



Approved Summary
BIOLOGY COMMITTEE MEETING
21-23 February 2017
San Juan College
Farmington, NM

Attendees

Biology Committee Members

Bill Miller – Southern Ute Indian Tribe
Jacob Mazzone – Jicarilla Apache Nation
Brian Westfall – Bureau of Indian Affairs
Jason Davis – U.S. Fish and Wildlife Service (Region 2)
Mark McKinstry – U.S. Bureau of Reclamation
Benjamin Schleicher – U.S. Fish and Wildlife Service (Region 6)
Vince Lamarra – Navajo Nation
Mike Ruhl – State of New Mexico
Tom Wesche – Water Development Interests
Dave Gori – Conservation Interests
Craig Townsend – Bureau of Land Management

Peer Reviewers

Steve Ross – University of New Mexico
Mel Warren – USDA Forest Service
Wayne Hubert – University of Wyoming
John Pitlick – University of Colorado

Program Management

Sharon Whitmore
Melissa Mata-Gonzales
Scott Durst
Nate Franssen
Eliza Gilbert

Other Interested Parties

Steve Platania – ASIR (American Southwest Ichthyological Researchers)
Mike Farrington – ASIR
Howard Brandenburg – ASIR
Nathan Brown – U.S. Fish and Wildlife Service Region 2 – Farmington Field Office
Tom Sinclair – U.S. Fish and Wildlife Service Region 2 (NMFWCO)
Bobby Duran – NMFWCO
D. Weston Furr – NMFWCO
T. Kim Yazzie – Navajo Nation Department of Fish and Wildlife (NNDFW)
Jerrod Bowman – NNDFW
Henry Day – Arizona Public Service (APS)
Richard Grimes – APS
Scott Clark – University of New Mexico
Nate Cathcart – University of Alaska Fairbanks
Christopher Cheek – Purdue University

Casey Pennock – Kansas State University
Brian Hines – Utah Department of Wildlife Resources

Daniel Lamarra – Environmental Research Institute
Carrie Lile – Southwestern Water Conservation District – Colorado
Katherina Diemer – Bureau of Land Management (BLM)
Susan Behery – Bureau of Reclamation Upper Colorado Region (BORUCR)
Marc Miller – BORUCR
Ryan Christianson – BORUCR
Pamela Norris – Four Corners Power Plant
Matt Zeigler – New Mexico Department of Game and Fish (NMDGF)

Tuesday February 21 2017

- A request was made from the Upper Colorado River Recovery Program for Grass Carp stocking information. NMDGF has importation permit requirements and this species would only be stocked from certified triploid sources. NMDGF will investigate any recent stockings. Few captures of Grass Carp occur in the SJ but there are many in the Upper Basin. BC members who have information should look into their records and send information to Kevin McAbee.

Approve draft summary from 29–30 November 2016 BC meeting

- Comments incorporated from Wesche, Gori, Westfall, and Zeigler. *Wesche motioned to approve meeting summary; Lamarra seconded; approved unanimously.*

2016 Project Reports/Presentations

2016 hydrology and 2017 operations – Behery

- 2016 snowpack was 76% of average for the April/July runoff. Winter base flow releases held to ~350cfs to store water for a spring release. The 2016 spring release was a 3 day ramp up but then reduced to 2,000 cfs due to private property concerns in the floodplain. Flow then slowly increased to ~4,000 cfs and matched Animas. Maximum flows of 4,200 cfs were sustained. There were 52 days >2,500 cfs, 35 days >5,000 cfs, 8 days >8,000 cfs. The 5 days at 10,000 cfs target was not met and 8,000 cfs target is past due. Both 2,500 and 5,000 cfs targets were met.
- 2016 was a perturbation year (21 storm events).
- 2017 - reservoir is currently 6,057 ft. with most probable snowpack 115% of average, predicting 630,723 af for a spring peak release. Ramp up will likely be incremental starting with 3,000 cfs due to previous year's flooding issues. A 59 day hydrograph release should result in a lake elevation of 6,050 ft.

Discussion

- To try and mitigate flooding issues BOR increased flows from 350 to 500 cfs as it is considered an additional 150 cfs will move sediment out of system, there is a lot of water in the reservoir, and an increase of 150 cfs does not require much water. BOR will send 5-7,000 postcards informing public of release and public meetings will be held.
- What will strategy be if flows restricted to 3,000 cfs and what will happen with extra water in this event? BOR would act to prevent overflow of dam such as increasing base flows. There should be enough storage after peak release to preclude overflow of dam.
- What is being done to maintain safe channel capacity set by Army Corps of Engineers (5-6,000 cfs)? No level of governmental has authority to move structures that are in floodplain.

- Why did previous release of 5,000 cfs have little impact to floodplain? Channel morphology has changed and long-term low base flows reduced the capacity of the channel to withstand flows due to channel aggradation (i.e. river sediment build up caused water's edge to differ between years). Would conservation easements help? Michele Truby is the floodplain manager for San Juan County Office of Emergency Management. Releases from Navajo are not allowed to destroy or threaten property if it is not for emergency or safety reasons. If 2017 is a slow ramp up (>3 days) 10,000 is possible but would require Animas (projected to be above average).
- Preclusion of 5,000 cfs releases in the future could result in the loss of channel capacity and reduce ability to meet flow recommendations.
- A perturbation trigger has not been developed for the current decision tree. Adding a perturbation trigger would likely reduce the availability of spring peak releases.
- Some runoff will soak into the ground but snowpack is already above average.

Water temperature – Miller

- Temperature depression observed during peak release and dissipates downstream. At Four Corners the depression was ~4°C. Temperature increased quickly upon cessation of peak flows.
- This was the last year of the project. Future data will be collected by and available from USGS.

Discussion:

- USGS is recording temperature at Shiprock (Gold King mine monitoring).
- The gage at Animas is no longer reading (BOR would look into why it is not reading).
- McElmo temperatures should be monitored to assist with stocking and determine if fish movement into the tributary is temperature related.

