February 21, 2018

Documents:

Meeting Agenda

Meeting Minutes

Read-Aheads and Presentations

- *2003 Goals of the Collaborative Program*
- *Interim AMWG Process Document*
- *April 2017 EC Retreat: Summary of Decisions*
- *MRGESCP Proposed 2018 Program Accomplishments*
- *Proposed MRGESCP Organization Structure*
- *February 2018 Recommendations From MAT*
- *MRGESCP Newsletter February 2018 [not included]*
- *MAT Initial 2018 Recommendations [presentation]*
- *MAT Preliminary Meeting [presentation]*
- *MAT RGSM [presentation]*
- *UAV Photogrammetry Modeling of a RGSM Habitat Restoration Project in Albuquerque, New Mexico: Geomorphological, Inundation, and Vegetation Changes Over Time [presentation]*

Middle Rio Grande Endangered Species Collaborative Program

Est. 2000

EXECUTIVE COMMITTEE MEETING
February 21, 2018 9:00 AM – 3:30 PM

Location: U.S. Army Corps of Engineers
4101 Jefferson Plaza NE, Albuquerque, NM 87109

Call-in Information:
Phone: 866-564-9902 **Passcode:** 1965181

MEETING AGENDA

8:30 - 9:00	**Arrival**	
9:00 – 9:05	**Welcome and Introductions**	*Co-Chairs*
9:05 – 9:15	**Review of December 2017 EC Meeting Minutes and Action Items** ☐ *Read-ahead: Draft December 12, 2017 EC Minutes* ➢ **Decision**: Approval of December 2017 EC Meeting Minutes	*Co-Chairs*
9:15 – 9:25	**Program Manager Update** ☐ *Read-ahead: February 14, 2018 MRGESCP Newsletter* • Introduce Lana Mitchell, WEST Project Coordinator • Newsletter Updates, Questions, and Discussion • Communications Plan Update • FY16/FY17 Annual Report Update	*Debbie Lee*
9:25 – 9:45	**SWCA Drone Work Presentation**	*Brian Bader*
9:45 – 10:25	**Minnow Action Team Update** ☐ *Read-ahead: February 2018 Recommendations from the Minnow Action Team* ➢ **Decision**: Approval of current MAT recommendations, based on current conditions. ➢ **Decision**: Request that MAT members continue to monitor evolving snowpack, streamflow, and reservoir storage conditions, and revise those recommendations should additional management actions for the species become available.	*Anne Marken* *Grace Haggerty*

10:25 – 10:40 **Break**

10:40 – 11:10 **Adaptive Management Work Group Progress Update** *Dave Wegner*

- *Read-ahead: Supporting Logic – Adaptive Management and the Middle Rio Grande Endangered Species Collaborative Program*

11:10 – 11:45 **2018 Program Direction and Goals** *Debbie Lee (facilitator)*

- *Read-aheads:*
  - *Goals of the Collaborative Program*
  - *April 2017 EC Retreat Summary of Decisions*
  - *Proposed 2018 Goals and Objectives*

- Proposed goals and objectives
- Selection of 2018 Direction and Goals

➢ **Decision**: Approval of Program Goals

11:45 – 1:00 **Lunch** *(on your own)*

1:00 – 1:40 **Program Structure Presentation** *Debbie Lee*

- *Read-ahead: Proposed MRGESCP Organization Structure*

- Proposed Program Structure
- Structure Discussion

➢ **Decision**: Approval of a Program Structure
➢ **Action Item**: Reconvene the By-laws Ad Hoc Group to develop language to reflect EC decisions

1:40 – 2:15 **Long-Term Planning** *Debbie Lee Julie Dickey*

- Medium- and Long-term Planning
- Program Activities Proposal Development
- Budget Timeline And Planning

➢ **Decision**: Create a Project Planning Committee
➢ **Action Item**: Project Planning Committee begin work to develop the Program's Interim-Plan (to feed into a Long-Term Plan)
➢ **Action Item**: Program work priorities submitted to U.S. Bureau of Reclamation by April 16th

2:15 – 2:30 **DBMS Update and Discussion** *Lynette Giesen Debbie Lee*

- Update
- Discussion
  - How does the EC use the DBMS?
  - What other features would the EC find useful?

➢ **Decision**: Request that WEST develop a list of EC DBMS requests based on conversation

2:30 – 2:45 **Break**

2:45 – 2:55 **MRGESCP Signatories Quarterly Reporting** *Julie Dickey*

- Report Quarterly Expenses by Category

  - **Action Item**: WEST provide Quarterly Budget Tracking Worksheet for ongoing contracts
  - **Action Item**: Signatories provide on-going and newly awarded contracts (on-going)
  - **Action Item**: Signatories provide January – March 2018 expenditures on contracts by April 10th for quarterly reporting

2:55 – 3:10 **April EC Planning** *Debbie Lee*

- Permitting Discussion
  - **Action Item**: Provide questions to WEST for submittal to USFWS and USACE
- Presentation on Middle Rio Grande (MRG) Biological Opinions (BOs)
  - **Action Item**: 2016 MRG BO Partners meet to discuss the BO Goals presentation
  - **Action Item**: WEST work with other signatories to gather BO information
- Other agenda items?

3:10 – 3:15 **Announcements**

- Permitting (ESA Section 7 and Section 10) Brown Bag: Date TBD
- Crawford Symposium: March 6th, 3:30 – 7:30pm at UNM
- Others?

3:15 – 3:25 **Public Comment**

3:25 – 3:30 **Meeting Summary and Next Steps** *Co-Chairs*

- **Decision**: Next proposed EC meeting – April 18, 2018

3:30 **Adjourn**

Middle Rio Grande Endangered Species Collaborative Program

Est. 2000

Executive Committee (EC)
Meeting Minutes
February 21, 2018 – 9:00 AM–3:30 PM
Location: U.S Army Corps of Engineers (USACE) – 4101 Jefferson Plaza NE

Decisions

- ✓ Pending the requested changes, the minutes of the December 12, 2017 EC meeting were approved with no objections.
- ✓ With no objections, the EC agreed with the February 2018 recommendations presented by the Minnow Action Team's (MAT).

Action Items

WHO	NEW ACTION ITEMS	BY WHEN
WEST	Make requested changes to the December 2017 EC meeting minutes and distribute final the version.	ASAP
WEST	Distribute a Microsoft Word version of the "Proposed 2018 Goals and Objectives" (renamed "Proposed 2018 Program Accomplishments") for Program comments and suggestions.	ASAP
WEST	Provide the presentations given at the EC add them to the DBMS once it is functioning.	ASAP
All signatories	Send questions about Endangered Species Act permitting to WEST, for consideration by USWFS as they develop a permitting guidebook and prepare a presentation for the Program.	ASAP
All signatories	Send comments and suggestions to WEST on the following related to Adaptive Management (AM): • Proposed definition of AM developed by the AM Work Group (whether to include "experimental") • Proposed conceptual framework for AM • The triennial budget cycle concept	3/9/18
WEST	Refine the draft Communication Plan and distribute to the Program for feedback.	3/16/18
All signatories	Send 2018 Program-related project information to WEST for inclusion in a project tracking sheet.	3/16/18

All signatories	Provide WEST with comments and suggested revisions on the Proposed 2018 Program Accomplishments	3/16/18
USFWS (Susan Millsap)	Send WEST suggested additions to the scope of responsibilities for the proposed "Project Planning Committee" to address coordination.	3/16/18
All signatories	Provide comments and suggestions on the proposed Program Structure.	3/16/18
WEST	Distribute the revision of the proposed Program Structure based on feedback from the Feb. 21st EC meeting and comments received through 3/16/18.	3/30/18
WEST	Distribute the draft FY16/FY17 Annual Report for Program review.	3/12/18
All signatories	Provide comments and suggested edits to WEST on the draft FY16/FY17 Annual Report.	3/27/18
All signatories	Provide feedback on the revised draft Communication Plan to WEST.	3/27/18
WEST	Provide the revised draft Communications Plan as an April EC meeting read ahead based on feedback received through 3/30/18.	4/5/18
AM Work Group & WEST	Revise the proposed AM definition based on feedback from the 2/21/18 meeting and received through Mar. 9th. Provide as an April EC meeting read ahead.	4/5/18
WEST	Compile 2018 Program-related projects received from signatories through 3/16/18, and develop a tracking mechanism for the EC to review project progress. Provide as an April EC meeting read ahead.	4/5/18
Science/Habitat Restoration Work Group	Define and prioritize Program work to present at the next EC meeting (prior to submittal to funding agencies – USACE and Reclamation – in mid-April).	4/5/18
WHO	**ONGOING ACTION ITEMS**	**BY WHEN**
All signatories	Provide updates and other content to WEST for inclusion in the Program newsletter.	Ongoing

All signatories	Share Program-related project information, updates, and changes as they are awarded/revised/progressed/completed with WEST for inclusion in the project tracking sheet for review at each future EC meeting.	Ongoing

Next Meeting

- April 12, 2018, 8:30am–12:30pm, Location TBD
    - The planned location is Reclamation, dependent on availability of a meeting space.
    - The meeting will end at 12:30pm to accommodate those attending Annual Operating Plan (AOP) meeting that day.
- Proposed agenda items:
    - Program Structure Discussion
    - AM Work Group Update
    - Annual Report Update
    - Standing EC Agenda Item: Status of 2018 Program accomplishments and projects
    - Project Descriptions/Work Plans Review Before Submittal to Agencies
    - Permitting Discussion: USFWS proposed giving a presentation on their guidebook being developed.
    - MRG BO's Presentation: 2016 MRG BO partners will meet with USFWS in March. The partners proposed making a presentation to the EC on the outcomes. Additional MRG BO's will be presented at a future EC meeting. The objective of the varied MRG BO presentations is to determine if and how the Program might have a support role.
    - MAT Update: If MAT recommendations presented on Feb 21st have substantially changed, the MAT will present the new recommendations.

Announcements and Deadlines

- The BEMP Crawford Symposium: March 6, 2018, 3:30 PM–7:30 PM at UNM. The theme is "In this Together: Collaboration along the Middle Rio Grande." Please RSVP to Kim Eichhorst if planning to attend.
- Reclamation requests proposed projects for funding in FY19 (title, dollar amount, and a short description) by April 16, 2018.
    - After the descriptions are developed, the EC will provide direction on which proposed projects should move forward to be funded. This is prior to completion of full scopes of work by the Program.

Review and Approval of December 2017 EC Actions Items and Meeting Minutes

- Approval of December 12, 2017 EC meeting minutes. The group discussed a few changes:
    - BEMP has 33 sites, but only one will look at the historical impact of saltcedar.
    - NMISC proposed changes to the minutes, of which a portion is summarized below:

        - Page 11, last bullet, description of the MAT is revised to explicitly acknowledge that MAT recommendations do not change BO obligations on the part of agencies that have BO's.
- ✓ Pending the requested changes, the minutes of the December 12, 2017 EC meeting were approved with no objections.
- ➢ **WEST will make the requested changes to the December 12, 2017 EC meeting minutes and distribute them.**

Program Manager Update

- Lana Mitchell is WEST's new Project Coordinator.
- Newsletter updates, questions, and discussion
    - The Program newsletter is designed to allow more effective updates to EC members while providing more time at meetings to focus on decision-making items.
    - In the future, the newsletter will be provided as a PDF document read ahead.
    - Newsletter change requests and updates:
        - NMDGF's contact for the New Mexico Riparian Habitat Map is Malia Volke (malia.volke@state.nm.us).
        - The listed species update should be as factual as possible. If there are research projects being described, the researchers should be referenced.
        - Include a disclaimer noting that it is informational and that it does not come directly from the EC (i.e., information comes directly from agencies).
        - Notate the author and submitting organization (e.g. "Submitted by…")
- ➢ **Ongoing: All signatories provide Program newsletter updates and other content to WEST at least two weeks prior to an upcoming EC meeting. WEST requests bios with photographs for future newsletters.**
- Communication Plan Update
    - WEST received comments that were significant enough to require more review and revision. The next draft will be sent out mid-March, and WEST requests comments on the new draft by March 30th so it can be revised prior to the next EC meeting.
    - All signatories should review it and understand its implications as it will become "standard operating procedure" for communication within the Program. While it serves as an internal communications plan for the Program, WEST is developing a separate plan for external communications (i.e., public involvement, external funding).
        - ➢ **WEST will refine the draft Communication Plan and distribute for feedback by March 16, 2018.**
        - ➢ **All signatories will provide feedback on the revised Communication Plan to WEST by the March 27th so a draft final can be revised, reviewed, and approved at the April EC meeting.**
- The draft FY16/FY17 Annual Report is currently being formatted, and there will be a draft out for review in mid-March. WEST will request a 2-week review by signatories so that WEST can provide a final draft for the next EC meeting.

SWCA Drone Work Presentation: "UAV Photogrammetry Modeling of a Rio Grande Silvery Minnow Habitat Restoration Project in Albuquerque, New Mexico: Geomorphological, Inundations, and Vegetation Changes Over Time"

- SWCA presented on a project that assessed geomorphic changes at ABCWUA's San Juan-Chama Drinking Water Environmental Mitigation Projects within about one river mile of the Rio Grande, including several restored habitat features, such as lowered banklines and embayments.
    - The presentation will be provided to the EC within two days of the meeting, and will be added to the DBMS once it is functioning.

Minnow Action Team Update

- The MAT met in February 2018 to discuss hydrology forecasts and models from Reclamation.
    - The presentations given at the EC will be provided within two days of the meeting, and will be added to the DBMS once it is functioning.
- Presentations summarized the MAT meeting including an update on hydrology and biology, MAT coordination, and MAT recommendations.
    - The recommendations are intended to involve all agencies since this is expected to be a difficult year.

✓ With no objections, the EC accepted the MAT's February 2018 recommendations.

Adaptive Management Work Group Progress Update

- The AM Work Group has focused on formulating what the AM program/process could look like.
- Suggestions that were discussed at the AM Work Group and EC:
    - Speed up the process of formulating the AM program. This will be challenging due to the concurrent BO processes and hydrologic forecast. At the same time, there is a lot of expertise to amass, and the AM Work Group should take the time that it needs to get it right.
    - Defining the structure for the AM program/process is necessary, including integrating the current Program structure into it. An important part of this is defining roles of all parties, the need to recognize and embrace the roles that folks have, so that no one is excluded and that overlap is avoided.
    - To work effectively, the AM process must integrate with the overall Program in a timely and effective way. Otherwise it will be a stranded effort with limited value to the overall goals of the Program.
    - Dave Wegner has been connecting with scientist colleagues for advice on how they have done AM in other places (i.e., Columbia River Gorge). This ensures that we are identifying "potholes" early, and using lessons learned from elsewhere.
- The AM Work Group recognizes that there have already been several MRGESCP efforts to understand what AM is and is not. One of the first things the AM Work Group did was develop a work group definition of what AM means for the Program. This definition represents the perspective of the AM Work Group requests EC review and recommendation. A common definition is necessary to make the AM program

development process have a focal point from which to develop. The definition was read aloud to the EC:

> *"Adaptive Management for the Collaborative Program is a structured, science-based process to promote flexible and informed decision making in the face of natural variability and other uncertainties. Monitoring of management actions and responses will advance scientific understanding and assist stakeholders in adjusting policies and/or operations in an iterative learning process."*

- Feedback on the definition:
  - This definition does not mention the concept of *experimentation*, although it is an important part of AM. The AM Work Group has been intentional about recognizing the importance and value of the science and the management and regulatory requirements that drive the work of the Program. The group was intentional in using the term "science-based" because of this concern.
  - How else can we highlight experimentation?
    - Suggestion: Include *"testing and monitoring of management actions and responses."*
    - Suggestion: There should be language about *"to the benefit of the species."*

➢ **All signatories will send additional feedback to WEST on the proposed definition of Adaptive Management that was developed by the Adaptive Management Work Group, to be considered at the next Adaptive Management Work Group meeting. The next meeting is March 21, 2018, and feedback is due March 9, 2018.**

➢ **WEST and the AM Work Group will revise the proposed AM definition, based on feedback, and will present at the April EC meeting.**

- Initial conceptual AM framework rendering
  - This framework recognizes the importance of decision-making. It is less an organizational structure, and more a framework of functional components for the AM program. For example, the Science Coordination Group would not necessarily be a new group, but it would be a function that can be applied to the Program's organizational structure.
  - Technical Work Groups know the workings of their individual agencies and the day-to-day challenges of managing the MRG.
  - Basic and Applied Science Applications: Example is the "jiggle" – the flow releases that are being discussed by the MAT.
  - Monitoring Programs: This is the ongoing monitoring we are doing today. These are distinct from the research-driven projects that may be done as a part of AM.
  - Science Advisors provide review of the science work. They need to be independent and not directed by any one agency or group. They may not need to be a standing committee.
  - Predictive Models: Examples are the PVA and hydrology models.
    - Suggestion: Change so that this encompasses other models.
  - There are inconsistencies in the organizational structure when looked at next to the AM framework. Both the organizational structure and the AM framework are just first shots at putting something together for discussion, and more work will be necessary to refine and integrate them.

- One of the things the Program may consider is looking 7+ years into the future for projects, which is something that some agencies do, such as USACE. These different planning horizons are one of the constraints that the AM Work Group must work within. The conceptual model was based on what has been used with other AM programs that have federal partners, which have used triennial planning.
- Triennial planning is suggested for this AM program as well, so the AM Work Group wants to assess whether this works for the individual Program partners.
- What are the resources to administer the AM program? This may be a barrier to effectively implementing AM. Attention should be given to what is actually necessary (i.e. money, employee positions, structure) to perform the functions under the AM framework.
- At the March meeting, the AM Work Group will begin expanding on what function the boxes in the framework provided, identifying parts of organizations that can perform those functions, and identifying the pieces that already exist.
- After the EC decides on an organizational structure, and what committees and work groups will be in existence, the next critical step is for each group to have a work plan.
    - **All signatories will send additional feedback to WEST on the proposed conceptual framework for AM, as well as the triennial budget cycle concept by March 9th.**

2018 Program Direction and Goals

- At the December EC meeting, the group brainstormed Program goals and committed to submitting further Program goals to WEST, including goals for the Program and goals for organizations for their involvement in the Program.
- WEST synthesized both the EC meeting input and the individual signatory submissions to develop the 2018 Program Goals and Objectives document.
- WEST reminded the EC of the goals listed in the "Progress Report on the Middle Rio Grande Endangered Species Act Collaborative Program for 2001 through 2003" and the April 2016 Retreat Summary of Decisions to provide context for this part of the discussion.
- The Proposed 2018 Program Goals and Objectives document is essentially an annual work plan. A programmatic long-term plan still needs to be developed.
- Signatories were supportive of WEST holding a tribal participation conference.
- Feedback:
    - Suggested changes to the 2018 Program Goals and Objectives:
        - Second bullet under the second first-level bullet: Change from "Begin" to "Continue."
        - Rename the document "2018 Planned Accomplishments."
    - The goals in the 2003 Annual Report were aspirational. The proposed 2018 list is task-oriented toward achieving Program goals.
    - The list provides direction for the Program. The EC requested a standing agenda item to regularly check-in on work plan progress.
        - Suggested metrics of success: Setting and meeting deadlines, having trackable items, and finding short-term items to complete.

        - Progress metrics and actual accomplishments are important for obtaining funding, and they set the foundation and/or serve as inputs for future projects.
- Is anything perceived to be missing?
    - There is a need for a baseline map to identify past and current HR projects that can inform future projects. This is an item currently being worked on by the ScW/HR with support from WEST, with the idea that this will eventually feed into DBMS development. USACE has offered to take on the bulk of this work given their large GIS database, and requests information from other agencies to support this effort.
        - **All signatories should send any map files that they have in any format to Ashley Tanner at WEST, who will provide the files to USACE.**
    - Several members noted that they did not want to lose sight of developing an Independent Science Panel, which fits into successfully implementing AM. Independent science panels can aid in designing better scientific approaches. The issue is whether the panels need to be a standing group, an ad hoc group, or something else.
        - WEST is currently working on a review of past and ongoing science.
- Selection of 2018 Direction and Goals
    - The group discussed making the list more specific including having explicit projects or activities under each accomplishment. There was a suggestion for more details of each activity to better inform the EC on status.
        - The EC is supportive of all items on the list.
        - Some EC representatives voiced the need to prioritize listed activities and suggested using deadlines or timelines to accomplish that. One EC member suggested a spreadsheet to help with tracking.
        - The EC suggested renaming the "Proposed 2018 Goals and Objectives" to "Proposed 2018 Program Accomplishments"
        - **WEST will distribute a Microsoft Word version of the "Proposed 2018 Goals and Objectives (Accomplishments)" 2/21/18 EC meeting read ahead.**
        - **All signatories will provide WEST with comments and suggested revisions on the "Proposed 2018 Program Accomplishments"**
        - **WEST will compile 2018 Program-related projects received from signatories through 3/16/18, and develop a tracking mechanism for the EC to review project progress.**
- An EC representative recalled that in the past, the EC received a spreadsheet list of projects, which included Program-related projects.
    - If the EC wants to do this again, every agency needs to contribute and the Program should focus on the current year (2018).
        - **All signatories will send 2018 Program-related project information to WEST by March 16, 2018 for inclusion in a project tracking sheet.**
        - **WEST will compile 2018 Program-related projects from signatories through March 16th and develop a tracking mechanism for the EC to review project progress.**
        - **Ongoing: All will share Program-related project information, updates, and changes as they are**

awarded/revised/progressed/completed with WEST for inclusion in the project tracking sheet that will be reviewed at each EC meeting.

Program Structure Discussion

- At the December meeting, the EC requested that WEST develop a proposed Program structure for discussion. The locations of the boxes on the figure can be moved around once they are defined. Each of the boxes in this proposed structure have preliminary definitions in the meeting read-ahead.
    - The Adaptive Management Committee (AMC) in the proposed structure is distinct from the current AM Work Group (the AM Work Group is currently an EC-sanctioned ad hoc work group to develop the Program's AM program and plan. The group will dissolve once the EC directs the Program's implementation of an adaptive management process).
    - The Work Groups box is specific to ad hoc groups that will sunset after their charge is fulfilled. For example: The RGSM Early Life History group that was formed to develop a SOW.
    - Solid lines denote direction or recommendations, and dashed lines denote coordination.
    - The Program Management Team (PMT) is currently WEST, serving as the third-party Program manager.
    - The By-Laws Ad Hoc Work Group will reconvene once the Program structure is finalized by the EC.
- Discussion
    - The structure is a work in progress and has not been finalized.
    - Suggestions:
        - Work Groups can be formed by the EC or the Project Planning Committee (PPC) and the diagram should depict this.
        - Do not include Work Groups at all as the by-laws address them, and they fall under other boxes in the structure (i.e., all ad hoc work groups are created and are directed by a standing group).
        - Given the PMT's overall coordination and support role for the Program, it could be considered as part of the EC.
        - The MAT is not currently a chartered group, and it may not belong in the Program structure if it remains unchartered.
        - The structure, as proposed, lacks hierarchy that might be expected from the lines of direction (top-down).
    - Discussion is needed to determine how and which groups under the current structure will or will not continue to operate under the new structure.
    - There are Program functions that are not currently captured in the structure:
        - Short and long-term planning
        - Non-AM projects
        - Public engagement and involvement
    - A comment was made that Independent Peer Review Panels are shown in the structure, but they are not officially part of the Program.

- **USFWS will send WEST suggested additions to the scope of responsibilities for the proposed "Project Planning Committee" to address coordination.**

- There needs to be more clarity around how the Program structure diagram and the AM functional framework diagram related to each other.
  - Some of the AM functions fall directly under the AMC, others are elsewhere. Some of the arrows in the AM framework are not captured by the structure.
  - The AM framework and the Program structure came from two different charges. With feedback from the EC, WEST will work on bringing them together.
  - **WEST will distribute the revision of the proposed Program Structure based on feedback from the Feb. 21st EC meeting and comments received through 3/16/18.**
- At the April 12, 2018 EC meeting, the EC will review and discuss the revised Program structure and potentially direct the By-laws Ad Hoc Work Group to reconvene and continue their work.

Long-Term Planning Discussion

- In February, the CC proposed a joint CC-ScW/HR March meeting to work on medium- and long-range planning.
- It was voiced at the EC meeting that the only groups that would carry over under the new structure would be the EC and potentially the MAT. Long-term planning will be a function under one of the groups in the new structure – likely the PPC.
- Before the EC can make a decision on creating a PPC or other groups, more work is needed on the structure, but there is general agreement that the PPC can take over medium- and long-term planning.
- The outcome of the EC structure decision will determine if current work groups will continue or if their functions will be subsumed by groups in the new structure.
- The groups will not begin new tasks or undertake long-range planning until a new structure is approved.
- The ScW/HR has an agenda item for the February 27th meeting to review, prioritize, and draft project descriptions. These descriptions will be submitted to Reclamation in mid-April 2018 to consider for FY19 funding. Beyond the work tasked to the ScW/HR at the December EC meeting, no new work should be undertaken.
- Once the EC has decided the structure, and the By-Laws Committee revises the By-Laws, the EC can talk about defining what the PPC is.
  - **The ScW/HR will define and prioritize science work to present at the next EC meeting (prior to submittal to funding agencies – USACE and Reclamation – in mid-April).**

DBMS Update and Discussion

- WEST and USACE have been working with USGS to develop the new DBMS.
- Beginning in March 2018, WEST and USACE will be scheduling stakeholder meetings with work groups and signatories to determine how they use the DBMS and what features would be useful to them.
  - The EC would like the calendar to be available soon, which will happen by the end of March.

- The EC also wishes to see geo-referencing features in the DBMS.

MRGESCP Signatories Quarterly Reporting

- At the December EC meeting, the EC requested that WEST collect quarterly contract progress reports, including expenditures from all signatories.
- At this meeting, it was agreed that the standing agenda item to track project timelines would suffice, and that quarterly reporting is not practical given the amount of work required to gather and report the information.

