal to have (from the modeler's perspective as to what is relevant to the PVA models and what is missing).
- *Missing Data Set #1: Population Monitoring Data – by seine haul*
  - ASIR is regularly providing population monitoring data but it is not organized by seine haul. The data increment is in a good format (monthly and quarterly) but the results are by sampling event. Results are needed by seine haul for the habitat information. The seine specific data are vital as it is the only idea to get a measure of precision around the sampling.
  - The data that has been (and is being) delivered has pooled numbers without the specific habitat.
  - The reason they are providing data by sampling event is because that is what is specified in their contract. One opinion is that they should already have the data recorded by seine haul so it should be simple data manipulation in spreadsheets to reorganize. It might not, however, be that simple and ASIR has requested compensation for the additional work.
  - Participants discussed possible resolution options.
    - *Contract Modification:* Modify the contract to specify reporting results by seine haul. They will have to be compensated for any additional work performed. The contract is near the 5 year termination so attendees requested Reclamation verify when the contract is up. When a new RFP is issued, the specific language for by seine haul can be included. The Corps wants to ensure that the database management systems (DBMS) data templates are available and included in new contracts – as a requirement for data and streamlining the reporting for inclusion in the database.
      - ASIR quoted in the high 6 or 7 figures as a cost to organize the historical data by seine haul. It is apparently more than just a spreadsheet exercise but would require going back to field notes to get the information and redevelop the spreadsheet (which is by site). Their estimate was 3 to 4 times higher than expected.
    - *Purchase Field Notes:* A second resolution option was to purchase a copy of their field notes and datasheets and then pay someone else (administrative) to enter the data. There could be the issue of the notes not being for sale.
      - Reclamation has maintained that the data collected belongs to the Program. This language should be in each contract but it hasn't always been specify

clearly in the past. Contractually, ASIR is compliant - the data is being provided just not in format desired.

Action: Dave Campbell and David Gensler will work with Jericho Lewis to discuss the potential of purchasing a copy of their field notes and datasheets and work with ASIR to determine what the cost might be.

Action: At the next PVA meeting, Reclamation (Gary Dean) will report back on when the population monitoring contract (and other pertinent contracts) are expected for RFP.

- *Missing Data Set #2*: *Population Estimation Data – recent*
    - Dr. Goodman has an older block of population estimation data that ASIR delivered in early 2010. ASIR had a contract assemble and provide that information. Time has past and the remaining 2010 and 2011 data are needed. It is interesting to note that in the recent postings of data files for the Program, ASIR have been including some of the population estimation data along with the population monitoring data. It is not clear what subset the information is. It is assumed that during the course of population estimation exercises, a certain number of samples are taken with the population monitoring protocol and others with depletions and block nets and such. It is probably that subset of population estimation information that is being included. This will need to be verified with ASIR to determine if that is what is really being provided or if it is accidental during data export.
    - The population estimation is currently under peer review with the population monitoring program. The PVA modelers would like to know if the population estimation is expected to continue in the future – this will determine the need for continuing to include the data.
        - It was suggested that if/when the population estimation contract is renewed/reissued, regular participation in the PVA work group should be included. Attendees were briefed that ASIR did regularly participate in the PVA work group until the fall of 2008 when they were informed there was a conflict of interest that could jeopardize their ability to bid on future work (even though PVA does not decide on future work that goes out for bid). It is a legitimate concern that the PVA work group needs to figure out how to resolve.
        - One possible approach could be to identify specific sections of the meeting agenda that contractors could participate in but then excuse them for the remainder of the meeting. In other words, they would only attend those specific discussions/agenda items. This option would require the co-chairs to be vigilant with following the agenda and limiting any side conversation. This option could be validated through Jericho Lewis so that ASIR could be comfortable in attending those meetings.
        - Another option suggested would be to have some level of participation from contractors that occurred outside the actual PVA meetings.

Action: Dave Campbell and David Gensler will seek guidelines and recommendations from Jericho Lewis on how to include expert contractor (ex. ASIR) participation in regular PVA meetings while also being sensitive to the potential conflict of interest concerns.

Request: The PVA would like to request that after the peer review results are available, the Science (ScW) work group discuss whether or not the population estimation work should continue in the future; this will partially inform the data needs for the PVA.

- *Missing Data Set #3: any updated data to J. Remshardt's work*
    - Jason and the Service have been good in providing their data and information but there may be updates and recent work that has yet to be delivered. This might be in part due to the field season and his lack of availability. The specifics of what be missing are not known right now. In fact, the data may be current.

Action: Dr. Goodman will email a written request of what data is needed from Jason Remshardt.

Action: Dave Campbell will coordinate with Jason Remshardt's supervisors for any additional data requested/needed.

- *Missing Data Set #4: Genetics Data*
    - The only genetics data available is the data file provided by Turner, et. al. for use by the SADD peer review. Dr. Goodman does not consider the information usable in its current form. The data file needs to be more detailed and more complete. The data file doesn't identify dates/locations for the samples; it is just basically a list of genetic alleles.
    - Retaining the genetics data will probably require a follow up with Jericho as it may take reviewing the grant specifications and the deliverables; there may also be privileged information issues.
        - It was suggested that it might be possible to take the Turner file and reconstruct the data - but it won't be easy with 5000 records.
    - Dr. Goodman shared that there is controversy in the genetics field over how to interpret the kinds of calculations being made with those data (in terms of population size and genetic health). Because of this controversy, the Program will need to be able to complete their own calculations and reach their own conclusions; this ties into being able to justify and support the PVA results.
        - There is a 2008 paper by Palstra and Ruzzante that reviewed the controversies in the literature.
        - In last 5 years, there has been controversy on how to statistically analyze those kinds of data – this means that older reports probably need to be recalculated with the corrected design for regression.
        - Dr. Goodman also referenced a key paper on literature exchange on habitat selection: Keating and Cherry, Journal of Wildlife Management, 2004.

Action: Dr. Goodman and Rich Valdez will provide the PVA work group with a detailed description of the genetics data needs.
Action: Mick Porter will do a trial workflow on the available genetics data to determine effort level (how feasible) it would be to determine sample sites from the IDs.
Action: Dr. Goodman will post the calculation interpretation controversy papers to his website (Palstra and Ruzzante, *Molecular Ecology*, 2008).
Request: The PVA work group would like to request that HRW review the data templates or schema to determine completeness and what else might be needed.

- *Missing Data Set #5: raw data for the paleo reconstruction of hydrology data*
    - The PVA group is concerned that when 10 year time sequences are "strung together by chunks" this may be breaking up a longer time horizon pattern and creating new (manufactured) cycles. This can be avoided by doing a time series analysis of the long, real time paleo data to tease out the kinds of patterns that exists and on what time scales. That knowledge is then used to create combinations of real data (sequences) in detail so that the sequencing and serial correlation matches the paleo record.

Action: David Gensler will determine what raw paleo data he already has and will begin to gather what is missing.

- *Missing Data Set #6 & #7: salvage data from diversion works and egg monitoring data*
    - From the egg monitoring data that he has seen, Dr. Goodman expressed concern that it is not currently usable. All the egg data needs to be assembled for the work group to be able to reach decisions on usability.
        - Part of the concern is that there have been many changes in the protocol over the years which makes it hard to compare between years.
    - Both ASIR and the Service have data (good spreadsheets) at the irrigation diversions. And ABCWUA's site is the northing most collection site since it is no longer being done in Angostura. A consolidated data set might be usable.

        - Part of the complication is determining exactly how the data was collected (measuring flow at the same time and exactly the same spot as the egg sampler? Same time across the entire river for total water flowing by in order to extrapolate egg flux in river?).
        - It was pointed out that sampling done in the canals would be much more precise and the canal entrainment data should be solid.
    - Attendees then discussed whether or not it would be better to collect velocity instead of having to calculate from flow. The issue of changing protocol remains – things were not done the same every year.
    - Regarding time series, the preferred method is singular spectrum analysis. It is a time domain instead of a frequency domain making it easier to interpret for this application.

Action: Reclamation (Gary Dean) will compile the egg collection datasheets/spreadsheets from J. Remshardt and SWCA's egg monitoring work at the ABCWUA's diversions.

Action: David Gensler to fill in the depth and flow information on the egg monitoring/collection data once compiled and provided by Reclamation.

Hydrology Discussion – D. Gensler; Hydrologic Issues: Fall 2011 Water Ops, Drying/River Losses, Modeling

- In an update to the work group, David Gensler shared: 1) the Fall 2011 water operations; 2) drying and river losses through Albuquerque Reach this fall; and 3) how to approach the hydrologic modeling that needs to be done.
- *Drying and River Losses:*
    - As everyone knows, it has been an extremely dry year. Runoff began in May and lasted longer than predicted. One reason might be the high elevation snow "hung on" probably due to freezing events at night. The result was a peak runoff considerably less than expected but it continued through June and into July. All things considered, Reclamation released a fairly small amount of supplemental water (approximately 7,000 to 8,000 ac-ft) this year. Once the main stem started to drop, Reclamation released but that that was not until the middle of summer. Flow went straight down to the BiOp targets. Typically, small summer thunderstorms are expected – but those didn't happen. The rain events were very localized and more southern. The monsoon season was a "non-soon."
        - *San Acacia:*
            - It was pointed out that flow down at San Acacia was brought down in a very controlled manner – even though there were rescue operations, not many fish were found. It is assumed that the fish moved readily with the flow.
            - Once the flow backed up to Escondida, it stayed there even though flows were continually reduced. This mirrors observations from 1996 and 2003 – where there was almost no flow past the San Acacia Dam (~10 cfs) but the river stayed to Escondida. Water quality might be another issue.
            - Attendees then discussed the disagreement on whether or not the river one time backed up to Lemitar.
            - There was a rain event on the Rio Puerco that put yellow clay in river and resulted in the plugging the leak at San Acacia. In 3rd week of August, RiverEyes reported river shrinkage so MRGCD started to bypass a little bit of flow to feed the pool (due to the suspicion that there was a concentration of fish). The river has shrunk 5 to 6 times this season; the final shrinkage is expected today. There has been a stable pool in Escondida this summer.
        - *Isleta:*
            - In Isleta, the river shrunk back rapidly toward the Los Lunas Bridge. MRGCD set a bypass through Isleta Dam at about 20 cfs. Interestingly, someone saw the gate cracked and shut it! It was immediately reopened.

- It was noted that the July/August ASIR data indicates a CPUE close to the 2004 values.

- *Water Ops:*
  - About 10 to 14 days ago, the District stopped releasing water from storage in order to save toward next year which is expected to be very dry as well. The natural flow of river is being accepted as the supply. In general, flow is around 425 cfs total release – with 250 cfs from natural flow and the remainder from Reclamation releases for the minnow.
- *Losses:*
  - There is thus about 175 cfs flow at the Albuquerque Gage. For PVA consideration, in terms of modeling and river drying, the losses measured from Angostura to Central is approximately 160 ft^3/sec. This will be important to consider when modeling.
    - From Central to the treatment plant outflow/City's return flow, the losses are less: between 80-100 ft^3/sec. This is a lot of water disappearing through Albuquerque. Possible reasons include: (1) surface evaporation – the river is shallow and thus warm and spread out in braided channels; (2) large seepage loss – some intercepted by drains; accretion in the drains; seepage to deep and shallow aquifers and cones of depression related to shallow ground water wells; and (3) bosque/riparian use – every spring, when the trees leaf out, the conveyance losses "go through the roof." Interestingly, in early fall (from late September to the first freeze) the conveyance losses also increase. The theory is that the trees have mechanism to "amp up" and store for the winter.
- *Winter Predictions and Suggested Projects:*
  - The current prediction is that winter 2011 will be another La Nina winter; the last time back-to-back La Nina winters occurred was in 2002-2003.
    - The conjecture is that fish are able to find places as the water recedes. It is important to think about how to verify/confirm that. It is recommended that the Program be opportunistic in response to these severe weather seasons in order to begin confirming the theories and assumptions (and what might be learned about and during very dry conditions). For example, begin monitoring of pit tags (such as stationary pit tag readers) to track movement in the stream.
      - Usually, once the river begins receding, it stays on one side or the other. But spacing numerous antennas would allow for a "leap frog" movement as the river recedes and could then collect data on recolonization during rewetting.
      - It was cautioned that it would be a big task (and might not be feasible) to tag wild fish and return them to the river just prior to recession.
  - Attendees discussed that not much work has been done on over-winter habitat. Over-winter habitat or other micro habitat could be the key to successful healthy individuals for spawning in spring. Dudley and Platania had some information from 1997, but most of the knowledge on over-winter habitat is anecdotal. No study on backwater winter habitats has been done. It will be important to learn about the relationship between winter habitat and healthy spring populations.
    - It was shared that 3 years ago (in February), there was a large backwater area near the pumps at the north boundary - hundreds of minnow were found there.
    - In 2003, there was essentially a backwater at the Isleta Pueblo 240 wasteway. Thousands of minnows (3,000 to maybe 10,000) were found in there. There

was no canopy and the conditions were sunny and warm. There were a lot of tumbleweeds downstream of there.