2016 Rare fish stocking summary – Furr

- Overall the Program is meeting targets for both species. Additional 2016 Pikeminnow stockings included age-1 prey trained fish and age-1 to 3 fish (Hogback Canal Weir test). Razorback stocking target has been surpassed but is 59% if fish from Uvalde removed. Retention studies analyzing hatchery source, stocking location, soft or hard release, and flow conditioned fish are in place. Analyses will begin next year. Revision of Pikeminnow augmentation plan scheduled.

Discussion:

- Many soft release sites are bermed off and some washed out.
- Concern was raised as to whether Uvalde fish should be considered in the total stocked when it is known their survival was minimal.
- What analysis of soft versus hard release has been done and what is the objective of analyzing stocking location? No analysis conducted to date. It will be difficult to conduct a full assessment because of current sampling regime. The only survey conducted throughout the entire river is fall adult monitoring. Stocking locations in the lower river will have more power to detect differences as they are sampled more frequently. The stocking studies were put in place prior to changes in the nonnative removal procedures, which moved effort in the upper to the middle portion of river.
- Because of the 2016 age-0 Pikeminnow captures, concern was raised about stocking hatchery fish on top of wild. What should the program do if as many age-0 fish are captured in 2017? A calcein marking study is underway. The 10-month study was begun in January and designed to mimic field conditions. To be considered an effective tool it needs 95% accuracy. BIO-WEST was unsuccessful with this marking technique but new technology may assist in discerning the mark. By August, some results will be available and may help with decision-making (stocking occurs in November). Marking is work-intensive for the hatchery staff.
- A contingency plan for 2017 Pikeminnow stocking should be developed if small-bodied monitoring captures a similar number of fish as in 2016. Stocking unmarked young of year means overwinter survival cannot be tracked.

- A trigger to change stocking, needs to be incorporated into the longer-term plan revision.
- The Program continues to capture untagged Razorback <300 mm TL. Should stocking this sized fish cease? It would be a cheap, easy, and instant way to know a fish <300 mm TL is wild. NMFWCO will work with PO to develop options on how to use fish too small to be stocked.

NAPI grow-out ponds and PNM Fish passage – Bowman and Sinclair

- Fish passage open 7 days/wk March-Oct. with 218 flowing days and 12 days nonoperational. Fish captured = 17,510 (144 Pikeminnow, 89 Razorback, and 88 Catfish). Pikeminnow passed above weir in July and Razorback, March–October. Channel Catfish captured in August.
- Upgrades included installation of debris pole, trash rake, and safety rails. Debris pole is keeping sediment down, the upstream island is smaller, and larger debris has been reduced.
- NAPI ponds filled in April and 7,000 fish stocked (194-220 mm TL). Harvest of fish began when 70% of fish were >300 mm TL. Passive harvest began mid-September and active harvest, mid-October. In one pond mortality due to Ich was 80%, with 200 fish surviving and those fish were ultimately stocked into the SJ. Normally ponds can be flushed but NAPI inflow was not functioning. A total of 2,510 Razorback were stocked into the river.
- Proposal has been submitted to BIA for a kettle at West Avocet.
- USFWS Southeast region has aquatic habitat restoration team with large scale heavy equipment and experience. Through a request from NMFWCO they traveled to NAPI and regraded the slope towards the kettle at East Avocet and Hidden ponds and removed emergent vegetation from the pond and shoreline. Shoreline work was also conducted at West Avocet.

Discussion:

- If BIA proposal is not approved should the SJRIP support purchase of the West Avocet kettle? No recommendation by BC was made.
- Ich treatment was 15 bags of salt but constantly flowing water was needed.
- The CC would likely want to see a slide showing long-term captures at PNM fish passage.
- Passage opened February 14th but there were few fish (n=4) and it was full of sediment.
- One Pikeminnow ~475 mm TL was captured. Length data important to the BC as well as the CC.
- Two year old Razorback are spawning in ponds and producing offspring.
- The trash rack does trap and kill some fish.
- No current plans to analyze and present PNM antennae data.
- Re-grading of pond should occur every 8-10 years and annual or semi-annual shoreline maintenance should be conducted, this requires a brush cutter and skid steer.

Fish entrainment at Hogback – Brandenburg

- Investigations incorporated adult, sub-adult and larval fish. Important to note intake into canal is 250 cfs with 2/3 of flow into irrigation canal. The system is often run manually. PIT tag antennae cannot assess entrainment because of electrical noise interference of Variable Frequency Drive (VFD) pumps downstream in canal. During testing when VFD pumps were shut down PIT tag antennae indicted many stocked fish remained in the diversion canal. For stocked fish, 14.1-53.3% returned to river. A high percentage of Pikeminnow stocked in 2016 at night went over the weir and were entrained. Wild suckers captured at PNM and stocked into the canal were not entrained.
- Two different ages of larvae were released in 2015 (swim-up phase) and 2016 (an older phase-flexion mesolarvae) as well as ~2.0+ million neutrally buoyant beads. Younger larvae were entrained at a higher density than beads or older larvae. Overnight studies showed a higher density of larvae in irrigation canal than in return for 3 of 5 surveys, 2 surveys had too few captures to make a comparison. A higher proportion of older larvae were captured in the return channel.

- The proportion of water diverted affects the proportion of fish returned to river.
- Acoustic Doppler mapping velocities along weir wall showed no substantial upwelling. Most flow is sweeping along the weir with flows coming from the surface over the weir.
- Hydraulic engineers that conducted the Acoustic Doppler work recommended a log-boom with skirt to potentially disrupt surface flows and reduce entrainment.