April EC Planning

- April 12, 2018, 8:30am–12:30pm, Location TBD
  - The planned location is Reclamation, dependent on availability of a meeting space.
  - This meeting is scheduled to end before the Reclamation Annual Operating Plan (AOP) meeting at 1:00pm.
- Permitting Discussion
  - USFWS worked individually with those signatories that submitted questions regarding permitting. If other signatories would like to discuss permitting, USFWS will meet with them, or signatories can submit questions to WEST and/or USFWS so that USFWS can prepare for the discussion with the appropriate staff and information.
  - USFWS is working on a guidebook for permitting. The beginning will address permitting types and what they are used for, and the appendix will address species-specific requirements. The guidebook will not be completed by the April EC meeting, but USFWS can be prepared to present on it.
    - **All will send questions about Endangered Species Act permitting to WEST, for consideration by USWFS as they develop a permitting guidebook and prepare to present on it at the next EC meeting**.
- Proposed Agenda Items:
  - Presentation on MRG BO's
    - At the December EC meeting, the EC suggested that the 2016 MRG BO partners meet beforehand, and that WEST gather information about the other MRG BO's to present to the EC. This stemmed from looking at Program goals and direction and asking the question, "How might the Program have a role in supporting the various BO's?"
    - The 2016 MRG BO partners will be presenting to the USFWS in March. The partners will make a presentation to the EC in April regarding the 2016 MRG BO.
    - It was suggested that all the MRG BO's should not be presented at once, but can be presented at future meetings as well so the EC can work with BO signatories to determine if, and the manner in which the Program has a role in supporting the various BO's.
  - Program Structure Discussion
  - AM Work Group Update
  - Annual Report Update
  - Standing EC Agenda Item: Status of 2018 Program accomplishments and projects

- Project Descriptions/Work Plans Review Before Submittal to Agencies
- MAT Update: If MAT recommendations presented on Feb 21st have substantially changed, the MAT will present the new recommendations.

Meeting Participants

Participant		Organization
EC Representatives in Attendance		
Rick	Billings	Albuquerque Bernalillo County Water Utility Authority
James	Booth LTC	U.S. Army Corps of Engineers
Kim	Eichhorst	Bosque Ecosystem Monitoring Program
Brent	Esplin	U.S. Bureau of Reclamation
David	Gensler	Middle Rio Grande Conservancy District
Alan	Hatch	Pueblo of Santa Ana
John	Longworth	New Mexico Interstate Stream Commission
Susan	Millsap	U.S. Fish & Wildlife Service
Megan	Osborne	University of New Mexico
Matthew	Peterson	City of Albuquerque
Cody	Walker	Pueblo of Isleta
Jim	Wilber	U.S. Bureau of Reclamation
Matthew	Wunder	NM Dept. of Game and Fish
Other Representatives in Attendance		
Brian	Bader	SWCA Environmental Consultants
David	Campbell	U.S. Fish & Wildlife Service
Rowan	Converse	University of New Mexico
Julie	Dickey	WEST, Inc.
Joseph	Fluder	SWCA Environmental Consultants
Lynette	Giesen	U.S. Army Corps of Engineers
Grace	Haggerty	New Mexico Interstate Stream Commission
Kyle	Harwood	Egolf+ Ferlic+Harwood (EFH) for Buckman Direct Diversion Project
Janet	Jarratt	Assessment Payers Association of the MRGCD
George	MacDonnell	U.S. Army Corps of Engineers
Mike	Marcus	Assessment Payers Association of the MRGCD
Anne	Marken	Middle Rio Grande Conservancy District
Kate	Mendoza	Albuquerque Bernalillo County Water Utility Authority
Ed	McCorkindale	WEST, Inc.
Lana	Mitchell	WEST, Inc.
Page	Pegram	New Mexico Interstate Stream Commission
Michael	Porter	U.S. Army Corps of Engineers
Elizabeth	Reitzel	U.S. Representative Lujan Grisham
Matt	Schmader	University of New Mexico, Anthropology
Summer	Scholz	U.S. Army Corps of Engineers
Tanya	Scott	LRPA – Middle Rio Grande Conservancy District
Dale	Strickland	WEST, Inc.
Cody	Stropki	SWCA Environmental Consultants
Jared	Studyvin	WEST, Inc.
Ashley	Tanner	WEST, Inc.
Rich	Valdez	SWCA for NM Interstate Stream Commission
Dave	Wegner	WEST, Inc.
William	Whitehead	SWCA Environmental Consultants
Stephen	Zipper	SWCA Environmental Consultants

Signatories Not Present

Pueblo of Sandia

NM Office of the Attorney General

Goals of the Collaborative Program

The ESA Workgroup, in forming the Collaborative Program, adopted the following goals in their governing document:

1 Within the Middle Rio Grande Program area, act to prevent extinction, preserve reproductive integrity, improve habitat, support scientific analysis, and promote recovery of the listed species. The Program will strive to accomplish this in a manner that benefits the ecological integrity, where feasible, of the Middle Rio Grande riverine and riparian ecosystem. Actions undertaken by the Program should benefit other protected species, maintain wild populations, improve the efficiency of water use and management, and provide water to sustain the listed species. The ultimate goal of the Program is to complete activities that, along with other activities by the action agencies and interested parties, meet established criteria in the Middle Rio Grande for its contribution to de-listing of the listed species, such that the Program within the Middle Rio Grande area will no longer be necessary.

Rio Grande at Coronado State Monument

2 To develop agreements with water users and water management entities that will make supplemental water available, and manage the storage and release of water, in ways that contribute to the recovery of listed species.

3 Implement creative and flexible options under the ESA so that existing, ongoing, and future water supply and water resource management activities and projects can continue to operate and receive necessary permits, licenses, funding, and other approvals so that the Signatories and other water users in the Program area are deemed by the Service to be in compliance with the ESA. These water supply and water resource activities and projects include, but are not limited to, maintenance of water conveyance facilities and other actions to meet New Mexico's downstream compact obligations; flood control; legal uses of native Rio Grande water; and diversion and consumptive use of Stage I of the SJCP water as provided by the Colorado River and Upper Colorado River Basin Compacts for its authorized, contracted, and legal purposes, as provided by contracts and in accordance with the SJCP authorizing legislation.

4 Achieve Goals 1 and 2 (recovery and water management goals) in such a way that the Program does not impair: valid state water rights; federal reserved water rights of individuals and entities; SJCP contractual rights; the State of New Mexico's ability to comply with interstate stream compact delivery obligations; and Indian trust assets including federal reserved Indian water rights, prior and paramount, and time immemorial water rights while exercising creativity and flexibility in order to address the needs of the listed species.

Supporting Logic
Adaptive Management and the Middle Rio Grande Endangered Species Collaborative Program
January 17, 2018
Collaborative Program Adaptive Management Work Group

The Middle Rio Grande Endangered Species Collaborative Program (Collaborative Program) has made considerable investment in discussing the idea/concept of developing and applying an adaptive management program. Concurrent with the adaptive management discussions has been ongoing efforts initiated under consultation with the U.S. Fish and Wildlife Service regarding the development and implementation of the different Biological Opinions in the Middle Rio Grande.

There are benefits and challenges in using adaptive management. Most important is to understand that adaptive management is a process while science is an independent program designed to support the effort. In order to identify and develop "Why" we are investing the time and energy in developing an adaptive management process it is helpful to make sure we have a collective understanding of where we are headed. The objective is to set up our discussion on the objectives of the Middle Rio Grande adaptive management process. As a start, it is appropriate to identify the key benefits and challenges of using an adaptive management process.

Benefits:

- An adaptive management approach can provide flexibility to act in the face of uncertainty.
- An adaptive management approach is based on learning by doing (in a science-based process).
- An adaptive management approach with an integrated science/technical/management decision support process can yield recommendations for when/what actions should be taken.
- An adaptive management approach encourages long-term collaboration and dialogue among stakeholders.
- An adaptive management approach should promote optimal decision dialogue and recommendations for management based on credible available information.
- An adaptive management approach should lead to improved management through better decision making.

Challenges:

- Institutional reluctance to change.
- Commitment to long-term monitoring and evaluation of management for a long time.
- Significant time lags between management actions and being able to evaluate their impacts.
- Implementation of adaptive management in a litigious world.
- Collection of adequate information to evaluate progress.
- Challenge of budget from both a fiscal year and collective basis.
- Challenge of not having adequate or appropriate staff.

- Challenge of side boards of the process and agency requirements
- Challenge of being endangered species driven

Bottom Line: An adaptive management process provides a means to reduce uncertainties that limit the effective management of natural (physical and biological) systems and to do so in a collaborative stakeholder driven process.

MRG Adaptive Management Work Group Definition of Adaptive Management

Adaptive Management for the Collaborative Program is a structured, science-based process to promote flexible and informed decision making in the face of natural variability and other uncertainties. Monitoring of management actions and responses will advance scientific understanding and assist stakeholders in adjusting policies and/or operations in an iterative learning process. (Adopted January 17, 2018)

As a starting point, this definition of adaptive management for the Collaborative Program embraces ongoing, real time learning and knowledge creation based on a sound scientific and management approach. A successful adaptive management program involves: active stakeholder involvement; a defined set of management objectives and alternatives; predictive models; monitoring plans; decision making monitoring responses to management, assessment, and adjustment to management actions. Finally, adaptive management is implemented within a legal context that includes statutory authorities such as the National Environmental Policy Act (NEPA), the Endangered Species Act (ESA), the Clean Water Act, and if necessary, the Federal Advisory Committee Act.

Science Underpinning of Adaptive Management

Three basic types of science should be recognized and identified in the Collaborative Program Science and Adaptive Management Process. Science required for regulatory purposes could include all levels of science categories.

- Basic Science – necessary to develop, understand and evaluate information to assess system (ecosystem, physical, social, economic or cultural) dynamics.
- Applied Science –utilizing existing scientific knowledge and uses to develop practical applications to address management needs.
    - Opportunistic Science – takes advantage of situational opportunities to collect data/information that might not have been planned or represents a unique situation.
    - Regulatory Science – specific data required by an agency to satisfy permit requirements
    - Either of these two sciences can be subsets of either Basic or Applied Science and are subject to credible scientific process and review.
- Monitoring Science – collection of data from ongoing or long term monitoring programs that are assessed to identify system trends, responses to management actions and/or relationships

Science should not be constrained by arbitrary spatial scales or physical boundaries defined by the morphology of channels, floodplains or terraces. Instead, the domain of the science required should be defined by the scales necessary to understand and predict river and ecosystem responses and processes as related to operational capacity and abilities. In the case of the Middle Rio Grande this means having a correct working understanding of the hydrologic drivers in the watershed and the constraints in water management associated with existing water rights, compacts and delivery requirements.

Integration of the Adaptive Management Process and the Middle Rio Grande Endangered Species Collaborative Program

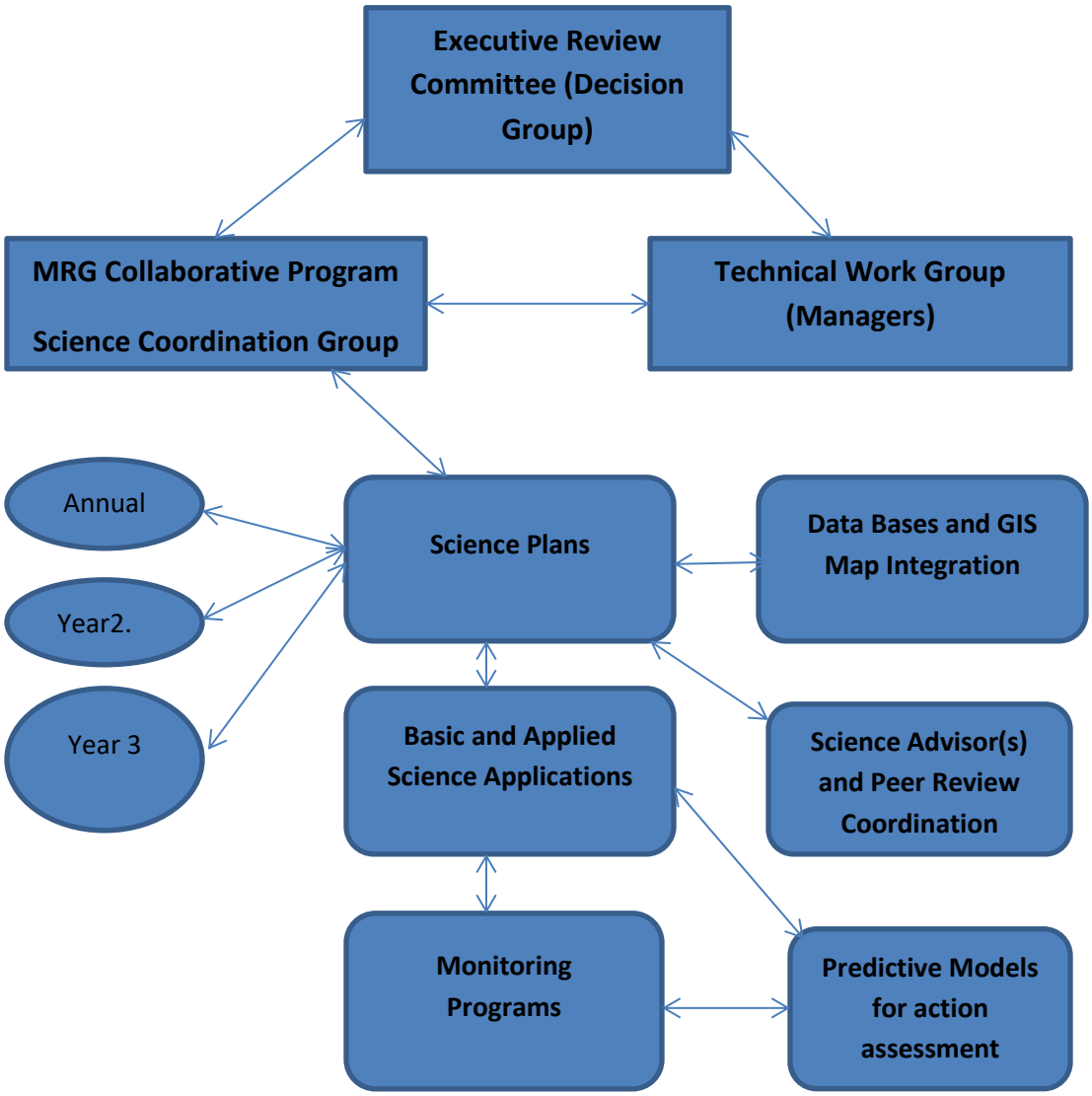
Agencies and stakeholders have been working towards a collective set of goals and objectives without a formal definitive process for adaptive management. To be clear, adaptive management is only necessary when there is uncertainty, concern over implementation, and/or risk with decisions not meeting objectives. Historically, the agencies and stakeholders have worked individually with the permitting agencies to ensure that management activities are covered legally. As a general rule, adaptive management is most useful when the consequences of management are uncertain, but objectives are clear and the potential for management intervention is high.

With the decision by the Collaborative Program to invest in the development and adoption of an adaptive management process, an opportunity exists to bring the various and independent Collaborative Program elements together under a common umbrella. To be successful a framework for adaptive management will need to be agreed upon with a timeline for action.

The success of the Collaborative Program adaptive management process will be measured through four primary pathways:

- Stakeholder involvement and support
- Progress made toward achieving resource objectives
- Scientific credibility in studies, monitoring and assessment
- Implementation of management actions consistent with applicable laws to achieving program objectives.

INITIAL CONCEPTUAL RENDERING FOR AN ADAPTIVE MANAGEMENT FRAMEWORK [1/2018]



April 2017 Executive Committee Retreat
Summary of Decisions

Collaborative Program Operating Space:

The Collaborative Program will focus on where it can contribute to the resiliency of the Middle Rio Grande now and in the future. Specifically,

(1) Collaborating around monitoring efforts, both for population trends, and to determine the effectiveness of management activities to inform adaptive management; and
(2) Collaborative science to identify and fill in data/information gaps for the natural systems.
(3) Collaboration on water management
(4) Coordination on project implementation. *Collaboration at the proponent's discretion*.

The Collaborative Program has to operate within legal and socio-economic realities.

Key Decisions

1. Near Term:
    - Collaborative Program to continue to operate under 2012 Bylaws until such time as those are updated. This includes CC.

2. Bylaws. EC formed a Bylaws Subgroup to evaluate and prepare proposed updates to Bylaws. This effort will consider the content of the 2006 Bylaws and the 2012 Bylaw edits. Recommendations brought back to June EC meeting.

3. Short-term Priorities. Direct the Program Manager, with coordination with the Army Corps and AMT, to prioritize the AM recommendations for short-term implementation. This will include evaluating any overlap with scopes already vetted by Science/HR and the CC. Recommendations brought back to June EC meeting.

4. Budget. EC directed Program Manager to develop an out-year budget process that links to the timing of EC decision-making on budget recommendations (to facilitate timely input to federal agency budgetary process).

    a. This includes a commitment by EC members to provide, in a timely manner, their respective budget information to Program Manager for development of the Collaborative Program budget.

    b. Each agency (federal agencies, ISC and MRGCD) to provide a short description and timeline to Program Manager of their respective budget cycle.

    c. There is a good faith effort on the part of the parties to implement consensus recommendations, while recognizing that consensus recommendations from EC on Collaborative Program budget requests do not guarantee that recommendations will, in fact, be funded because each EC member retains discretion in implementing its statutory authorities and based on availability of funding.

    d. Develop an out-year budget to conform to the process developed and approved by the EC.

5. Adaptive Management Plan. EC directed Program Manager to proceed with development of an Adaptive Management Plan for consideration, refinement and approval by EC.

   Yet-to-be-determined:
   - How the AMP will coalesce with the LTP (is it part of or does it become the LTP).
   - The extent to which the BO actions (versus the monitor of those) are to be included in the LTP, if at all.

6. Cost-Share Flexibility. EC directed a legal group to evaluate whether flexibility exists under current authorities to recognize that the non-fed cost share is built into the new BO, including an examination of potential unintended consequences of adjusting this cost-share component.

7. Signatories have agreed to continue in the MRGESCP.

Middle Rio Grande Endangered Species Collaborative Program
Proposed 2018 ~~Goals and Objectives~~ Program Accomplishments

This document presents proposed goals and objectives for 2018 for the MRGESCP, based on discussion at the December EC and individual input from the signatories to the WEST.

- Reduce uncertainty around:
  - The Program space
    - Develop an annual work plan
    - Begin work on a Long-Term Plan/AM Plan
  - Regulatory authorities and biological opinions
    - Presentation listing all BOs in the MRG and their goals
    - Clarity on where the Program might have a role
  - Program structure
    - Update By-laws
    - Decision on Program structure
    - Develop new charters and charges for committees and work groups

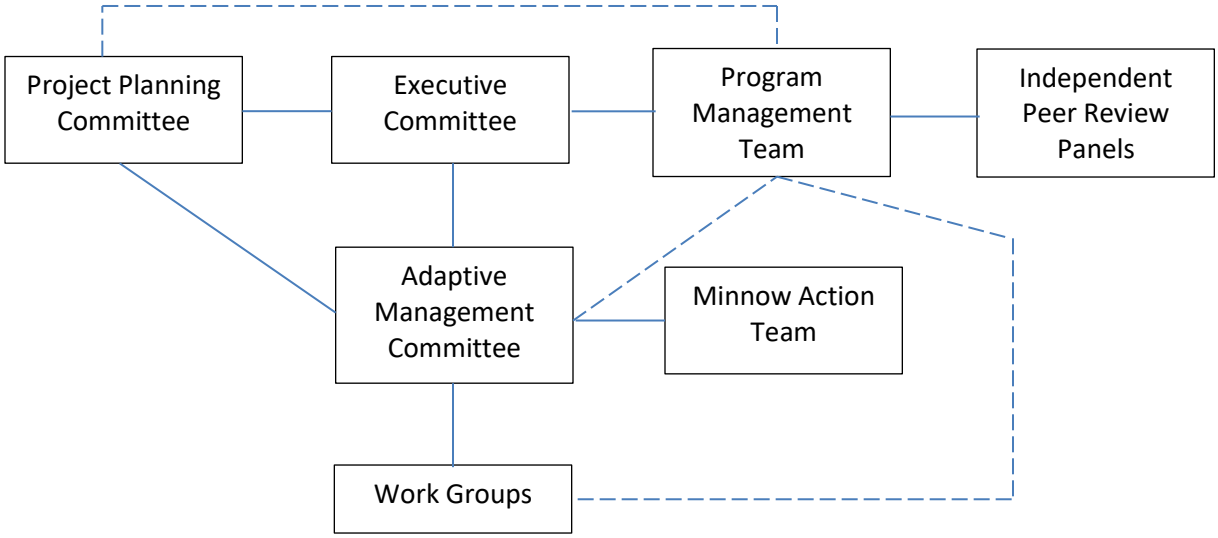
- Continue and finish the work that has been started in the Program
  - RGSM Population Monitoring Data Re-Analysis Task
  - Begin PVA (after data re-analysis)
  - Prioritize and begin implementing recommendations from peer reviews
  - Complete contracting and implement Development of High-throughput Markers for RGSM SOW
  - Complete the RGSM Early Life History SOW (contract award timing one year into RGSM High-throughput Markers development)
  - Complete contracting and begin work on the Identifying Restoration Priorities for Threatened Tamarisk Dominated Habitat to Benefit Future Habitat for Southwestern Willow Flycatcher SOW

- Concrete deliverables for 2018:
  - Annual work plan
    - Science work plan
      - Review of past/ongoing science
      - Develop a prioritized list of science projects
      - A baseline map of the MRG (including past/current projects, and habitats)
      - Data collection and monitoring
        - RGSM Population Monitoring Plan
      - Evaluate cost-benefits and impacts of ongoing management efforts
    - Program annual work plan
  - Mid-term/Long-term plan (3-5 years)
    - Direction to the Project Planning Committee to begin developing mid- and long-term planning process
  - Annual Report
    - Joint FY16/FY17 Annual Report
    - Begin working on FY18
  - Budget reporting and Cost-share processes
    - Program planning timelines and signatory deadlines

        - Signatories outstanding/ongoing contract spreadsheet
        - Cost-share reporting
    - Progress in AM Plan
        - Establish a Science Peer Review process
        - Outline of AM Plan, possibly with drafts of sections
        - Framework for coordination with signatory AM programs
    - Communications Plan
        - Including external communications plan
    - Revised Program structure
        - Develop new charters and revise old charters as needed
        - Revision of Program By-laws
    - Development of a functioning and useful Program website, DBMS, and calendar
    - Host a tribal participation conference

Proposed MRGESCP Organization Structure
February 21, 2018

This document proposes an organizational structure for making decisions and carrying out activities related to the Middle Rio Grande Endangered Species Collaborative Program (MRGESCP; Program). This structure is proposed by the third-party Program Manager, WEST, at the direction of the Program's Executive Committee from the December 2017 meeting.



——— Direction (top-down) / recommendations (bottom-up)
– – – Coordination (not direction)

- **Executive Committee** – The decision-making body of the Collaborative Program.

- **Project Planning Committee** – A group to coordinate on project funding, coordinate funding/agency timelines and deadlines, and to provide recommendations on what projects to move forward for EC consideration. Made up of the signatory representatives with funding for the Collaborative Program.
    - Takes recommended projects from the Adaptive Management Work Group and other Work Groups (e.g. ScW/HR), and works through the objectives of each funding agency to fund recommended activities.
    - Identifies potential partnerships to implement projects.
    -
- **Project Management Team** – Currently, this is WEST as the third-party Program Manager, Science Coordinator, and associated staff.
    - Coordinates Program work groups and committees.
    - Manages any independent peer review panels.
    - Provides Program support including the following:
        - Facilitating Program work getting done (i.e. work plan development, adaptive management planning)
        - Coordinating Program work with signatory representatives
        - Handing meeting logistics and action item follow up

        - Coordinating and facilitating communication amongst Program signatories on Program activities
        - Supporting day-to-day Program needs and longer-term Program projects (i.e. annual report, developing information documents)

    - Provide Program Science support including the following:
        - Supporting the Program's day-to-day needs (i.e. gathering signatory representative input on science needs, developing preliminary scope of work descriptions for Program activity planning/funding)
        - Facilitating communication on science topics
        - Supporting any independent science panels and coordinating work on recommendations
        - Coordinating and supporting the Program's adaptive management framework and development of a plan
        - (any other broad overarching activities)

- **Adaptive Management Committee** – A group made up of technical experts (biologists, hydrologists, engineers, ecologists, etc.) and managers.
    - Develop the list of science/management priorities for each year, for consideration by the Project Planning Committee for funding, and ensure that the priorities are in line with the Program's Adaptive Management Plan/Long-term Plan.
    - Coordinate science and the related management efforts to inform management actions on the MRG.
    - Provide recommendations on science studies related to management actions for EC consideration.
    - Recommend topics to the EC for independent peer review panels.
- **Minnow Action Team**
    - Operates as it has in the past, but as an official chartered group of the Program.
    - Reports to the Adaptive Management Committee.
- **Work Groups**
    - To be formed as needed for a specific project. They have a specific charge from the Adaptive Management Committee, and sunset after that charge has been fulfilled.
    - Examples:
        - Formed for the development of a specific SOW
        - Tasked with reviewing the recommendations from a peer review panel, and developing a proposal to address the recommendations
        - Formed to develop or revise a specific Program document or plan
- **Independent Peer Review Panels**
    - To be convened on a specific topic or topics at the request of the EC. The Program Management Team (specifically, the Science Coordinator) will convene and manage the panel to ensure the panel's independence.
    - Will be convened and managed using an agreed-upon Peer Review process, TBD, based on National Academies guidelines and best practices.

February 2018 Recommendations from Minnow Action Team

MAT Meeting Summary

The Minnow Action Team (MAT) met on February 9, 2018 to discuss the current hydrologic outlook for the Middle Rio Grande and to discuss water and species management actions that could be taken to best protect and conserve the Rio Grande silvery minnow (RGSM) under the forecast hydrologic conditions. Current conditions including the February runoff forecast and agencies' water operation planning efforts were presented. As well, the October 2017 populations monitoring results, and other recent habitat monitoring efforts, for the RGSM were presented and discussed.

The MAT then discussed a variety of potential water and species management actions to be considered and initial recommendations were prepared for the Middle Rio Grande Endangered Species Collaborative Program (MRGESCP) Executive Committee. Although the MAT recognized that much planning and coordination is still needed, MAT participants concurred that it is critical for the MRGESCP signatories respond quickly and in unison to implement the recommendations presented in this report. Therefore, the MAT requests the Executive Committee review this document in preparation for discussion and decision making at their February meeting.

