Middle Rio Grande Endangered Species Act Collaborative Program
Science Workgroup (ScW) Meeting

20 March 2012 Meeting – 9:00 AM-12:00 PM

ISC

Decisions

- The February 21st, 2012 meeting notes were approved for finalization with no changes.

Actions

- Jason Remshardt will distribute a copy of the March Captive Propagation and Genetics meeting notes to the ScW work group.
- Stacey Kopitsch will coordinate/organize a meeting for ScW volunteers to discuss the continuation of the genetics monitoring and make recommendations/provide feedback to the CC.
- Jen Bachus and Alison Hutson will elevate the lack of volunteers for the ScW co-chair positions to the PM and CC.
- Any additional comments, edits, or feedback on the recent changes to the Draft Data Synthesis Plan (in response to the CC requested edits) are to be provided to Stacey Kopitsch by email no later than April 9th.

Meeting Summary

- Jen Bachus brought the meeting to order. The agenda was approved with a change in order to have the ASIR Population Monitoring and Population Estimation presentations follow the approval of the February meeting notes. The February 21st, 2012 meeting notes were approved for finalization with no changes.
- Rob Dudley then presented on ASIR's primary projects: the RGSM Population Monitoring and RGSM Population Estimation programs. *Due to the presentation length and complexity, please refer to the actual presentations for details. Some brief highlights are presented below:*
    - Beginning with the Population Monitoring, Rob explained that the project objectives have pretty much remained constant over time although the methodology (e.g., number of sites, sampling frequency, and sampling effort) has been updated/changed several times during the project evolution.
        - The sites were selected in 1992 and have mostly remained constant since then although there have been some additions. There are sites in all reaches except for Cochiti reach due to problems obtaining consistent sampling access over time.
        - In a description of the sampling methodology, it was shared that the length of each sampling site is 200m with shoreline associated mesohabitats (e.g., shoreline pools, shoreline runs, and backwaters) being the prevalent areas sampled. Large seines are used throughout the year but larval seines are included between April and October. It takes about 1 hour to complete the sampling effort. The fish are collected, counted, and then released. The data collected is used to then calculate a Catch Per Unit Effort (CPUE) or basically a density of fish per 100 m^2.
        - The results for the last year (Dec 2010 to Oct 2011) show high catch rates in the winter most likely due to the recent stocking events. The delayed peak flow (not until July) resulted in a delayed spawning during 2011.
        - Other than 1998, there has been continuous October sampling and data collection for 18 years. Compared to the ~20 other fish taxa, the minnow constituted up to

70% (or 7 out of 10 fish) in 2005 whereas recent relative abundance (2010/2011) was around 4%.

- In terms of catch rate, there is a lot more difference (booming and busting) of the Rio Grande silvery minnow population compared to the other fish species, which as a whole remain mostly constant over time.
- Regular monitoring occurs throughout the year at all 20 sites; however, in November the sites are repeatedly sampled 4 days in a row in order to understand the variation in density for each sampling site.
- In terms of distributional abundance between the reaches, Angostura tends to remain constant between years while Isleta and San Acacia tend to fluctuate. Approximately 80% of Rio Grande silvery minnow were in San Acacia in 2011.
- In summary, some general observations/trends were shared. The abundance of minnow fluctuates greatly over time. Higher population densities generally occur following periods of elevated/extended spring runoff. Correlation of minnow densities to changes in winter flows are not seen, likely because there is not the variation in winter flows, which are generally fairly constant during that time. For years that the density increased over the previous year, the average increase is ~1,199%. There has not been the same magnitude of drought conditions since 2002/2003, which means that statistically determining the relative impact of salvage/stocking efforts on recent population increases/decreases (i.e., post 2003) might be hampered by a lack of data during periods of highly reduced densities when the relative impact of those efforts might be highest.
- *Question:* Has the analysis included using a curvilinear regression on October CPUE and hydrologic variables? *Response:* This could be useful and might improve the R^2 values. They have done this on prior plots, and could present the analysis both linear and curvilinear. As more data become available that could be useful for identifying a pattern that is informative for management decisions.
- *Question:* Right after the spring peak, there is an increase in minnow densities. Is that all due to YOY? *Response:* That represents overall changes in minnow densities, but 90-95% of those are young juveniles (around 20mm SL). This increase is not due to more adults; we see gradual mortality in spring and summer of age-1 adults.
- *Question:* What are the primary important conditions that support cohort recruitment? *Response:* Starting in 2003, there has been more intensive recruitment data collected. Two components seem to be (1) persistence in higher flows following the spring peak, with more steady and gradual decline beneficial to recruitment, and (2) the number of days (<200 cfs), which appears to be a threshold below which there is a change in recruitment. It appears that if the minnow numbers are strong following the spring peak and afterward, then effects from river drying later in the year may not be as impactful. If the flows drop too quickly following the peak, then there is a large impact on recruitment even with a good spawn.
- *Question:* When the analysis on log-transformed data is transferred, is it normal? *Response:* Yes, they end up with skewed distribution before it is log-transformed, weighted toward low CPUE values because there are more of those data points than at high densities. They also looked at homogenated variance and ran other tests. ANOVA statistics are robust to slight deviations in normality. They also ran nonparametrics and got the same patterns. A natural log plus one is used and accounts for issues with the zero-value data points that often occur in

sampling. This was especially the case in 2002-2003 with so many zeros making the analysis difficult at those low fish densities.