Discussion:

- Unknown when VFD will be replaced or mitigated, but plans are for fall of 2017 or winter of 2018. It affects most of the 9 PIT tag antennae.
- A little variability in upwelling may be observed when return gates are closed.
- Tests done when system was on automatic but it is known that flow diverted into irrigation canal is variable and this may be when system is taken off automatic and/or because upstream diversion gates are operated manually. BOR believes the system would operate correctly if consistently operated on automatic. Irrigators are reluctant to operate system on automatic.
- BOR will move forward with installing the log boom with skirt.
- In the future there will be a modification to Hogback Canal as it will be the intake location for the Navajo-Gallup water project.
- The Hogback Canal consultation allowed for take of larvae but not adults. There are more favorable ways to operate the system. The irrigators did not ask for an automatic system. There is an issue if they are not getting their water when it is run automatically. To have the system run correctly may require a person in the local area to check on it. This should not occur with the Fruitland diversion as it will not have an automatic option. The Hogback system is better than traditional screening. In the Upper Basin screens are raised 75% of time.

Larval fish monitoring – Farrington

- 2016 resulted in more Pikeminnow captures than in any previous year (n=548). Captures were distributed throughout river. Mixture modeling indicated adult captures from fall monitoring best predict larval captures. 2016 model results similar to 2014. Back-calculated spawning dates were 29 June - 12 July (14 days). Water temperatures at Four Corners were between 15–18 °C during that time. Pikeminnow spawning identified in 8 of the last 14 years. Pikeminnow only captured in July 2016 sampling trip. This was the first time captures occurred in Reach 5 and this was at Hogback Canal during weir tests.
- 2016 resulted in an average number of Razorbacks larval captures. Year is the top predictor for mixture model with some support given to flow. Flow shows an inverse relationship and may be why fish were collected lower in the system in 2016. Developmental stages of larval fish captured included protolarvae through juveniles. The broadest spawning period to date was calculated for 2016 (16 March – 1 July; 16 weeks). Water temperatures were ~8-18 °C during this time. Extended spawning period due to late captures of Razorback at Hogback during weir tests. Almost 20 years of Razorback spawning documented.
- Annual density of common fish is variable.
- 2016 Channel Catfish density estimate was significantly higher than 2015 but not different from prior years. Catfish were captured in late July with highest captures in Reaches 2 and 1.
- Larval fish captured in similar proportions at TNC restoration and control sites. Pikeminnow captured at both.
- Opercular deformities still present but low (~20%).

Discussion:

- Catfish captures low (i.e. lower than for Razorback even though Catfish population likely much higher than Razorback). This is possibly due to nest guarding behavior of adults which occurs until yolk sack is absorbed or due to habitat sampled and season of sampling. Catfish spawn later

and last larval fish sample is conducted in late July possibly before most Catfish larvae are mobile.

- Larval habitat appeared unembedded and backwaters and secondary channels cleaned.
- Some of the larger collections of Pikeminnow were 2014 and 2016 (July months only) even though flow years differed between years.

Wednesday February 22 2017

Small-bodied monitoring – Zeigler

- Used a Delta-GLM approach to model density and compared predicted to actual captures. Crews captured twice as many fish as previous years with 80% of those captures consisting of native fish. The majority of these fish were Speckled Dace although Channel Catfish captures were also high. Age-0 Pikeminnow (n=23; 35-51mm TL), 3 age-0 Roundtail Chub, and 1 age-0 Razorback (123mm TL) were captured. Age-0 Pikeminnow captures occurred from RM 108 down to RM 58. Probability of presence was higher in zero velocity habitats. A river-wide estimate of 10,000-20,000 wild age-0 Pikeminnow was calculated using a capture probability of 0.075 and estimate 1% of available habitat sampled.
- Common sucker population numbers have not demonstrated changes over time and Speckled Dace increased in 2016. Channel Catfish increased significantly and continued low densities identified for Red Shiners.
- Adjustments to monitoring protocol suggested (sample middle river first and then based off of number of Pikeminnow captured decide whether to sample either the lower or upper river). Recommended fall stocking be adjusted if age-0 Pikeminnow captured in 2017. Recommended PIT tagging fish as small as 100 mm TL rather than the current 150 mm TL cutoff.

Discussion:

- The BC discussed tagging smaller Pikeminnow. There are many different places where a PIT tag could be inserted into a smaller fish. The tagging protocol is not set in stone.
- The desire to change effort from the upper river to the lower river, if needed, is based on the idea the lower river may hold more age-0 Pikeminnow. The change may reduce applicability of long-term data set but may be useful. The new concept will be presented in the next statement of work for consideration by the BC.
- The number of backwaters sampled in 2016 (n=23) was greater than 2015 (n=8) and may be an indication of the work done by the 2016 peak release. Cobble was not as embedded as prior years.

Adult monitoring-Schleicher

- 2016 was the first time Pikeminnow captured in SJ above confluence with Animas. Razorback not captured in this section of the river in 2016. Oldest Pikeminnow captured in SJ in 2016 was from 2006 year class. A total of 142 Pikeminnow captured in 2016. The 2011 cohort continues to be present in captures. Captures of age 4-6 fish are occurring. Seventh consecutive year of sub-adult or adult captures.
- Razorback captures were higher than any prior year (densities ~ 5fish/mile).
- Percent of samples with endangered fishes (80%) has been consistent in the last couple of years.
- Flannelmouth Sucker was the most abundant species captured. Catfish continue to vary and densities increase downstream. A single Roundtail Chub was captured
- Relative condition has not decreased year to year indicating little impact from electrofishing.

Discussion:

- Not known why Pikeminnow from 2011 were retained at a higher rate than other stockings but many more age-1+ fish stocked in 2011 than other years.
- One of the triggers calculated and discussed for downlisting was 25 adult Pikeminnow, 4 were captured in 2016.

- The condition factor evaluation was a comparison of averages within the population not a comparison to a standard. For the presentation to the CC, BC suggested the comparison line should be a “0” rather than a “100”. The BC desired to know the value of “good” verse “bad” condition and then wanted to make comparisons to Upper Basin fish.