Hydrology

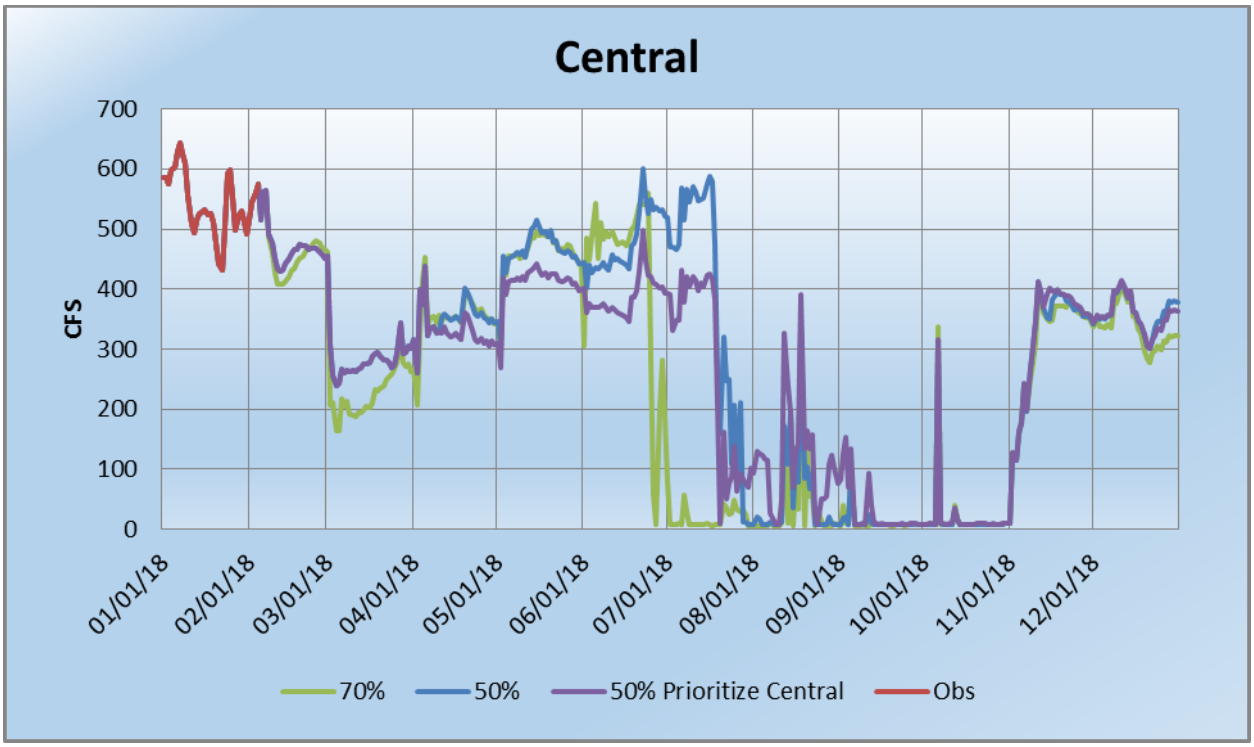
- Existing hydrologic conditions are extremely poor. The February NRCS forecast indicates basin-wide snowpack is at 22%, with expected Mar-July streamflow volume of approximately 150,000 acre-feet (AF) at Otowi, and 50,000 AF on the Rio Chama.
- Preliminary URGWOM model runs based on the 50% and 70% probabilities from the Feb 1st forecast suggest that peak discharge through the MRG may be less than 1,000 cubic feet per second (cfs) and will likely occur in March or April, with rapidly decreasing flows by late April and May.
- Normal storage (i.e., not under Grande Compact Article VII restrictions) of runoff water in El Vado will occur once flows increase on the Rio Chama but storage is expected to be very limited. First, because only about 50,000 AF of runoff is expected to enter the reservoir. Second, the mainstem Rio Grande flows are expected to be insufficient to meet MRG demands and it is likely that there will be a need to bypass water at El Vado during the runoff period.
- Rio Grande Compact Article 7 restrictions currently are not in effect but are expected to be back in effect by mid-May. With the current forecast, it is expected that runoff on the Rio Chama will be effectively over before Article 7 restrictions are in place. However, should there be an opportunity to store late spring flows, relinquishment credit water through the Emergency Drought Water Agreement (EDWA) and an El Vado flow modification, if

approved, could allow small amounts of El Vado water storage, if only temporary, for the benefit of the RGSM.

- The MRGCD currently has stored water in El Vado that should allow operation through the spring and the first half of summer. Water supplies may support normal river operations through early September depending on unforeseen conditions such as changes in depletions, weather conditions, additional storage acquired post runoff, and operating efficiencies.
- Reclamation expects to have between 20,000 and 26,000 AF of supplemental water in 2018. That amount is composed entirely of leased San Juan –Chama (SJC) contract water. Reclamation can also store up to 13,000 AF of relinquishment credit water, but it is unlikely that it will do so based on the current forecast.
- The current forecast models indicates that if all stored water is used, then flows entering the MRG below Cochiti reservoir could reach as low as 100 cfs in 2018. This amount will be fully consumed through evaporation, riparian evapotranspiration, and/or diversion to Pueblo irrigation upstream of Angostura dam. It is possible that this scenario could happen during the year at some point.

Location	period	50%, KAF	% of avg	70%, KAF	90%, KAF
Rio Grande nr Lobatos	Apr - Jul	29	15	14.1	1.78
El Vado Reservoir Inflow	Mar - Jul	53	24	32	11.1
	Apr - Jul	48	23	28	9.2
Rio Grande at Otowi	Mar - Jul	150	21	98	42
Rio Grande at San Marcial	Mar - Jul	-33	-6	-155	-335
Rio Blanco at Blanco Diversion	Apr - Jul	28	52	22	14.1
Navajo R at Oso Diversion	Apr - Jul	33	51	26	16.6

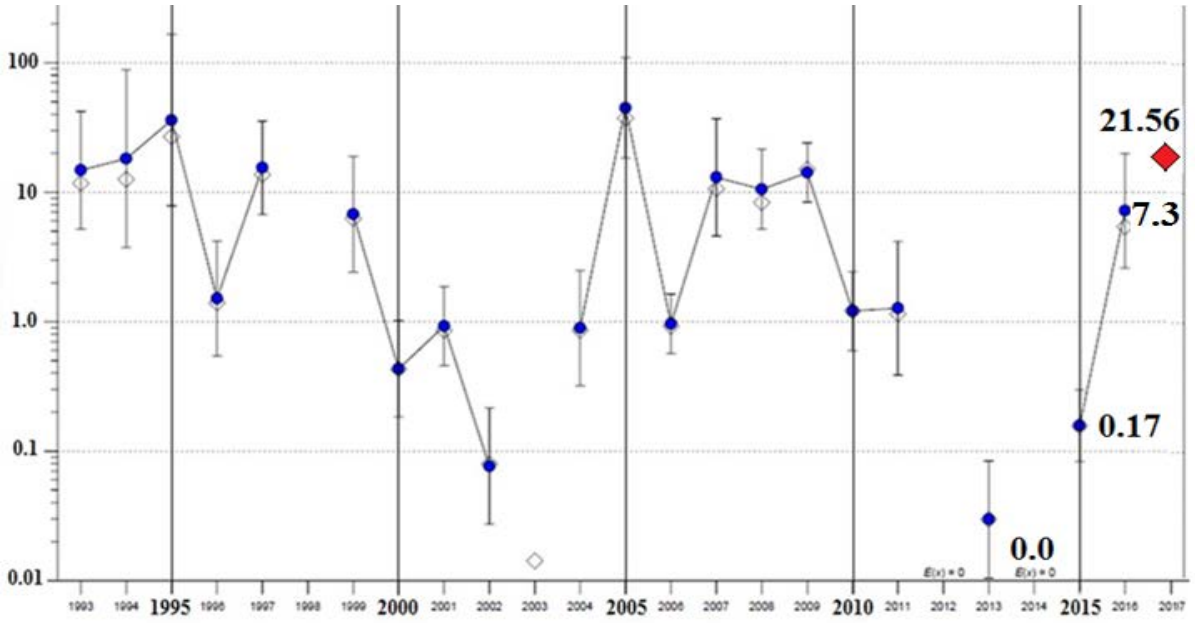
NRCS Final February Forecast



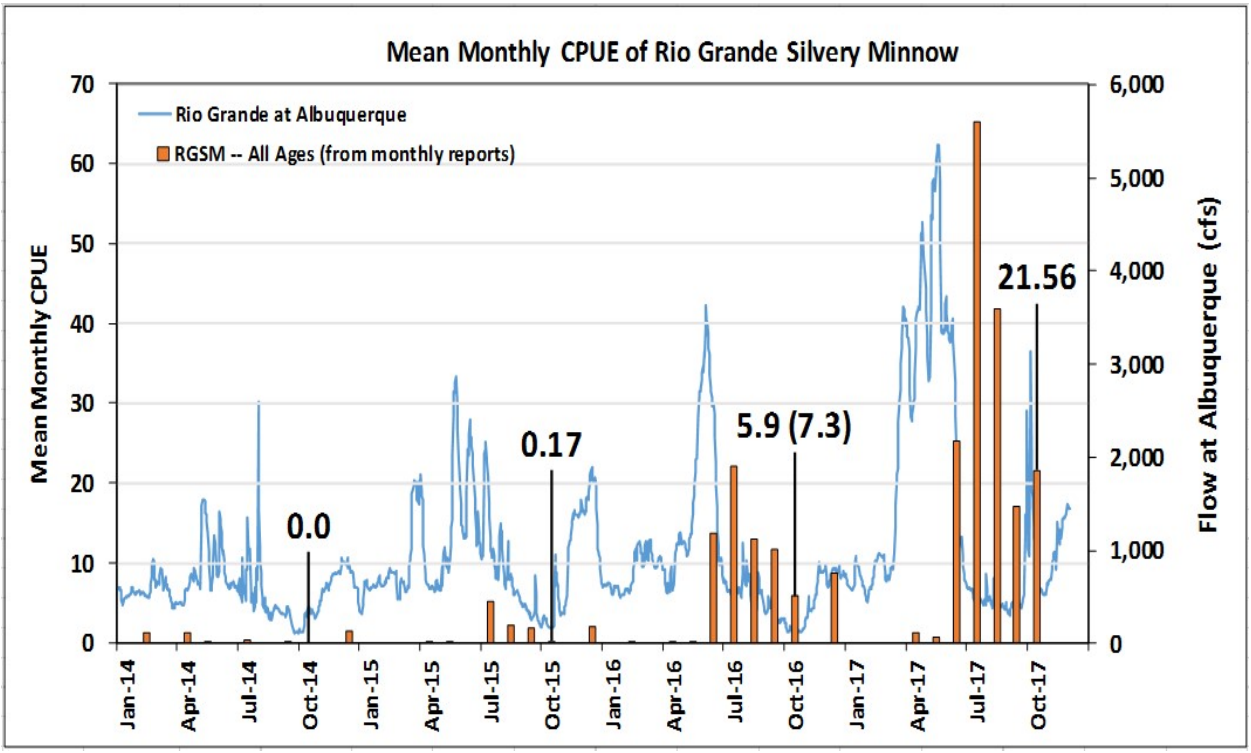
Modeled Flows at Albuquerque (preliminary draft, Reclamation 2/9/2018)

Biology

- Reproduction and survival of RGSM in 2016 and 2017 were successful, and the October 2017 CPUE of 21.6 fish/100 m^2 is the 3rd highest since monitoring began in 1993.
- In October 2017, RGSM were collected at 19 of the 20 standard sampling stations and were present in 213 of the 309 seine hauls, indicating that the species is distributed through much of the MRG at a relatively high population level.
- Densities of unmarked and marked individuals were 21.56 (n = 2,192) and 0.00 (n = 0) individuals/100 m^2, respectively, indicating that much of the current population is "wild."
- Densities of age-0, age-1, and age-2+ individuals were 19.62, 1.86, and 0.08 fish/100 m^2, respectively, showing a cross-section of ages for reproductive individuals.
- The potential for egg production in spring 2018 is high, but it is currently uncertain if many fish will spawn and the survival of eggs and larvae, given the forecast low spring runoff.
- In the 2016 BiOp, the Service used the positive relationship of flow to RGSM density as the basis for the Hydrobiological Objectives (HBOs). The HBOs are comprised of potential water management strategies for RGSM production and survival. The production strategy fosters the production of young RGSM (eggs and larvae) during spring, and the survival strategy provides guidelines to manage for RGSM survival (age-0+) when spring and summer flows are low.



Rio Grande Silvery Minnow mixture-model estimates ($E(x)$), using October sampling-site density data, across years. Sampling did not occur in 1998. Modeled estimates (circles), 95% confidence intervals (bars), and simple estimates using the method of moments (diamonds) are illustrated.



- All CPUEs from Dudley et al. (2017) Monthly Reports
- CPUEs are for unmarked fish only
- Annual releases of RGSM by the Service could affect reproductive base

MAT Discussion

- The MAT discussed a number of possible directions for water and species management given the extremely dry forecast for 2018 and the available ESA supplemental water as described above. The expectations are that native flow in the Rio Grande, Chama, and Jemez will be so low that water management operations are limited. It is unlikely that water managers will be able to store even small quantities or to use supplemental water for spring operations with a priority towards providing water during the summer.

- With fairly high densities of fish (21.6 RGSM/m2) currently in the river system in all three reaches, the general consensus of the MAT is to protect viable populations in the MRG where possible and enable the captive propagation facilities to collect eggs in the spring to ensure genetic diversity of captive bred stock. Efforts to learn from any actions taken should be prioritized through data collection.

- Historically recruitment of Age 0 RGSM and survival of Age 1+ RGSM in dry year conditions has been very poor, based on the population monitoring results. Ideas were discussed during this initial MAT meeting on ways to enhance the potential for survival of both Age 0 and Age 1+ fish, with an emphasis on Age 1+ RGSM, through temporary measures such as improve habitats and relocate eggs and fish to specific areas. Realistically, these will be small scale experimental efforts and will unlikely to be measurable in the October census. However, the experimental studies could provide valuable information for developing larger-scale adaptive management in future years.

- It is recognized that any species management (fish or egg relocation) will need to be reviewed and approved by the US Fish and Wildlife Service and other environmental compliance requirements will need to be addressed.

Initial 2018 Hydrology Recommendations

1. Manage the timing and rate of river recessions to minimize the need for supplemental water for this action. River recession is likely to begin as early as late March with drying in the San Acacia reach.

2. Create brief small scale flow manipulations at diversion dams to trigger RGSM spawning, for egg collection purposes.

3. Store water through the EDWA and/or El Vado modification agreement should hydrologic conditions change that allow for that action. Currently it is unlikely water will be available to store in El Vado in late spring.

4. Water operations coordination and “River Eyes” should begin as soon as needed.

5. Prioritize supplemental water for maintaining flows to refugial habitats should other water sources (e.g., MRGCD supplies) become depleted. Refugial habitat should be focused below diversion dams and select drain outfalls.

6. Keep the Angostura Reach perennially wet, if possible.

7. Use LFCC pumps to keep flows below south boundary (BDA) through summer, if possible.

Initial 2018 Biology Recommendations

1. River recessions should be managed to reduce fish mortality. For example: establish rate of recession that allows for fish to move to wetted areas to keep as many adult and juvenile fish alive through the summer.

2. Accelerate fish salvage activities by FWS with the assistance of others as river recession occurs.

3. Fish salvage operations should incorporate distribution of some salvaged fish to locations other than immediately upstream, possibly above Isleta or Angostura dams, considering the possibility of extreme drying later in the year if conditions remain poor.

4. Collect RGSM eggs for the captive propagation facilities.

5. Collect RGSM eggs to stock into refugial habitats and the Angostura Reach, thus improving potential for increased survival of Age 0 fish.

6. Install temporary habitat improvements (embayments, LWD, other) to entrain eggs and larval fish and to increase fish survival through the summer.

MAT Coordination

The MAT recommends that regular MAT meetings occur in 2018, to closely monitor hydrologic and biologic conditions, and revise recommendations given changes in hydrologic condition. Elements that require coordination to implement include:

1. Egg collection
2. Spring studies and monitoring efforts
3. Fish rescue
4. Summer studies and monitoring efforts
5. Data collection

The MAT recommends an emphasis on monitoring and data collection in 2018 specifically intended to better our understanding of RGSM under low-water conditions (e.g., survival curves, density dependence, nutrition, water quality, spawning triggers, and larval habitat).

Minnow Action Team
Initial 2018 Recommendations

Presented to the Middle Rio Grande Endangered Species Collaborative Program

February 21, 2018

Hydrology Recommendations

1. Manage rate and timing of river recession to reduce use of supplemental water

2. Create brief small scale flow manipulations at diversion dams to trigger RGSM spawning, for egg collection

3. Store water through EDWA and/or El Vado modification agreement if conditions allow (unlikely)

4. “River Eyes” and water operations should begin as soon as possible

Hydrology Recommendations Cont'd

5. Prioritize supplemental water for refugial habitats if alternative water is depleted

6. If possible, keep Angostura Reach perennially wet

7. If possible, utilize LFCC channel pumps to keep flows below BDA

Biology Recommendations

1. Manage river recessions to reduce fish mortality
2. Accelerate fish salvage as river recession occurs
3. In fish salvage activities include relocation of fish to alternative reaches (based on likelihood of remaining wetted)

Biology Recommendations Cont'd

4. Collect RGSM eggs for refugial habitats and Angostura Reach

5. Install temporary habitat improvements to entrain eggs and larval fish

6. Collect RGSM eggs for captive propagation facilities

MAT Coordination

- Hold MAT meetings regularly through 2018 to monitor changing conditions

- Emphasize monitoring and data collection for understanding RGSM under low flow conditions

Elements that require coordination:

1. Egg collection
2. Spring studies and monitoring efforts
3. Fish rescue
4. Summer studies and monitoring efforts
5. Data collection

RECLAMATION
Managing Water in the West

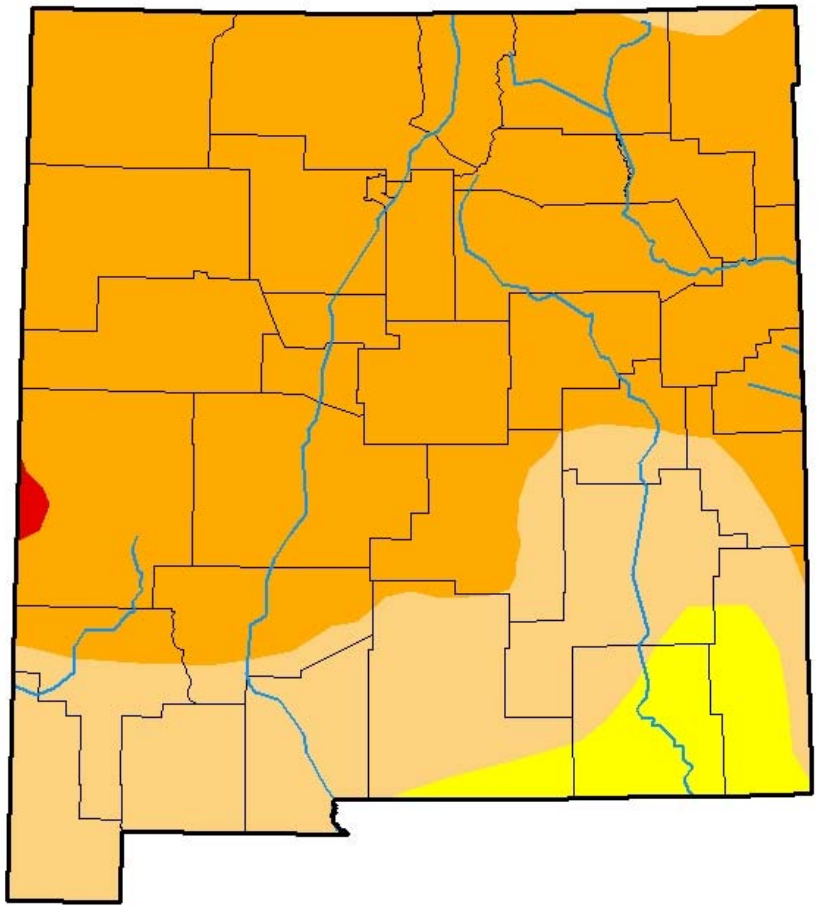
Minnow Action Team Preliminary Meeting

Carolyn Donnelly

February 9, 2018

U.S. Drought Monitor

New Mexico



January 30, 2018

(Released Thursday, Feb. 1, 2018)

Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.00	100.00	94.13	68.03	0.27	0.00
Last Week *01-23-2018*	0.00	100.00	93.78	59.96	0.00	0.00
3 Months Ago *10-31-2017*	83.45	16.55	1.88	0.00	0.00	0.00
Start of Calendar Year *01-02-2018*	7.01	92.99	45.97	4.76	0.00	0.00
Start of Water Year *09-26-2017*	85.16	14.84	0.00	0.00	0.00	0.00
One Year Ago *01-31-2017*	88.05	11.95	2.49	0.00	0.00	0.00

Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

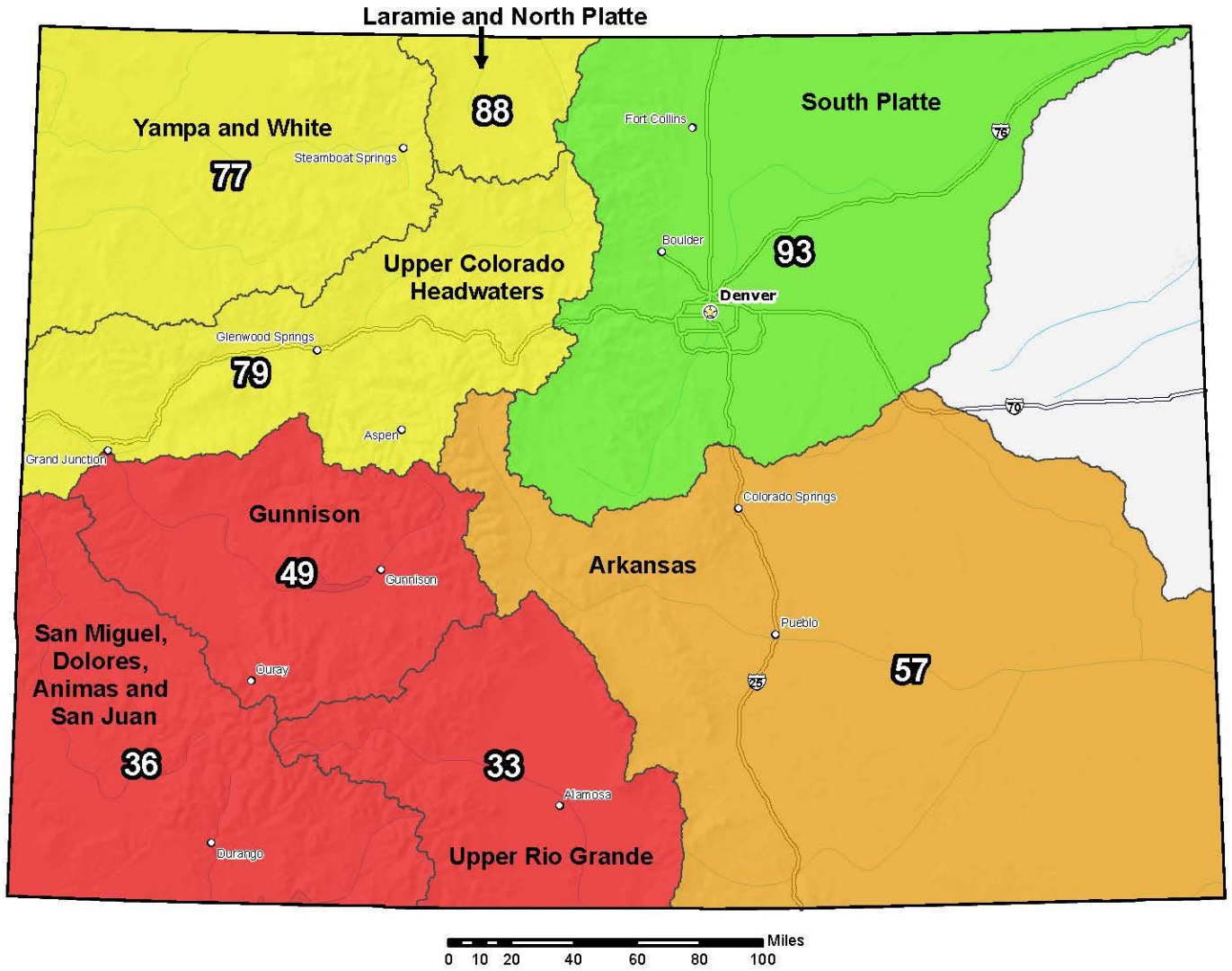
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:
Richard Heim
NCEI/NOAA

http://droughtmonitor.unl.edu/

Colorado
SNOTEL Current Snow Water Equivalent (SWE) % of Normal

Feb 07, 2018



Current Snow Water Equivalent (SWE) Basin-wide Percent of 1981-2010 Median

- unavailable *
- <50%
- 50 - 69%
- 70 - 89%
- 90 - 109%
- 110 - 129%
- 130 - 149%
- >=150%

* *Data unavailable at time of posting or measurement is not representative at this time of year*

Provisional Data Subject to Revision

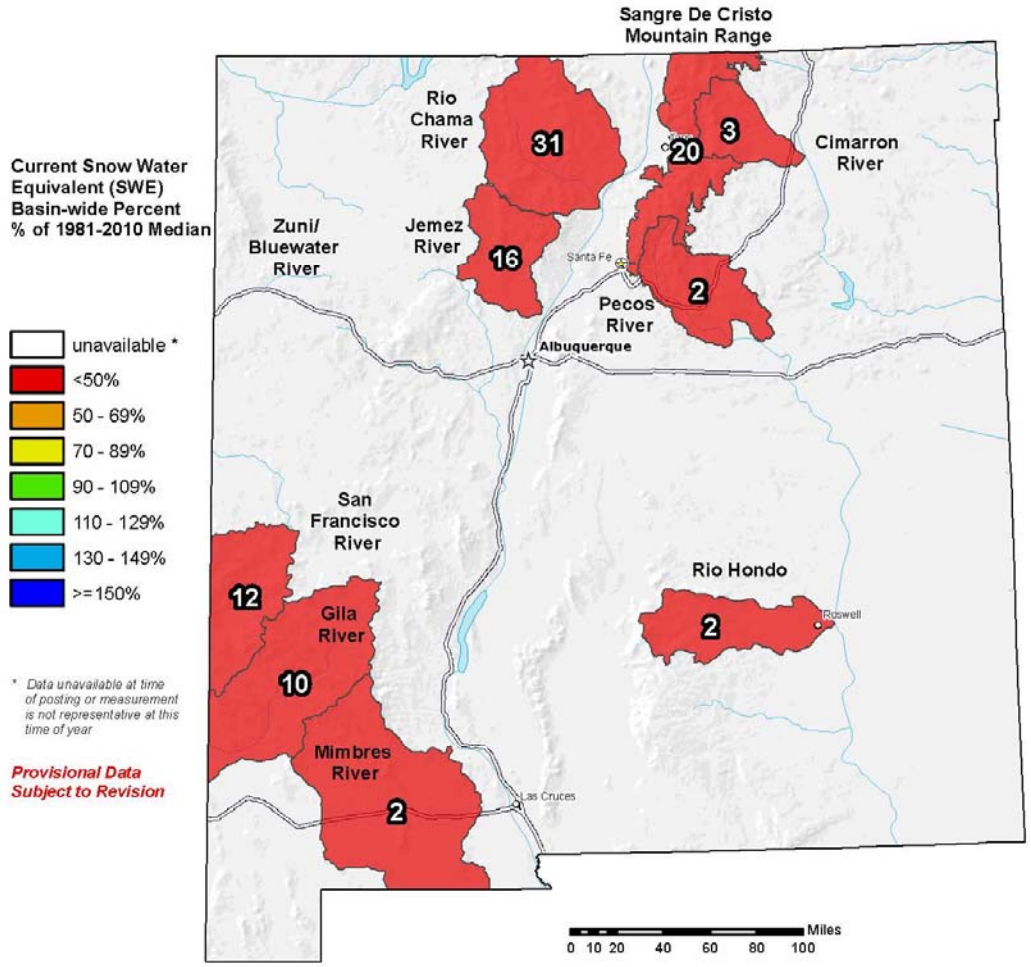
0 10 20 40 60 80 100 Miles

The snow water equivalent percent of normal represents the current snow water equivalent found at selected SNOTEL sites in or near the basin compared to the average value for those sites on this day. Data based on the first reading of the day (typically 00:00).