- The Population Estimation program has a completely different protocol from the population monitoring and uses a generalized random tessellation stratified (GRTS) sampling for site selection. Basically, this allows for random sampling of sites but keeps a distributional balance so that at least some sites are selected in each reach. It just happened by chance alone that the number of sites per reach came out to the same as the population monitoring.
    - Population Estimation conducted pilot studies of methods in 2006 and 2007. From 2008-2011 the same methods have been used. This program generates an actual estimate of the number of silvery minnow, which can allow more specific ties to environmental variables.
    - Discrete mesohabitats are mapped to within 10 cm accuracy using GPS. Then a random subsample is taken for anything that is not a run. In general, the sampling areas are about the same as with the population monitoring but the duration of the sampling effort is much greater at about 8 hours to complete (compared to 1 hour for population monitoring). The sampling is then used to determine the density estimate for each mesohabitat per site for all 20 sites.
    - Experiments were completed in 2007 to compare the benefits and differences of open versus closed sampling; closed sampling was determined to be the most robust method and has been implemented consistently since 2008.
    - Calculation of fish density is made by dividing the number of individuals collected by area sampled (#/m^2) for each mapped habitat patch. Density was calculated using empirical data but values were corrected based on the global capture probability estimates that utilized all comparable closed mesohabitat electrofishing data available (i.e., since 2008). It turns out that for each mesohabitat about 30% of fish are not detected on the first pass with the exception of runs (ca. 15% of fish are not detected on the first pass).
    - The population estimation was then calculated using: (1) the empirical density stratified by mesohabitat; (2) depletion correction (e.g., runs, pools, backwaters); (3) the density variation among mesohabitats; (4) the density variation among sampling reaches; and (5) the area of sampled reaches & total study area.
        - The population estimation results indicated that there are more minnow in the Angostura Reach (64,207) than the other 2 reaches combined (Isleta = 34,891 and San Acacia = 22,505). The total population estimate is 122,381.
    - Overall, a general trend is that if the population monitoring *trends* go up, then so does the estimated population size. However, using the population monitoring data of the past few years to try to predict (or extrapolate) a population estimation results in a poor correlation. The 2011 population monitoring would predict a population size of about 250,000 when in reality the 2011 population estimation was about 122,000. Thus the overall trend is similar, but the precision is not.
- Rob then shared on work ASIR has done with Estimating Site Occupancy Rates. The site occupancy gets to a fundamental question of how the distribution of Rio Grande silvery minnow changes over time, which can potentially be related to changes in environmental conditions. The same November sampling dataset is used (data mined) to calculate site occupancy. This work was initiated because there are known problems/issues that occur when the minnow population is small but that is a critical time to be able to address where the population might be headed and inform management. The site occupancy allows for the generation of extinction probabilities, colonization probabilities, as well as the probability of occupancy.

- At low numbers of minnow, there is more variability in detection of the species across four consecutive days of sampling.
- Based on the November 4-day repeated sampling, Rio Grande silvery minnow occupy 82% of the sites; this is in contrast to the population monitoring in October which indicates that the minnow occupy about 40% of the sites.
- There is about a 3% probability per year of losing existing sampling sites that are currently occupied and there has been about a 20% cumulative decline in the number of occupied sites since 2005. Site occupancy has been declining over the last 3 years and the percentage of occupied mesohabitats has followed a similar trend.
- A comparison across population monitoring, population estimation, and site occupancy projects was then provided. The value of these different types of sampling depends on the high or low levels of minnow abundance and distribution. Population monitoring is the only one to give seasonal changes and trend information and that allows calculations of survivorship. Population estimation is more objective and statistically defensible for quantifying where the minnow population is going.
- *Question:* What about scattering of minnows during sampling? *Response:* The techniques used have been honed to account for this to the furthest extent possible. The MRG is turbid so it is less likely there is a visual scatter that occurs at the start. There have not been any red flags to indicate this is occurring. For population estimation, they did try using a smaller sampling enclosure at first. Using a range of enclosure sizes could be conducted to see if there is a difference; however, this is a difficult question to answer because of the inability to conduct replicate sampling (i.e., area is already impacted once sampled).
- *Question:* What would happen if the 20 sites for population monitoring were changed to other sites for sampling? *Response:* This has been considered and there would likely be a difference in the numbers because habitat and structure do change over time. There is much spatial variation between sites, that if we introduced additional variables such as changing sites around, it would be very difficult to use or continue comparisons to historical trend data in any analysis.
- *Question:* If you changed the sites in the population estimation work, would that change the results in some way? *Response:* If you add sites, then the confidence intervals would be reduced some, because it would help improve precision. If you were to change sites, it is unknown what you would end up with. The confidence intervals are driven largely by the high density data points which occur at a few sites, rather than the low densities which occur at most sites.
- *Question:* What nonparametric test was used? *Response:* Kruskal-Wallis.

- Due to time constraints, the February 21st, 2012 Action Item Review was postponed until the April ScW meeting.
- Jason Remshardt then shared highlights from the March RGSM Captive Propagation and Genetics Working Group (CP&G) meeting. He explained that the spring meeting is always focused on the stocking needs and planning for the year. CP&G attendees discussed the number of fish stocked last year (~200,000 for the Middle Rio Grande or MRG). It is assumed that the same amount will be needed this year plus an additional 10-15% based on the predicted flow conditions for a total of 225,000 for the MRG. Generally, the BioPark annually produces ~40,000 to 50,000 minnow; the Los Lunas refugium produces ~5,000 to 10,000 minnow (they may produce more this year); and then the Dexter facility produces the remaining fish (~400,000+/-).