Non–native species monitoring and control – upper river - Duran

- A presentation of changes to be implemented in 2017 and request for discussion.
- River sectioned into control and treatment reaches. Shiprock to Montezuma sampled by NMFWCO and Montezuma down by UDWR. For NMFWCO, 6 trips prior to spring release and 4 trips in the fall (2 passes each trip). Six options were developed and then ranked at workshop. Preferred option was to concentrate sampling before spring runoff with a population estimate at the beginning and end, maintaining control reaches. A population estimate will be obtained for control reaches, returning Catfish to river during control reach population estimate.

Discussion:

- Population estimates will be done for 100 river miles and will include endangered fishes.
- Another workshop will be convened in 2017 and then the CC will make a decision.
- Franssen will present results of nonnative fish removal to CC. Duran or Hines will present protocol changes.
- The initial premise was that Catfish don’t move but 2016 data showed they moved and this makes having a control reach difficult. The study was developed to assess whether nonnative removal can have an impact on the Catfish population - enough to affect native fish. The system is leaky with a lot of noise but the study design is good for such a large scale. If the system is so leaky we may not be able to separate the results from the noise; but we won’t be able to tell until we do the work. It would be clearer to call the “control” a “reference”. If a signal can be identified within all the noise, it will be a convincing signal. If we don’t get a signal we still can’t say there is not a strong effect by Catfish on the system. We do know that we have “an effect” as we remove Catfish. There needs to be at least one more serious effort.

Non–native species monitoring and control – lower river - Hines

- Focus was on endangered fish as nonnative fish data presented at workshop. The 2016 population estimate for Pikeminnow (n=218) needs to be redone but there may not be enough recaptures to obtain an estimate.
- Many Razorback (n=263) were captured but low recaptures precluded population estimate.

Discussion:

- A disproportionate number of Razorbacks captured below the waterfall were stocked in 2013 at Montezuma Creek. Are these fish in the lower river too?

PIT tag summary - Durst

- As in prior years, 78% of Pikeminnow recaptured are recently stocked individuals. The number decreased in 2016 likely due to change in nonnative removal strategy.
- In 2016, about 32% of Razorback handled were stocked prior to 2011. About 8-9% were considered untagged and the length frequency histogram indicates these are large fish. The high percentage of untagged fish is attributed to tag loss and possible issues with data collection rather than wild recruitment.
- In 2015, 175 Razorback were stocked <275 mm TL with 31 < 250 mm TL. A minimum size at stocking (>300 mm TL) is recommended, as any fish <300 mm TL would automatically be identified as a wild fish.
- Population modeling showed inclusion of variation in time affecting detectability was best model.
- 2016 data different from other years.

- Inclusion of PIT tag antennae detection data improved encounter records.
- The “Pathways” document uses downlist and delist criteria, with caveats specific to the SJ. Current calculations for Pikeminnow would require adult monitoring to have a 4.2% detection probability and capture of 25 fish >417 TL. Scott Clark (UNM) is working on determining survivorship of age-6 and 7 which will be needed to assess a population estimate of 400 self-sustaining adults (age 7+). Razorback annual post-stocking survivorship would need to be ~81% with a detection probability of 2.4% and capture of 19 age-3 wild fish. Including Lake Powell should be considered once effort is standardized and detection probabilities calculated.

Discussion:

- When population modeling presented to CC it should be “river mile abundance”
- STReAMS is missing data. There were 201,135 fish of unknown species. Some cleaning of the PIT tag antennae data is done before upload. There is a QA/QC at time of data upload but this will be discussed at upcoming workshop. Waterfall data may not be in STReAMS
- There is money in 2017 SOW to summarize PIT tag data but not known who will be assigned task. It would be good to assess detections by site.
- The combination of field recaptures and PIT tagged antenna detections suggests the Program is not missing many fish. The PIT tag antenna array was just installed in the large bypass at Hogback in December 2016. Addition of behavior to the mark-recapture model was weak suggesting fish are not learning to avoid electrofishing boats.
- Variation around the population estimate trigger should be considered. One trigger point is necessary to hone in on the need to conduct a population estimate and then better estimates can be derived. It may be an expensive way to learn the trigger was too broad.
- The recruitment trigger is different from what was in previous “Pathways” versions. Recruitment is now defined as juvenile fish recruiting into the adult life stage.
- A long-term plan to scale back or reduce stocking as well as a short term contingency plan needs to be put in place. An important question is whether stocking is detrimental to wild fish and what is the value of wild versus stocked fish.
- We need to know how to increase survivorship and devote energy into increasing reproduction and early life-stage survival.
- Using existing data, we have some ability to get abundance and capture probability. Remote detection helps increase ability to understand some demographic parameters.

Trophic ecology and isotope analysis - Franssen

- Using stable isotope data (^{15}N) Pikeminnow transition to piscivory is gradual in the SJ rather than dramatic as previously conceived. For age-1 fish only total length predicts ^{15}N . For this age, ^{15}N did not depend on flow or small-bodied prey abundance. For age-2 fish, total length was a strong predictor. Age-1 ^{15}N densities had predictive power but it was negative, opposite from what was expected. ^{15}N did not seem to depend on drivers one would think besides total length.
- A lab diet study was conducted to determine trophic discrimination factors, previously not known for this species. The study was useful for ^{15}N but ^{13}C results were unexpected and unexplainable.
- A Bayesian mixing model estimated contributions of different diet sources for captured age-1 and age-2 Pikeminnow. About 30% of diet comes from invertebrates with 20-60% variation among years. The data is mostly unimodal; bimodal would support a hypothesis that the age classes were eating different diets. On average there is a decrease in the contribution of invertebrates as fish grow to 300 mm TL. At that size they are still predicted to be feeding on 10-15% invertebrates.
- The change in ^{15}N is linear. A distinct diet shift would result in non-linearity.
- Why do age-2 fish show such similar values to age-1 fish? Is it prey base, is it their natural feeding ecology, an issue of hatchery fish, or some other trophic interaction that doesn't allow Pikeminnow to quickly transition to fish?