- Anecdotal, the river looks the same every winter (for the most part). Occasionally there will be a large movement of water (400-700 cfs).
- Other things to consider include food supply and cover. Good sun and cover (tumbleweeds) may provide the framework for algae and diatom production. A continuous food supply means the minnow could be feeding through the winter.
  - ***Question:*** Now that the river banks have a thin coating of black slime (from the fires), has any differences been noticed?
    - ***Response:*** The algae and diatoms are remarkably robust. There are diatoms and algal growing on top of the slime. It is assumed that the "slime" is granulated/ground ash and charcoal. The fish kills out of Peralta Canyon indicate lye – but this is localized.
    - Since low flows are likely this winter, a study on minnow movement into refugial winter habitats could be beneficial.
      - A possible, productive site to consider in a project would be the Sandia Pueblo site (northern side of east bank) where Reclamation installed weirs – backwaters form on the downstream end.
  - ***Question:*** Is there anything in terms of manipulating habitat for studies?
    - ***Response:*** The flow at the Isleta 240 wasteway can be easily controlled. Water can be added, then dried, etc.
    - It was suggested that projects begin with sampling to establish a baseline and determine minnow use. Suggested sites could be monitored through the winter to establish minnow use (if any) as well as a crude food assessment.

Suggestion: It was suggested that a minnow movement into refugial winter habitat study/project is needed.

Action: David Gensler, Gary Dean, and Jason Remshardt will develop baseline monitoring protocols for establishing minnow use and crude food assessment for the 240 wasteway and other sites in which flow can be easily manipulated.

- *Hydrologic Modeling:*
  - With upcoming deadlines and the fact that PHVA has been "on-hold" while Reclamation's BA is drafted, it was proposed that the PVA work group complete their own hydrologic modeling in order to attain the necessary 50+ year sequences.
  - It was suggested that the Rio Grande Model that has already been developed south of Elephant Butte might be a good starting place. The Rio Grande Model was built on the Semi-distributed Land Use-based Runoff Process (or SLURP) model. The Rio Grande model needs to be extended northward but is missing the detailed operating rules and conditions.
  - This model is not a competitor to URGWOM.

Action: David Gensler will contact Brad Griggs (NMSU) about using the SLURP Rio Grande Model as a starting place for hydrologic modeling.

Meta-analysis of Questions Posed by Fish Passage Peer Review

- In a brief refresher, it was shared that the CC tasked ScW to address the synthesis of all minnow data (life history, water quality, etc.). Originally, the synthesis of data came as a recommendation from the SADD Fish Passage peer review panel. This is a huge task and one issue that challenges the Program is the lack of discussion and analyzing of the data to reach consensus on what it all means. There may be competing ideas on life history, for example, that will require discussion of what the data is telling us (vs. opinions). Combining and compiling all the data is a starting place but we have

to get to the point of open, honest communication instead of just taking our own little piece and ignoring the rest.

- It was clarified that the peer review panel was not impressed with the distance between arguments over the life history – specifically reproduction (ex. laboratory studies extrapolated out for egg drift but not linked back to the population data).
    - It is fair to say that what SWCA collects is real data; what ASIR collects is real data. All the data sets should be assumed valid. The problem is that not everyone wants to accept all the data.
    - In terms of the PVA, there needs to be agreement and consensus on what data will be used.
        - The data needs to be analyzed to determine the strongest relationships (trends in population data; how egg drift vs. eggs on floodplain relates to the population data, etc.). This will help determine a conceptual model that explains all the data.
- Dr. Goodman then introduced the work group to the concept of "meta-analysis" or estimating the true effect size of variability introduced and the confidence limit on the *entire set of all the data* versus individual studies.
    - Meta-analysis grew out of a very disquiet phenomenon in medical research and clinical trials. All these studies are published in literature that requires statistical support for the research; for example, result A is significant at the 5% level. Then roughly 20 yrs ago, it was thought that if all the studies were significant at the 5% level then the *collection* of all the studies should also be at the 5% level. However, it turned out that there was more than a 5% disagreement (or frequency of contradictions) among the papers.
    - Meta-analysis is a more sophisticated way to analysis all the data simultaneously. While the results of individual studies are valid, there are additional differences between the studies that needed to be considered (ex. socio-economic, health status, race, sex, etc.). This explains why one shouldn't expect the same results since each was carried out on a different portion of the population. This raised the challenge on how to include the size of effect regarding the variability introduced.
        - Eventually, the Program wants to be able to say: X% of recruitment in the river is owing to inchannel spawning and remainder is owing to floodplain spawning. There needs to be confidence limits established for that X value statement. Meta-analysis is that statistical machinery that puts the confidence limit on the *entire set of all the data* versus individual studies.
        - Meta-analysis will help determine how much difference should be expected due to reach variably, site variability, etc. This is why it is important to have all the data in one dataset – for simultaneous analysis. Meta-analysis is the flexible statistical machinery that will assess the answers.
        - For example, in a good water year with overbank flooding there may be a high percentage of spawning in the floodplain, but in years with flooding all the spawning occurs within the channel. How can these 2 different water situations be compared? That is what the meta-analysis is aimed at - clustering the variable to determine which produces the best conditions.
            - All the datasets are valid - they just represent different conditions within the system when taken.
            - Unfortunately, there is no guarantee that any definite conclusions will be reach. But it is worth knowing which terms are so interrelated that they can't be tease apart. This is where AM comes in - to experiment and gather new information and results. This interposes the specific questions that can't be answered with the data we have and guides the AM process.

Suggestion: Members suggested that workshops on basic statistical analyses, techniques, and assumptions could be beneficial.

DAY 2: September 30th, 2011

Presentation on USGS Mesohabitat Survey

- Mick Porter opened the meeting with a presentation on *Mapping River Habitat at Different Flow in the Big Bend of the Rio Grande*. This is a condensed version of the USGS mesohabitat project that has been presented to the Science and Habitat Restoration work groups. The Corps is pursing a similar project in the Middle Rio Grande with the intent of comparison of habitat in Big Bend to here. There will be approximately 15 to 20 sites mapped in the MRG (J. Remshardt & P. Tashjian sites and some URGWOM sites; Pena Blanca). The current schedule is to have the low flow mesohabitat mapped this fall (November/December).
- The Corps will be funding some fish sampling to include in the Rio Grande mapping and other agencies are encourages to provide staff if possible. The fish sampling will occur a day after the mesohabitat mapping to help determine fish preferences. Based on the reconnaissance, noticeable differences between Big Bend and the Rio Grande have already been identified.

- *Silvery Minnow Introduction Effort in Big Bend:*
    - In December 2008, silvery minnows were introduced in the Rio Grande as a nonessential experimental population under section 10(j) of the Endangered Species Act. Approximately 1.43 million minnows have been released to date with 3 releases completed (in 2008, 2009, and 2010) and 2 releases to go (2011 and 2012).
        - In September 2008, the Rio Conchas flooded and might be contributing to the minnow success.
    - The Big Bend reach extends from Mulato Dam (confluence of Alamito creek and the Big Bend Nation Park boundary) downstream to the IBW gaging station just below the Terrell/Val Verde County line. The Big Bend reach length is 140km to 250 km. It is an undivided stretch of river and comparable to the entire length of the MRG. Historically it has varied in size.
    - There are 4 minnow release sites: Rio Grande at Controbando Creek, Rio Grande at Rio Grande Village, Rio Grande at Stillwell Crossing (Adam's Ranch), and Rio Grande at Terlingua creek.
        - ***Question:*** How regulated is this water?
            - ***Response:*** It is about as regulated as the Rio Grande. There is a big coalition that is working on some flow agreements as far geomorphic "big" flow every couple of years. But they are still in the beginning of the process. There are sections that have dried within the last 10 years. Photos from DFC website show dry sections in 2003 or 2005.
        - ***Question:*** Are there any other significant tributaries below the Conchas?
            - ***Response:*** There are some (ex. Terlingua Creek) but most are ephemeral although minnow have been found up some of the tributaries so they may provide some habitat.

- *Overall Project Objectives:*
    - The overall project objectives included: (1) completing river mapping and fish assemblage assessments collocated with the minnow release sites to better understand variability among release sites; (2) determine the area, frequency, and physical characteristics of in-channel river habitats at the mesohabitat scale over a range of river flows; (3) determine how the fish assemblage varies in composition and distribution among mesohabitat types and between reaches over a range of river flows; and (4) characterize the area of inundation and land cover features associated with the fall 2008 over-bank event in the Big Bend Reach.

- *Rationale Behind the Mesohabitat Approach:*
  - The intent is to study how the geomorphology interacts with the hydrology to create mesohabitat and how the fish respond. This is consistent with the Program's ideas in the MRG on the importance of understanding interrelationships.
  - FWS wanted a habitat component and fish assemblage survey done in the early stages of the minnow introduction efforts and in the context of river flow.
  - For this project, mesohabitat is defined as *a priori* (already known or self-evident) classification of "eco-hydraulic" habitats biased towards including more backwater and slack-water habitats that are important to the minnow and similar species. Mesohabitats used in this study include: backwater, forewater, embayment, rapid, riffle, run/glide, pool (eddy, main channel and isolated), submerged channel and point bars.
  - For the MRG, the Corps wants to emphasis the shallow, near shore habitat which wasn't mapped in Big Bend - for both utilization and food supply.
    - ***Question:*** Are there overbank flows in Big Bend? Or is the USGS measuring to the 100 year floodplain?
      - ***Response:*** In some parts there were huge floods and overbanking occurred. These were the results of severe rainstorm event, hurricanes, or late winter storms and not spring runoff.
- *Approach for Selecting River Flow Targets:*
  - The flow hydrograph over a 70 year span and the output from Index of Hydrologic Alteration (IHA) software were used to investigate the frequency and magnitude of flows over time. It is important to note that both the small and large floods occur less frequently but at about the same volume. It is also important to note the change in flood source. Tributaries are now responsible for the larger "peaks" in the flow.
  - Historically, the Rio Grande used to be wider, with finer sands and less vegetation. It is now much narrower and bounded by vegetation (with an increase in non-natives). The divers of habitat change include: 1) altered flows and sediment transport; (2) an aggrading and narrowing channel; and (3) invasives such as salt cedar and exotic river cane.
  - In the early 20th century, nearly 60% of stream flow came from the Rio Conchos but today more than 90% comes from the Rio Conchos.
  - Attendees were directed to a paper on the role of feedback mechanisms in historic channel changes of the lower Rio Grande in the Big Bend region by Dean and Schmidt in Geomorphology, 2010.
  - Attendees briefly discussed the "reset" (including sediment transport and scouring) resulting from the 2008 flooding event. Over a meter of sediment deposited since the 1970s possibly due to stabilization and collection caused by vegetation. The 2008 high flow event moved a lot of sediment.