Prepared by:
USDA/NRCS National Water and Climate Center
Portland, Oregon
http://www.wcc.nrcs.usda.gov

New Mexico
SNOTEL Current Snow Water Equivalent (SWE) % of Normal

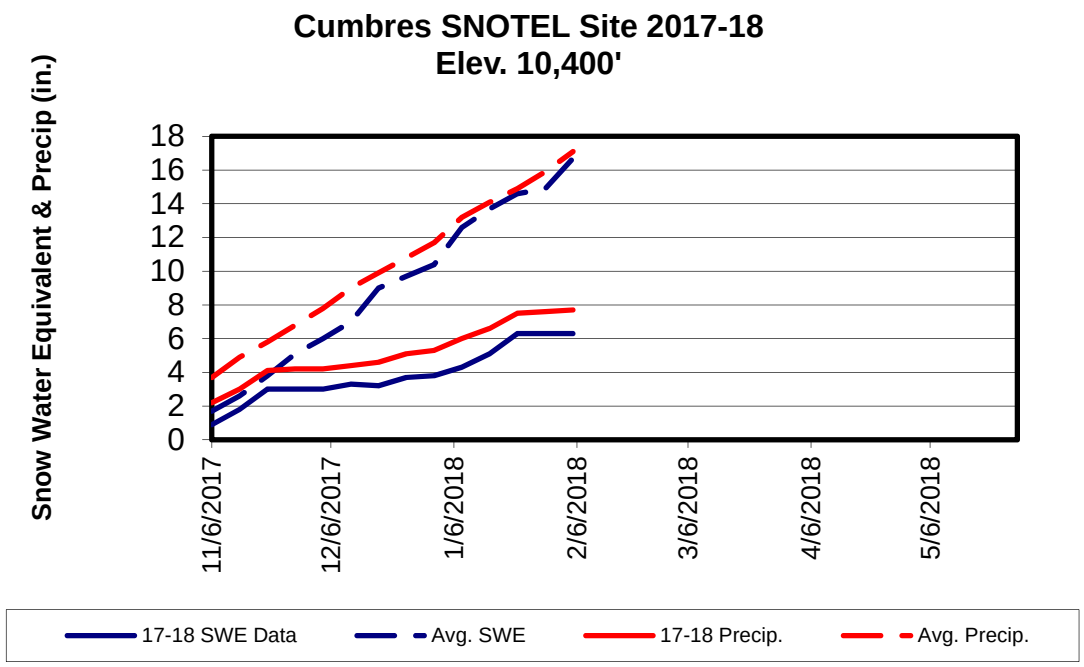
Feb 07, 2018

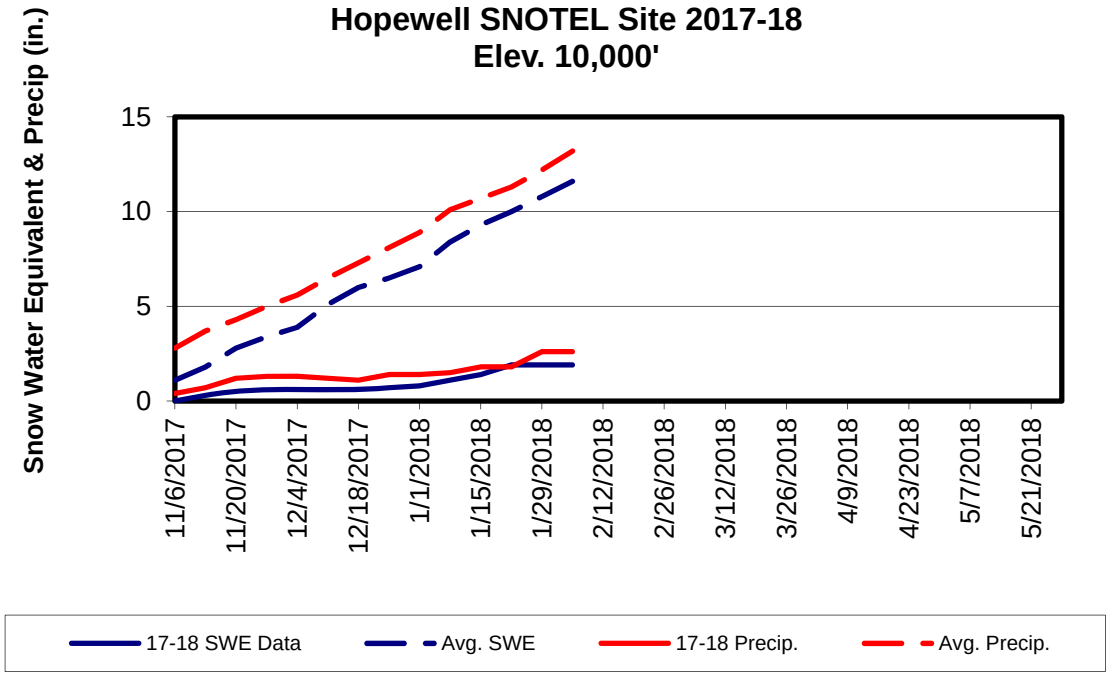


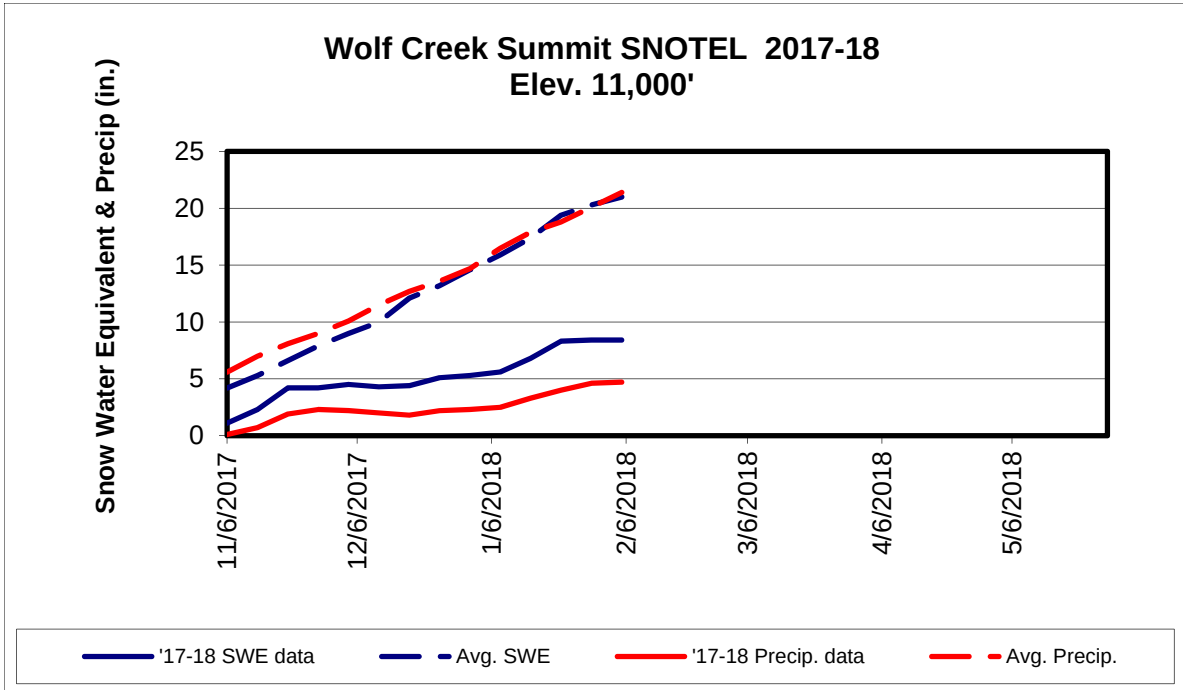
USDA NRCS

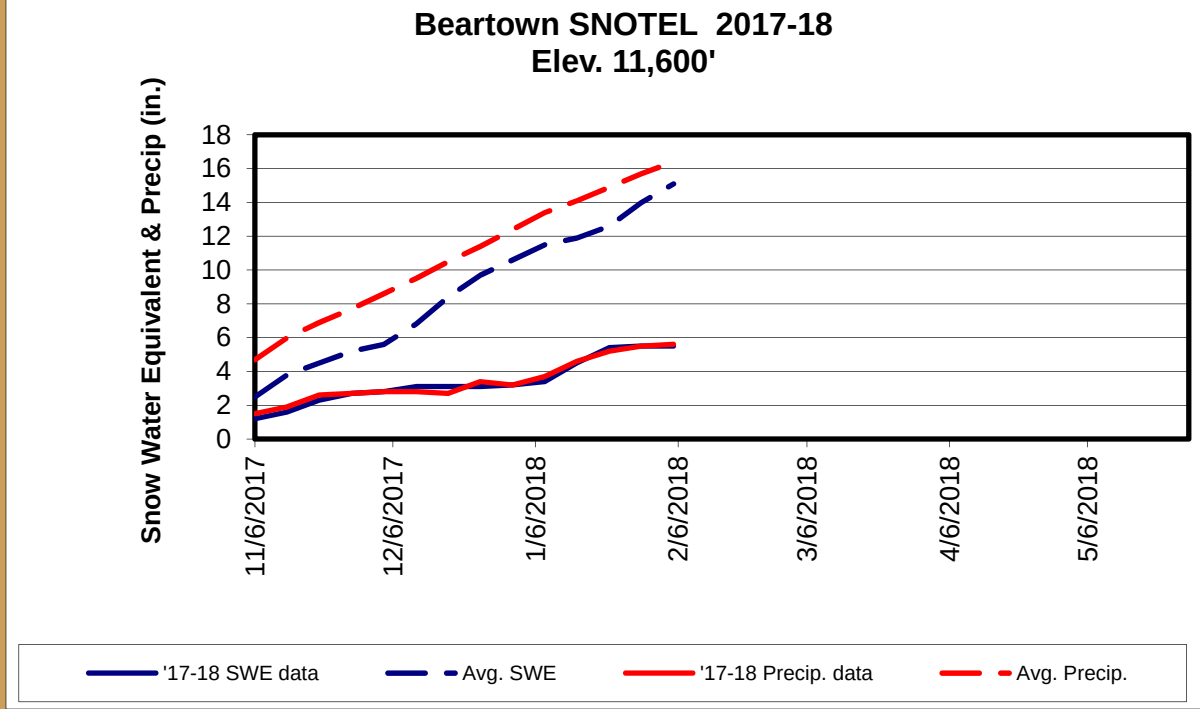
The snow water equivalent percent of normal represents the current snow water equivalent found at selected SNOTEL sites in or near the basin compared to the average value for those sites on this day. Data based on the first reading of the day (typically 00:00).

Prepared by:
USDA/NRCS National Water and Climate Center
Portland, Oregon
http://www.wcc.nrcs.usda.gov

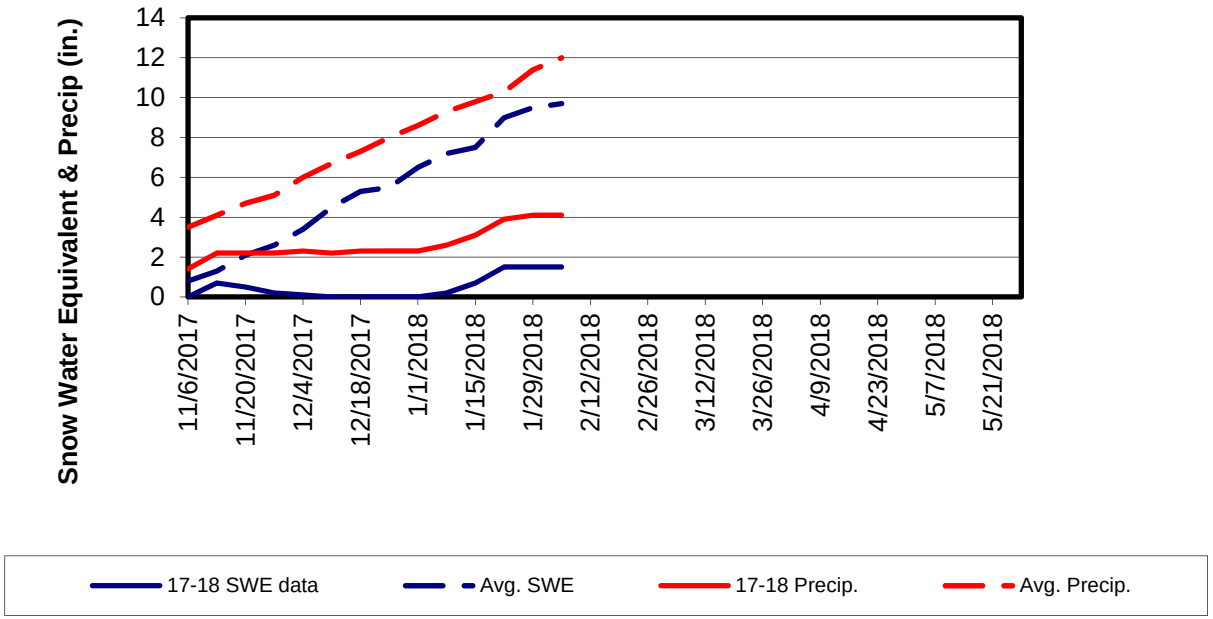

Cumbres SNOTEL Site 2017-18
Elev. 10,400'
Snow Water Equivalent & Precip (in.)
18
16
14
12
10
8
6
4
2
0
11/6/2017
12/6/2017
1/6/2018
2/6/2018
3/6/2018
4/6/2018
5/6/2018
17-18 SWE Data
Avg. SWE
17-18 Precip.
Avg. Precip.


Hopewell SNOTEL Site 2017-18
Elev. 10,000'
Snow Water Equivalent & Precip (in.)
15
10
5
0
11/6/2017
11/20/2017
12/4/2017
12/18/2017
1/1/2018
1/15/2018
1/29/2018
2/12/2018
2/26/2018
3/12/2018
3/26/2018
4/9/2018
4/23/2018
5/7/2018
5/21/2018
17-18 SWE Data
Avg. SWE
17-18 Precip.
Avg. Precip.

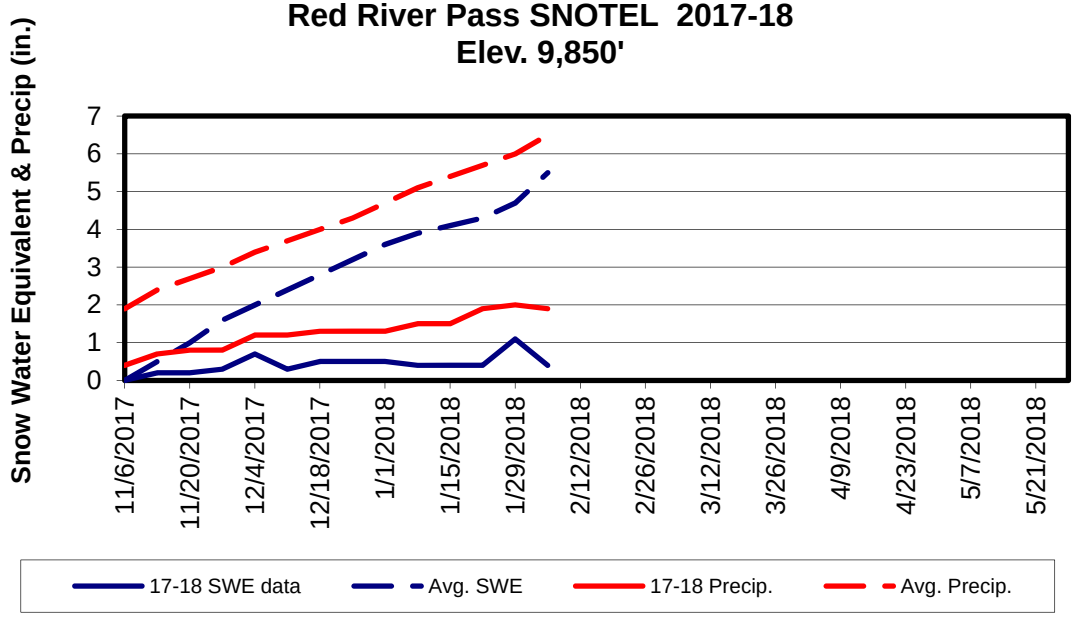

Wolf Creek Summit SNOTEL 2017-18
Elev. 11,000'
Snow Water Equivalent & Precip (in.)
25
20
15
10
5
0
11/6/2017
12/6/2017
1/6/2018
2/6/2018
3/6/2018
4/6/2018
5/6/2018
'17-18 SWE data
Avg. SWE
'17-18 Precip. data
Avg. Precip.

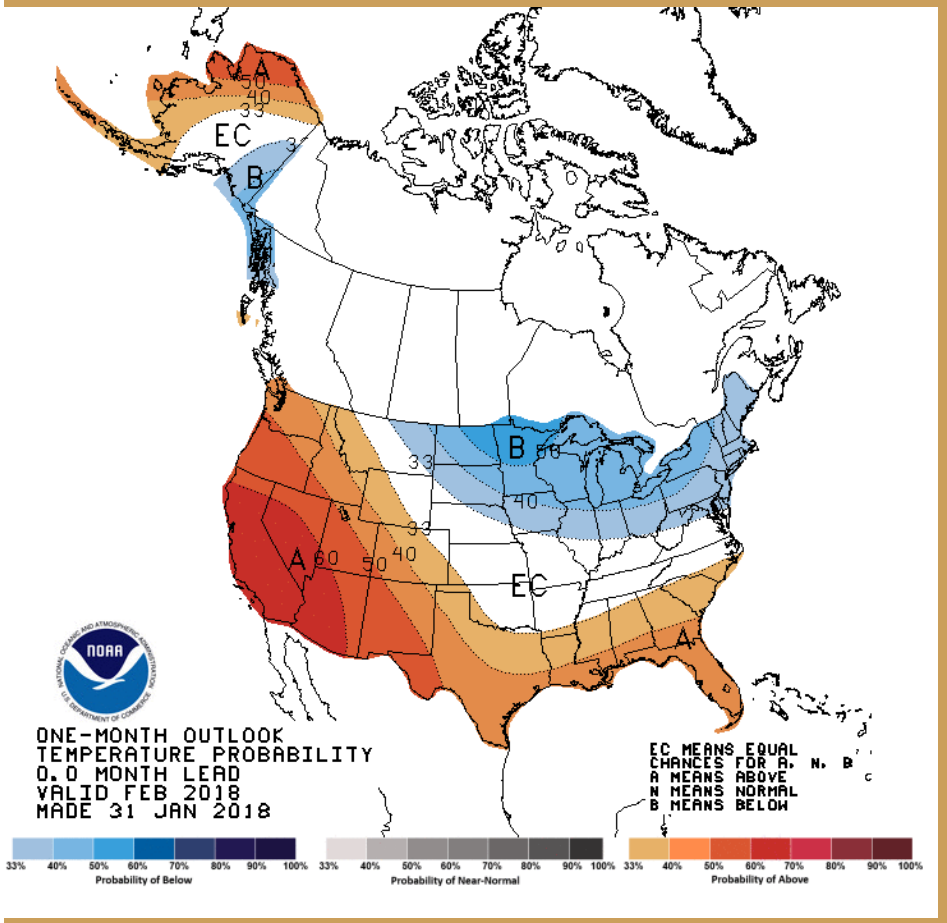

Beartown SNOTEL 2017-18
Elev. 11,600'
Snow Water Equivalent & Precip (in.)
18
16
14
12
10
8
6
4
2
0
11/6/2017
12/6/2017
1/6/2018
2/6/2018
3/6/2018
4/6/2018
5/6/2018
'17-18 SWE data
Avg. SWE
'17-18 Precip. data
Avg. Precip.

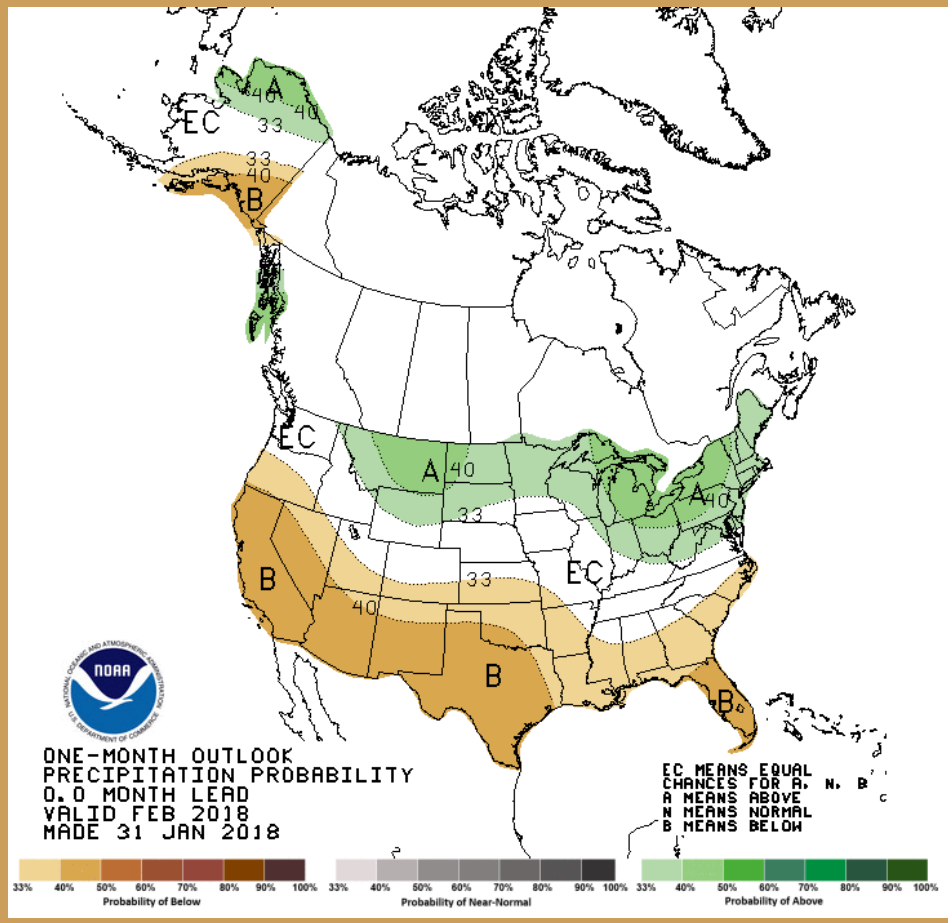
Santa Fe SNOTEL 2017-18
Elev. 11,445'