  - CP&G attendees also discussed the role of genetics and how it fits with the propagation and augmentation efforts. Jason sent a courtesy letter sharing the CP&G perspective on the impacts of genetics on the propagation and augmentation to Jen Bachus (ScW co-chair) and provided hard copy hand-outs to the ScW members.
  - Since this year is expected to be a low water year and thus a good egg collection year, the BioPark suggested they would be collecting all the eggs they need this year for propagation from the wild. They will probably do one captive spawn for consistency.
  - A question was asked about Big Bend stocking for this year. This is the fifth year for stocking Big Bend population, and will involve 200,000 minnows for this fall. The timeline for stocking the MRG is after the irrigation season ends and before the RGSM population estimation work is conducted in November.
- Attendees then briefly discussed the future of the genetics monitoring work. This is the last year for the 5 year grant which will expire in September 2012. Originally, the genetics program was the next project to be peer reviewed but that peer review has been put on hold until the Executive Committee develops an official peer review process and procedures. With the current expiration date and without a new procurement in place, the genetics monitoring will not capture the captive stock monitoring that occurs in October or November (since their contract will be expired by then). The wild stock was monitored in February.
  - The Program's Contracting Officer stated that the genetics monitoring has to be competed as a new procurement which is expected to take 4 to 6 months to have in place. The Contracting Officer stated that this would not allow enough time for a contract to be awarded by October 2012.
  - There was general agreement that the genetics monitoring is critical and the genetics controls need to be in place in order to be aware of and respond to any potential emergency situations. Ideally, this means a contract would be in place no later than October 1st, 2012 in order to avoid loss of sample continuity and analysis.
  - It was agreed that ScW members need to discuss this issue in more depth before the next CC meeting, scheduled for April 11th, in order to inform the CC of the gravity of the situation and need for funding. An additional meeting will be scheduled for those interested.
- Participants then discussed the need for both a federal and non-federal co-chair of ScW. Neither Alison nor Jen can continue as the co-chairs. However, there has been no response and no volunteers to fill the positions. No one volunteered during the meeting, so the issue will be elevated to the PM and CC. Concern was raised that Reclamation has not provided a primary ScW representative since Jeanne Dye left.
- In a very brief update, attendees were informed that the CC-requested edits to the Draft Data Synthesis Plan have been addressed in track changes. Members with no conflict of interest were encouraged to take a hard copy for any additional review and comment. Any additional comments, edits, or feedback on the recent changes to the Draft Data Synthesis Plan (in response to the CC requested edits) are to be provided to Stacey Kopitsch by email no later than April 9th.
- Due to time constraints, the 2012 Program Budget update was postponed until the April ScW meeting.
- In an update on the potential fecundity study, it was shared that the Dexter Facility has prepared a draft scope of work. There currently is no money in the Program's FY12 budget to fund this study, but Dexter is looking into the possibility of funding the study through their budget. It was recommended that the scope review and any additional work on this potential process be put on hold until it is known whether or not Dexter will be able to move forward using their own funds, which should be known within the next month. If Dexter will be able to fund the project, then the ScW will provide feedback on the draft scope of work.

- In a brief Program update, it was shared that the EC will be meeting for a full day on March 28th. The March 7th CC action items and decisions were distributed to ScW members via email. The CC will be meeting again on April 11th. They will continue to discuss the 3 remaining projects for potential funding in FY12 – data synthesis, population estimation, and genetics monitoring.

Next Meeting: April 17th, 2012 from 9:00 AM to 11:30 AM at ISC.

- April tentative agenda topics: (1) K. Buhl presentation; (2) election of co-chair positions; (3) approve the draft data synthesis plan; (4) FY12 budget updates; (5) February and March Action Item Review;
- Future tentative agenda topics: (1) joint session with HR; (2) discussion on increasing the museum sample size (preservation of the October collection) including the objectives, benefits, status of current collection, etc.;

Upcoming Meetings

- EC: March 28th, 2012 from 9:00am to 3:00pm at Reclamation
- CC: April 11th, 2012 from 12:30pm – 4:00 pm at Reclamation
- ScW: April 17th, 2012 from 9:00am to 11:30am at COE

Middle Rio Grande Endangered Species Act Collaborative Program
Science Workgroup (ScW) Meeting
20 March 2012 Meeting – 9:00 AM-11:30 AM
ISC

Meeting Notes

Introductions and Agenda Approval

- Jen Bachus brought the meeting to order. The agenda was approved with a change in order to move the ASIR Presentations to the beginning of the meeting.

Approve the February 21st, 2012 ScW Meeting Minutes

- The February 21st, 2012 meeting notes were approved for finalization with no changes.