- *Selection Flows:*
  - Three flows were targeted:
    - (1) a winter to spring low-flow of 200-400 cfs;
    - (2) a late spring to mid-summer flow including within-bank high pulse of 500 to 1500 cfs; and
    - (3) an overbank flooding flow using the peak of the Fall 2008 event (peaked at about 50,000 cfs).
    - Reaches are defined at about 1 km in length and the channel width (at low flow) is about 40-50 meters.
    - An extreme low flow of about 35 cfs was captured in May 2011. The late winter flow was 210 cfs and the late summer high pulse flow was 762 cfs.
  - ***Question:*** What causes the late summer pulse?
    - ***Response:*** Large winter monsoonal affects or hurricanes.

- ***Question:*** Please clarify the percentile values – are those relative to channel cross section at that spot?
  - ***Response:*** Those are related to pure flow – the standard percentile of flow 99% of the time, etc.

- *Mapping Methods*:
  - In general, the project created a detailed reach map at each of the targeted flows using hi-performance GPS receivers in conjunction with hi-resolution remote sensed imagery
  - The first step in mapping the mesohabitat was to capture the water's edge on both banks to create a boundary for each site. Next, each mesohabitat was mapped by delineating its perimeter with the GPS receiver mounted in a boat or in a backpack by wading.
  - Each mesohabitat (e.g., rapid, riffle, run, pool, glide, embayment, backwater) was edited and stored on a field laptop as geo-referenced polygons using ArcGIS.
  - The Trimble DSM 232 modular GPS receiver (a marine unit) that has an Omnistar subscription service to correct GPS location was used. The Omnistar service improves the accuracy of the GPS and allows for real-time positions. Feeding the data directly into GIS means there is much less time needed for post processing.
  - Data was collected in each mesohabitat "unit" within the site perimeter.
  - ***Question:*** What is "hi-resolution remote sensed imagery?"
    - ***Response:*** Aerial photography. Google Earth photography was shot during the 2008 flood so the extent of the Conchas flooding can be seen.
  - ***Question:*** As a site was walked, did they collect depth?
    - ***Response:*** They first do a walk through to classify the habitat (run, submerged island, etc.). After those polygons are mapped, they measure substrate, depth, flow, etc. The elevation is not trusted to GPS; they are in the water.

- *Lessons Learned:*
  - Multiple flotation devices (canoe/kayak) were needed.
  - It took effort to complete the work and limit impact to the habitat.
  - Low flow mapping much easier than high-pulse mapping, since wading is possible in low flow.
  - Laptop battery has to be able to last 8+ hours and having a backup battery is critical. All equipment, including laptop and electronics, needs to be water resistant or water proof.
    - ***Comment:*** Once mapped at low flow, stage can be applied.
      - ***Response:*** Some things translate well with increased stage, but other features can completely disappear. In November/December, the USGS will be mapping the winter base flow in the MRG. This will provide information on the habitat available during winter and much of the year. The spring mapping will be challenging since we expect a second La Nina winter. If needed, the Corps will consider delaying the high flow mapping by a year in order to achieve decent information.
    - ***Question:*** What is this work costing the Corps?
      - ***Response:*** Between $250,000 to $300,000 for 2 visits of 15-20 sites.
    - ***Question:*** We all hear and use mesohabitat terms (pools, runs, riffles, etc.) but when in terms of having a common definition, is the USGS adopting the AFS habitat types? Or are they basing the classifications on their own judgment?
      - ***Response:*** It is unknown; but for comparative purposes they are collecting enough data that could be post-processed.
      - The intent is to see what type of habitat selection the minnow are using, but one issue is that the numbers of minnow are low right now so there won't be much power. There is value in comparing what habitat is available compared to what habitat the fish actually use. One of the pieces of information we don't have is good habitat selection criteria.

Action: Mick Porter will enquire if the USGS is using the AFS habitat classifications in their mesohabitat mapping projects

- ***Question:*** Is this project data going into the database?
  - ***Response:*** Yes; the USGS was enthusiastic about the database templates and they want to have all the Big Bend data included.
- ***Question:*** Is there aerial photography on the MRG?
  - ***Response:*** Yes, both photographs and LIDAR. Hopefully we will have reach or river wide habitat assessment at the end of this project.
- ***Question:*** What is the prospect of expanding the project to reach wide?
  - ***Response:*** It is not in this scope, but that might be a next step to consider. This project of 15-20 sites will take at least 2 years to complete. One of the information gaps for the species is way the fish responds to flow and that is related to how the fish responds to habitat.
  - A first step to river-wide extrapolation would be a brainstorming session on how this study could be used to ground-truth remote sensed information. Over-laying the mesohabitat boundaries with the remote sensed layers already available might lead to probabilities of how deep the water is or what the flow is.
  - Ideally, the Corps would like to have USGS mapping at 3,000 cfs or higher but that might not be possible this year with the expected water situation. The Corps is also trying figuring out how to start quantifying or qualitatively assessing food supply and the interactions of shallow water and food supply (such as the diatoms in the shallow water). One suggestion has been to use a Plexiglas box and shoot pictures that coincide with the sampling.
  - Attendees then discussed using pigment extraction of samples taken at the same time as the photos. PCR (or polymerase chain reaction) might provide a quick breakdown of taxonomy.
    - PCR is basically a molecular techniques that looks at DNA from a piece of the target species. Chain reaction steps amplify the "snip" of DNA. The amplification process and florescent tags allow for identification.
    - Getting the specific markers identified is a separate step, but once done those can be easily targeted. Once a species marker is identified, you can also get a qualitative estimate of the amount out there.
    - PCR is becoming increasingly cheaper especially if there is a local machine and technician. The technology is getting more and more sophisticated.

Action: Rich Valdez and Mick Porter will organize a subgroup brainstorming session to discuss how to expand the mesohabitat mapping studies to reach or river-wide scale; how the studies could be used to ground-truth the remote sensed information (to get to probabilities of water depth and flow); and food supply assessment.

- *Physical Characterization of Mesohabitat*:
  - Mesohabitat units were classified as "large" if greater than 10 meters in length, or "small" if less than 10 meters in length.
  - Depth, velocity, and substrate were measured at 3 to 5 points in each mesohabitat unit. Fish cover along 1 meter wide bank-to-bank transect at each point was recorded. Margin or near-shore habitat at mid point transects was evaluated for percentage of periphyton cover and dominant substrate using .25 m^2 quadrants.
    - ***Question:*** Is the 3 to 5 points of depth/velocity/substrate enough?

- ***Response:*** That is pretty standard considering that each mesohabitat is not that large.

- *Fish Assemblage at Big Bend – wadeable at lower flows:*
  - One seine haul per mesohabitat was randomly selected from nine possible locations. Two or more seine hauls were done in some very large runs.
  - Length, depth and velocity (center point), dominant substrate, and counts per species recorded per seine haul.
  - All the data is being put into the geospatial database.

- *Fish Assemblage at Big Bend– electrofishing at higher flows:*
  - Boat-electrofishing was done at higher flows to sample larger and deeper pools in more swift mesohabitat. A single pass through was done for each non-wadeable mesohabitat and the counts per species was recorded.
    - ***Comment:*** Another topic to look at would be a power analysis on the fish sampling. The by-seine haul data that is available is extraordinary in that the fish densities are almost all zero. The averages being used are the results of rare seine hauls. There is a "clump" distribution which means the Program should be strategic and smart about sampling design. The PVA group may have to consider whether the money and effort is being allocated correctly in order to get at the data that is needed.
    - One issue is that it is really hard to sample a mesohabitat without considering the adjacent habitat.
    - ***Comment:*** One seine haul per mesohabitat at a given site is worrisome since the expected haul will provide a zero. There is a statistical problem in that regardless of the circumstances, hauls are zero. One seine haul per mesohabitat is not enough; there are there ways to make the effort economical in order to get more seine hauls (so not all of them are zeros).
      - Sampling issues can be explored and advanced before the study is over. Another option is to test the design before the study in done in the field to determine the chances of getting significant data.
      - The point is to determine how accurate the fish sampling is at determining selection/utilization? For example, are fish actually from that habitat type or from an adjacent habitat but moved? Are the fish really there if the water wasn't being disturbed during sampling?
    - ***Question:*** Is the seine the only real feasible gear type?
      - ***Response:*** Seining has been used for over 20 years. SWCA has compared the different options: electrofishing, standard seine, hoop nets, etc. The preliminary results are that the hoop nets are great for size distribution of fish but can't be employed to sample mesohabitat. There is bias to every gear type.
      - A schooling species with good burst speed (minnow cruising speed: 5-60 mm/sec for 200+ hours; minnow burst speed: 1 meter/sec for several minutes) is always hard to capture.
      - In the mid-west, researchers set up an electric grid and wait for the fish to settle in and then employ. There is also the cost and effort to consider.

Action: Before the USGS begins mapping the MRG mesohabitat in November/December, Dr. Goodman, Jason Remshardt, and Mick Porter will do a power analysis on the fish sampling data from Big Bend.

- ***Question:*** How severe is the permitting issue for electrofishing?
  - ***Response:*** It depends; but there are permit holders here in the area. It needn't be a big issue. In other places the water authorities can make it difficult to electrofish. But they use the electrofishing within the

population estimation program. There is a standardization process that has been developed in other areas.
        - Dr. Goodman expressed interest in more discussion on electrofishing and how the samples differ. There is the issue of not being able to do a second pass for a depletion.

- *FY2011 Extreme Low Flow Mapping – Big Bend:*
    - West Texas and surrounding areas are under "extreme drought" conditions.
    - The USGS was able to capture "bottom out" flows (historically low flows) in May 2011. There has been no measurable rainfall since September 2010.
    - A full habitat assessment was completed including the mapping the study reaches and fish assemblage data collection.

- *Conclusions:*
    - There are a lot of local experts who want to engage in the post study discussions and result interpretations. If the spring flow in 2012 is not better than this year, the Corps will consider delaying the mapping for another year - instead of paying for results that won't be useful.

Presentation on River Drying Data – R. Valdez

- Rich Valdez then presented *River Drying on the Middle Rio Grande (1996-2011).* The main objectives were to: 1) try to relate drying to gaged flows at certain points in the river; and 2) to see if there is a reasonable, doable action that an be undertaken or promoted to enable the fish to persist in certain areas during events. There is recorded drying information since 1996 and the RiverEyes program has continued the work every year since then.
- *Available Data:*
    - 1996-97, and 2000-01: these are based on the Service's observations during salvage work
        - ***Question:*** Do these observations indicate where it was wet or just where it was dry?
            - ***Response:*** It is just the minimum extend known. But in 2001, they put in where the river was dry and drove until they reached water. Those break points (end of river points) were identified. Isleta had flow targets so most of the drying was in San Acacia.
    - 1998: based on anecdotal reports from the Albuquerque Journal; these may not be as reliable. There was no Service monitoring or salvage. This is minimal information at best.
    - 1999: various monitoring and anecdotal observations.
        - It was suggested that Rich contact Jude Smith (FWS Muleshoe Wildlife Refuge in TX) for additional information. Jude ran the rescue efforts during that time. He might have additional information
    - 2002-03: RiverEyes program was started; the details vary since the program was just started.
    - 2004-11: RiverEyes continued with people confirming the details;
        - There is at lease one (or in many cases 2) daily observations of river reaches with start and end points for each drying area. The database (Excel spreadsheet) is reach, river mile to the tenth and GPS location, being checked against ArcGIS and ArcMap.

- *History of Drying Table:* The PHVA work group issued a preliminary drying report back in July of 2008. The table presented in this slide is an expansion from that report. The top row (vertical text) is the drying sources that were just reviewed. The average drying is recorded by year and by reach. The first 3 rows are the percentage of that reach that was dry in the year – the maximum extent that was dry. The last 3 row are the actual miles dried to the nearest ½ mile. This tells how much of the river in a reach went dry as a percentage of the total reach and total miles. There is only information on maximum drying and not for duration.

- *Percent of River Miles Dried (Graphs)*:
    - There is limited evidence for drying in the Isleta Reach for 1996, 1997, and 1998.
        - Attendees described the drying from this time as they remembered it. In 1996 the entire reach was virtually dry, even dry in Bernardo. It was a period of very dramatic drying. Basically, the river was dry from below Isleta Dam to south of the Belen Bridge and then dry by Bernardo again. David Gensler has photos.