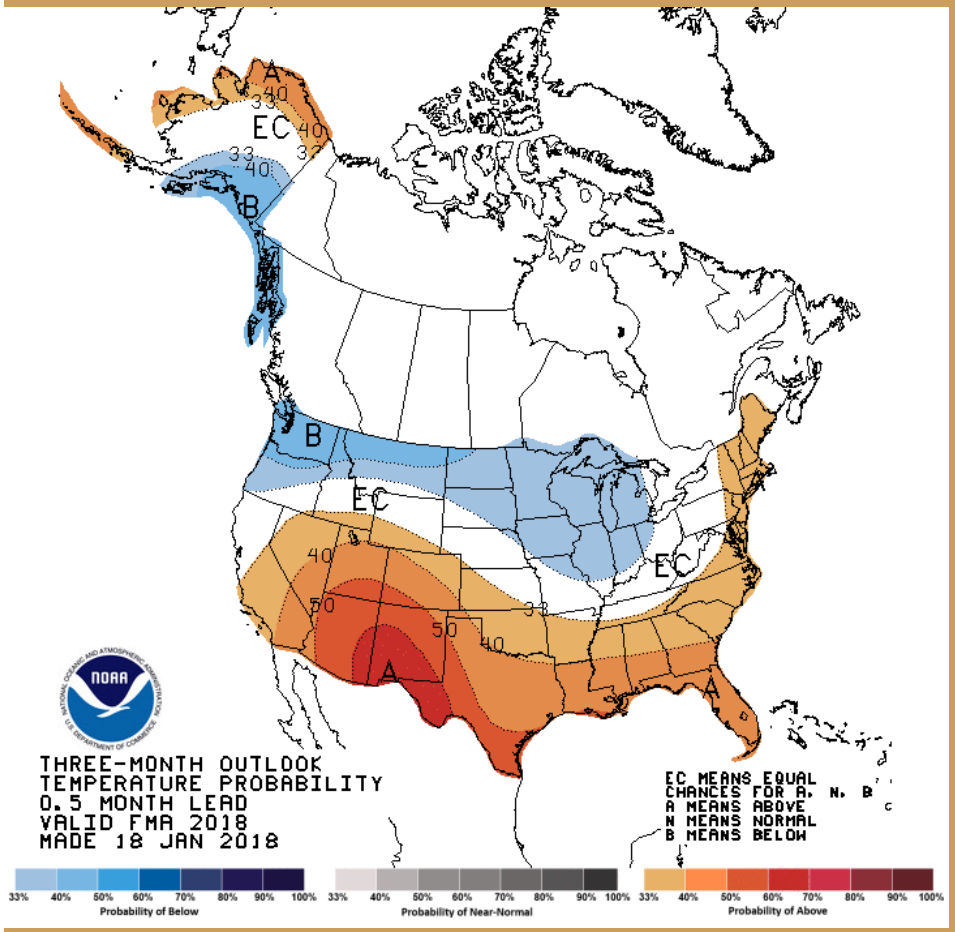


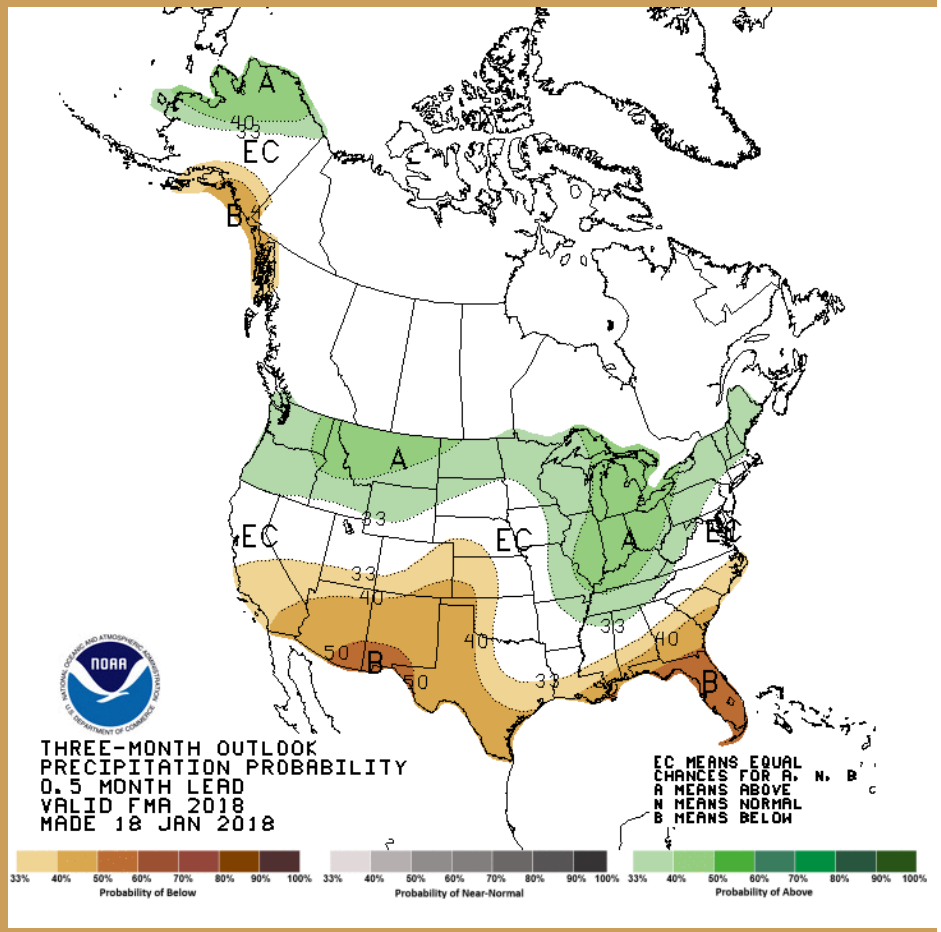
Red River Pass SNOTEL 2017-18
Elev. 9,850'




ONE-MONTH OUTLOOK
TEMPERATURE PROBABILITY
0.0 MONTH LEAD
VALID FEB 2018
MADE 31 JAN 2018
EC MEANS EQUAL CHANCES FOR A, N, B
A MEANS ABOVE
N MEANS NORMAL
B MEANS BELOW
Probability of Below
Probability of Near-Normal
Probability of Above


ONE-MONTH OUTLOOK
PRECIPITATION PROBABILITY
0.0 MONTH LEAD
VALID FEB 2018
MADE 31 JAN 2018
EC MEANS EQUAL CHANCES FOR A, N, B
A MEANS ABOVE
N MEANS NORMAL
B MEANS BELOW
Probability of Below
Probability of Near-Normal
Probability of Above


THREE-MONTH OUTLOOK
TEMPERATURE PROBABILITY
0.5 MONTH LEAD
VALID FMA 2018
MADE 18 JAN 2018
EC MEANS EQUAL CHANCES FOR A, N, B
A MEANS ABOVE
N MEANS NORMAL
B MEANS BELOW
Probability of Below
Probability of Near-Normal
Probability of Above


THREE-MONTH OUTLOOK
PRECIPITATION PROBABILITY
0.5 MONTH LEAD
VALID FMA 2018
MADE 18 JAN 2018
EC MEANS EQUAL CHANCES FOR A, N, B
A MEANS ABOVE
N MEANS NORMAL
B MEANS BELOW
Probability of Below
Probability of Near-Normal
Probability of Above

NRCS' Final February Forecast

Location	period	50%, KAF	% of avg	70%, KAF	90%, KAF
Rio Grande nr Lobatos	Apr - Jul	29	15	14.1	1.78
El Vado Reservoir Inflow	Mar - Jul	53	24	32	11.1
	Apr - Jul	48	23	28	9.2
Rio Grande at Otowi	Mar - Jul	150	21	98	42
Rio Grande at San Marcial	Mar - Jul	-33	-6	-155	-335
Rio Blanco at Blanco Diversion	Apr - Jul	28	52	22	14.1
Navajo R at Oso Diversion	Apr - Jul	33	51	26	16.6

Supplemental Water Supply

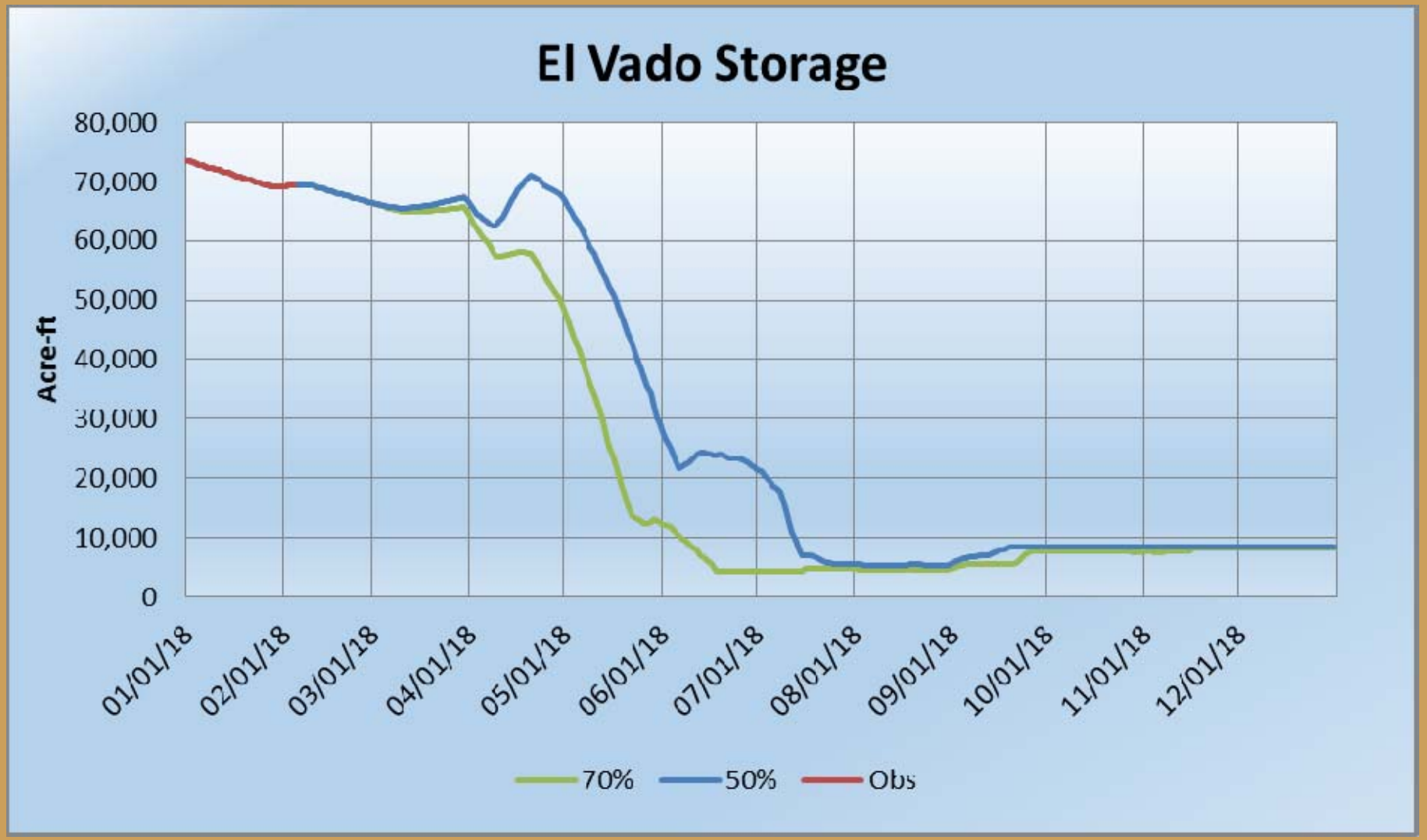
- ~12,600 ac-ft in hand (2017 SJC leases)
- Up to ~13,000 ac-ft in 2018 leased SJC
  - Final volume depends on % SJC allocation
- 13,000 ac-ft of EDW available to store
- Most likely won't store EDW
  - Article VII status
  - Low total inflow into El Vado (median – 53,000 ac-ft)
- 20,000 – 26,000 ac-ft total

Use of Supplemental Water

- 300 cfs release = 37 days
- 250 cfs release = 44 days
- 100 cfs release = 110 days
- 75 cfs release = 147 days
- 40 cfs release = 277 days

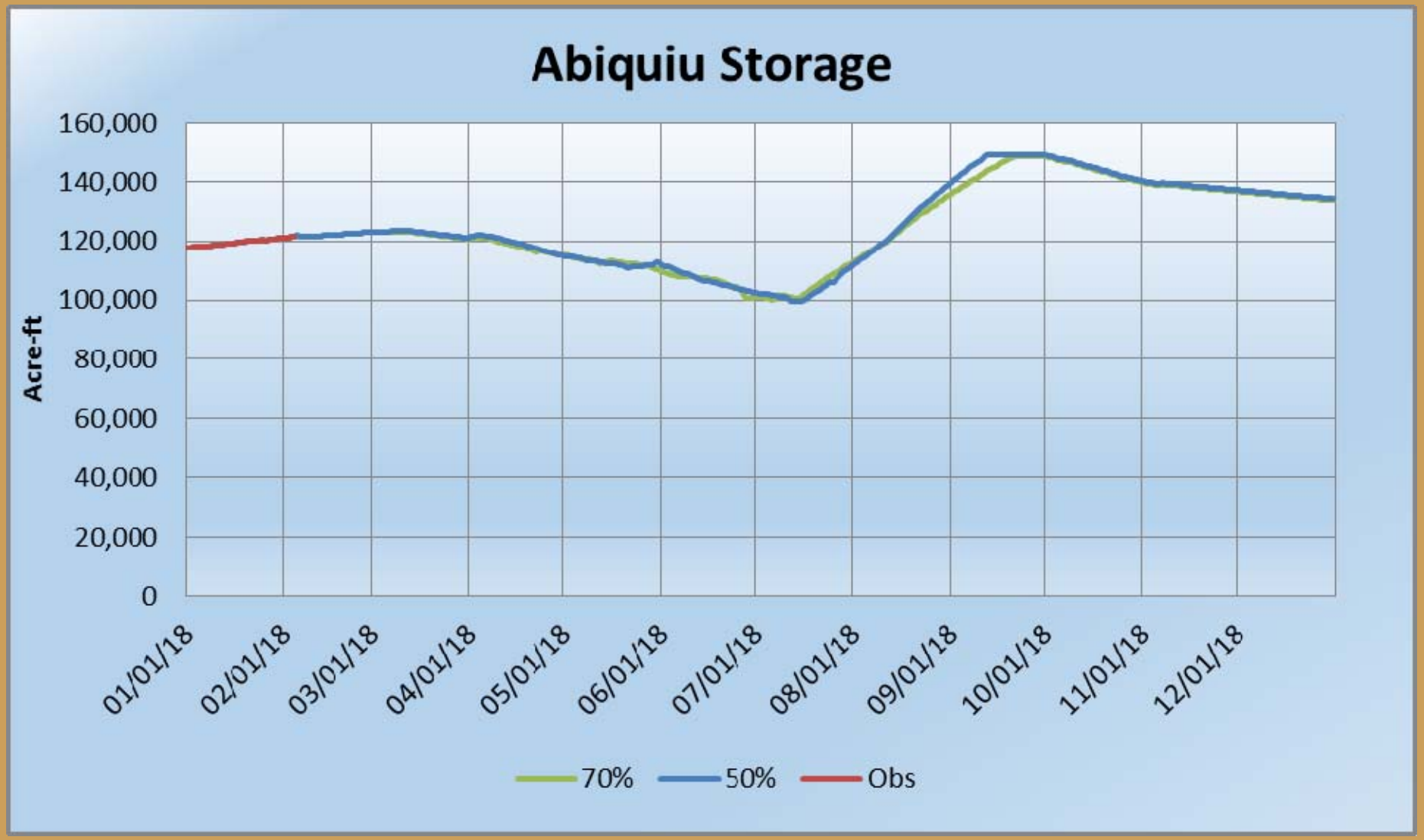

El Vado Inflow
CFS
1,200
1,000
800
600
400
200
0
01/01/18
02/01/18
03/01/18
04/01/18
05/01/18
06/01/18
07/01/18
08/01/18
09/01/18
10/01/18
11/01/18
12/01/18
70%
50%
Obs

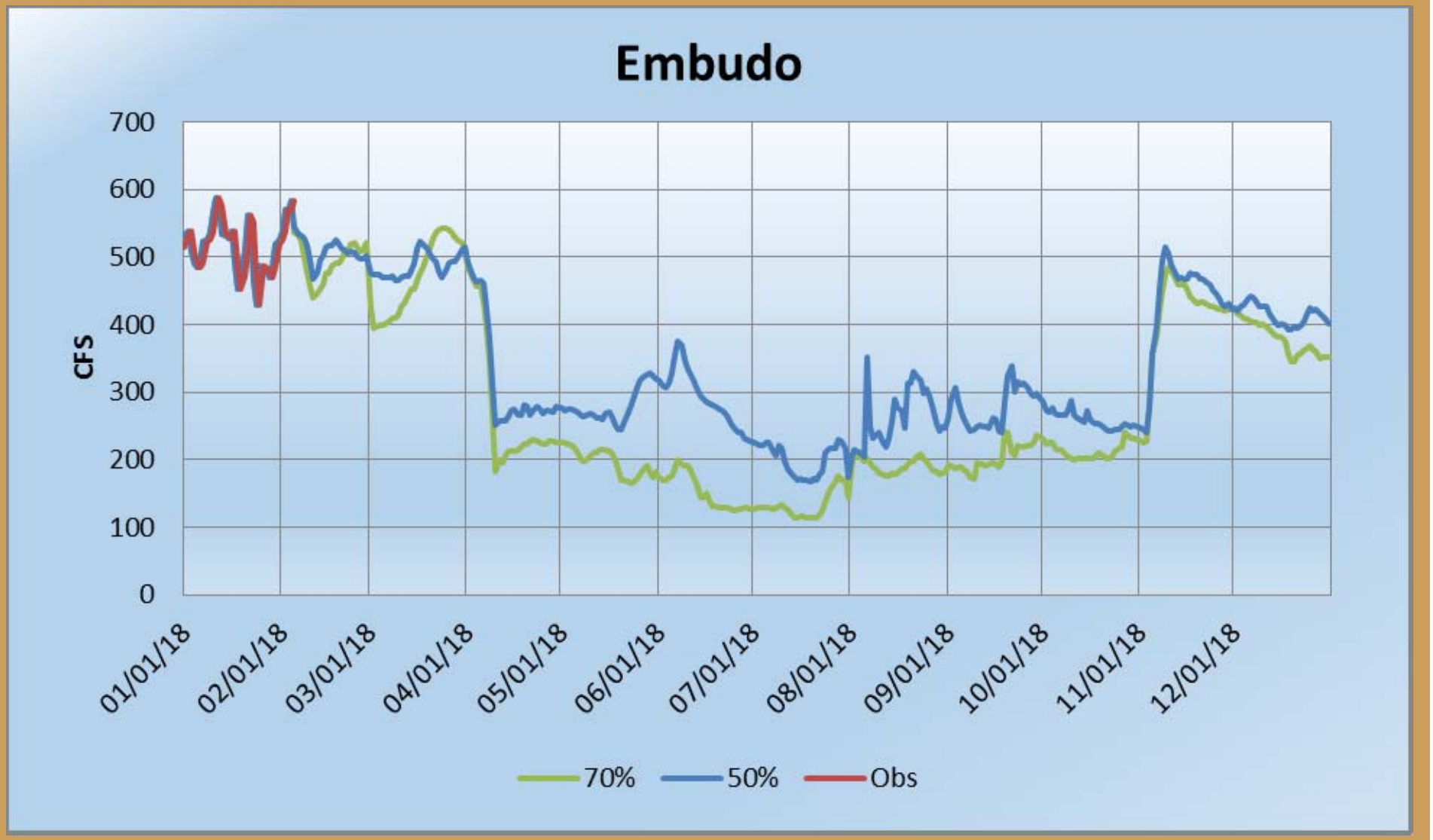

El Vado Outflow
CFS
1,600
1,400
1,200
1,000
800
600
400
200
0
01/01/18
02/01/18
03/01/18
04/01/18
05/01/18
06/01/18
07/01/18
08/01/18
09/01/18
10/01/18
11/01/18
12/01/18
70%
50%
Obs


El Vado Storage
Acre-ft
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
01/01/18
02/01/18
03/01/18
04/01/18
05/01/18
06/01/18
07/01/18
08/01/18
09/01/18
10/01/18
11/01/18
12/01/18
70%
50%
Obs

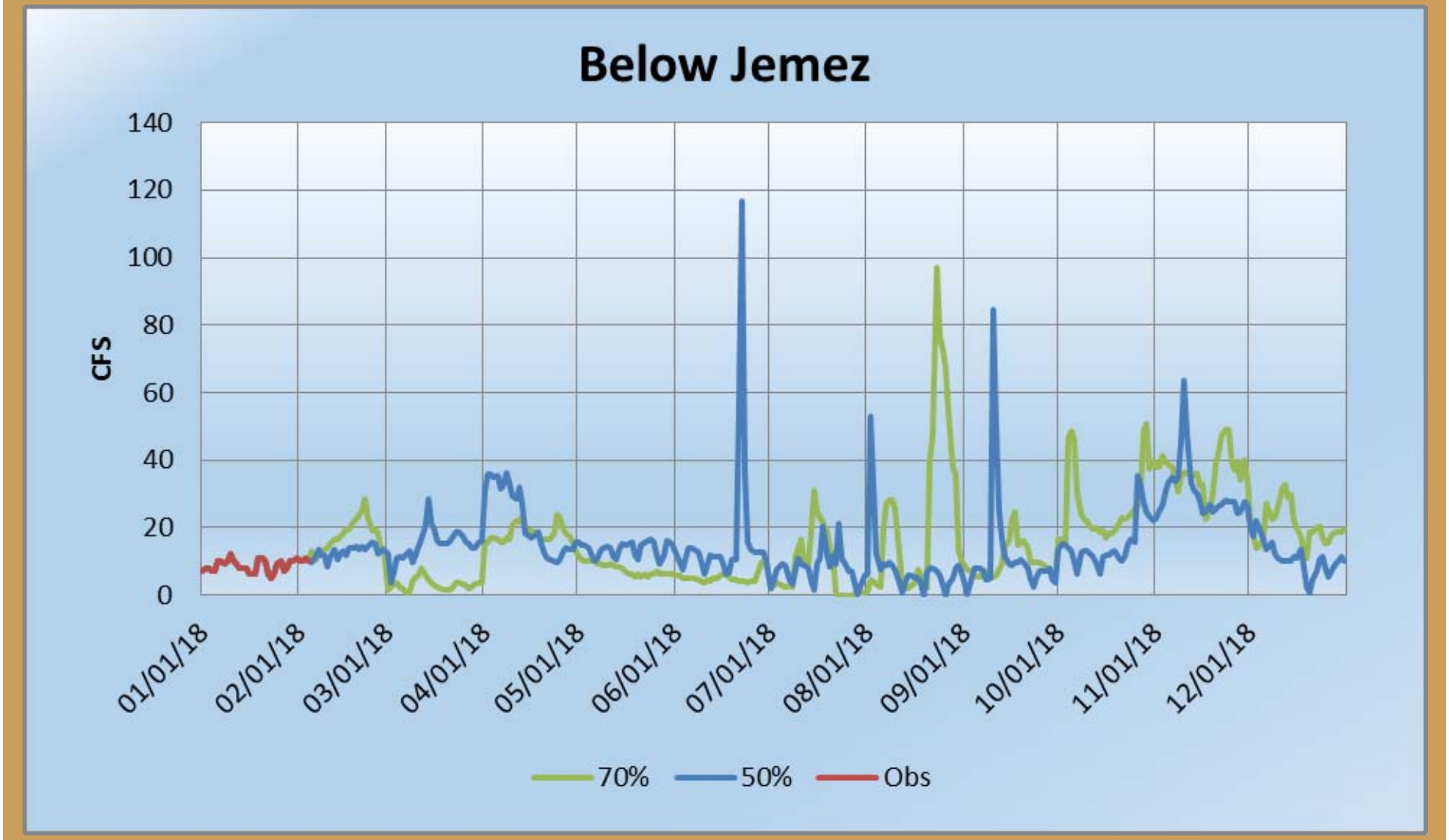

Abiquiu Inflow
CFS
1,600
1,400
1,200
1,000
800
600
400
200
0
01/01/18
02/01/18
03/01/18
04/01/18
05/01/18
06/01/18
07/01/18
08/01/18
09/01/18
10/01/18
11/01/18
12/01/18
70%
50%
Obs

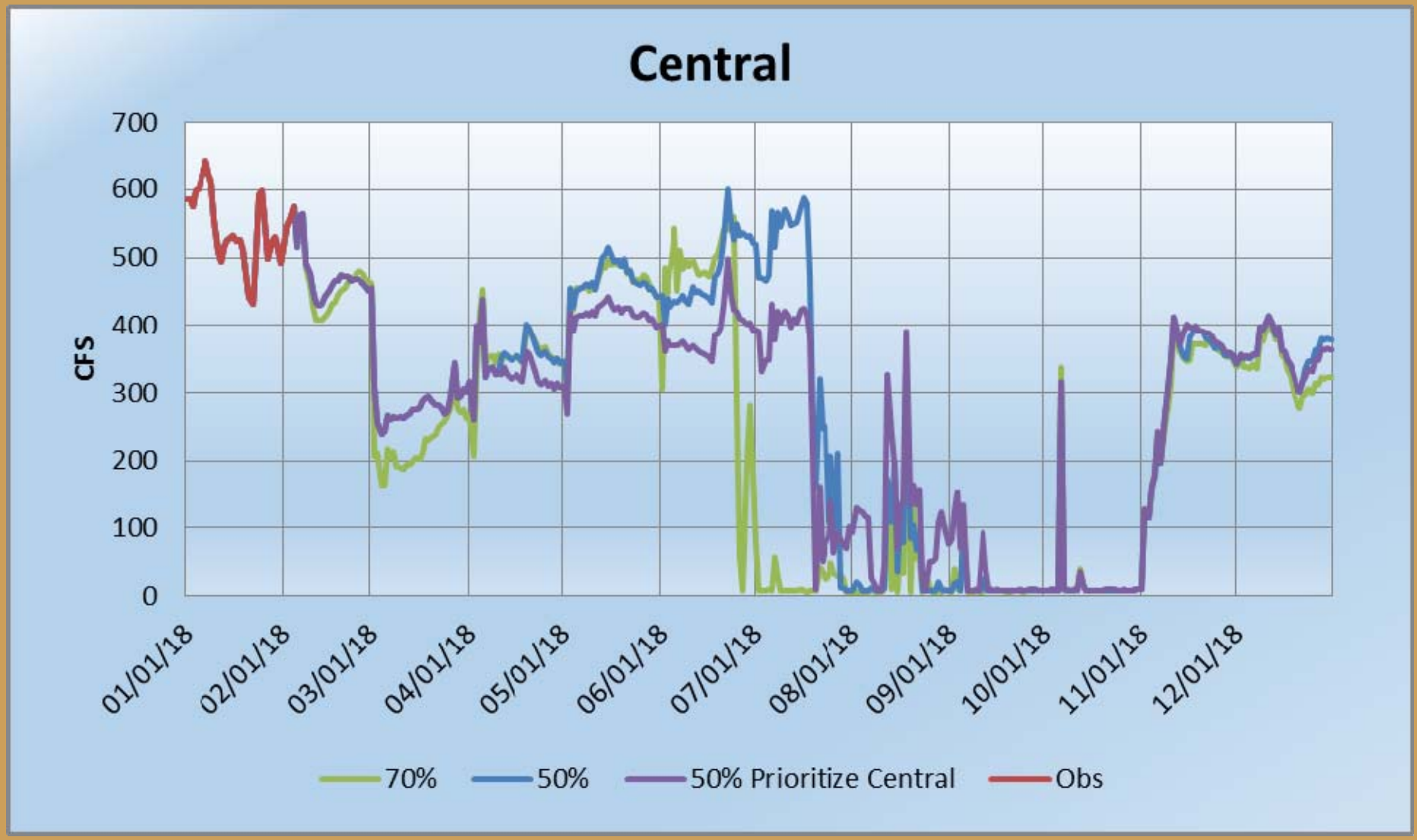

Abiquiu Outflow
CFS
1,400
1,200
1,000
800
600
400
200
0
01/01/18
02/01/18
03/01/18
04/01/18
05/01/18
06/01/18
07/01/18
08/01/18
09/01/18
10/01/18
11/01/18
12/01/18
70%
50%
Obs