ASIR presentation on Population Monitoring and Population Estimation programs

- Rob Dudley then presented on ASIR's primary projects: the Population Monitoring and Population Estimation programs. *Due to the presentation length and complexity, please refer to the actual presentations for details.*

- *Population Monitoring*
  - Rob explained that the Population Monitoring objectives which have pretty much remained constant over time:
    - Determine long-term (multiple year) and short-term (seasonal) trends in fish populations of the Middle Rio Grande (MRG) using statistical approaches; the focus is on the Rio Grande silvery minnow (minnow) but information is collected on all fish taxa.
    - Evaluate the influence of environmental conditions (discharge time, magnitude, duration) on changes in both the minnow population and other fish taxa (but the focus is on the minnow).
    - Determine general habitat use patterns by comparing mesohabitat type in sampled areas with and without minnow. Remember, however, this is not a habitat use study.
    - Compare changes in minnow relative and rank abundance to that of other native and nonnative fish species.
    - Determine site-specific sampling variation (temporally and spatially and during sampling).
  - The 20 sites were selected in 1992 and have mostly remained constant since then although there have been some additions. There are sites in all reaches except for Cochiti due to problems obtaining consistent sampling access over time.
    - The placement of the diversion structures influences the flow patterns. In 2010, there was an early pulse around mid-April and then again in June 2010; interestingly, the 2011 peak was delayed and there was lower flow. A number of sites were lost in 2011 due to the low flow.
  - Field Sampling Methods
    - The length of each sampling site is approximately 200m with sampling occurring in each mesohabitat type (e.g., runs, pools, shoreline pools, backwaters, riffles, shoreline runs).
    - Large seines are used throughout the year and larval seines are used between April and October. Most of the sampling is shoreline. It takes about 1 hour to

complete the sampling of a site (approximately 400-600 m^2). The fish are collected, counted, and released.
    - Catch Per Unit Effort (CPUE) or density is calculated for each species, at each of the sampling sites, as the number of individuals collected per 100 m^2 of water sampled (CPUE= #/100 m^2).
- Key Factors that Drove Project Evolution and Methodology
    - The drought conditions of 2000-2003 resulted in many of the changes in sampling methodology from the original protocol (e.g., increased number of sites, sampling frequency, and sampling effort). Concurrently, the Collaborative Program was initiated at this time. There was more scrutiny of the methods from governmental agency review and through the 2004 Program Advisory Panel (PAP) review.
    - The Population Monitoring Group (Science Subcommittee of the Collaborative Program) produced a document in 2006 that outlined the desired monitoring protocols, tables, figures, and data analyses. The opinions ranges from nothing but provision to data to a fully analysis. The decisions made during this process were the result of consensus (compromise) within the group.
- Inter-month fluctuations in catch rates**:** December 2010 to October 2011,
    - The results for the last year (Dec 2010 to Oct 2011) show high catch rates in the winter most likely due to the recent stocking events. The delayed peak flow (not until July) resulted in a delayed spawning during 2011.
- Relative Abundance
    - With the exception of 1998, there is 18 years of data. No sampling occurred in 1998 due to permitting/contracting issues.
    - Compared to the ~20 other fish taxa, the minnow constituted up to 70% (or 7 out of 10 fish) in 2005 whereas recent relative abundance (2010/2011) was around 4%.
- Catch Rates of Minnow
    - In terms of catch rate, there is a lot more difference (booming and busting) of the Rio Grande silvery minnow populations compared to the other fish species, which as a whole remain mostly constant over time.
    - There was a large decrease in the population during the 2000-2004 drought period. More management was instituted after 2004 so there are a lot of different inputs that need to be considered when evaluating the increase in population after 2004.
- Variation in density for each sampling site during November 2011
    - Monitoring occurs regularly throughout the year at all 20 sites. But in November of each year, sampling is repeated 4 days in a row to understand how variable the catch rates are between days.
    - No variance (i.e., same number of fish each day) would have a coefficient of variation of 0. The variation, in general, is about 0.10. According to the literature, a variation below 0.20 is good. Rob suggested that 0.10 is actually very good since the literature was not selective in terms of species.
    - In low density years, the variation is much higher.
- Distributional Abundance of minnow
    - In terms of distributional abundance between the reaches, the population in Angostura tends to remain constant between years while Isleta and San Acacia tend to fluctuate. Approximately 80% of Rio Grande silvery minnow were in San Acacia in 2011.
- Mesohabitats sampled

        - Only general trends of mesohabitat use can be gleaned because no statistical tests are run on the mesohabitat data since this is not a true habitat study (with true measures of habitat availability). No real significant differences between the mesohabitats are observed except with the main channel runs.
    - Quarterly catch rates
        - In a graph of catch rate compared to the flow rate over time, general trends can be observed. Following the flow peaks are the catch rate peaks. The population response to the strength of the peak (height and width) can get interesting: the apparent responses from the minnow population can last several months after the event.
    - Regression analysis of October catch rates - Albuquerque
        - Regression analysis of the October catch rates helps to understand the "flow versus fish" response and the possible impacts of the timing, magnitude, and duration of flow.
        - What aspects of the spring runoff spike (May to June) in flow are important?
            - A maximum discharge of ~1,500 cfs usually means low catch rates. Outliers around 4,000 cfs are lower than expected (e.g., expect the catch rates to be higher at this flow).
            - There is still some scatter with the flow duration, but the R^2 values go up and the amount of outliers go down. This indicates that the persistence of the flow is a significant influencing factor. As the number of days of discharge exceeds 2,000 cfs are increased, then the expected observation of fish in the fall is also increased.
    - Regression analysis of October catch rates – San Marcial
        - If the flow peak ends early (mid to late-June), the observed population is consistently low. There are no recorded instances of high numbers of minnow when the flow peak ends early.
        - In general, higher flows usually mean more fish. Remember, however, that is observation is specifically for the minnow.
    - Summary
        - The abundance of minnow fluctuates greatly over time. Higher population densities generally occur following periods of elevated/extended spring runoff. For years that the density increased over the previous year, the average increase is ~1,199%.
            - There has not been the same magnitude of drought conditions since 2002/2003, which means that statistically determining the relative impact of salvage/stocking efforts on recent population increases/decreases (i.e., post 2003) might be hampered by a lack of data during periods of highly reduced densities when the relative impact of those efforts might be highest.
        - The Annual Population Monitoring Final Reports are available at the following website: http://www.asirllc.com/

- *Population Monitoring Questions:*
    - ***Question***: Regarding the last set of graphs (the regression of October catch rates): those were analyzed with a linear regression, correct? Have you tried or considered a curved linear regression? In other studies, when the environment is favorable (i.e., gives the population a "boost") they respond even better. The R^2 values might get better with a curved regression.