Action: Rich Valdez will contact Grace Haggerty or David Gensler to obtain the photos of the significant drying that occurred in 1996-1998.
Action: Rich Valdez will confirm the length of the Albuquerque Reach (closer to 40 miles long).

- *History of Drying:* This graph was created (expanded from the PHVA report) to visually indicate how the drying occurs by year. River miles are indicated across the top. Red indicates drying; yellow indicates periods of intermittency; and green indicates pools or presence of surface water source. It was noted that the 2010 data is not included in this graph, but it is assumed that there was not much drying.

- *Days of Drying in 2007 compared to gage*: There are 4 points that need to be considered when studying drying: (1) the timing – when does the drying occur; (2) the location – where does the drying occur; (3) the duration – how long does an area remain dry; and (4) gage predictability - how these might relate to a gage and which gage might be the best indicator. All these need to be understood in order to determine what can be done to mitigate drying events. It does not take much water at all to keep the river wet.
    - In the example for the 2007 drying, the periods of drying (range from 1 week to 2 weeks) can be compared to the gage data. In 2007, there was a dry period over 9 miles for 15 days. But most of the drying is for less than 2 weeks. Rain storms are likely responsible for resuming flow.
    - For PVA purposes, it would be great to get some predictive capability with regard to the use of these data.

- *Isolated Pools*:
    - Rich then updated the work group on the Isolated Pool work that SWCA has been working on. The details of each pool include: maximum size, location, and shrinkage (area, depth, volume) by date.

- *Refuge (Pool) Criteria:*
    - Physical criteria
        - Access for wild fish from the main river channel during drying events;
        - In proximity to a reliable water source; e.g., groundwater, outfall, wasteway, irrigation return, managed pumps;
        - Pool-like feature 50-200 m long, able to retain water with small flow;
        - Banks with gradual and steep slopes with average depth of 0.3 to 0.5 m;
            - Steep slope on one side usually with cover, as opposed to an open-dish or bowl shaped feature.
            - Cover and vertical steepness may be important.
        - Little or no velocity from turnover of water (once/24hr)
            - It doesn't take much water, but there needs to be some inflow for water quality.
        - Sand/silt substrate, flushing flows prevent filling of pool with fine sediment;
            - The pools need to get "flushed" out every year so as to retain depth and not fill in
        - Sanctuary pools with and without debris piles should be tested
            - If cover available, they will use it. Cover may also harbor food as well

- Biological Criteria:
  - Low numbers or absence of large predators (LMB, GSF, CCF, BHs)
  - Abundance of diatoms, small algal forms, and macroinvertebrates for food
    - Most of the pools are productive in terms of food; this seems to not be a real problem.
    - ***Question:*** Was any consideration given to external predators?
      - ***Response:*** No; herons and other birds can do damage. It is a definite factor.
- Chemical Criteria:
  - Based on the SWCA information, Rich looked at the data and ran quick calculations and these are the summations:
    - Water temp no greater than 35^{o}C – very tolerant of warm water
    - Dissolved oxygen no less than 1.5 mg/L;
    - Ammonia no greater than 15 mg/L as N;
    - ***Question:*** This are factors for survival but are the fish healthy? Do they thrive or recovery after?
      - ***Response:*** There are definite stressors and it is not known if the fish thrive after a pool is reconnected. It is very difficult to monitor during re-wetting and upstream movement. It would require taking the fish from the pool and collecting blood work.
      - It would be logical to assume that survivability/thrive-ability would decrease as the pool decreases.
      - Keep in mind, these are the minimum criteria measured on pools isolated for a week or more. Inputs of flow to refresh the pool changes the setting.
      - Cortisol levels are a good indicator (index) of stress as a percentile chance (prediction) of recovery.
      - Modeling these characteristics might enable the Program to create, duplicate, or maintain pools during extreme dry periods. (In other words, determine and then create/maintain those pool criteria that are most advantageous to survivorship/recovery of minnow once rewetting occurs).
    - ***Question:*** What is different now (compared to the past, historically)?
      - ***Response:*** The frequency of drying and groundwater changes. Historically, the pools in Albuquerque were sustained by groundwater inflow. Now, however, there is a lot of groundwater pumping so there is no longer re-supply.
      - The relationship between groundwater pumping and drying could be an important factor.
      - Attendees then briefly discussed using groundwater supply to help the pools persist for a while. It was also suggested that a small "digging structure" be installed so that the river continued to "flush" the pool(s) a little more each year and deepen them.
        - There is a Tom Wesche (HabiTech) report on woody debris that did create pools but they were quickly filled in with sediment. High flows scour out around the cottonwoods but as soon as the flow slows they get silted in very rapidly.
        - There is also the need to consider that by in large, the pools tend to migrate. There are a few that do persist year to year in the same location.

- ISC expressed interested in using the Strategic Water Reserve to simulate historic groundwater and test the supporting of pools over time at multiple locations – if this were to be a management objective.

- There is always consideration on how to maintain pools near the outfalls. But short of mechanical intervention, it is unlikely that the pools could be maintained at fixed locations (due to migration and filling).
- There are also water quality issues to consider - some of the waste ways can be marginal (high TDS, high temps, high salinity, etc.). North of San Acacia doesn't have the salinity issues (San Acacia has groundwater upflow).

- *Possible Additional Studies/Research*
  - The objectives of this work, as stated earlier were: (1) try to relate drying to gaged flows at certain points in the river; and (2) to see if there is a reasonable, doable action that an be undertaken or promoted to enable the fish to persist in certain areas during drying events. In order to inform management, the following questions need to be settled: (1) how long can the minnow survive in pools?; and (2) how long can the pools be maintained?
    - Pool maintenance and persistence will be affected if cattle have enough water (or are they using the pools as well).
    - The period of refreshing (such as managed pulses of water down river every 7 days) needs to be known.
    - We also need to known when the minnow can immerge and still be healthy in order to recover and contribute to the next spawning. This could be a relationship with the volume of the pool.
      - In the SWCA, the pool volumes decreased by about 90% in a 4 to 5 day period. That trend of reduction occurs quickly over time. The pools, in order to sustain the fish will need some source of water over time (whether that is small continuous or more infrequent large pulse).
      - Attendees discussed that determining the refreshing of pools could be tested under adaptive management. The affects of short pulses could be tested in the actual river during a dry summer. Or isolated pools could be created in one of the longer wasteway channels; the water supply in and out could be controlled easily enough.
        - Other suggestions including using the BioPark to create and test isolated pools. This option would be easier to collect minnow bloodwork to evaluate recovery.
  - SWCA did not monitor the numbers of fish within the pools so there is no fish information associated with each of the pool size dates. There were samples of fish taken at a given point in time but those cannot be extracted to determine how many fish there were in beginning and in the end. Those numbers are just a minimum number of fish present on a given date.
    - Collecting fish information would have to include bloodwork (Cortisol levels) to learn about the recovery relationship to pool conditions.
    - ***Question:*** Is there annual monitoring of fish health to evaluate the extent of drying affects?
      - ***Response:*** No, there is no fish health monitoring. So far, Dr. Goodman's research has indicated that summer conditions do not affect survival as measured through the winter to be present as spawners the next spring; all that matters is how good the reproduction it.
      - However, some fish have to survive the summer. But the research is indicating that over time the fish adapted to a drying system. The

difference is that now (compared to historically) the river is drying more frequency now; it is disconnected; and there is a lack of groundwater.

- In terms of PVA model needs, there is a lot of historic flow and drying data missing. This could affect the model validation component. The PVA models need to be run with historic flow and drying data to see if the produced population results are similar to what is actually observed. There is possibility of reconstructing drying based on flow at the gages. The Albuquerque gage is probably one of the most reliable gage and it has been around a long time. The Isleta Lakes gage is known to be unreliable until fairly recently.
  - ***Question:*** How often are there monsoon rain storms down stream?
    - ***Response:*** Rarely; but there are some on the south diversion channel which on occasion is a big contributor.
  - If we use the (1) Albuquerque Gage information and (2) assumptions on the City's return flows (which are predictable and we have the daily data) and (3) the District's big return flows (data since 2000), then we can take an estimate on how much water was arriving at Isleta Dam. There is data on the diversion at Isleta Dam back to 1973. For example, subtracting the amount the District took from the known amount of water that arrived would be a calculation of the flow the past Isleta Dam. Then based on observations of last few years (2002 on) we could predict the drying that occurred.
    - As the "blanks" are filled in, through analysis, calculations, assumptions, and interpretations, it needs to be noted that these parameters have changed over time. The uncertainty needs to be documented and accepted.
  - There are also complexities to the system that need to be considered. For example, the conditions of the previous year will have an impact on the current year. The system is more based on the operation of the irrigation system instead of drought conditions (ex. how long the District operates in a season).
    - The San Acacia reach is different. The San Acacia gage is not thought to be great, at least for the purposes of the PVA work. There is information on the passing of water over time, but the numbers are off for the daily values during low flows. The flow channel moves around and at times moves away from the gage itself. There is only intermittent data.
    - Another complication is that for long time the diversion records at San Acacia were the total flow of the Socorro Canal (not differentiated from the Unit 7 drain).
    - It was recommended that the Albuquerque Gage be used for Isleta.
- ***Question:*** Are these presented data from the 2007 experimental ops program?
  - ***Response:*** It was explained that Rich expanded the 2008 PHVA drying report with other river drying data. The measurements of isolated pools are from SWCA reports that are available online. Some of the information is from the experimental operations reports.
  - Since there is not a file with actual numbers, the PHVA report was created with an iterative process based on tenancy to dry instead of specific numbers.

Action: Dagmar L. will confirm if the River Eyes data is publically available now (or who owns the rights).

- Dr. Goodman raised concern that in the monitoring data, the flag for a site not being sampled because it is dry or denoted as an isolated pool is extraordinarily rare even though there is fairly extensive drying common in the San Acacia and Isleta Reaches. There is a representation bias in the design of the monitoring program favoring sites that are wet.
  - It was suggested that Rich add a row on the drying graphs to mark where the monitoring sites are.

- Attendees discussed some of the changes in sampling over time. The original 16 sites were expanded to 20, and some of the sites have moved. There is also some bias in the San Acacia reach where 2 or 3 sites are downstream of the Bosque del Apache (BdA). Those sites have been maintained by pumping so they are artificially wet; although several sites around BdA should show up as dry in the really dry years. In general, 4 of the 10 sites in the San Acacia Reach don't dry.

Suggestion: It was suggested that Adaptive Management group consider (1) adding several new, additional monitoring sites to the monitoring program to be sampled every month regardless of water conditions; (2) add some sites with a high probability/frequency of drying; and (3) add adaptive sampling to the monitoring program to accommodate water recession and rewetting to attempt to get at fish movement and utilization after rewetting. It was acknowledged that the monitoring work was specific to the population monitoring and estimation and additional work is not in the original mission or contract. But the addition of sites would be valuable in determining how fish refill after a rewetting and how fast they refill. It may be more appropriate to include additional monitoring sites in the Service's rescue/salvage work

- ***Comment:*** There is also drying that occurs over the winter. However, as soon as the irrigation system comes back on line, the shallow aquifer rises back up soon. For example, following a really dry winter farmers began irrigation early in March (which it turns out did nothing for the crops) but returned the floodplain to "normal."
  - After the first water, the deficit is eliminated.
  - Albuquerque hasn't dried since the 1970s; this is due to the flow targets and the agreement between the District and the City.