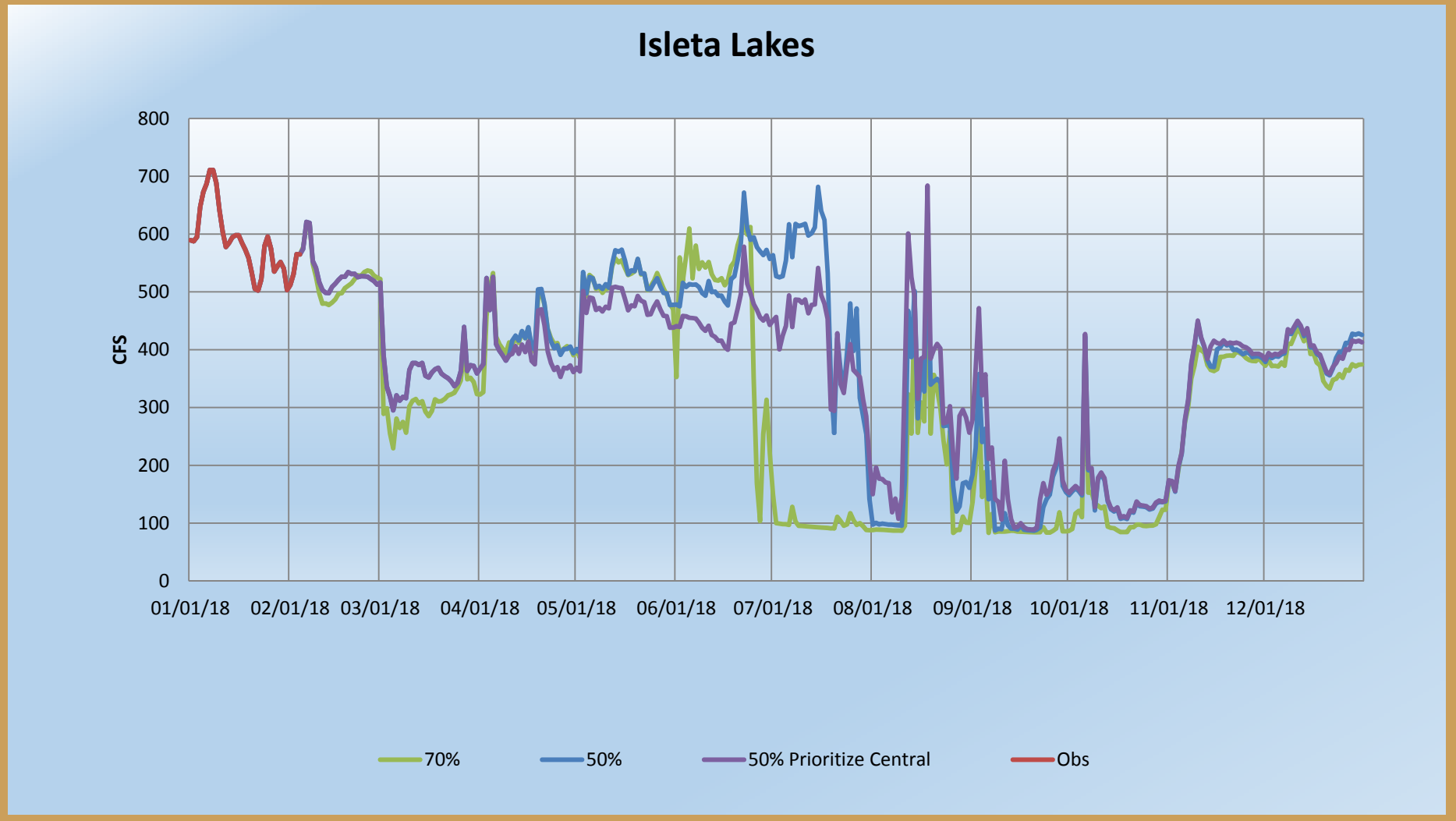

Abiquiu Storage
Acre-ft
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
01/01/18
02/01/18
03/01/18
04/01/18
05/01/18
06/01/18
07/01/18
08/01/18
09/01/18
10/01/18
11/01/18
12/01/18
70%
50%
Obs

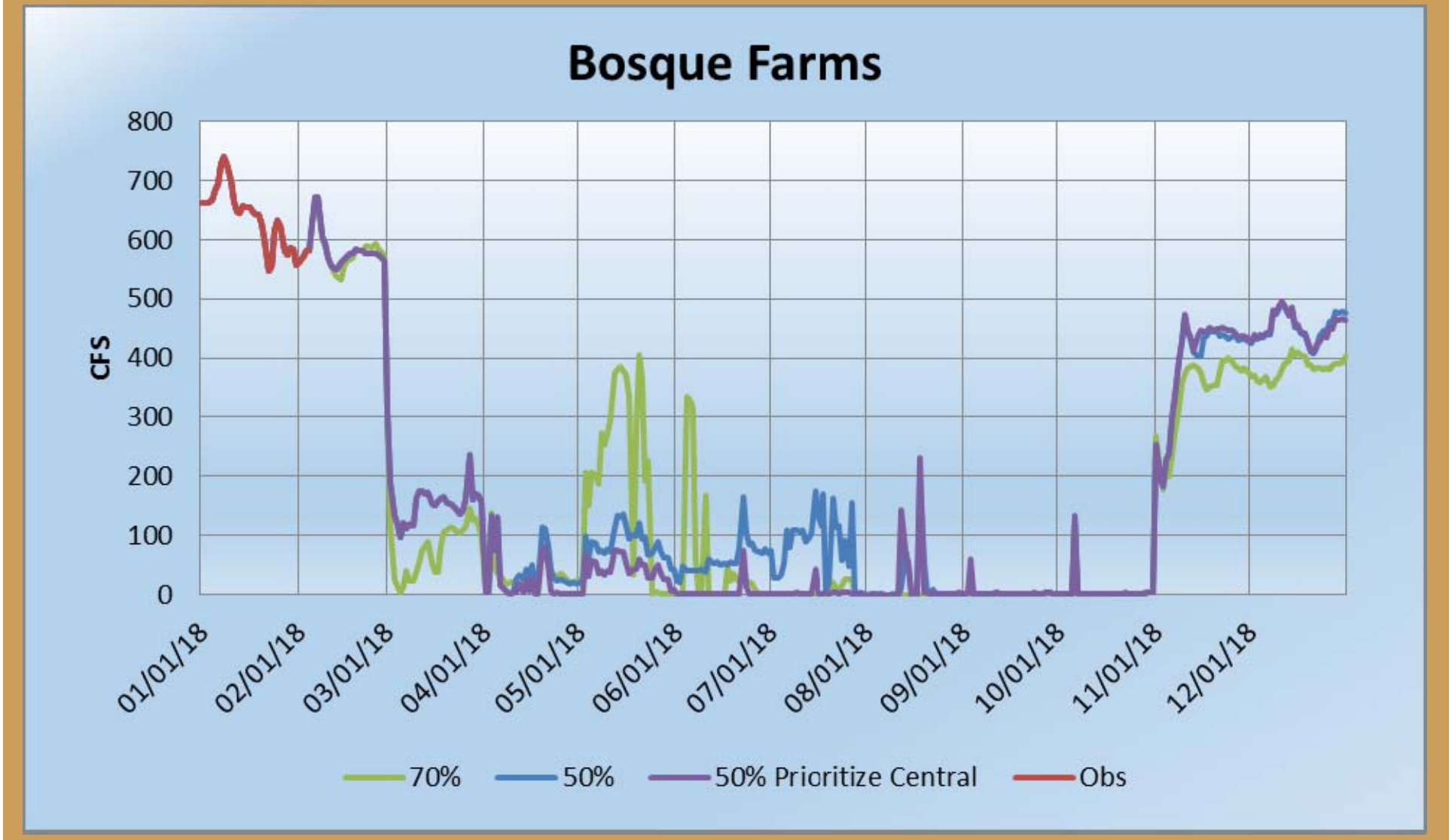

Embudo
CFS
700
600
500
400
300
200
100
0
01/01/18
02/01/18
03/01/18
04/01/18
05/01/18
06/01/18
07/01/18
08/01/18
09/01/18
10/01/18
11/01/18
12/01/18
70%
50%
Obs

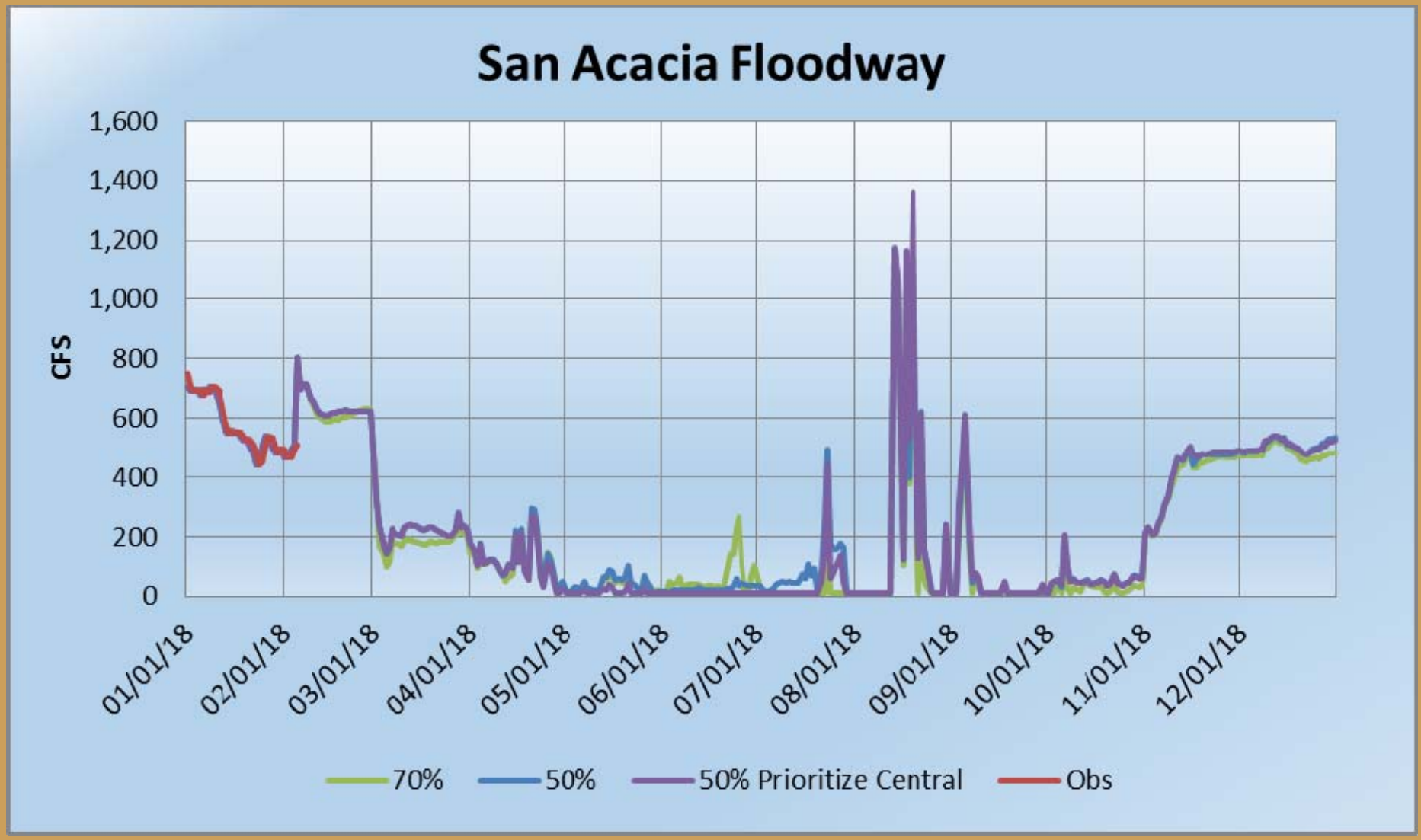

Otowi
CFS
1,400
1,200
1,000
800
600
400
200
0
01/01/18
02/01/18
03/01/18
04/01/18
05/01/18
06/01/18
07/01/18
08/01/18
09/01/18
10/01/18
11/01/18
12/01/18
70%
50%
Obs

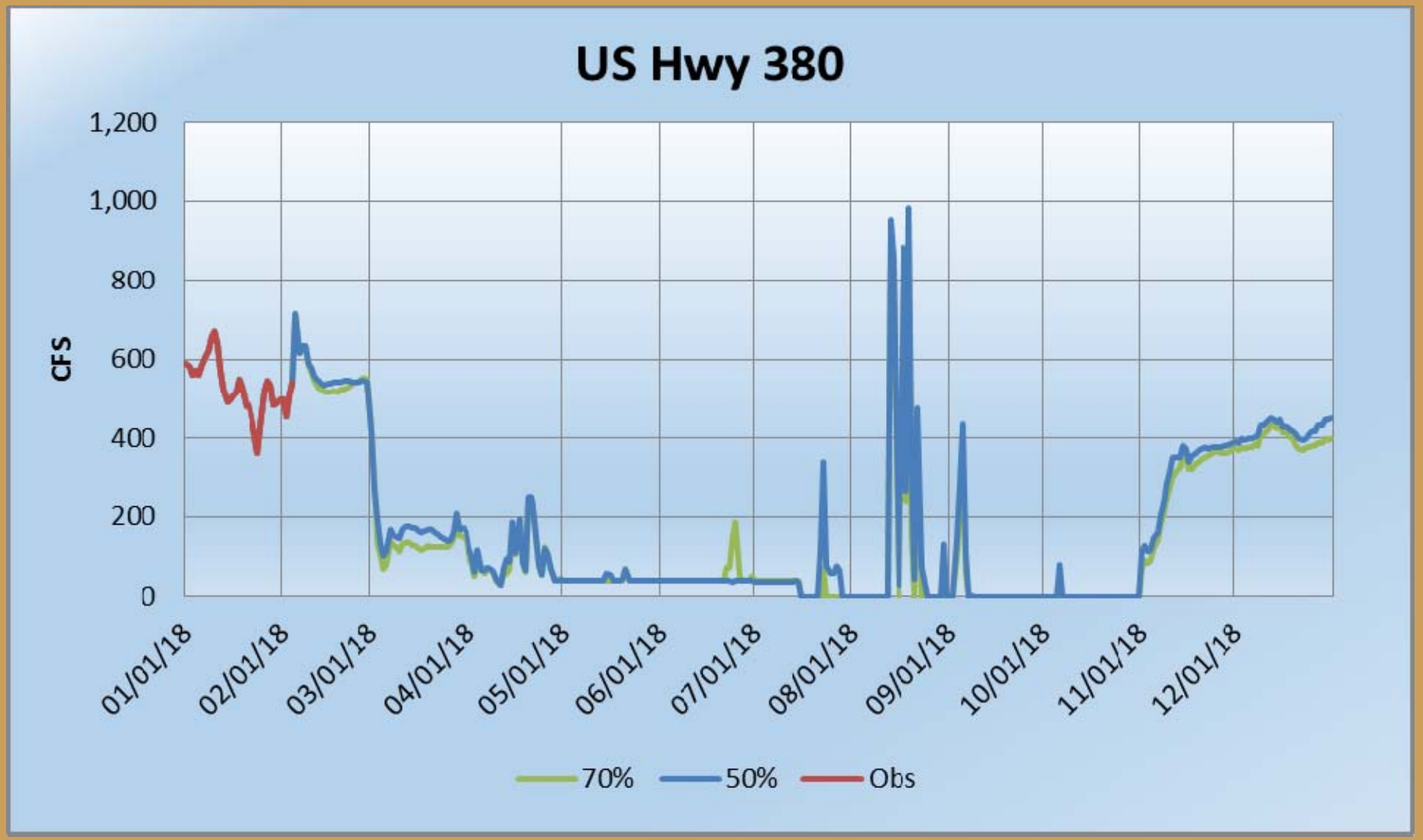

Below Jemez
CFS
140
120
100
80
60
40
20
0
01/01/18
02/01/18
03/01/18
04/01/18
05/01/18
06/01/18
07/01/18
08/01/18
09/01/18
10/01/18
11/01/18
12/01/18
70%
50%
Obs

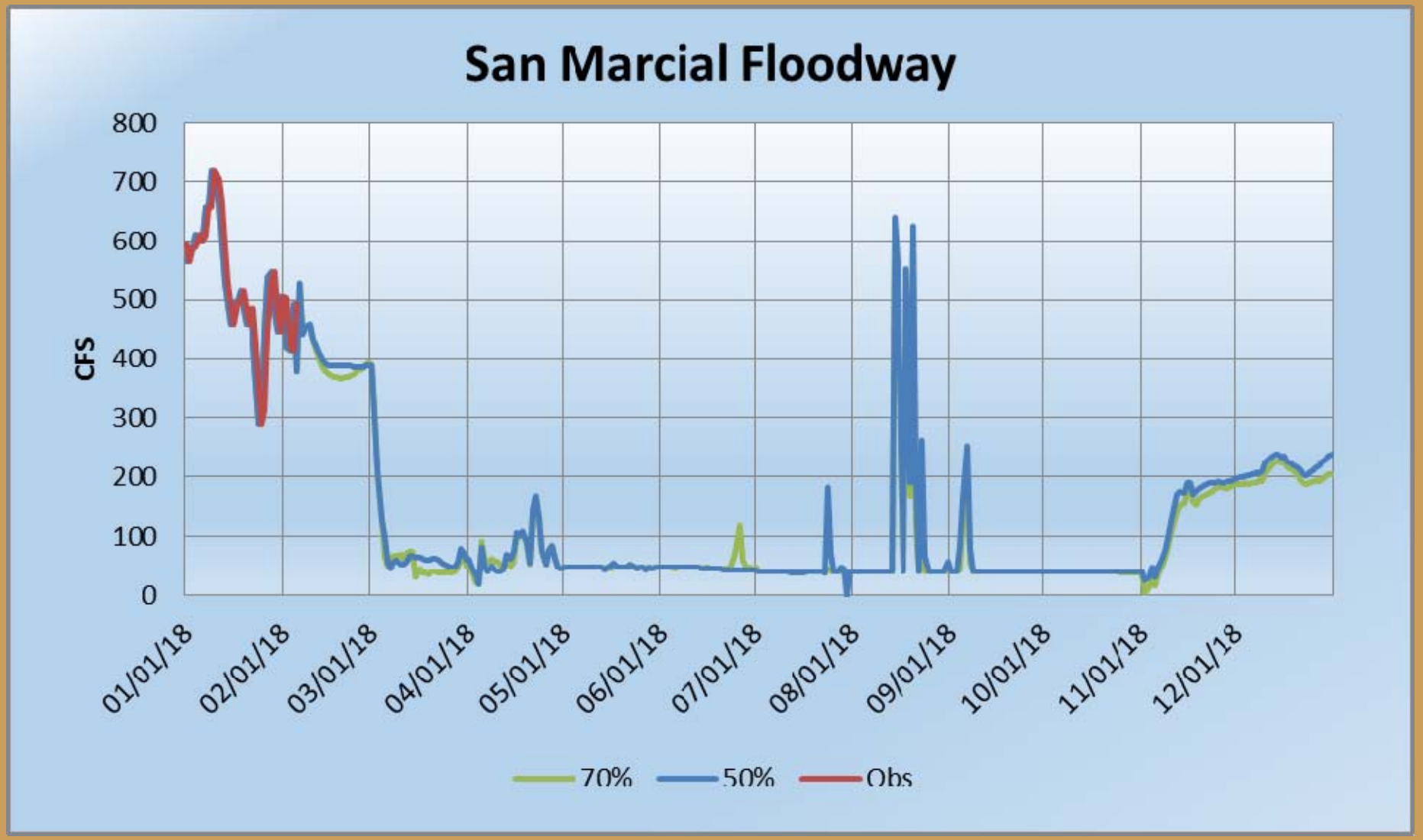

Central
CFS
700
600
500
400
300
200
100
0
01/01/18
02/01/18
03/01/18
04/01/18
05/01/18
06/01/18
07/01/18
08/01/18
09/01/18
10/01/18
11/01/18
12/01/18
70%
50%
50% Prioritize Central
Obs


Isleta Lakes
800
700
600
500
400
300
200
100
0
CFS
01/01/18
02/01/18
03/01/18
04/01/18
05/01/18
06/01/18
07/01/18
08/01/18
09/01/18
10/01/18
11/01/18
12/01/18
70%
50%
50% Prioritize Central
Obs

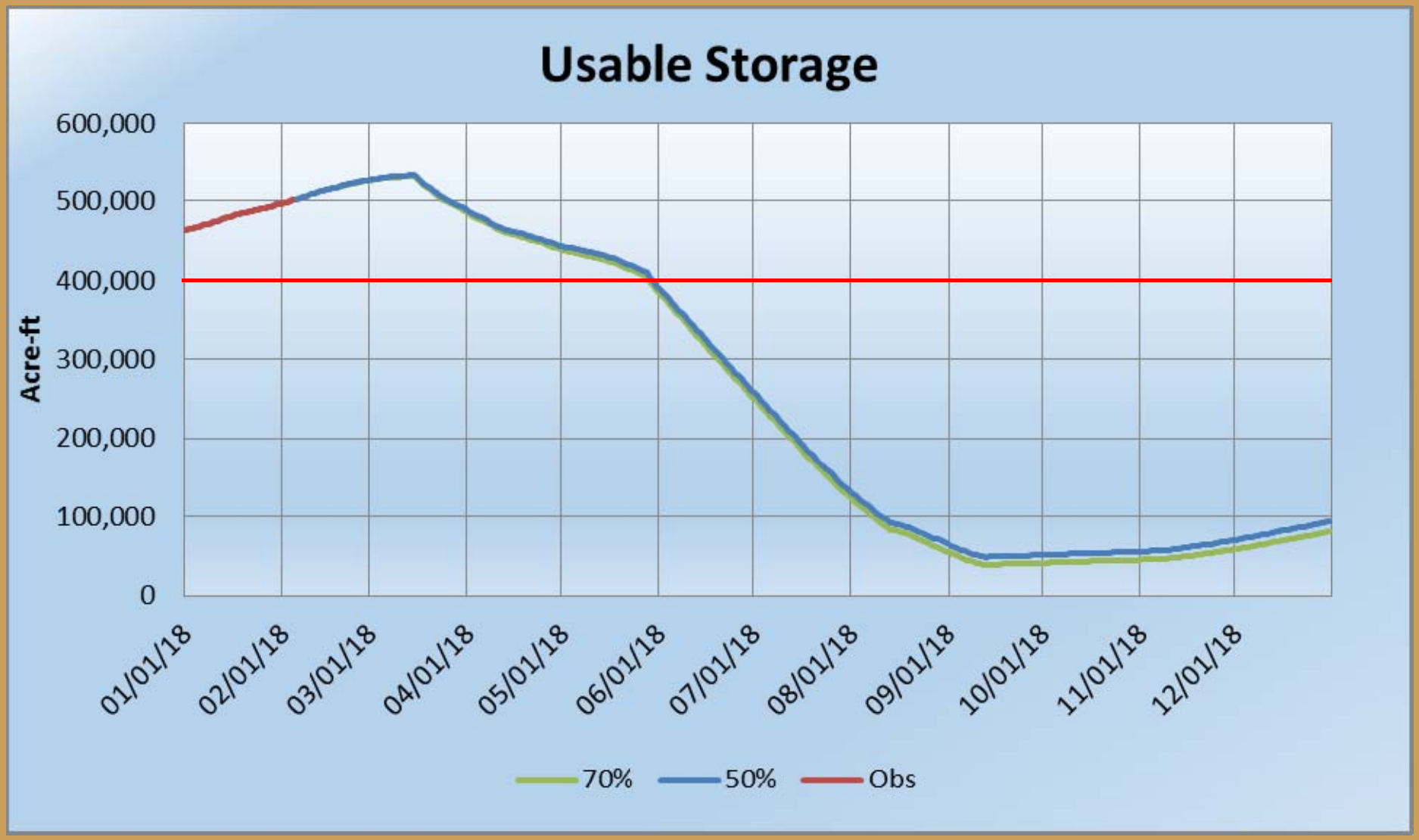

Bosque Farms
CFS
800
700
600
500
400
300
200
100
0
01/01/18
02/01/18
03/01/18
04/01/18
05/01/18
06/01/18
07/01/18
08/01/18
09/01/18
10/01/18
11/01/18
12/01/18
70%
50%
50% Prioritize Central
Obs


San Acacia Floodway
CFS
1,600
1,400
1,200
1,000
800
600
400
200
0
01/01/18
02/01/18
03/01/18
04/01/18
05/01/18
06/01/18
07/01/18
08/01/18
09/01/18
10/01/18
11/01/18
12/01/18
70%
50%
50% Prioritize Central
Obs

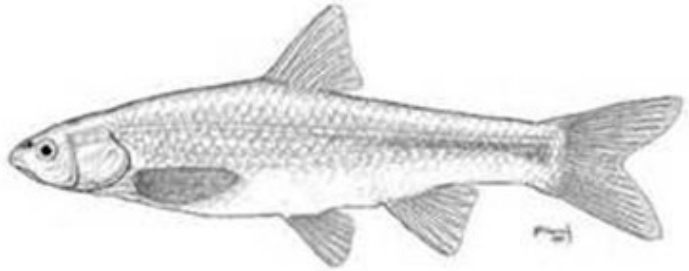

US Hwy 380
CFS
1,200
1,000
800
600
400
200
0
01/01/18
02/01/18
03/01/18
04/01/18
05/01/18
06/01/18
07/01/18
08/01/18
09/01/18
10/01/18
11/01/18
12/01/18
70%
50%
Obs


San Marcial Floodway
CFS
800
700
600
500
400
300
200
100
0
01/01/18
02/01/18
03/01/18
04/01/18
05/01/18
06/01/18
07/01/18
08/01/18
09/01/18
10/01/18
11/01/18
12/01/18
70%
50%
Obs