- ***Response:*** Yes, curved linear regression has been considered and was done in previous year. The R^2 values were pretty similar but there were some areas of better fit.
- In terms of management, a curved linear regression might help to determine the areas where small changes could result in significant population response. Remember, a straight line just represents incremental steps.
- It was suggested both the linear and curved linear regressions could be presented.

- ***Question***: Are the spikes in population all young of year?
  - ***Response:*** During those times of year, about 90-95% of the population sampled is comprised of the young juveniles (20m standard length); they swamp the system. We observe a large number of small fish following the spawning after spring runoff. In general, we don't tend to see more adult fish during that same time. Through the spring (April and May), there tends to be a gradual mortality of the older age classes probably related to the spawning.

- ***Question***: In the final conclusions section, there are statements about renewing focus on things (ex. natural flow regime) that would help establish a self-sustaining population and eventually recovery. However, the monitoring program is not necessarily in a position to distinguish or determine what the salvage, augmentation, etc. have actually done to the system. The monitoring data doesn't provide the quantitative support. These statements come across as more of a "soap box" discussion instead of related back to the monitoring program and results.
  - ***Response:*** As far as helping to prevent catastrophic population declines, these statements were really only saying that if those management strategies were removed then there is more susceptibility to the drastic declines. For example, if there were no stocking, once could envision a scenario where the population declines to a critical threshold. These statements are not put in the results but in the summary as more of a philosophical point of consideration in the discussion related to the interpretation of the results. These are the sort of activities that literature and studies indicate have worked in other systems to prevent short-term catastrophic decline.
    - There might be an extreme flow scenario that would change those statements but we haven't been able to scientifically collect that data or test (ex. catastrophic drying like 2002/2003).
    - It would be great if the population monitoring study could help to determine how to optimize the survival. This will become increasingly important as water sources decrease and the likelihood of severe river drying/drought increases. We are going to have to make some hard decisions in the future.
  - It was recommended that the concern regarding the general statements could be resolved with the removal of the term "conclusions" from the last section and leave it as a "summary." This could help to address the misperception of "absolute."

- ***Question:*** What are the principle conditions or metrics that support the cohort to requirement? Are there some conditions in the spring that support a successful spawn and large cohort moving forward?
  - ***Response***: Gleaning through the changes in the population from June through October, which is the best data, we essentially observe a pretty steady decline from June to October in monthly steps. Based on the analysis, the component that seems to explain

the variation based was the persistence of higher flow over time – in other words, the duration of the spawning peak elevated flows. The persistence results in higher requirement success. When there is rapid decrease, we tend to see a survivorship curve that dips lower than if the decrease is extended and steadier. If there is a slow decline then the habitat remains longer even though eventually the flow will come down. Tempering that decline appears to be very important to supporting the success.

- The minnow need approximately 1 month to develop from the egg to juvenile. If there is a rapid spike and decline, there can be a really nice spawn but poor recruitment response. Regardless of the large spawning pulse, the habitat is not maintaining so the mortality is increased. However, there are a lot of other factors that could be considered such as the timing and reproduction of other species which varies yearly as well. It is difficult to pin down the ultimate factors.

- ***Question***: All the analysis are done on log-transformed data? When transformation is it normal?
  - ***Response:*** Yes; before the transformation, the minnow end up with a heavily skewed distribution - weighted toward the low density values. Running the transformations with the log essentially results in a more "bell shaped" curve. Things like Nova statistics are robust to slight deviations and variations particularly with high values. Non-parametrics have been done out of curiosity sake, but they haven't been included in the reporting. The same patterns are seen. There can be issues with the non-parametric Type I and Type II errors. Natural log +2 has been shown to really work with these types of systems and helps to address the issues with "zeros." In the lowest years (ex. 2002/2003) there are so many "zero" values that the analysis is crippled. This is unfortunate, since it is during the periods of low numbers that it is critical to understand how the population is responding.

- *Population Estimation Program and Site Occupancy for 2005-2011*
  - The Population Estimation study has some straight forward objectives:
    - Provide statistically robust population estimates of the minnow; refine and implement methods as needed and appropriate;
    - Provide a population estimate of the minnow based on fish densities stratified by mesohabitat for 20 sampling units; there were different methods in 2006/2007 from 2008-2011 so there should not be direct comparisons;
    - Develop site occupancy rates for minnow populations over time;
    - Calculate a population estimate of the minnow using Population Monitoring data, controlling for mesohabitat, and compare this value to that generated in Objective #2.
  - The population estimation is done using a Generalized Random Tessellation Stratified (GRTS) sampling protocol which allows for spatially balanced samples. For this system, with 3 distinct reaches, it is not purely stratified but a representative scattering of points. The justification is that there can be inherent dangers using random sampling to characterize changes in the population for situations where the organism is rare or highly mobile over time (ex. "clustering" occurs). In this situation, the samples are random but distributed through the range of the organism.
    - A number of these sites were randomly selected and there was no guaranteed access; however, it just happened that the number of sites per reach came out to the same as the population monitoring.
  - Field sampling methods
    - Aquatic mesohabitats were classified into six broad categories: runs, pools, shoreline pools, backwaters, riffles, and shoreline runs.