Discussion:

- There is a study underway (Chris Cheek, PhD supported by SJRIP) to assess whether there are differences between the SJ and Upper Basin Pikeminnow in regards to ¹⁵N values
- This work is important as it comes down to a question of whether the condition factor of Pikeminnow in the SJ is good; do they grow like they should?
- Larger fish were sampled but not included because of complications with assigning a cohort. Their ¹⁵N values continued in a smooth linear fashion with age-2 fish.
- The lab experiment provided a ¹⁵N half-life of 92-211 days.

Remote PIT tag monitoring and sampling of endangered fishes downstream of the waterfall in 2015 and 2016 – Cathcart

- Unique Razorbacks detected and/or captured = 716; Pikeminnow = 21; and 1 Bonytail Chub. Antenna deployed earlier in 2016 (2 March) than in 2015 (21 March) with 90% of 2016 detections occurring in the portion of the year not sampled in 2015.
- Razorback was most abundant before runoff flow when water temperatures < 16 °C. Spawning behavior is a possible reason fish are moving to waterfall.
- Pikeminnow detected were stocked in 2006 or later and Razorbacks were from as early as 2000. Razorbacks detected and/or captured from the Upper Basin were from stockings as early as 2004.
- 50% of Razorbacks detected in 2015 were redetected in 2016 including Green River fish.
- Half of the Razorbacks detected were fish stocked in 2013 at Montezuma Creek.
- Captured fish were different individuals from those detected on the PIT tag antenna. One Pikeminnow was 571 mm TL and had no prior captures.
- Overall, 148 Razorbacks were translocated above waterfall with 35 implanted with sonic tags. Three Pikeminnow were translocated.
- STReAMS query identified 1 Pikeminnow detected at RERI site in July. Four detections of Razorbacks as high up as RM 167, one detection was at an RERI site.

Discussion:

- Data from PNM passage has not been entered into STReAMS.
- No submersible ultra-sonic receivers (SURs) above PNM so it would be important not to move sonic tagged fish above weir.
- The SURS have low detection probabilities (two fish detected so far). An active search for translocated fish will be done monthly (Casey Pennock, KSU). A SUR will be placed below waterfall to identify when fish first arrive.
- A thoughtful analysis needs to be made of fish movements.
- The waterfall project indicates fish below the waterfall will move upstream if given access. This is a critical part of the population, large spawning adults that are attempting to move upstream. The waterfall may have a more critical impact on Pikeminnow. The SJ has few big older Pikeminnow. If they go over the waterfall they are unable to return.
- The waterfall has been present since 1994 and inundated a couple of times. In the last 12 years it has only been inundated once with duration of two weeks in late July. Lake Powell has to exceed 90% capacity to inundate waterfall, an elevation of 3,686 ft.
- 2 of 148 translocated Razorback detected at RERI sites - how many other secondaries are these fish moving to? In June, the RERI site was only running 600 cfs but there were two fish translocated from the waterfall detected there.
- The antennas will be at the waterfall until early April, likely Razorback pre-spawn time period.
- BC should provide Casey Pennock (KSU) with appropriate questions to address.

Habitat monitoring – Lamarra

- The longer duration of high flow had an impact on habitat.

- The mapping flight was 14 August 2016 and field verification done from Shiprock to Four Corners. There was debris in the river and much sand and cobble movement.
- Total wetted area was similar among years but dramatic change in movement of material (pre and post peak release habitat described for 6 specific areas of river).
- Island count increased from 2015 to 2016 mostly in reaches other than reach 5.
- Large widespread low velocity habitat created. 2016 had the most low velocity habitat since 1996 - most increase occurred around RM 119. Backwaters were gained in all reaches except 6.

Discussion:

- The SJ experienced flows like 2016 in 2002, 2003, and 2005, why didn't the river respond in the same way in those previous years? Was it duration or peak that caused the 2016 geomorphic restructuring? There wasn't much of a peak in 2016 but the duration was at $\frac{3}{4}$ bankfull. Flows were greater in 2005 but the difference between years might have been the volume of water or preceding monsoonal flows, although it appeared much of the work done in 2016 was prior to the majority of monsoonal events. If a change is observed without 10,000 cfs can we focus in on a lower magnitude and flow duration, to initiate beneficial changes in river morphology? Moving sediment is nonlinear so it may be ill advised to target duration over magnitude. More work is done with higher magnitude. The Upper Basin always tries to boost peak as much as possible.
- Flows above 9-10,000 cfs create incredible nursery habitat.
- Gravel berms may now act as dams. This will likely be site specific.
- There is a new technique called "Structure from Motion" which is a way to make digital topography from photographs. It would provide topographic change.
- The BC should decide what it wants to see for habitat monitoring and provide direction. Time and thought should be given to development of a comprehensive habitat monitoring plan and might mean a year is allocated to plan development. Conversation tabled to afternoon.

Monitoring of secondary channel restoration sites – Gori

- Phase II included simultaneous habitat and fish (larvae and small-bodied) data collection. In 2016, cross channel transects were re-surveyed (6 restored and 1 reference). Pressure sensors with temperature sensors redeployed but not game cameras due to vandalism.
- Stage-flow data shows restoration was successful. Prior to restoration, secondary channel flowed when mainstem >930 cfs and did not flow at <659 cfs. Now flow is present at ~ 300 cfs.
- Total wetted area increased in 2016 as a result of high spring flows.
- Overall increase in cross sectional area in restored channel but reference channel lost area. Tertiary channels did not all respond the same. Spring flow kept channel open and flowing.
- Density of native fishes varied by habitat. Nonnative fish density was similar across mesohabitats. No significant difference in native or nonnative fish density in restored versus reference channels.
- Age-1⁺ Pikeminnow (n=4) captured in restored channel.