Preliminary Inventory of Consensus Data Sets for PVA Models

- Time is of the essence in the PVA process now. Dr. Goodman suggested pursue the data consensus issues in "chunks" instead of trying to agree on everything all at once. For the purposes of the next version of the PVA within the next year, his perspective was that the essential issue is population monitoring and maybe flow meteorology.
  - In long run, there will be other data sets that will be relevant and important but they are not likely to be processed soon enough to make a difference to the next PVA version. If the work group is in agreement, Dr. Goodman offered to produce a strawman version of the data based on what he has already. The work group will need to structure a process on how to review the version of the data that he produces. This process should include the owners (Jason & ASIR) should there be any questions and to get their agreement that the data "looks right" and therefore everyone is comfortable blessing it as the dataset to be used for the next PVA version.
  - One possible obstacle is getting ASIR participation. They are the experts on how the data was collected and any nuances. It is important that they be part of the discussion to confirm what our understanding of the data, answer questions, and express any objections (if they have any).
  - Attendees discussed the ASIR the ASIR sampling process. A sampling event is going to a site on a given day with 10 to 20 seine hauls. In the spring, in addition to the regular seine hauls, they collect larval numbers. They are conscious of the mesohabitat, even if the habitat information is not being provided.
    - If they give characterization to a sampling event, it must be a dominate type.
    - According to Dudley, prior to 2006 they did not record individual seine hauls in the database. So it is probable that this information is not available electronically; it may exist in field notes.
    - The decision on when to use the larval net is made on site based on whether larvae are present. However, they always do a few larval seine hauls through about August. Most of the sampling is conducted with the large net and then a few additional

samples with the small net. They don't do the full site with a larval seine. The mesh size ($1/8^{th}$ in) is consistent for the monitoring data.

- *By-seine haul data from 2006 on:*
  - Everything included in the dataset was pooled before 2006. They have provided Yvette Paroz (new COTR) with the seine specific data from 2006 and on.
  - In a quick review, attendees pointed out that the codes for larvae, isolated pools, and mesohabitat was missing from this spreadsheet.
  - Dr. Goodman commented that there are slight differences and changes between the different versions of ASIR data. He would like to know which versions are correct (why new sample, why did numbers change, why this sample deleted, etc.).
    - It was acknowledged that all data files are "cleaned up" to a certain extent before analysis. That being said, in general, the more recent the data tends to be cleaner.
  - ***Question:*** Have the station identifiers become standard?
    - ***Response:*** The station is just the sample number and doesn't necessarily correlate with a specific site.
    - The data projected today includes all samples – both with and without minnow.
  - In the past year, all the files also have a code for "project": (1) population monitoring; (2) population estimation; and (3) replication studies. This spreadsheet of data is compatible with Project 1 data.
  - As long as the mesohabitat information can be added and this version is consistent with previous versions, then this spreadsheet could be used to create a completed data set. There will still need to be a discussion on the correctness of the merging manipulations.

Action: Yvette Paroz will determine if the by-seine haul spreadsheet can be updated to include a larval seine field, isolated pool field, mesohabitat code for each, and VIE field.
Action: Yvette Paroz will confirm with ASIR how the preserved larval fish data becomes part of the record and if the information is included in their database.

  - ***Question:*** At this level of detail, is there any way to get the by-seine haul data back to the 1990s?
    - ***Response:*** Not likely. And if there were, it would be at great time and expense. There have been changes in methodologies – in the past, the information was purposely batched.
    - However, if Dudley could participate in the group, we could request he bring the log books and provide clarification.

- Returning to the dataset consensus process discussion, it was reiterated that there is a lot of population monitoring data that Dr. Goodman could use to create a strawman. However, the group needs to determine how to test for consensus. After the data manipulation, check the totals, the means, etc. against the real database to determine matches. This is the quality control check.
  - There is still unease that each file (from ASIR) has differences. The control step also has to include the contractors to confirm that the manipulated data makes sense.
  - Jason's and ASIR's data should reconcile and reinforce each other even though at no point have they sampled the same point on the same day. But all along, both have been sampling the same river within a month.
    - In an aside, it was shared that Dr. Goodman has overlaid Jason's data with ASIR data for a particular month and they match nicely.

- It was suggested that the dataset consensus process include "cutoff" date for the basic data set, with the recognition that the data set(s) will be added to at regular intervals.
  - Attendees were optimistic that with the retrospective analysis of the population data that nothing foreseen would happen with those data that would force a review of the past 18 years of data (i.e., there is a level of stability with the data).
- It was suggested that the group consider putting the process in writing, with the steps clearly defined.
  - Some members suggested the following steps: (1) identification of data needs/wishes; (2) acquire that data; (3) review (initial look) at dataset; (4) request clarifications, explanations, present questions to owners/source; (5) work group accepts dataset as "certified" or "approved" for PVA use. Each step will need to have a set "deadline" in order to keep the process moving forward. For example, there could be 30 days to complete the dataset review or 15 days for owner/source to respond to questions.
  - Other participants suggested that the datasets be likened to "buckets" – based on data categories.
  - Dr. Goodman presented a suggested a conceptual process at the May 2011 meeting; Dr. Miller was in agreement with that suggested process. It does not have timelines or actual institutional process details (such as who has to concur, etc.).
  - Attendees then discussed the consensus process in terms of the entire Program. It was agreed that the PVA work group should develop a robust protocol and adopt the policies and procedures that works for them; this lets everyone in the Program know that all information for use in the PVA models will be handled in this way. The work group can suggest the Program adopt a similar approach but that will be up to the CC and EC.
    - ***Question:*** How hard (time consuming) is it to update the data/models each year?
      - ***Response:*** The hardest step is the first dataset. The yearly updates should not hard. It might take a couple of weeks. Annual updates are not unreasonable.
    - It will be important to document the consensus process (paper trail on how consensus was achieved). The Program's DBMS should assist in tracing all the datasets back to original sources and original raw data. The most primitive versions (of data) should be archived as well as the process of manipulation. The purpose is to maintain the pedigree; all components that are included need to be sound.
      - It was suggested that in addition to regular archives of the datasets, it would be useful to have "tags" on the records so that during QA/QC reviews erroneous data points can be omitted from a specific query but maintained in the original dataset. This way, no one has to constantly "fiddle" with the original dataset but a log of evolution on the use and interpretation of the data is built. The tags need to be portable between operating systems to accommodate users who may download from the database to do their own analysis.
- Attendees returned to the proposed data consensus steps and supported the following steps with the condition that specific time frames and deadlines sbe added:
  - 1. agree on data categories for models
  - 2. identify/procure data sets
  - 3. evaluate/organize data
  - 4. reconcile inconsistencies w/ collectors
  - 5. perform "filter analysis"
  - 6. reach consensus for 1-year datasets

- It was suggested that a "trial run" of the consensus process could take place at the next PVA meeting if ASIR and Jason Remshardt were both in attendance.

Decision: Conceptually, all members present at the September 29th 2011 meeting were in agreement with developing a rigid, stepped process for establishing a consensus data to be used in the PVA models.
Action: Dave Campbell will request that Jason Remshardt attend the next PVA meeting, depending on the confirmed meeting date.

- Participants then discussed the next steps in terms of the data consensus. The next step is to complete the data sets that are needed for this version of the model. In this case, the population data and hydrology are the outstanding data sets that are critical for this iteration of the model.
- *Hydrology Discussion*
  - ***Question:*** When we talk about recent meteorology that is used for interpreting the paleo, what goes into that besides the gage information from the USGS gages? What other information does URGWOM use to reconstruct a year to match some paleo hydrologic year – which is now linked to a year in the last 50 years of real data?
    - ***Response:*** URGWOM uses: (1) the total annual volume at Otowi and (2) dendrohydrology from tree rings to understand the distribution over the season (what the hydrograph looks like – heavy in spring or heavy in fall). The paleo record provides the ranges and frequencies of extreme conditions that have existed historically.
    - The paleo record is some appraisal of what the Otowi gage looked like every year for the past ~600 years. For each year, the appraisal is just an annual total.
    - In other words, URGWOM and PHVA select the year of real data that is the closest match to the paleo record (based on total Otowi supply and distribution).

Action: David Gensler will pursue the answer on how the URGWOM model makes a prehistoric year look like an historic year (in other words what does URGWOM use to reconstruct a year to match some paleo record?).

- For this iteration, the work group agreed to not pursue the raw paleo data because it could be difficult to get and analyze in a timely fashion. There was general agreement that it makes sense to accept the paleo reconstruction at face value for the time being.
  - However, there are concerns about the "massaging" of the measurements that occurs during dendrohydrology (ex. particular trees from particular places). One issue is that sometimes they use formulas in the reconstruction that involve moving averages of the rings widths. These moving averages could contaminant the time series of the resulting reconstruction. Some of the properties in the reconstruction could be artifacts of whatever massaging was done. Using 10 year sequences (as provided by URGWOM) could interrupt longer serial correlations.
  - Dr. Goodman said that a spectral analysis on the 600 year reconstruction to determine if any of the peaks could be artifacts should be done sometime in the future; then the work group can discuss if correction would make a significant difference to the model.
    - PVA will use some of the URGWOM results or another hydrologic time series, but either way the work group will have to understand and justify why. In order to have hydrologic sequence that the PVA modelers can use, they need to understand the scenarios being run. Part of that understanding is knowing the linkage URGWOM used to create its sequence.

The data sets URGWOM uses to make its sequences need to be available to the PVA so that (1) if PVA uses the URGWOM projections the modelers understand what they contain, and (2) if PVA decides to use another source we can explain and justify that action.

Action: Over next week, Dave Campbell and David Gensler will continue discussing the consensus data process and develop recommended timelines for each step.

- *Data Consensus Categories*
  - Dr. Goodman offered the following as the main categories to consider in data consensus:
    - Hydrology;
    - Paleo;
    - Population Monitoring - on hold with the peer review underway;
    - Population Estimation – on hold with the peer review underway; report document expected in February 2012;
    - Genetics – on hold with the peer review underway;
    - Egg Drift; and
    - Habitat.
  - The focus between now and January 2012 is the population estimation, hydrology, and paleo. The next step would be to them focus on the genetics, habitat, and then egg drift.

Action: Yvette Paroz will look into getting the updated population estimation data.

Action: Stacey Kopitsch will check with Jericho Lewis if the age/length study draft report can distributed to the work group (contractors excluded).

PVA Meeting Attendees
September 29th & 30th, 2011

NAME	AFFILIATION	PHONE NUMBER	EMAIL ADDRESS	Date	
				09/29	09/30
David Gensler	MRGCD; Co-Chair	505-247-0234	dgensler@mrgcd.com	✓	✓
Dr. Daniel Goodman	Specialist – MRGCD rep; PVA Modeler	406-994-3231	goodman@rapid.msu.montana.edu	✓	✓
Rick Billings	ABCWUA	796-2527	rbillings@abcwua.org	✓	
Mick Porter	COE	505-342-3264	michael.d.porter@usace.army.mil	✓	✓
David Campbell	FWS – NMESFO; Chair	505-761-4745	david_campbell@fws.gov	✓	✓
Gary Dean	Reclamation	505-462-3601	gdean@usbr.gov	✓	✓
Terina Perez	Reclamation	505-462-3614	tlperez@usbr.gov	✓	
Stacey Kopitsch	FWS	505-761-4737	stacey_kopitsch@fws.gov	✓	✓
Yvette Paroz	Reclamation	462-3581	yparoz@usbr.gov		✓
Rich Valdez	SWCA/ISC	435-752-9606	valdezra@aol.com		✓
Dagmar Llewellyn	Reclamation	505-462-3594	dllewellyn@usbr.gov		✓
John Caldwell	NMDGF	---	john.caldwell@state.nm.us	✓	✓
Peter Wilkinson	ISC	505-827-5801	peter.wilkinson@state.nm.us		✓
Marta Wood	Tetra Tech	505-259-6098	marta.wood@tetratech.com	✓	✓

River Drying Data
Middle Rio Grande (1996-2011)