        - The perimeter of the wetted channel and of all mesohabitats was mapped to within 10 cm accuracy with a GPS. Then a random subset of "non-run" mesohabitats was samples for fish.
- Key factors that drove the project evolution and methodology
    - The population monitoring had been ongoing when the PAP report indicated that was need/desire for more rigorous population size estimates. The original idea was to explore the feasibility of taking the existing population monitoring data and converting it into a population estimated number of fish.
        - The actual estimate of the number of fish in the population is important in understanding the density-dependent processes and relating those to environmental variables. Essentially, with size estimates we can look at metapopulation changes due to drift and immigration, etc. It was also a part of the recovery criteria at the time.
    - Open (one-pass using seines) versus closed (depletion using electrofishing) sampling techniques were evaluated during 2007 through a series of field experiments.
        - It is important to note that the methods are based on the needs of this project since it hasn't been done anywhere else for a similar system.
- Generating a population estimate
    - Calculation of fish density is made by dividing the number of individuals collected by area sampled (#/m^2) for each mapped habitat patch. Density was calculated using empirical data but values were corrected based on the global capture probability estimates that utilized all comparable closed mesohabitat electrofishing data available (i.e., since 2008). It turns out that for each mesohabitat about 30% of fish are not detected on the first pass with the exception of runs (ca. 15% of fish are not detected on the first pass).
    - The population estimation was then calculated using: (1) the empirical density stratified by mesohabitat; (2) depletion correction (e.g., runs, pools, backwaters); (3) the density variation among mesohabitats; (4) the density variation among sampling reaches; and (5) the area of sampled reaches & total study area.
- Population estimation results
    - The population estimation results indicated that there are more minnow in the Angostura Reach (64,207) than the other 2 reaches combined (Isleta = 34,891 and San Acacia = 22,505). The total population estimate is 122,381.
- Comparing population monitoring to population estimation
    - The population monitoring doesn't have the mesohabitat-specific correction since we are not using a depletion. The sampling area is estimated since it is not mapped (i.e., not precise). Population monitoring methods violates the assumptions for estimating population size.
    - Overall, the general trend is the population estimates increase/decrease as the population monitoring data increases/decreases. However, upon closer examination of the individual reaches there are different trajectories for the distinct populations. There are very few data points, but this is not a good start in terms of reach-specific trends.
    - If the regression is completed using the last 3 years of population monitoring data the estimated population size for 2011 would be 250,387 but in reality (using the population estimation program) there were only 122,381. The over trend is fine, but the precision is not.
    - Based on the variation over the last few years, a strong correlation between the population monitoring and population estimation data is not expected over time.
- Critiques/criticisms of the population monitoring and population estimation data.

        - Since we cannot completely redo everything for the past 15 years, we can't really address every criticism.
        - The variation among samples at a site is accounted for in the population monitoring reports. In the early years, we didn't distinguish how many fish were from each habitat.
    - Estimating site occupancy rates: (distribution vs. abundance)
        - The site occupancy gets to a fundamental question of how the distribution of Rio Grande silvery minnow changes over time, which can potentially be related to changes in environmental conditions. The same November sampling dataset is used (data mined) to calculate site occupancy.
            - Just because no minnow were caught in a sampling event does not mean they aren't there. This is a species that "booms and busts" and our ability to detect the changes when the population size is low/declining is critical.
            - The site occupancy allows for the generation of extinction probabilities, colonization probabilities, as well as the probability of occupancy.
    - Site occupancy analysis
        - 400 mesohabitat samples at 20 sites (using the population monitoring dataset) were used to build a matrix of information based on presence/absence of minnows in habitats. A "0000" means no minnow were captured in that habitat for all 4 days. A "1111" indicates that minnow were captured in that habitat on all 4 days. In "boom" years, we don't see the same variation between days because the population is greater.
        - The numbers have declined since the 2005 boom year.
        - Over the 4 sampling days in November, minnow occupy 82% of the sites; this is in contrast to the population monitoring in October which indicates that the minnow occupy about 40% of the sites.
        - There is about a 3% probability per year of losing existing sampling sites that are currently occupied and there has been about a 20% cumulative decline in the number of occupied sites since 2005. Site occupancy has been declining over the last 3 years and the percentage of occupied mesohabitats has followed a similar trend.
    - Summary
        - Population estimates were significantly lower in 2010-2011 than in 2008-2009.
        - A strong correlation between the population monitoring and population estimation is unlikely to persist over time – this means population monitoring cannot be used to predict population size estimates.
        - Site occupancy indicates there is ~ 3% per year decline in sites occupied by minnow since the first year in 2005 when the minnow occupied all sites.

- *Population Estimate and Site Occupancy Questions*
    - ***Question***: At the refugium, the fish scatter before we can even approach. They have an impressive burst speed. The question is, how many fish are actually there compared to the numbers captured? Might you only be capturing a percentage of the actual fish present because with their burst speed "they are out of there?" Is there any correction for this?
        - ***Response***: We've honed the technique of the sampling to try to account for that. Remember, river water is turbid and the fish are less likely to see us coming and less likely to scatter immediately. Although this isn't a conclusive statement, it is based on field experience "best guess." We haven't observed any patterns or differential densities that might indicate the minnow are "spooked." Comparison

of a smaller and larger sampling box and analysis of the data from each might be one method to address that question. But there would have to be enough information to be tested statistically. Ultimately, the question is whether or not it is a big enough issue that it would consistently result in biases or concerns. It also comes down to the ability to work with the equipment and conditions.