Discussion:

- Habitat richness is measure of habitat complexity or turnover along 100 meters. Why would richness change so much from fall 2015 to spring 2016 given winter low flows and hydrograph stable? The differences may be due to such a small scale analysis.
- 2017 is the last year of monitoring for this project.
- Four potential sites have been selected and a preliminary assessment is being conducted for Phase III. There will be site visits in spring and a possible trip to Stewart Lake. Property at Recapture Lodge is still in consideration. The vision is to build in any necessary management, use an experimental approach, and avoid O&M costs as seen in Upper Basin. The PO will be involved with the selection process.
- Sites like those selected in Phase II should be considered as they seemed to work well.

Discussion of 2016 project reports, results, and data; overall assessment of what was accomplished; progress toward recovery; questions to be addressed for annual meeting; additional data integration priorities; 2018 scopes of work

- 2016 indicated that flows are still a viable management tool.
- A priority for new scopes of work is habitat monitoring.
- What can be done to allow for 5,000 cfs from Navajo? Is there channel modification that would help? Can the properties in the floodplain be identified?
- If another peak flow is released there should be aerial mapping and a request was made to include aerial mapping below the waterfall to Lake Powell.
- The flight schedule depends on what questions we want to answer. Base flows are flown for monitoring purposes. Additional funds are not available to determine bank full which is what you would get by flying at high flows. Determining bankfull would have to be carefully timed so that flow was just beginning to overtop banks. Just flying at any high flow might not give you bankfull. If you only did a high flow flight you would not know what work was done to river. High flow could give you bankfull and you can test what this amount is along the entire river. This is a very different question than what is being captured at low flow which provides you details of complexity. Both are useful.
- Hypothesis or questions to be answered need to be incorporated into the habitat scope of work. This should be part of all new proposals as it dictates what actions should be taken.
- Habitat data were used in 2016 to provide an estimate of wild age-0 Pikeminnow. Having good habitat information will be important to estimate river-wide population.
- Small bodied monitoring should be expanded down river. The protocol dictates effort is standardized to sampling habitat in proportion to available rather than disproportionately sample suitable Pikeminnow habitat.
- If there is feedback on the approach to translating number of wild age-0 Pikeminnow captured to a river-wide estimate, it would be appreciated. The 2016 river-wide estimate incorporated a range of capture probabilities.
- Management decisions must consider complex interactions especially as it ties in with augmentation. There is a concern about the negative impacts of stocking hatchery fish on wild spawned fish but stocking has been one of the most beneficial management strategies employed by the SJRIP.
- A consensus is needed on how to identify wild fish. The calcein study is a start. Coded wire tags can be injected into the cheek of stocked fish. It would be a lot of work to tag the 400,000 Pikeminnow stocked. The Program needs a mark that will let field crews know if a fish in hand is wild or stocked. The last reading for the calcein experiment will be in December 2016. By August, 6 month retention of the mark will be known. There is a level of mortality with this marking procedure and it depends on how long fish are left in the salt bath which is what determines mark retention time. A request was made for some type of white paper on different marking techniques. If a wire tag was used, retention time and mortality rates should first be determined.
- For Razorback, the desire is to be able to detect a wild fish in the field. Strictly adhering to a minimum stocking size of >300 mm TL would allow for this.
- SJRIP will have fin ray samples from Razorback that are not PIT-tagged and be able to tell if they are SJ fish. This is a good procedure and will help refine the time scale of knowing when to reduce stocking.
- NAPI is the only source of fish <300 mm TL. In 2016, there were 480 fish stocked <300 mm TL. It seems reasonable to continue collecting fin clips of untagged fish and not stock fish < 300 mm TL. The discussion on what to do with fish <300 mm TL should be held with hatcheries.

- Is there a way to batch mark Pikeminnow? How long should the Program keep stocking 400,000 Pikeminnow and what are the consequences? What is the survival rate for Pikeminnow 7-days post stocking? The BIO-WEST study should be reviewed. Where did the target of stocking 400,000 Pikeminnow come from? It was derived from the population model, survival estimates that came from other species in the Upper Basin, and is SNARRC's full capacity for the size of individuals stocked. How much downstream migration is there for Pikeminnow once stocked? In 2007, when Pikeminnow were stocked during small-bodied monitoring, fish were picked up 50 miles away one day post stocking.
- The number of fish stocked can be adjusted should it be needed.
- Since many of these questions are unanswerable one way to attempt to understand would be to conduct experiments. It is unlikely we will ever know the effect of stocked fish on wild fish.
- Maybe the trigger to stop stocking would come from the number of adults present in the system rather than the number of age-0 fish captured. That will give enough time to decide whether to stock the next year. Reducing stocking would not test anything. The reason so many fish are stocked is because of the high level of mortality.
- For FY 2017, the Program funded a study to look at effective population size (N_b) for both species. The results from this study should factor into when to reduce or stop stocking. The study was not designed to run 2016 samples but these should be run instead of an earlier year.
- Larval fish will be preserved in formalin starting in 2017. Is there is a desire to have larval fish preserved in ethanol to answer a specific question? A standard operating procedure for collection in ethanol needs to be developed. To get good specimens for morphological identification they need to be in formalin. Ethanol has little flexibility for error. Larval fish can be preserved in ethanol in 2017 if there is a request to do so and a project for which the material will be used. There is time to switch to ethanol during the year if the initial results from the N_b study look promising.