PVA Meeting

September 30, 2011

R. Valdez

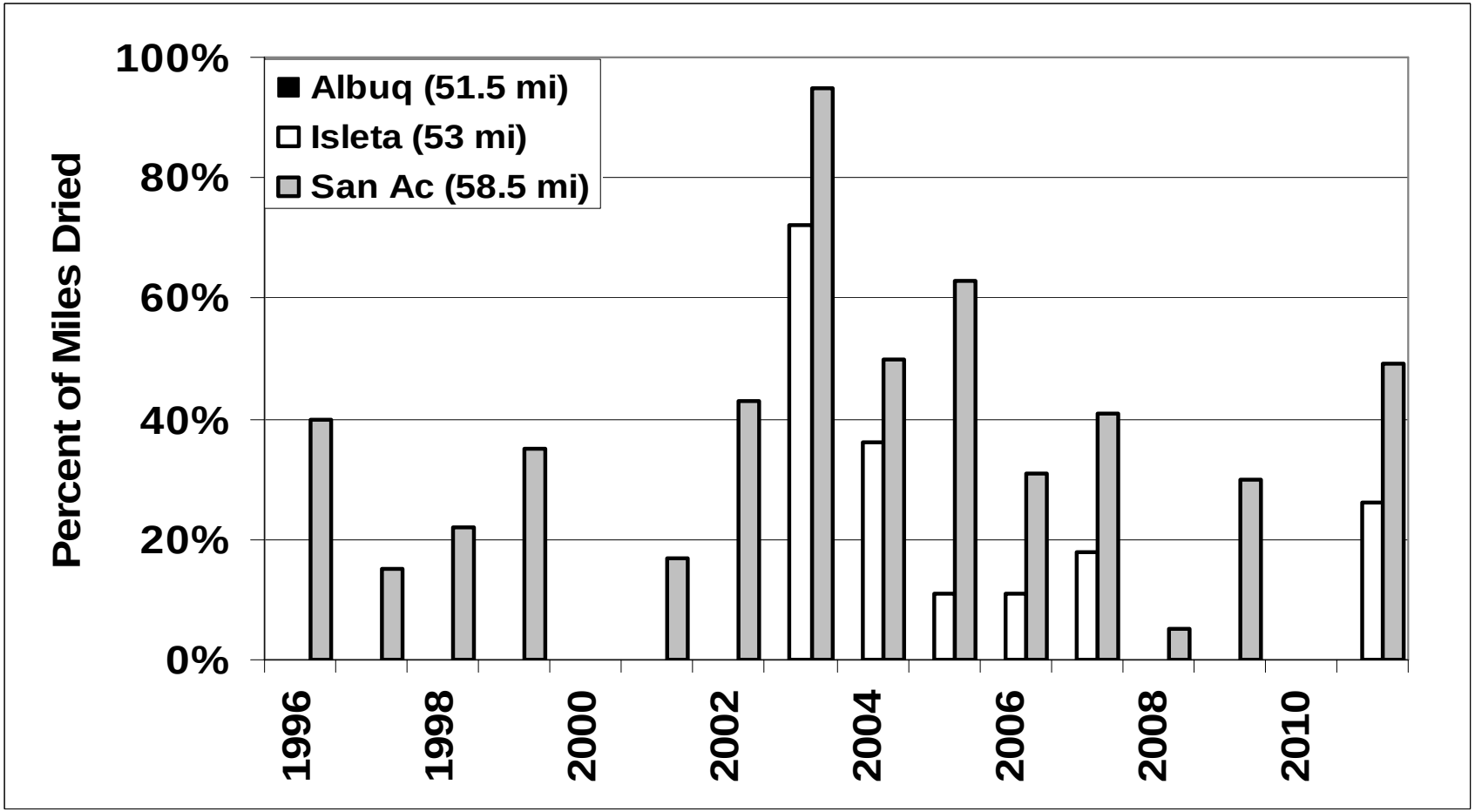
Available Data

- 1996-97, 2000-01: FWS Observations (RGSM Monitoring/Salvage)
- 1998: Anecdotal Reports (Albuquerque Journal)
- 1999: Various Monitoring (Anecdotal Observations)
- 2002-03: River Eyes (Various Detail)
- 2004-11: River Eyes (ArcGIS ,ArcMap)

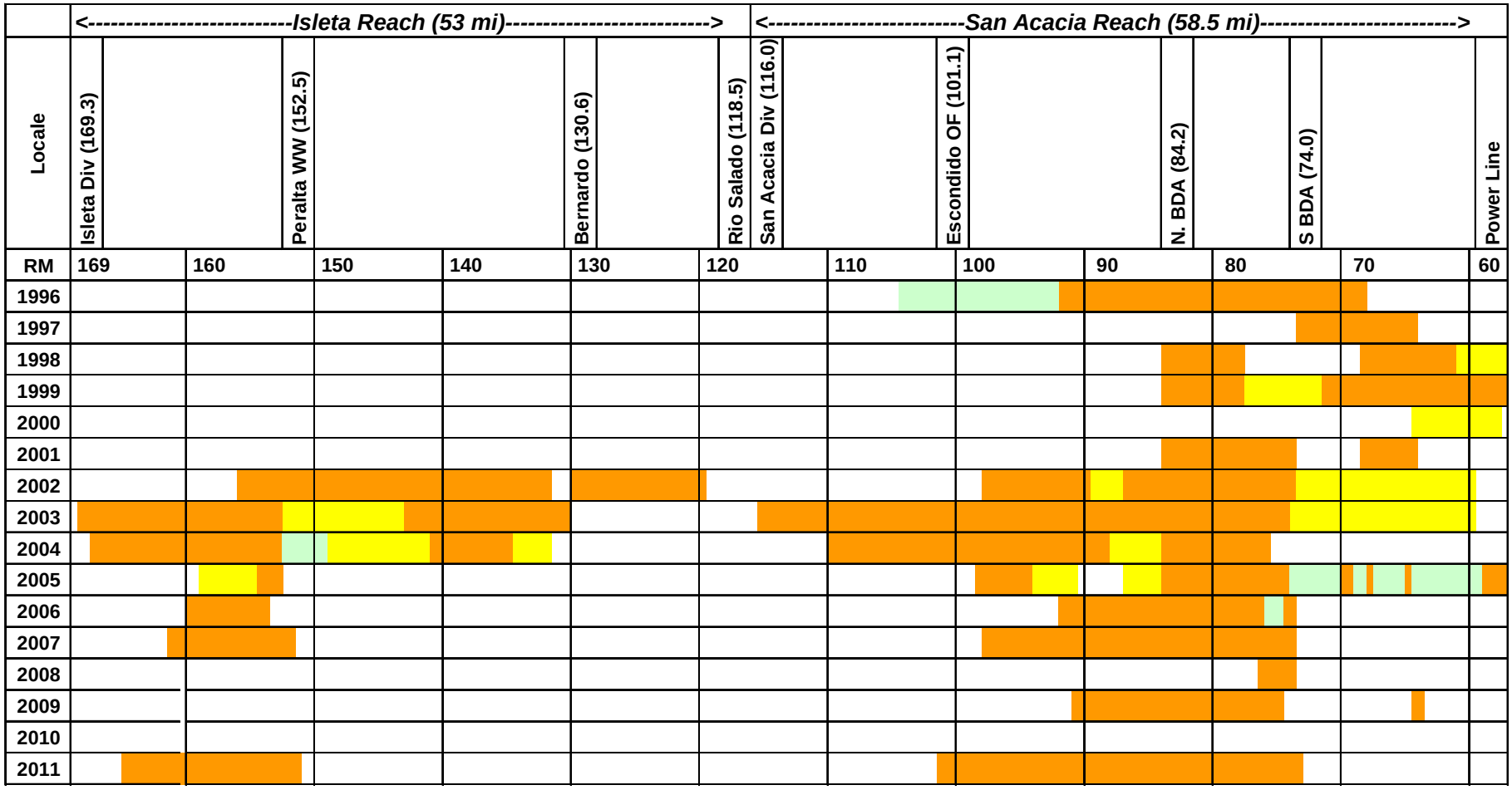
History of Drying
Middle Rio Grande (1996-2011)

Data Source, Quality, Reliability --------→	FWS Observations (RGSM Monitor/Sal)	FWS Observations (RGSM Monitor/Sal)	Anecdotal Reports (Albuquerque Jour)	Various Monitoring (Anecdotal Observ)	FWS Observations (RGSM Monitor/Sal)	FWS Observations (RGSM Monitor/Sal)	River Eyes (Various Detail)	River Eyes (Various Detail)	River Eyes (ArcGIS ,ArcMap)	River Eyes (ArcGIS ,ArcMap)	River Eyes (ArcGIS ,ArcMap)	River Eyes (ArcGIS ,ArcMap)	River Eyes (ArcGIS ,ArcMap)	River Eyes (ArcGIS ,ArcMap)	River Eyes (ArcGIS ,ArcMap)	River Eyes (ArcGIS ,ArcMap)	
Reach	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**Ave.**
Albuquerque (51.5 mi)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%		0%	0%
Isleta (53 mi)	0%	0%	0%	0%	0%	0%	0%	72%	36%	11%	11%	18%	0%	0%		26%	12%
San Acacia (58.5 mi)	40%	15%	22%	35%	0%	17%	43%	95%	50%	63%	31%	41%	5%	30%		49%	36%
Crit. Hab. (163 mi)	14%	6%	8%	13%	0%	6%	31%	57%	30%	26%	15%	21%	2%	11%		26%	18%
Isleta (mi)	0	0	0	0	0	0	18.2	38	19	6	6	9.5	0	0		14	7.4
San Acacia (mi)	23.5	9	13	20.5	0	10	25	55.5	29.5	37	18	24	3	17.5		28.5	20.9
Total (mi)	23.5	9	13	20.5	**	10	43.2	93.5	48.5	43	24	33.5	3	17.5		42.5	30.8

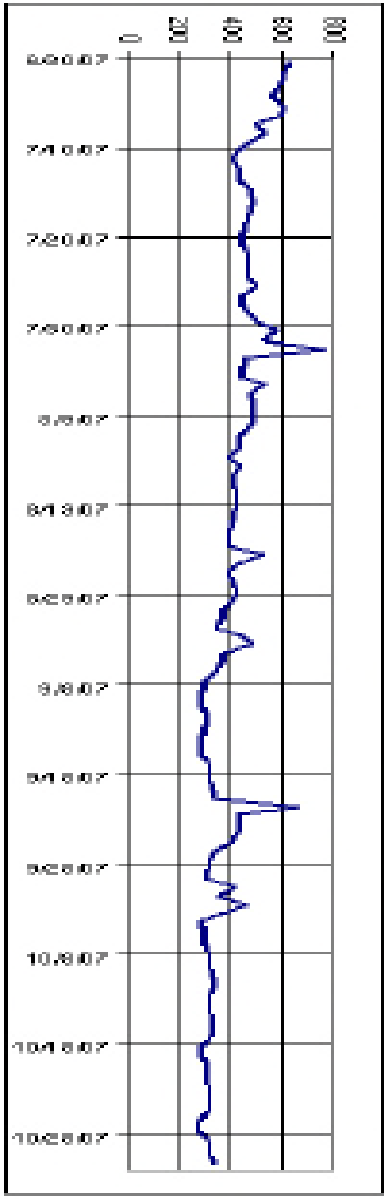
Percent of River Miles Dried Middle Rio Grande (1996-2011)