- ***Question***: The 20 sample sites have been consistent over the years. Have you thought about combining sites or adding sites? There is consistency with sampling the same sites over and over but this is a dynamic river system with fish movement and occupancy changes.
  - ***Response***: This has been considered, yes. And yes, there would most likely be a difference in the numbers. The structure of habitat changes over time and there is flux within this system - a lot of which is due to management. Luckily, most of the 20 sites have not been significantly reworked. Although if the existing population estimation sites were used, there would be less bias since the sites were selected at random but it would make it hard to use the historical data to reach any conclusions on changes and it could introduce new factors.
    - If reselected for sites where fish are known, this might reduce variants or remove "zeros". It could increase accuracy, true. Interestingly, there are more sites that dry in the population estimation selection than with the population monitoring sites. If not done randomly, then sites that are known to dry could be removed and replaces with randomly selected within a wetted area – this might be a better route to explore. Although, we could end up with the situation where it is more difficult to defend the trends because the biased selection toward sites that have higher densities.
    - At some point though, we have to move beyond consistency and start to address long-term needs. We can't just continue programs that may or may not be providing the answers we need.
    - Instead of eliminating sites, maybe adding 4 random sites every year could serve as a check. There are different options. If more sites are added, the sample variation will be decreased and there will be more robust statistical analysis. The question is then, would we be able to ascertain what is the variation in the density estimates by reach by adding a different set of sites over time? Having introduced a new source of variation, it could be very difficult to tease long-term trends out of the analysis. Decreases in density could be a result of sites that just happen to land in areas where habitat quality was significantly different. It might be possible that habitat could be stratified to make sure there is appropriate distribution throughout reaches (or based on geomorphology, etc.). If there were more numbers to deal with, it might be possible to break reaches into functional subreaches (areas of dry or wet, etc.).

- ***Comment***: With less water expected in the future, accuracy and precision need to be increased so that these programs can provide as much useful information as possible. The possible transition to a Recovery Implementation Program (RIP) may provide a reevaluation or reassessment period to review what has been done and what needs to be done.

- ***Question***: If additional sampling site are added or site are removed from the estimation, what might happen to the confidence intervals (greater or less)? Are changing the sampling sites going to drive the confidence one way or another?
    - ***Response***: Most likely, adding sites will decrease the distance between error bars or precision narrowing. The error bars will most likely increase with a sample site decrease. There is no way to know what would occur with just changing sites – that would depend on the types of sites. Anytime there is a "zero," the variation "shoots" way up. Any "zeros" can really impact the confidence interval.
    - Remember, this isn't an elephant or elk; there are error bar of 1 million ± 500,000. It is hard to make any real conclusions when the confidence interval is so large. We need the historic fluctuations to properly understand the differences between the years (ex. 122,000 for 2011 but 1.9 million for 2009). There almost needs to be a separate study to get at targets within certain areas or to tie responses to specific management actions.

- Any additional questions need to be submitted to the ScW co-chairs in writing; they will then be elevated to the project COTR (Yvette Paroz).
- Rob Dudley was thanked for his time and some members encouraged ASIR to regularly participate in ScW meetings, even on a quarterly basis.

February 21st, 2012 Action Item Review – postponed to April

- Due to time constraints, the February 21st, 2012 Action Item Review was postponed until the April ScW meeting.

Update from March Captive Propagation & Genetics Meeting

- Jason Remshardt shared highlights from the March Captive Propagation and Genetics (CP&G) meeting.
    - The spring meeting is always focused on the stocking needs and planning for the year. CP&G attendees discussed the number of fish stocked last year (~200,000 for the Middle Rio Grande or MRG). It is assumed that the same amount will be needed this year plus an additional 10-15% based on the predicted flow conditions for a total of 225,000 for the MRG. Generally, the BioPark annually produces ~40,000 to 50,000 minnow; the Los Lunas refugium produces ~5,000 to 10,000 minnow (they may produce more this year); and then the Dexter facility produces the remaining fish (~300,000).
    - CP&G attendees also discussed the role of genetics and how it fits with the propagation and augmentation efforts. Jason sent a courtesy letter sharing the CP&G perspective on the impacts of genetics on the propagation and augmentation to Jen Bachus (ScW co-chair).
    - Since this year is expected to a low water year and thus a good egg collection year, the BioPark suggested they would be collecting all the eggs they need from the wild. They will probably do one captive spawn for consistency.
    - This is the final year in the stocking hiatus "experiment" for Angostura unless the population monitoring numbers are very low that there is a risk concern. The Service won't let the population drop to a significant low.
        - Usually augmentation in the MRG occurs after the irrigation season but before ASIR does the population estimation work – usually in the first weeks of November. The fish are marked so the data can be separated.

Action: Jason Remshardt will distribute a copy of the March Captive Propagation and Genetics meeting notes to the ScW work group.