Article VII Status



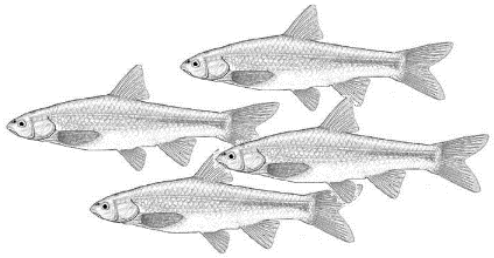
Rio Grande Silvery Minnow



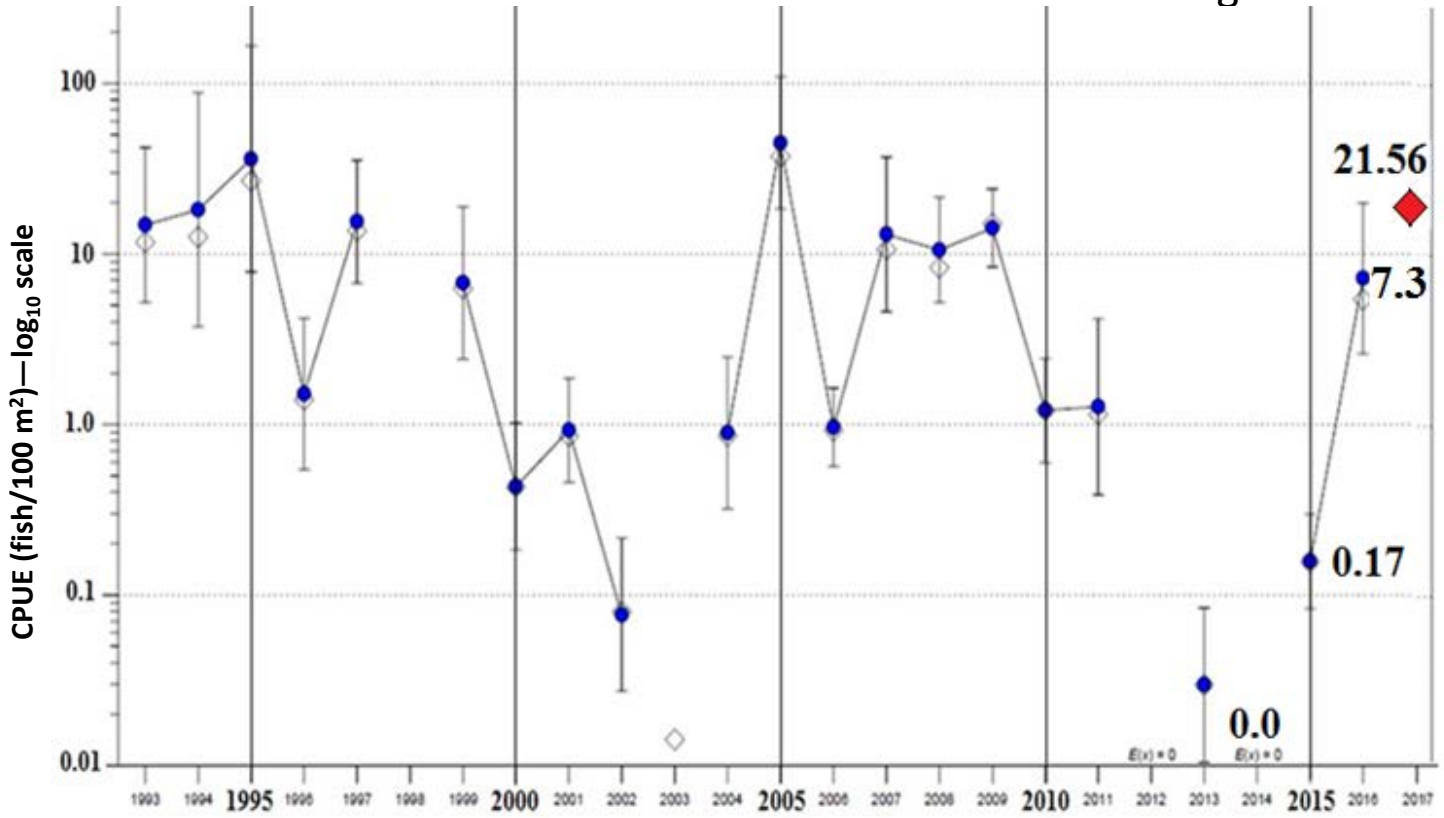
Minnow Action Team
R. Valdez
Feb 9, 2018

DENSITY: RGSM CPUE (1993 – 2017)

- October 2017 CPUE = 21.56 (Dudley et al. 2017; up from 7.3)
- October 2017 CPUE is third highest since 1993 (only 1995 and 2005 are higher)
- High CPUE in 2016 set strong reproductive base for 2017
- Strong reproductive base for 2018



All ages



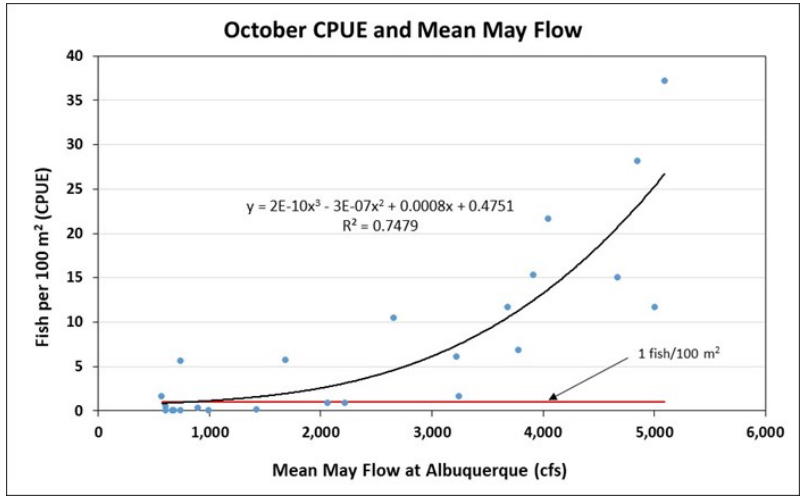
Rio Grande Silvery Minnow mixture-model estimates ($E(x)$), using October sampling-site density data, across years. Sampling did not occur in 1998. Modeled estimates (circles), 95% confidence intervals (bars), and simple estimates using the method of moments (diamonds) are illustrated.

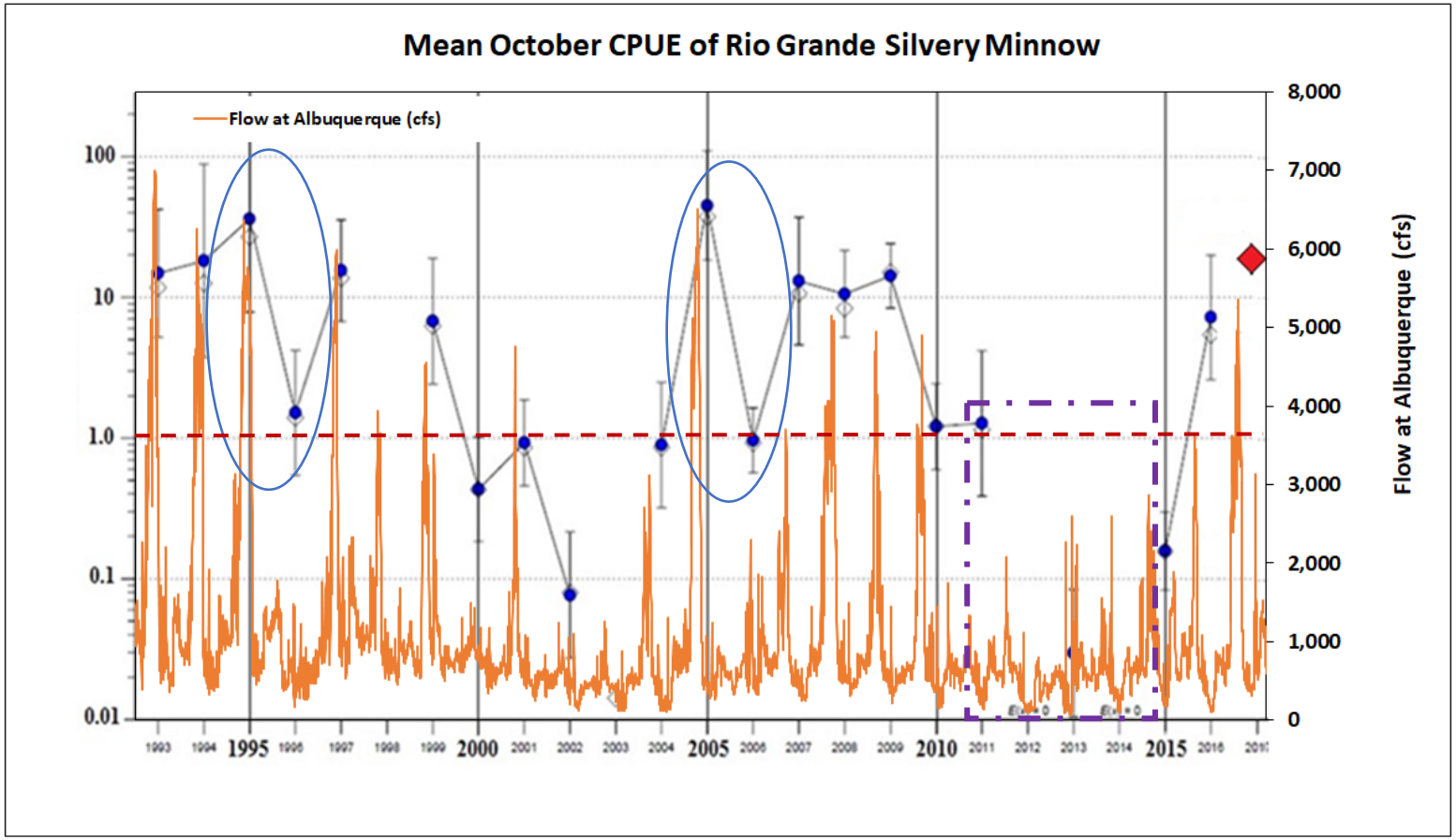
- Base figure from Dudley et al. (2017) Annual Report; 2017 CPUE from Dudley et al. (2017) October 2017 Report

River Flow and RGSM Density

(1993-2017, 23 yrs)

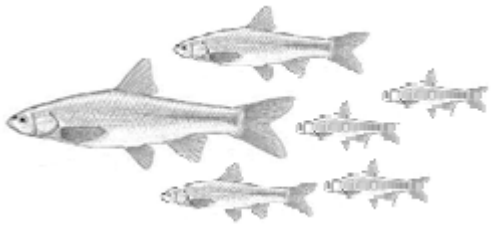
- Density of RGSM is positively correlated to river flow.

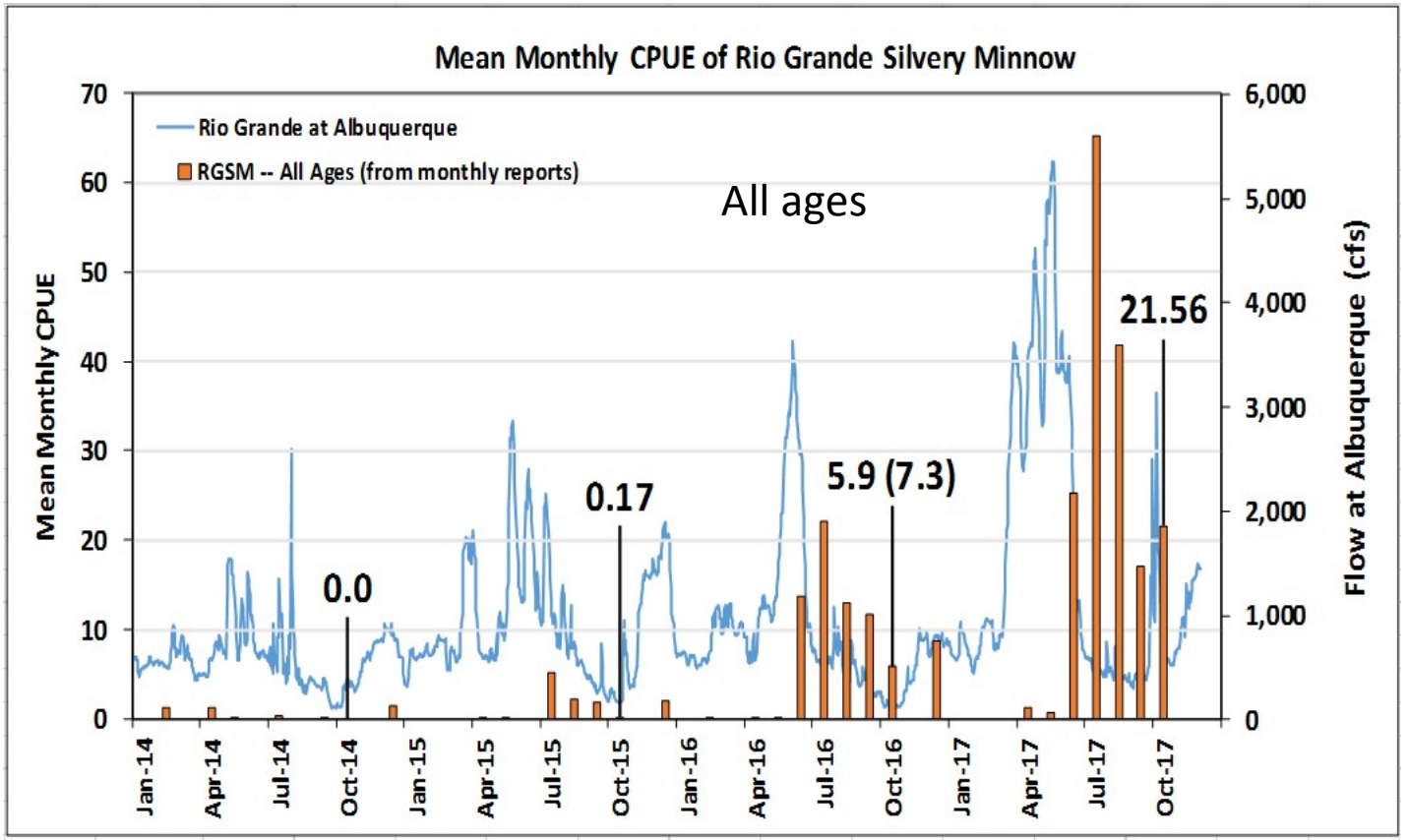




Rio Grande Silvery Minnow CPUE and River Flow

- High spring flow = high CPUE
- Low spring flow in 2014 = 0 CPUE in Oct
- Moderate spring flow in 2016 = 5.9 CPUE (7.3 with mix model)
- High spring flow in 2017 = 21.56
- Low spring flow in 2018
- Mirror of 2005 high and 2006 low runoff went from ?





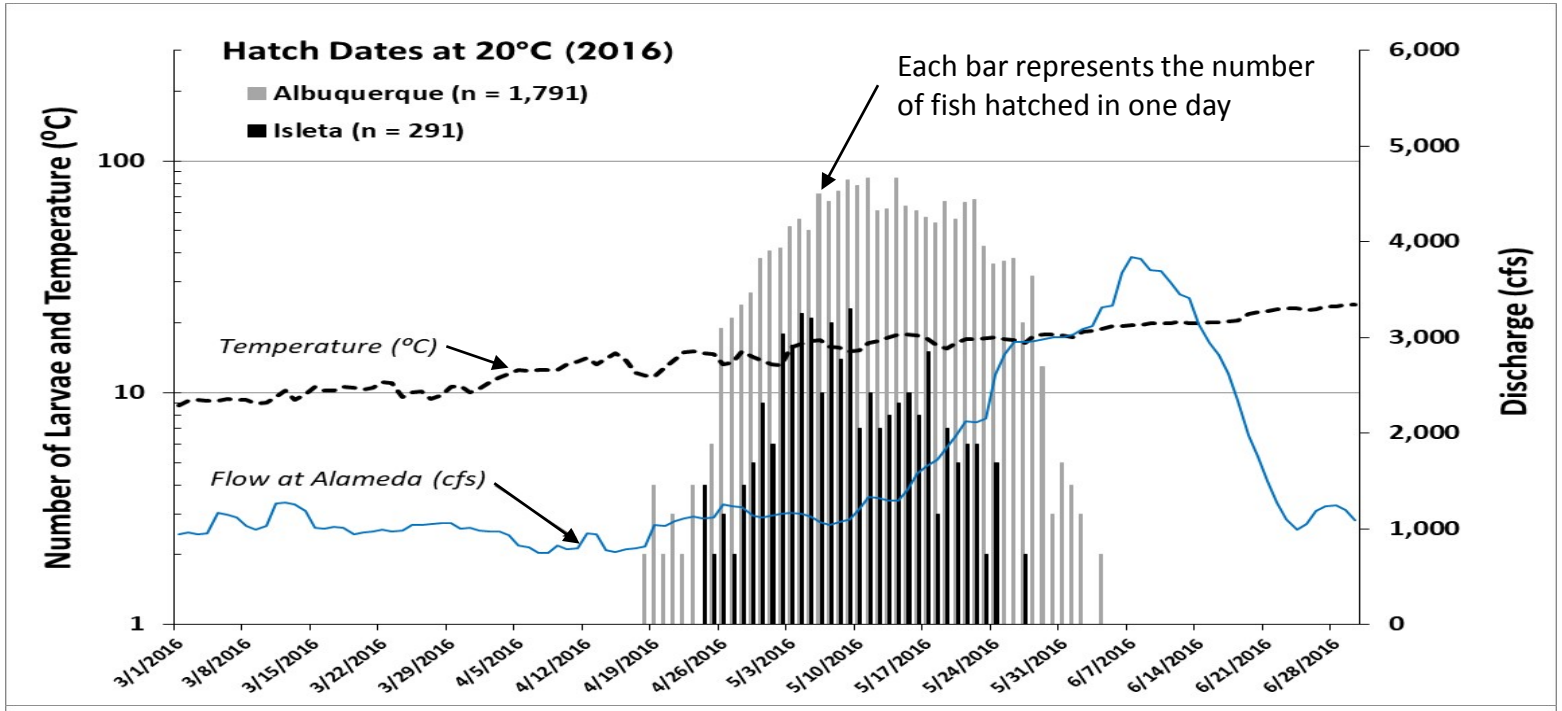
- All CPUEs from Dudley et al. (2017) Monthly Reports
- CPUEs are for unmarked fish only
- Annual releases of RGSM by the Service could affect reproductive base

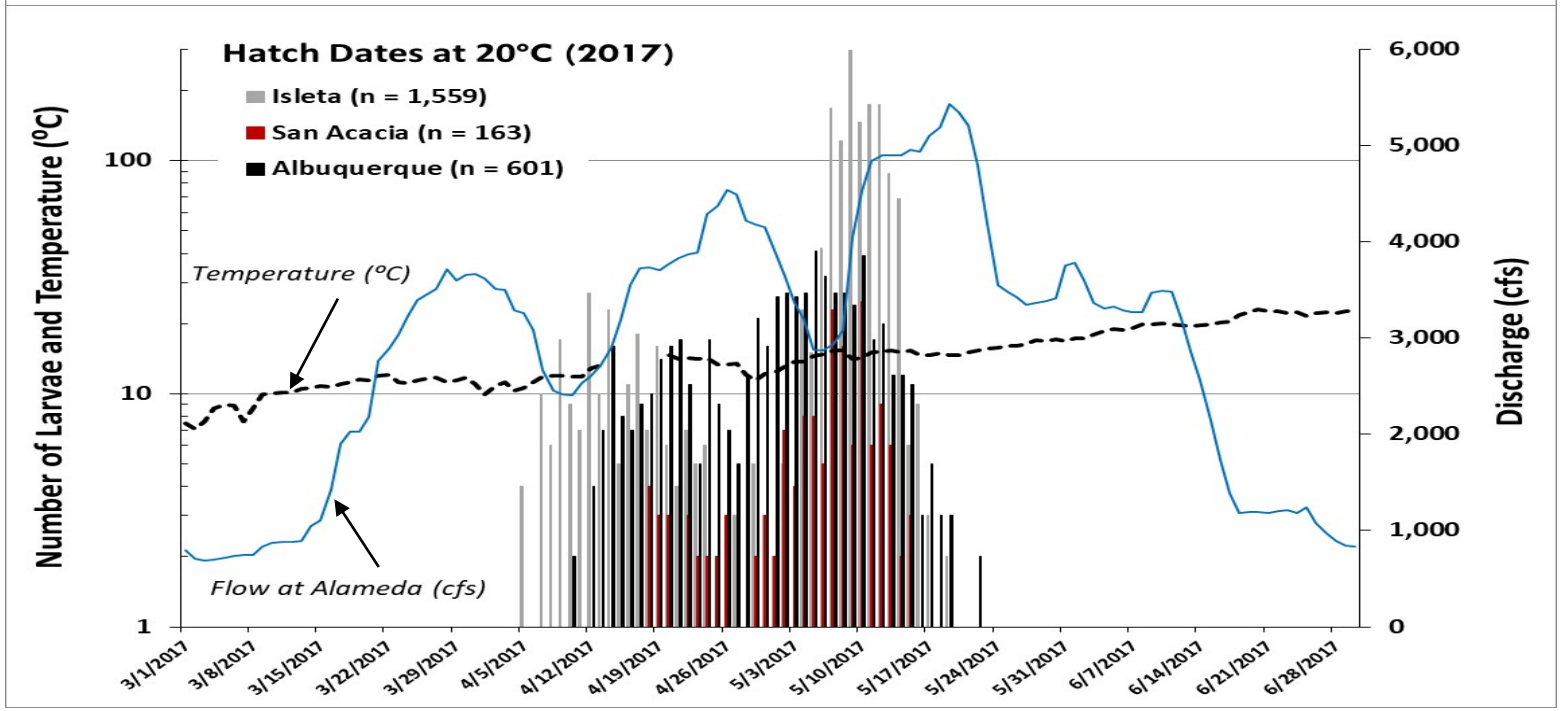
HATCH DATES:

- Estimated Hatch Dates were computed from growth measured in a laboratory (Platania and Dudley 2003)
- More precise estimates of age and hatch date from otoliths

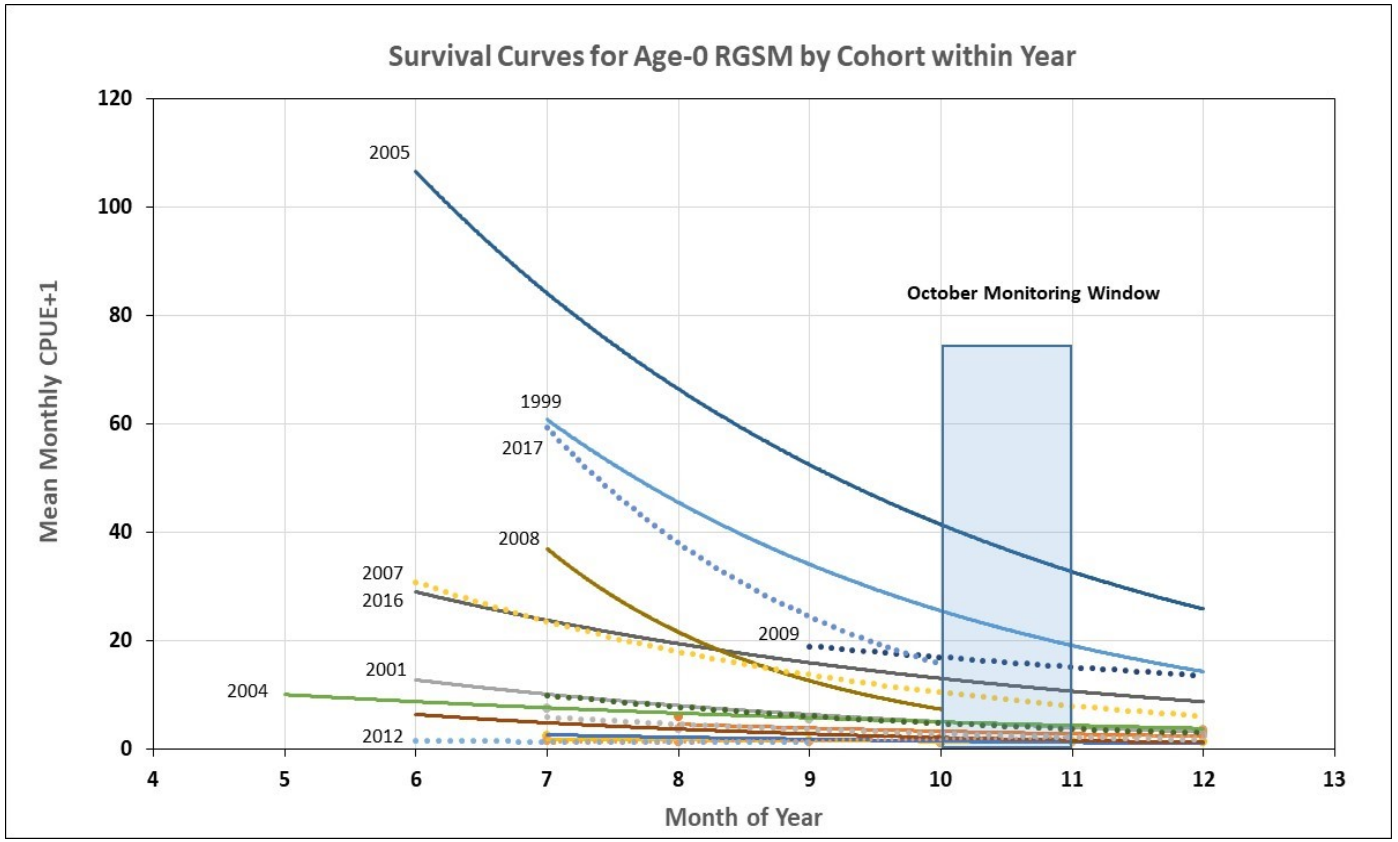
Fish Standard Length (SL)

HD = (SL - 3.66) / 0.14
(r^2 = 0.94; up to 50 mm)