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- *Gori motioned that Razorback <300 mm TL not be stocked; Davis seconded; unanimous approval. The PO and NMFWCO will develop a plan for the undersized fish.*
- *All fish captured below the waterfall will be moved in 2017 except for 30 that would be sonic tagged and released below waterfall. There should be a document that describes details of experimental translocations. The PO asked for a recommendation from the BC. There has been no mortality to date. None of the fish moved are known to have been from the Upper Basin. Ruhl motioned that the committee recommends experimental movement of fish above the waterfall; Wesche seconded; unanimous approval.*

Outstanding BC Business

Discuss process for incorporating reviews of SOWs and reports

- *Gori motioned that an addendum be included in all final SOW's and reports that respond to all comments received; Davis seconded; approved unanimously.*

Clarification of BC review of documents and recommendations to CC

- The CC is working on guidance the BC requested in December. No final decisions have been made except blind reviews on SOW's will not be accepted. The CC gave permission to BC to revise and resubmit the blind review process document which was tabled by CC. The CC said the BC could make a list of documents and how they would like them to be reviewed for the CC to

then consider. This task was not prioritized for the BC because the CC has already indicated it will not consider blind reviews for SOW's.

- PO sent out guidance that the SOW deadline is earlier than previous years. This is an initial step in changing the process to allow more time for BC review of SOW's.
- Still under discussion was whether peer reviewers would submit single or consolidated reviews.

Discuss process for prioritizing SOWs to include in the AWP, SOWs that are place holders, and new SOWs

- PO will develop a list of ongoing and new projects that need SOW's and send to BC.
- SOW's should be reviewed by BC reviewers on technical merit. It is understood that new SOW's will be more conceptual but should include hypothesis and have enough details to review technical merits. If the SOW gets a favorable response, the BC will request more details be developed. Budgets will not be included in SOW's sent to BC members for technical review but will be included in those sent to the PO. Developing the priority list is an iterative process.

Discussion of potential conceptual projects

- What are bottlenecks to recruitment and reproduction, what duration and magnitude of flows creates geomorphic restructuring, SJ specific larval fish growth rates, expand larval fish monitoring upstream, larval fish back calculated growth rate, Catfish diet study, telemetry tracking, radio tagging small Razorback (<300 mm TL).

Update on "Pathways" document

- Durst reported nothing has been changed in the version the BC last saw. Before he works on it any further, the PO would like to know if BC concurs with the conceptual direction provided.
- Question was raised as to why measures of recruitment did not incorporate larvae to age-1 fish.
- PO would have to take liberties to put more detail in next draft if BC does not provide input.
- PO said it would redraft the "Pathways" document.

Discussion of when stocking should cease for CPM and RZB. Need for triggers?

- A trigger to stop stocking should be included in the revised Pikeminnow stocking plan. The trigger for population estimates calculated and discussed as 25 adult Pikeminnow. It is premature to think about ceasing stocking until this target is hit or until we get 1,000's of larvae and 100's of age-0's. A framework for making decisions is desired.
- A shorter term plan needs to be developed in case a larger number of age-0 Pikeminnow are captured again in 2017. Considerations of hatchery operations must be incorporated. The Program needs to identify stocked versus wild fish to discern overwinter survival and track a cohort's long-term survival. This might require a dedicated project for tagging wild fish since the few captures during other efforts may not provide large enough detection probability.
- If hatchery fish cannot be tagged what is the contingency plan? The hatchery will not have space to hold unwanted fish. Maybe they could be stocked in Lake Powell, but that could complicate looking for recruitment in that area.
- What number of wild fish captured would trigger the contingency plan? Larval fish cannot be used because specimens must be processed and annual larval fish numbers do not always translate to age-0 captures. If the same number of fish are caught in 2017 as in 2016, should this trigger the contingency plan? The Upper Basin should have some numbers of age-0 captures and what that means about overall numbers. PO said there will be an effort to develop a contingency plan in coordination with NMFWCO and NMDGF. NMDGF suggested they could put a presentation together for the May meeting. Discussion tabled until May.

Updating SJRIP Annual Cycle and revised SOW submission deadline

- SOW's are due March 1. PO will send them out to BC by end of March without budgets. BC will provide reviews by 2nd week of April. PO will assemble reviews and distribute them for discussion at May meeting. Hypothesis should be in scopes.

Update on PIT tag antenna installation

- McKinstry reported two permanent antenna arrays were installed at McElmo Bridge. The work was tacked on to a bridge abutment reconstruction project which made permitting easy. The antennas closer to the SJ are not permanent but still have some limited functionality. The antennas at McElmo Bridge are upstream and downstream of the bridge and embedded in large rock
- Antenna data showed McElmo Creek may be important for Razorback. It may be a more recent use as irrigation from the Dolores River project created perennial water. Historically, it was an ephemeral creek with flows during annual spring runoff.
- It may be valuable to consider stocking in McElmo and imprinting larvae. Water temperatures are warm and food production is substantial.
- McKinstry reviewed the antenna system at the Hogback diversion. A new system of antennas was installed in the larger bypass between the canal and the fish passage. The fish passage at Hogback is often dry and questions were raised as to whether fish can move upstream through the diversion radial gates.
- There is a lot of antenna coverage in the upstream portion of the river. There are no plans to install antennas in the section between McElmo and the waterfall. The antenna effort is being done relatively inexpensively as compared to the west coast where salmon are present.
- There is no document that indicates where all the antennas are or a priority list for where they should go. Each antenna has been installed for a specific question and primarily where there are hard structures to keep them in place.
- Use of the floating antennas requires a separate effort and is funded from non SJRIP funds. So far it has not been easy to differentiate tags that may be dead or shed from fish that have tags.
- An analysis of the PNM antenna has not been conducted but could lead to a lot of information about the effectiveness of the fish passage as well as numbers of fish that are in that area.

Update on posting published paper on SJRIP website

- Mata reported the PO is working with CO Water Conservation Board which has a library platform open to the public (<http://cwcbweblink.state.co.us/weblink/search.aspx?dbid=0>:). Platform is used by Upper Basin.
- Meeting summaries on the SJR Program's website are not updated in timely fashion. Request to update the website quarterly as meeting summaries are approved. Mata would make sure that happened.