Discussion on future genetics monitoring work

- This is the last year for the 5 year grant which will expire in September 2012. Originally, the genetics program was the next project to be peer reviewed but that has been put on hold until the Executive Committee develops an official peer review process and procedures. With the current expiration date, the genetics monitoring will not capture the captive stock monitoring that occurs in October or November (since their contract will be expired by then). The wild stock was monitored in February.
    - The CC is still discussing the possible funding of this project for FY12. The genetics monitoring has to be competed as a new procurement which is expected to take 4 to 6 months to have in place; unfortunately, there is no time to do new procurements.
    - Concern was expressed that the genetics monitoring is critical and the genetics information need to be in place in order to be aware of and respond to any potential emergency situations. Ideally, this means a contract would be in place no later than October 1st, 2012 in order to avoid loss of sample continuity and analysis.
    - Due to the time constraints at this meeting, it was suggested that the ScW continue discussing the genetics monitoring work at another time.

Action: Stacey Kopitsch will coordinate/organize a meeting for ScW volunteers to discuss the continuation of the genetics monitoring and make recommendations/provide feedback to the CC.

Elections for co-chair positions

- Alison Hutson has completed 2 consecutive terms as the non-federal co-chair. Jen Bachus has completed her year and is unable to volunteer for a second year.
- This was discussed at last month's meeting and a call for volunteers was issued. However, there have been no responses and no volunteers to fill the positions.
- No one volunteered during the meeting, so the issue will be elevated through the chain-of-command to the PM and CC.
- Concern was raised that Reclamation has not provided a primary ScW representative since Jeanne Dye left.

Action: Jen Bachus and Alison Hutson will elevate the lack of volunteers for the ScW co-chair positions to the PM and CC.

Review/approve changes to draft data synthesis plan

- The CC edits to the Draft Data Synthesis Plan have been addressed in tracked changes. Members with no conflict of interest were encouraged to take a hard copy for any additional review and comment. Any additional comments, edits, or feedback on the recent changes to the Draft Data Synthesis Plan (in response to the CC requested edits) are to be provided to Stacey Kopitsch by email no later than April 9th.

Action: Any additional comments, edits, or feedback on the recent changes to the Draft Data Synthesis Plan (in response to the CC requested edits) are to be provided to Stacey Kopitsch by email no later than April 9th.

Update on 2012 budget

- Due to time constraints, the 2012 Program Budget update was postponed until the April ScW meeting.

Update on Fecundity Study– request for volunteers

- The Dexter Facility has prepared a draft scope of work. There is no money in the Program's FY12 budget to fund this study, but Dexter is looking into the possibility of funding the study through their budget.

  - This was a ScW proposed study and members expressed wanting to continue to be involved and proactive with the process.
  - Jericho Lewis (Reclamation's Contracting Officer) recommended that the scope review and any additional work on this potential process be stopped until it is known whether or not Dexter will be able to move forward using their own funds, which should be known within the next month.
- If Dexter will be able to fund the project, then the ScW will provide feedback on the draft scope of work.

Program Update

- *Executive Committee (EC) Update*
  - The EC will be meeting for a full day on March 28th.

- *Coordination Committee (CC) Update*
  - The March 7th CC action items and decisions were distributed to ScW members via email. The CC will be meeting again on April 11th. They will continue to discuss the 3 remaining projects for potential funding in FY12.

Next Meeting: April 17th, 2012 from 9:00 AM to 11:30 AM at ISC.

- April tentative agenda topics: (1) K. Buhl presentation; (2) election of co-chair positions; (3) approve the draft data synthesis plan; (4) FY12 budget updates; (5) February and March Action Item Review;
- Future tentative agenda topics: (1) joint session with HR; (2) discussion on increasing the museum sample size (preservation of the October collection) including the objectives, benefits, status of current collection, etc.;

Upcoming Meetings

- EC: March 28th, 2012 from 9:00am to 3:00pm at Reclamation
- CC: April 11th, 2012 from 12:30pm – 4:00 pm at Reclamation
- ScW: April 17th, 2012 from 9:00am to 11:30am at COE

Science Work Group
March 20th, 2012 Meeting Attendees

	NAME	AFFILIATION	PHONE NUMBER	EMAIL ADDRESS	Primary, Alternate, Other
1	Stacey Kopitsch	FWS	761-4737	stacey_kopitsch@FWS.gov	A - PMT
2	Alison Hutson	ISC	841-5201	alison.hutson@state.nm.us	P – Co-chair
3	Dana Price	USACE	342-3378	dana.m.price@usace.army.mil	A
4	Jen Bachus	FWS	761-4714	jennifer_bachus@fws.gov	P – Co-chair
5	Yvette Paroz	Reclamation	462-3581	yparoz@usbr.gov	P
6	Rick Billings	ABCWUA	796-2527	rbillings@abcwua.org	P
7	Peter Wilkinson	ISC	827-5801	peter.wilkinson@state.nm.us	O
8	Douglas Tave	ISC	841-5202	douglas.tave@state.nm.us	A
9	Jason Remshardt	FWS	342-9900	jason_remshardt@fws.gov	O
10	Rebecca Houtman	COA	248-8514	rhoutman@cabq.gov	P
11	Kirk Patten	NMDGF	476-8103	kirk.patten@state.nm.us	P
12	Rob Dudley	ASIR	247-9337	robert_dudley@asirllc.com	O
13	Jericho Lewis	Reclamation	462-3622	jlewis@usbr.gov	O
14	Grace Haggerty	ISC	383-4042	grace.haggerty@state.nm.us	O
15	Ann Demint	Reclamation	462-3654	ademint@usbr.gov	O
16	Marta Wood	Tetra Tech	259-6098	marta.wood@tetratech.com	O – note taker