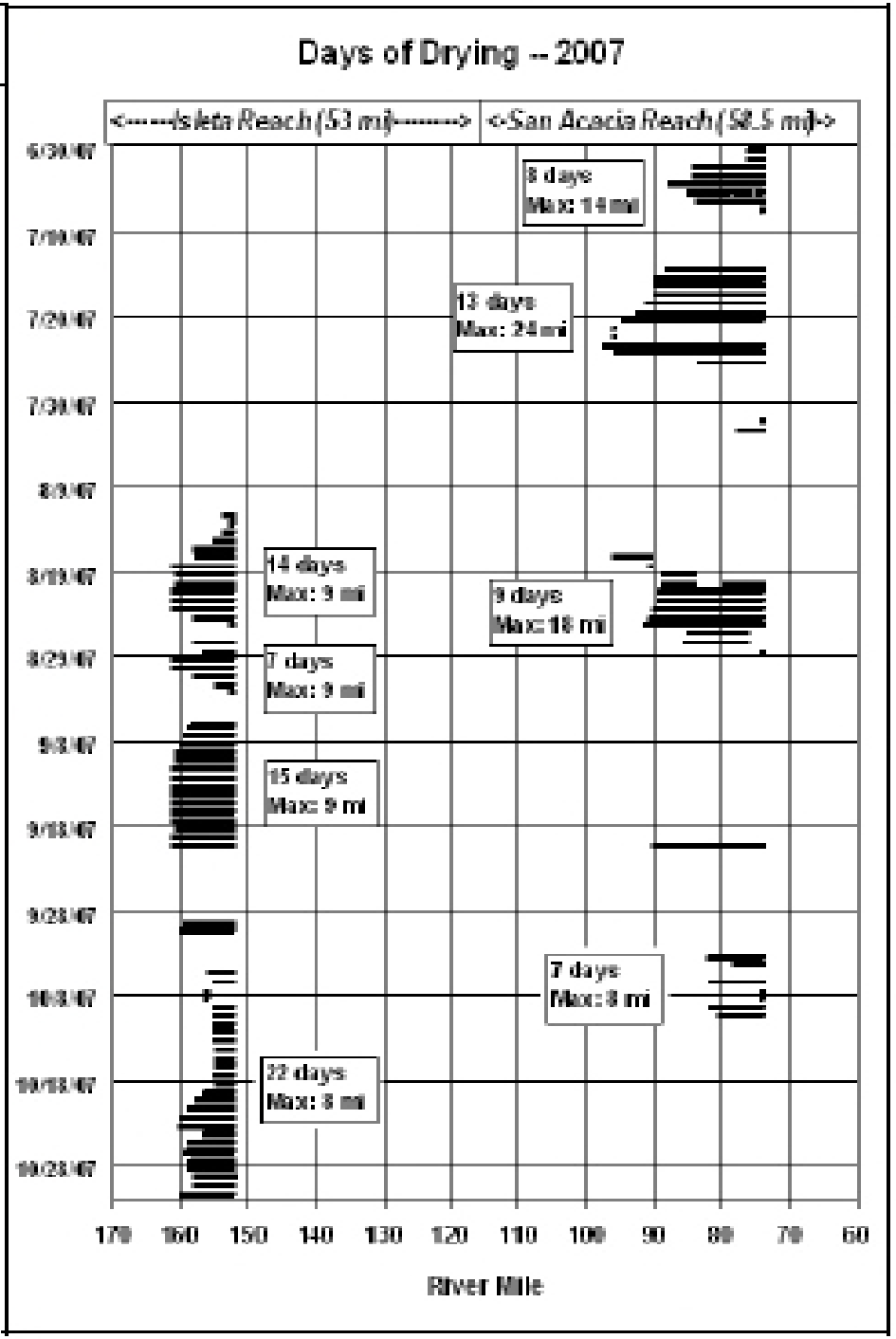
History of Drying
Middle Rio Grande (1996-2011)

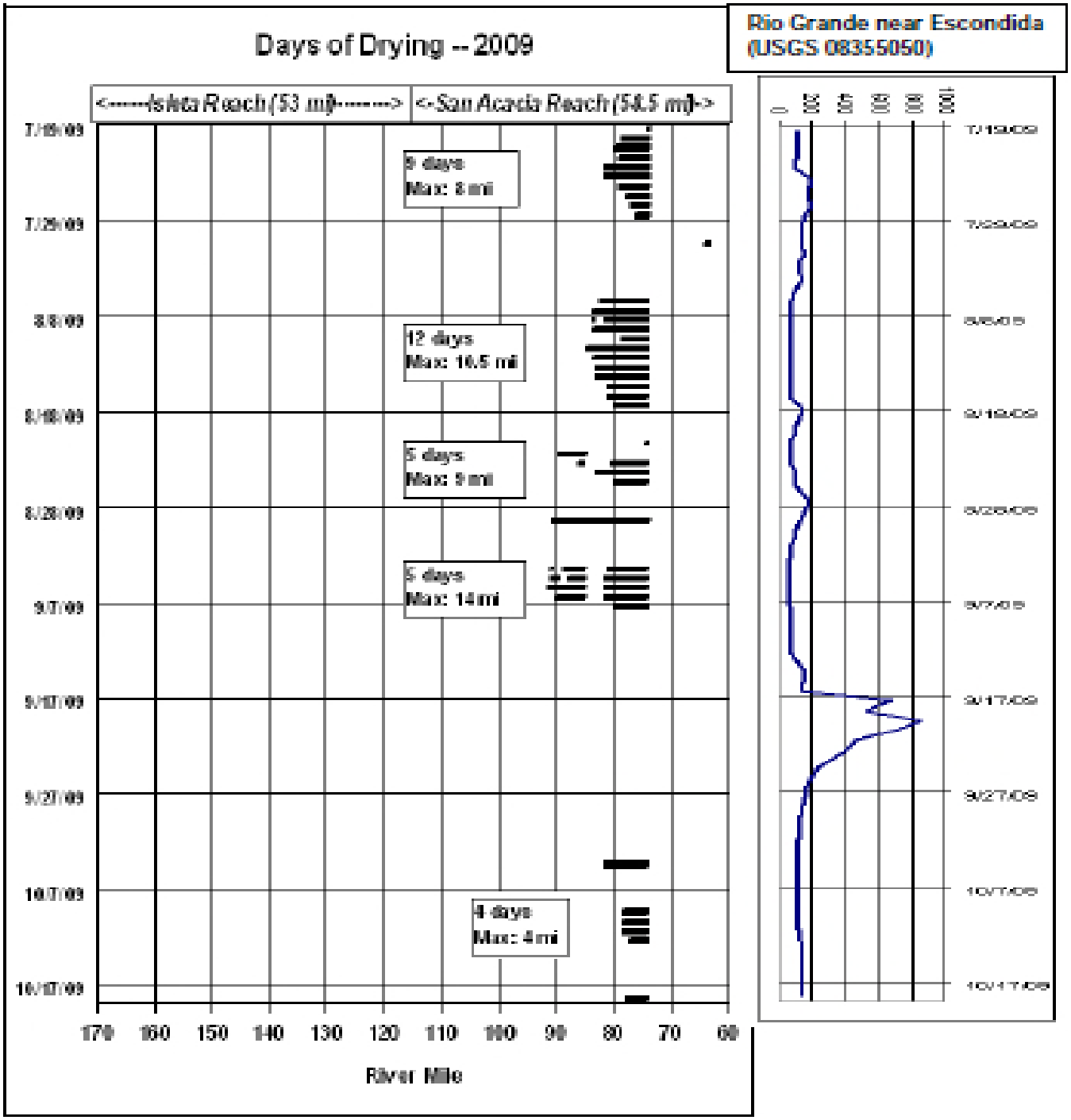


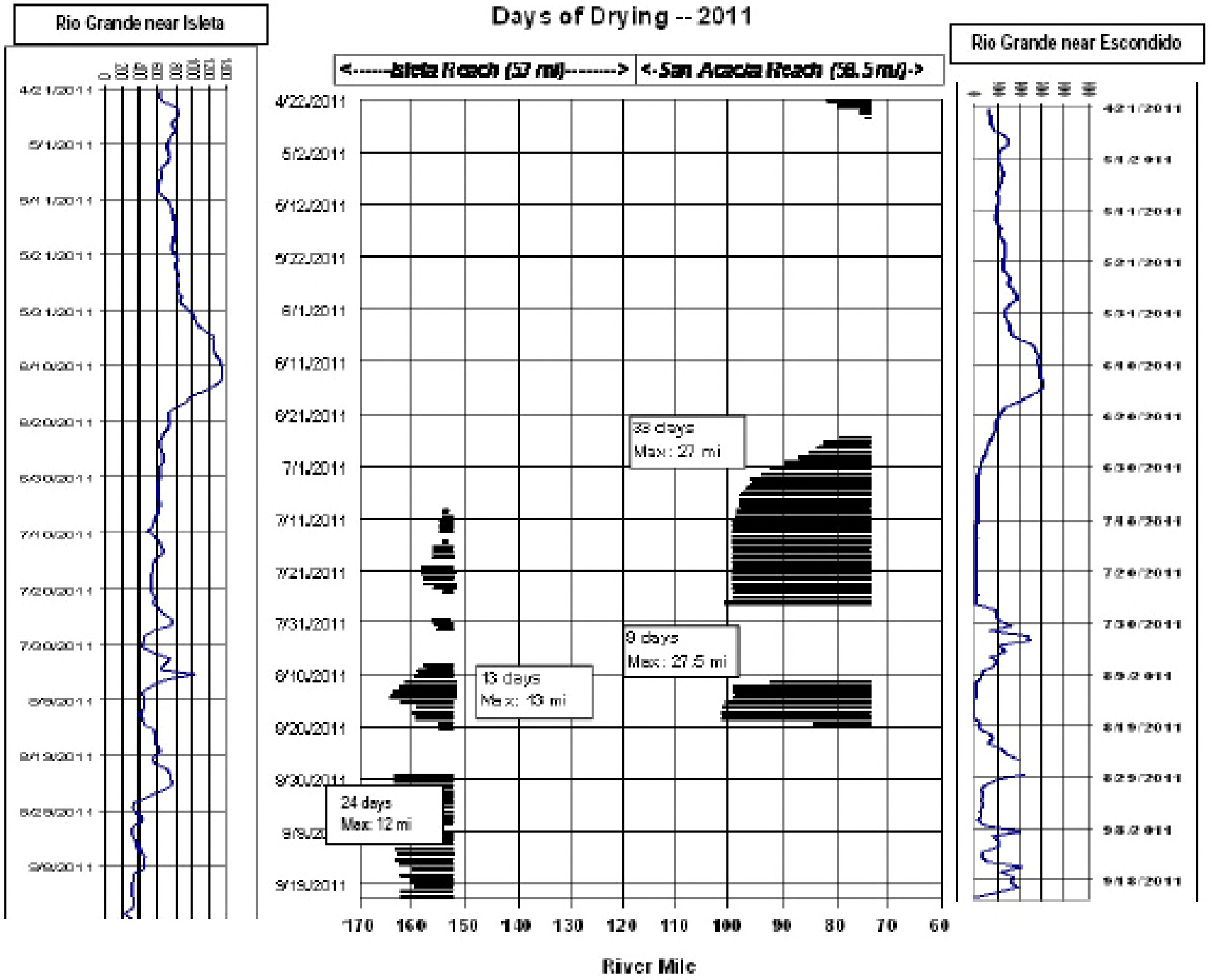
Rio Grande near Isleta
(USGS 08330875)