Update on 2017 LRP

- Mata reported revision to long range plan would result in a stand-alone document that will only be revised when large programmatic changes occur. The reason the LRP is in the form it is now was due to an effort to parallel the Upper Basin's riprap, which lists project needs and project accomplishments. The sufficient progress report does not parallel the LRP because the LRP is always changing.
- Task completion and status updates will be annually tracked in appendices.
- The goal is to have a draft LRP for the BC by May.

Update on revised flow document

- A section should consider perturbations. It has been 17 years since this metric was developed and it should be revisited.
- Franssen reported a decision tree draft is in progress. Currently making quantitative comparison with Gen 4 model. The runs need to be reanalyzed as it currently looks like the benefit may not be as much as earlier runs suggested, possibly due to inclusion of full build out of NIP diversions. This is a priority for PO.
- The document will include a brief history of how the Program got to the new decision tree, how the tree works, comparison to the old tree using the model, and workshop meeting notes will be appended.
- Gen 2 and Gen 4 model comparison will not be part of the revised decision tree document.
- Consultations in place used Gen 2 models and current flow recommendations, will those be revisited? PO did not see a basis for those consultations changing based on the new model. The new model would likely show flow recommendations would not be met. If take is not changing there should be no reason to reopen consultation. Sufficient Progress is an assessment of SJRIP success. Prior to Sufficient Progress, Gen 2 assessed fulfillment of flow recommendations.
- Request for a Service memo stating that reinitiating consultations would not occur because of Gen 4. Whitmore said the Service has provided memos in the past that describe how the model is used in Sec. 7 consultations.

New agenda item – Nomination by BLM for BC member

- Craig Townsend from the Farmington BLM Office was nominated to represent BLM on the BC. BLM hasn't had a member on the BC since 2012; unanimous approval.

Recap decision points and assigned action items

- BC members would determine if they have information pertaining to Grass Carp stockings and send info to Kevin McAbee
- PO will send out a list of ongoing and new projects that need SOW's
- PO, NMFWCO, and NMDGF will draft a contingency plan for stocking
- NMFWCO will draft triggers to reduce or cease stocking in revised Pikeminnow stocking plan
- PO will redraft "Pathways" using the concepts outlined in the presentation given during meeting
- SOW's and final reports will include an addendum with response to all comments received
- PO and NMFWCO will develop plan for minimum stocking size for Razorback Sucker

Upcoming meetings

- Biology Committee meeting 16 May 2017, Durango
- SJRIP annual meeting 17 May 2017, Durango
- Coordination Committee meeting 18 May 2017, Durango

BIOLOGY COMMITTEE ACTION ITEM LOG
(Updated 19 December 2016)

Item No.*	Action Item	Meeting/Origination Date	Responsible Party(s)	Due Date	Revised Due Date	Date Completed
1	Provide RBS/CPM stocking/capture/recapture data		P.I.'s to the Program Office	Annually before Jan. 1		
2	Provide Preliminary Draft Report Presentations		Project Leads (authors)	Annually at Feb. meeting		
3	Review LRP		BC	Annually at fall meeting		
4	Review Peer Review Comments from the February and May meetings		BC	Annually at fall meeting		
5	Provide Draft Reports		Project Leads (authors) to Program Office	Annually by end of March		
6	Scopes of Work		Project Leads to Program Office	Annually by end of March		
7	Provide Final Reports		Project Leads (authors) to Program Office	Annually by end of June		
8	Annual Data Delivery		PIs to Program Office	Annually by June 30		
9	T&E Species Data		BC to Program Office	Annually by Dec. 31		
10	Annually compile T&E data and Program progress into summary to address overall Program recovery goals/objectives for presentation at annual meeting		Program Office/BC	By Annual Meeting in May		
11	Distribute Consolidated Data and list of annual data collected and available in the Program's database		Program Office to BC	Annually by Jan. 31		
12	Recapture analysis on PIT tagged fish		Durst	Annually by March		

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(Updated 19 December 2016)

Item No.*	Action Item	Meeting/Origination Date	Responsible Party(s)	Due Date	Revised Due Date	Date Completed
13	Coordinate CPM stocking closely with Reclamation to avoid negative impact due to high flows/releases		Project Leads	Annually		
14	Revise RBS Augmentation Goals (based on the outcome of experimental stocking and analysis by Franssen and Durst). What is the appropriate numbers of fish to stock?	5/10/10	FWS Fisheries/Program Office	5/2011 – provide update and extend as needed	6/15/16	6/15/16
15	Pursue Non-native fish stocking procedures	11/5/09	Crockett and Ruhl	2/23/16	12/15/16	
16	Pursue effects study on Hg/pikeminnow with other groups/programs	1/14/10	Program Office lead	ongoing		
17	Include benchmarks for recovery in LRP	12/5/14	Whitmore	1/5/15	9/30/16	
18	Status updates for the LRP	12/2/15	PIs to Whitmore	2/23/16	9/30/16	
19	Investigate Upper Basin requests for STReAMS database funding	12/2/15	Whitmore	3/31/16	9/30/16	
20	BC needs to comment on Peer Reviewer 2017 SOW	11/29/16	BC	02/21/2017		02/21/2017
21	BC needs to comment on updated Annual Cycle	11/29/16	BC	02/21/2017		
22	Make Program peer-reviewed publications available to Program participants.	11/29/16	PO (Mata)	02/21/2017	5/16/16	

BIOLOGY COMMITTEE ACTION ITEM LOG
(Updated 19 December 2016)

Item No.*	Action Item	Meeting/Origination Date	Responsible Party(s)	Due Date	Revised Due Date	Date Completed
23	BC needs to comment on updated Annual Cycle	11/29/16	BC	02/21/2017		
24	Revise "Pathways" Document	11/29/16	PO	02/21/2017	5/16/16	
25	Draft a plan for CPM stockings	02/21/2017	PO, NMFWCO, and NMDGF	5/16/17		
26	Plan for unstocked Razorback Sucker <300 mm TL	02/21/2017	PO and NMFWCO	5/16/17		