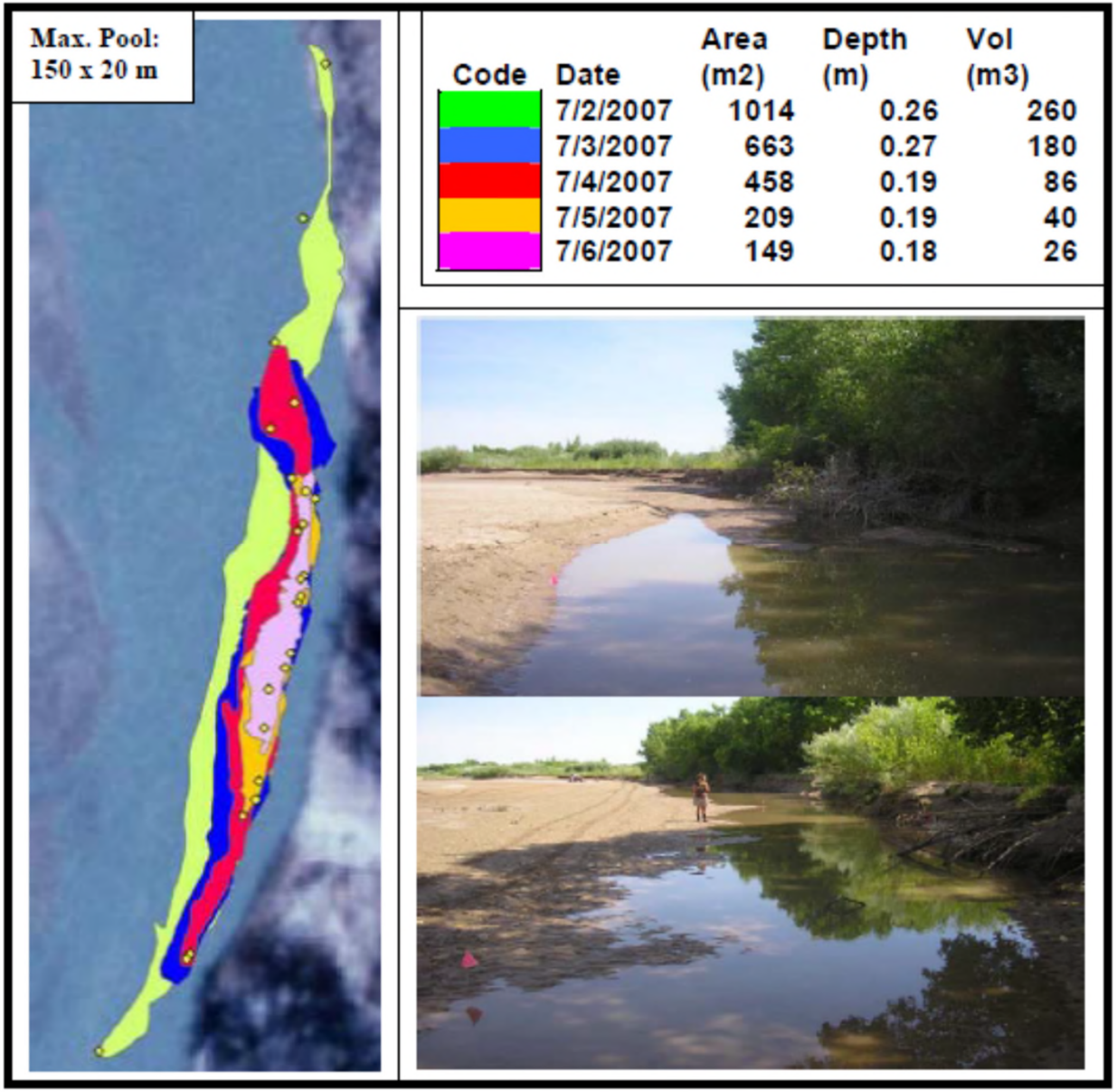
Days of Drying -- 2007




Days of Drying -- 2009
<------Isleta Reach (53 mi)------><-San Acacia Reach (54.5 mi)->
9 days
Max: 8 mi
12 days
Max: 16.5 mi
5 days
Max: 9 mi
5 days
Max: 14 mi
4 days
Max: 4 mi
170
160
150
140
130
120
110
100
90
80
70
60
River Mile
Rio Grande near Escondida
(USGS 08355050)

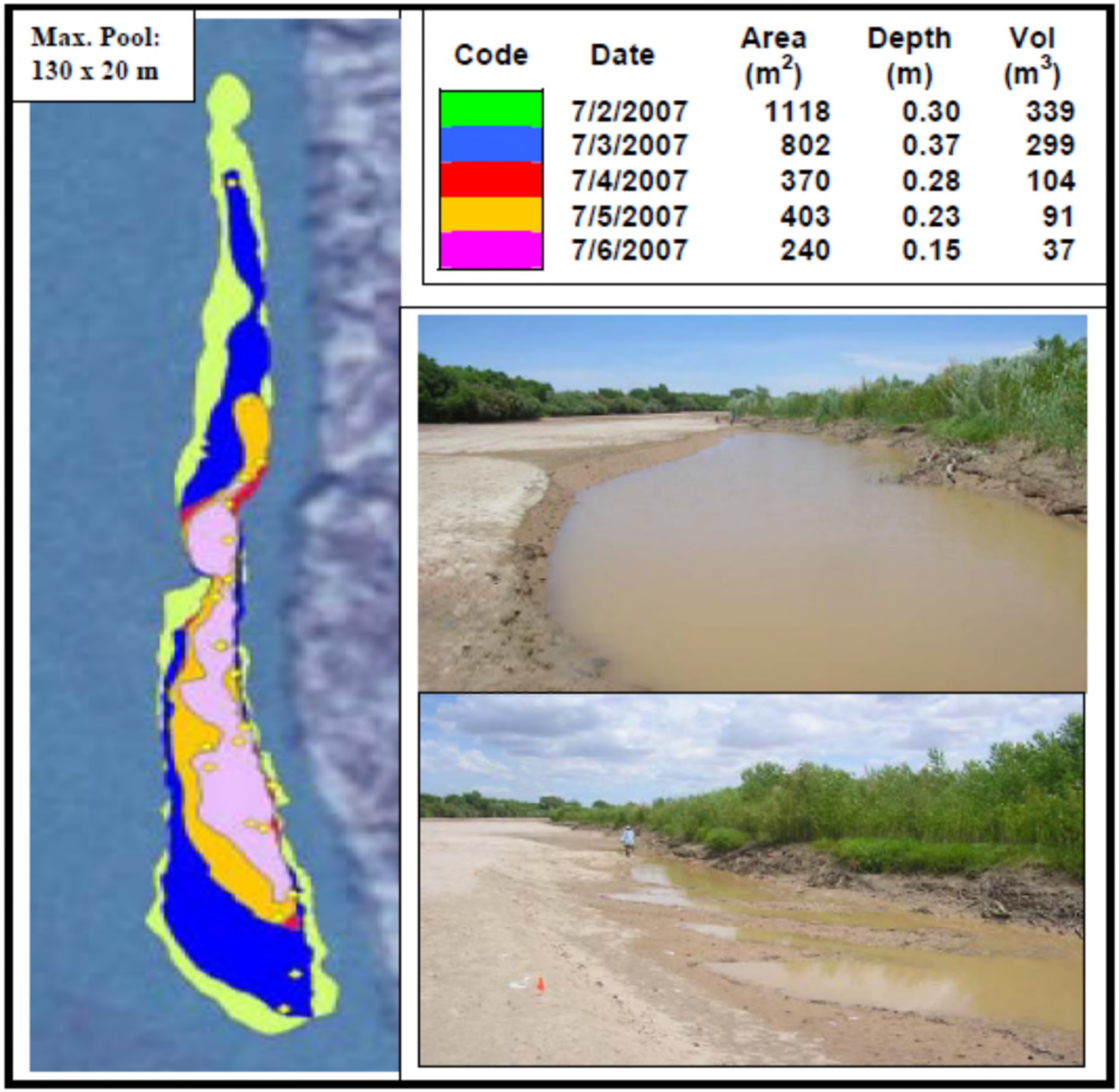

Days of Drying -- 2011
Rio Grande near Isleta
Rio Grande near Escondido
<------Isleta Reach (57 mi)-------> <-San Acacia Reach (58.5 mi)->
4/22/2011
5/2/2011
5/12/2011
5/22/2011
6/1/2011
6/11/2011
6/21/2011
7/1/2011
7/11/2011
7/21/2011
7/31/2011
8/10/2011
8/20/2011
8/30/2011
9/9/2011
9/19/2011
33 days
Max: 27 mi
9 days
Max: 27.5 mi
13 days
Max: 13 mi
24 days
Max: 12 mi
170
160
150
140
130
120
110
100
90
80
70
60
River Mile

Isolated Pool (RM 77.4)
(San Acacia Reach)

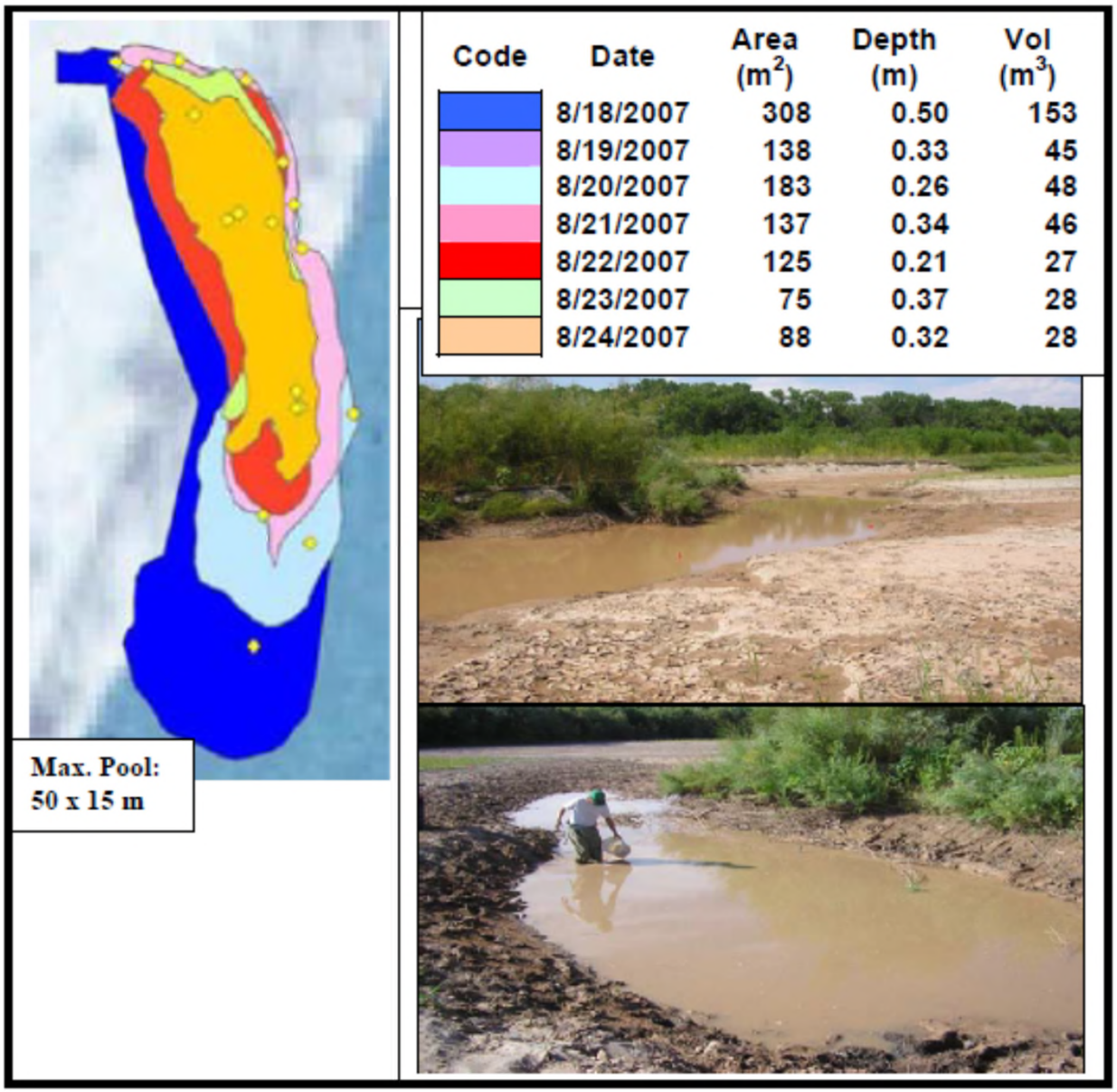


Code	Date	Area (m2)	Depth (m)	Vol (m3)
	7/2/2007	1014	0.26	260
	7/3/2007	663	0.27	180
	7/4/2007	458	0.19	86
	7/5/2007	209	0.19	40
	7/6/2007	149	0.18	26

Isolated Pool (RM 81.5)
(San Acacia Reach)



Isolated Pool (RM 161.3)
(Isleta Reach)



Refuge Criteria

Physical Criteria

- Access for wild fish from the main river channel during drying events;
- In proximity to a reliable water source; e.g., groundwater, outfall, wasteway, irrigation return, managed pumps;
- Pool-like feature 50–200 m long, able to retain water with small flow;
- Banks with gradual and steep slopes with average depth of 0.3–0.5 m;
- Little or no velocity from turnover of water (once / 24 hr);
- Sand/silt substrate, flushing flows prevent filling of pool with fine sediment;
- Sanctuary pools with and without debris piles should be tested.

Biological Criteria

- Low numbers or absence of large predators, e.g., LMB, GSF, CCF, BHs;
- Abundance of diatoms, small algal forms, and macroinvertebrates for food.

Chemical Criteria

- Water temperature no greater than 35°C;
- Dissolved oxygen no less than 1.5 mg/L;
- Ammonia no greater than 15 mg/L as N.