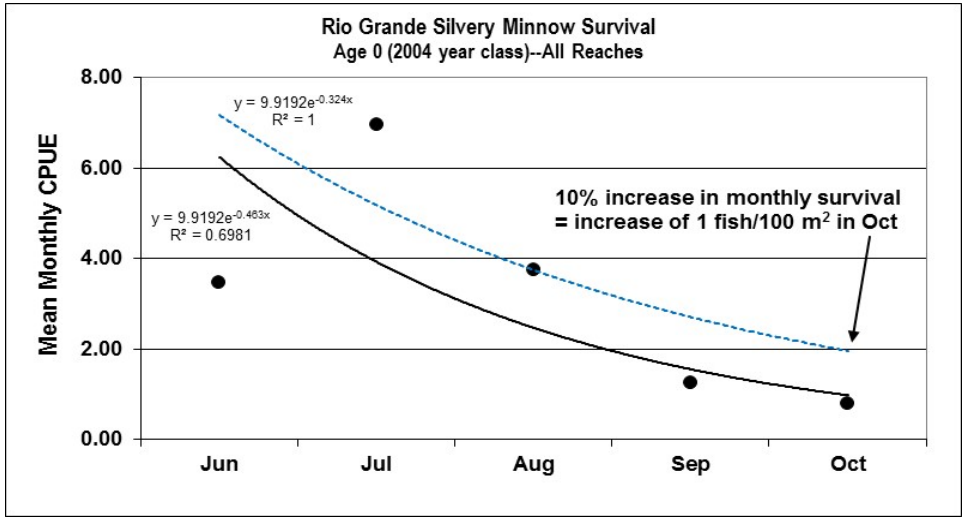




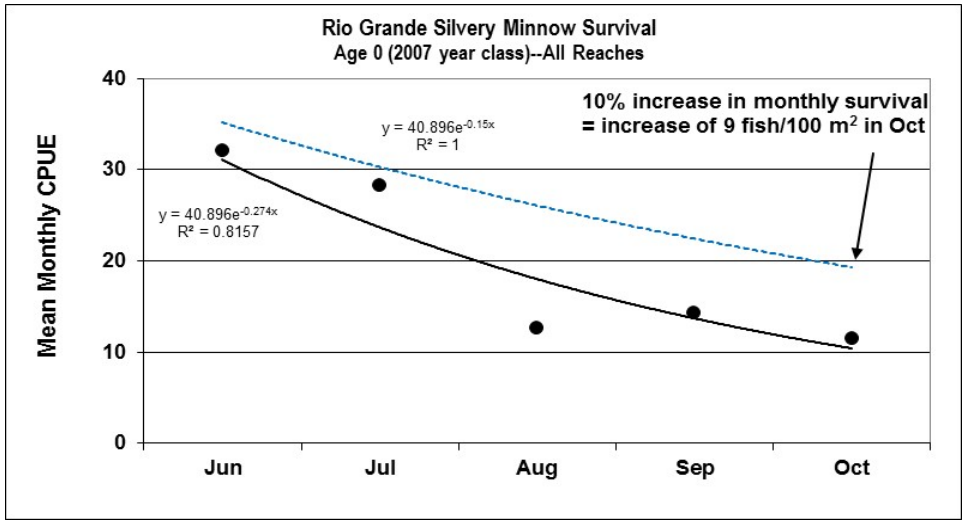
Key to Maintaining High CPUE:
10% Increase in Larval Survival Can Substantially Increase Cohort Strength



- At low density, from ~1 to 2 fish/100 m^2



- At high density, from ~10 to 20 fish/100 m^2



UAV Photogrammetry Modeling of a Rio Grande Silvery Minnow Habitat Restoration Project in Albuquerque, New Mexico: Geomorphological, Inundation, and Vegetation Changes Over Time

William Whitehead, Brian Bader, Jesse Shuck

SWCA Environmental Consultants

MRGESCP Meeting – February 21, 2018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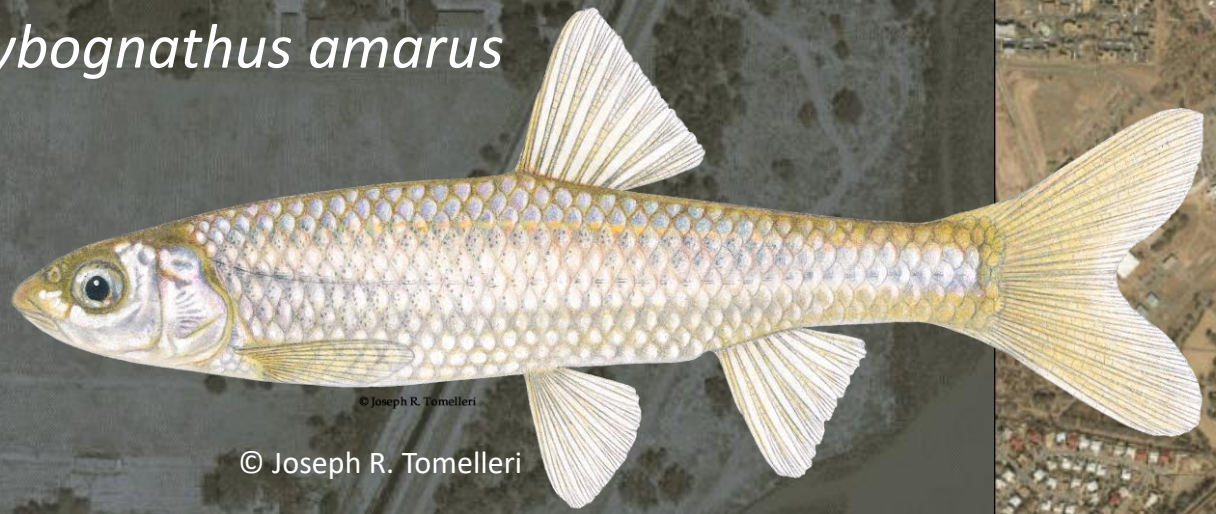
Hybognathus amarus



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Albuquerque Bernalillo County Water Utility Authority

HDR

Roadway
River Mile
Restored Habitat Feature
Project Site

Project Location

Feet
0 300 600 1,200
Meters
0 150 300 600

N
1:15,000

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Restoration Sites Inundated

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Methodology

- Pre-Flight Planning
- Photographic Surveys
- Data Analysis

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Pre Flight Planning

As-Built Surveys

SWCA mapping and reporting

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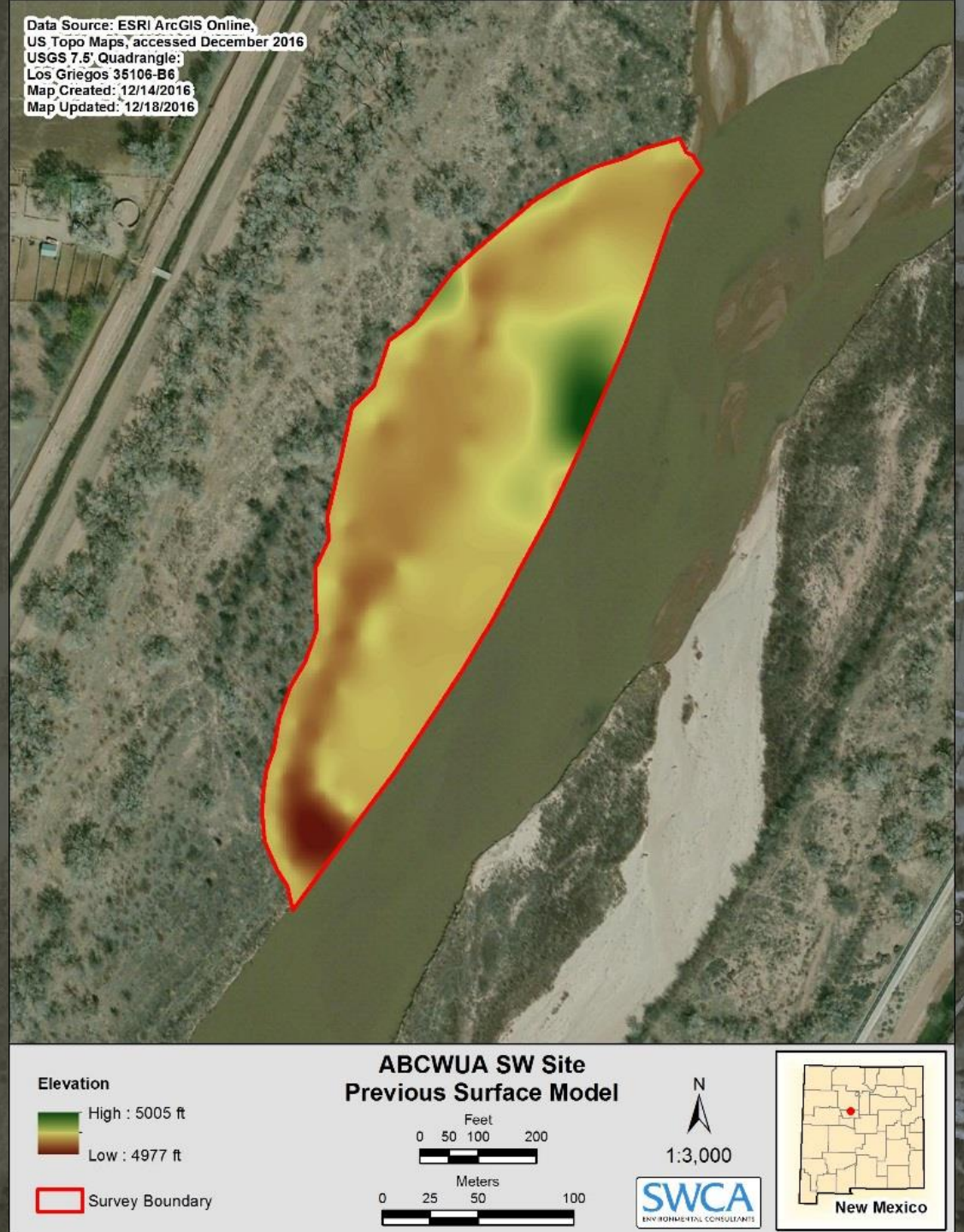

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FAA Regulations are followed

- Part 107 FAA Licenses are required for flying Unmanned Aerial Vehicles for commercial purposes
- Local airports and helipads within 5 miles require notification
- Flying over general public is not allowed

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Drone Flights

- Drone Deploy (controller software) was used for planning and setting up side and front overlap of photos
- Drone Deploy also flies the drone after takeoff and returns after flight is complete or batteries are too low.
- Pilot is responsible for avoiding any manned aircraft or wildlife.
- All photos are stored on a SD card which is then uploaded to Pix 4d for processing.

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Field Mapping

Leica GS 14 with RTK correction

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Ground Control Points

Used Chilitags (**C**omputer **H**uman **I**nterface in **L**earning and **I**nstruction **Tags**)

Mapped nearest range line end point datums (CR-436-LEP and CR-603-REP)

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Data Processing

- Pix4D – software
- Adding GCPs to job files
- Output files
  - Orthomosaic
  - Google KML tile set
  - LAS file
  - Digital Surface Model
- Elevation Difference Models

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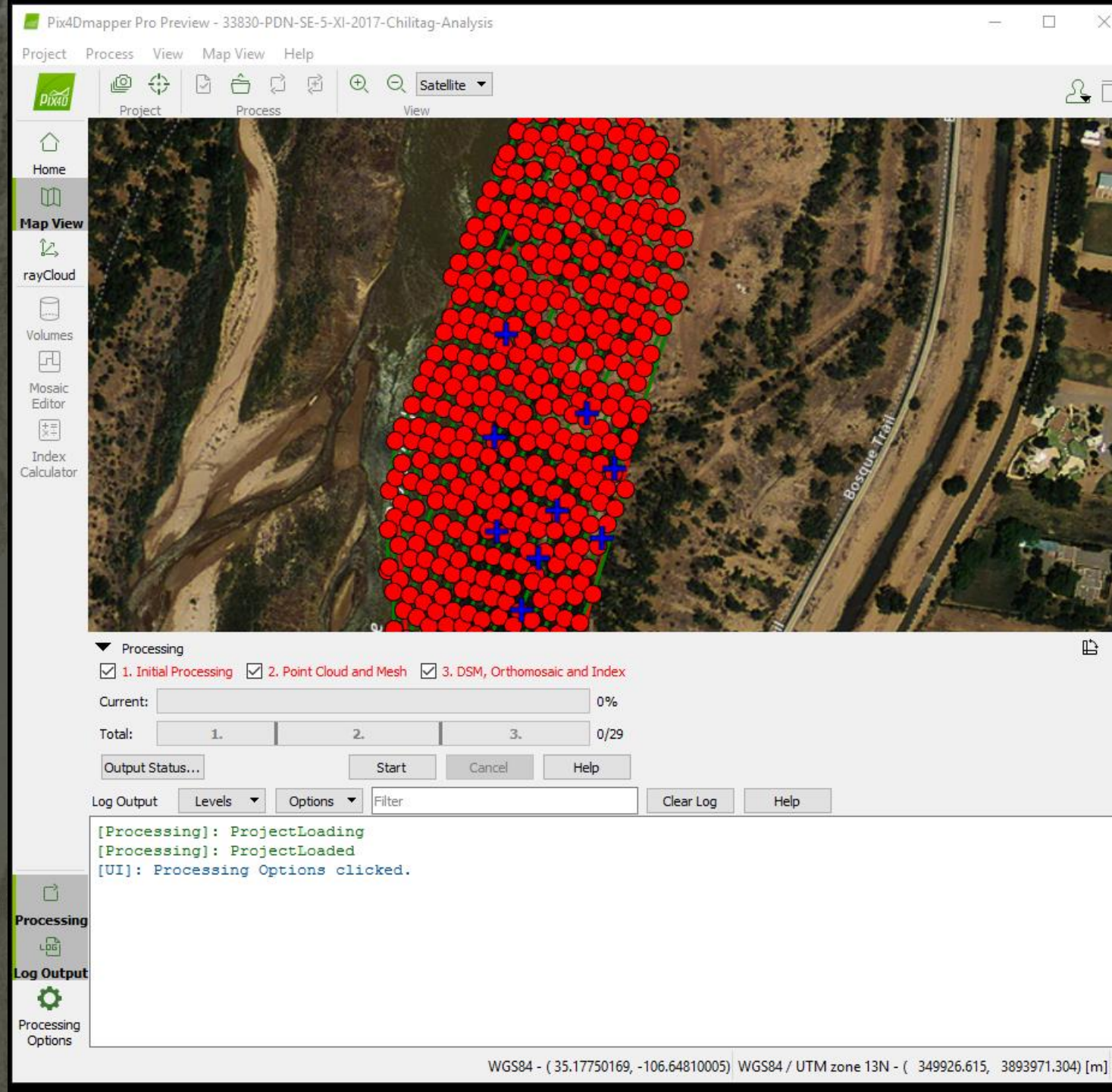

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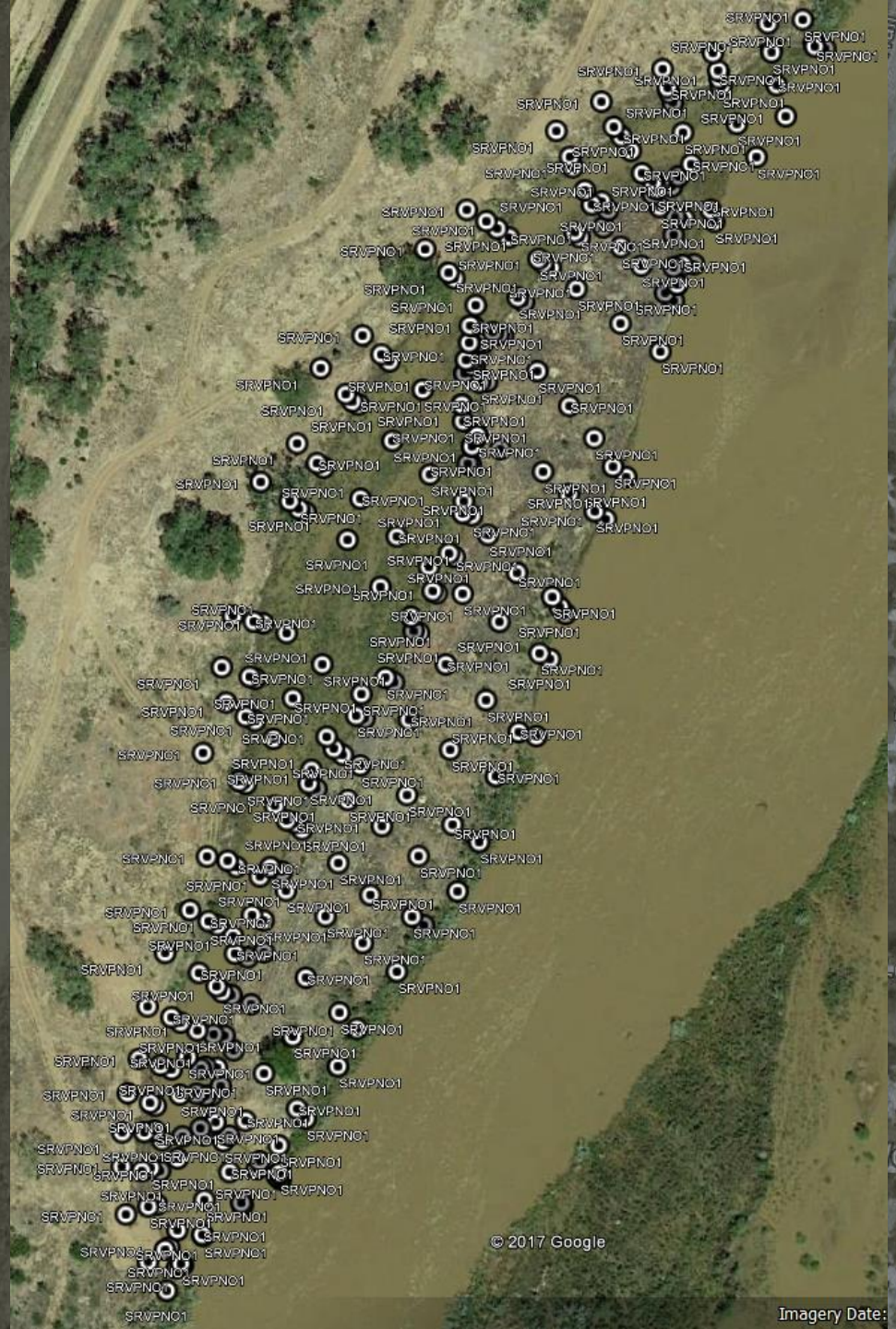
2017 Results

Traditional Mapping
less than 1 point per 5m²

UAV Mapping
250,000 points per 5m²



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Summary of Flight Data

Date (2017)	Number of Raw Images	Mapping Type	Data Density: Ground Sampling Density	Area Mapped (acres)	Mapping Products Produced
June 15 and 16	2,311 images (11.5 GB)	Total station mapping of GCPs	SE: 0.97 cm/0.38 inches SW: 0.81 cm/0.32 inches	SE: 11.6 SW: 13.3	Orthomosaics and digital elevation model (relative altitude)
June 22	1,040 images (5.17 GB)	None (orthomosaic only)	SE: 0.98 cm/0.38 inches SW: 1 cm/0.39 inches	SE: 11.1 SW: 11.0	Orthomosaics and digital elevation model (relative altitude)
November 5	900 images (4.39 GB)	Leica GS-14 mapping of Chilitags	SE: 1.09 cm/0.43 inches SW: 1.09 cm/0.43 inches	SE: 8.7 SW: 15.4	Orthomosaics and digital elevation model (corrected elevation to CR-438-LEP)

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2017 Results - Orthomosaic Southwest Area

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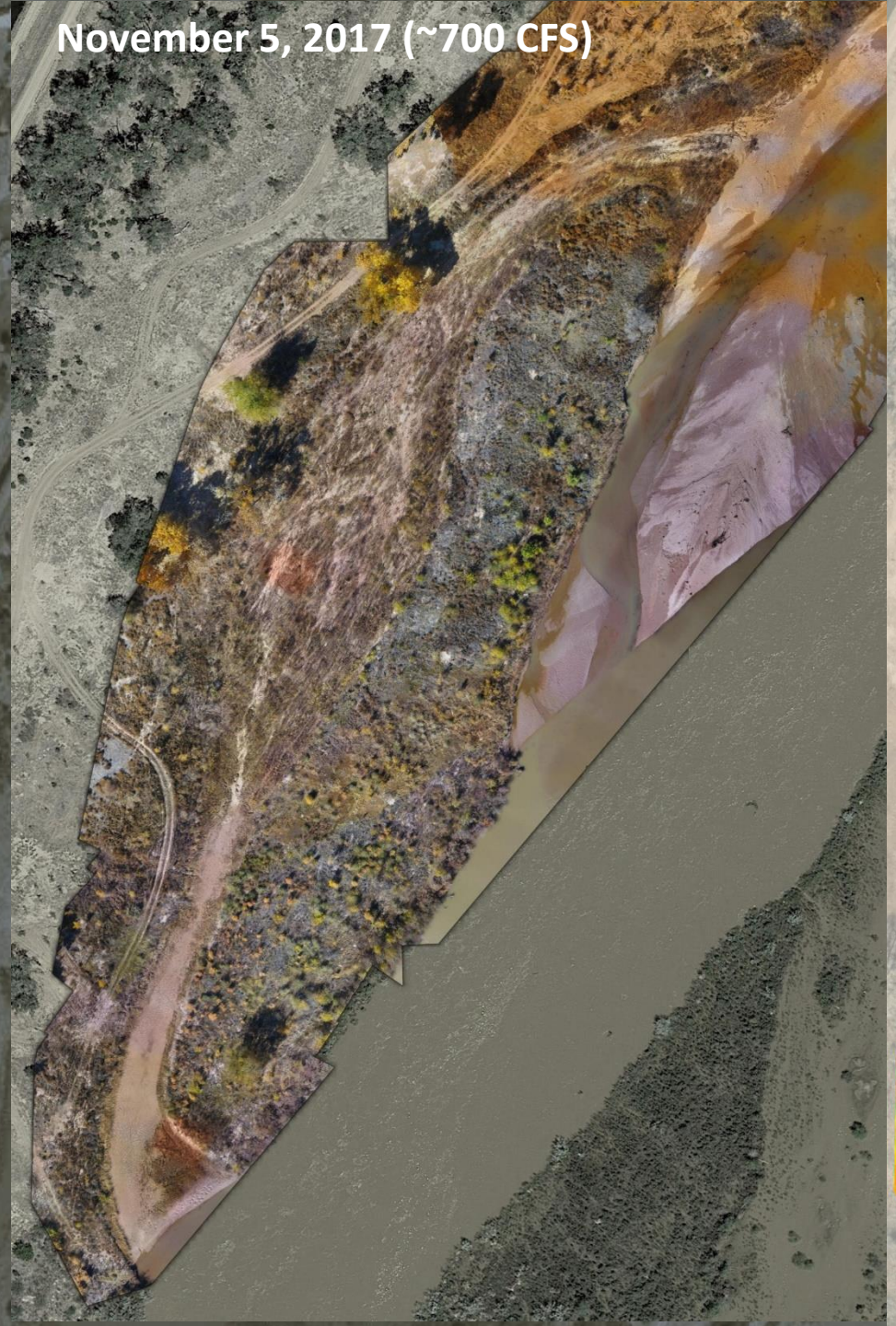
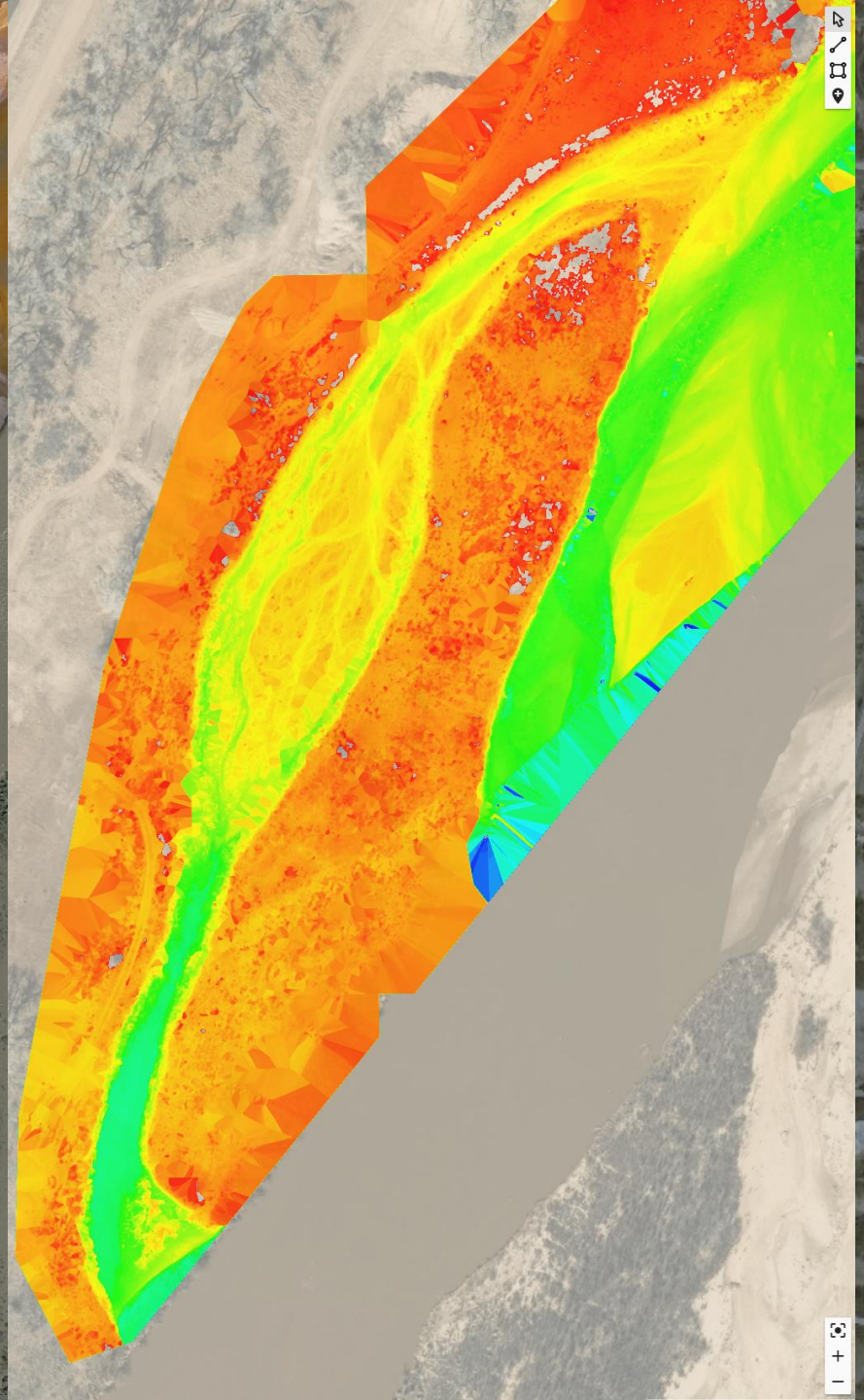
Orthomosaic and Digital Elevation Model Southwest Area





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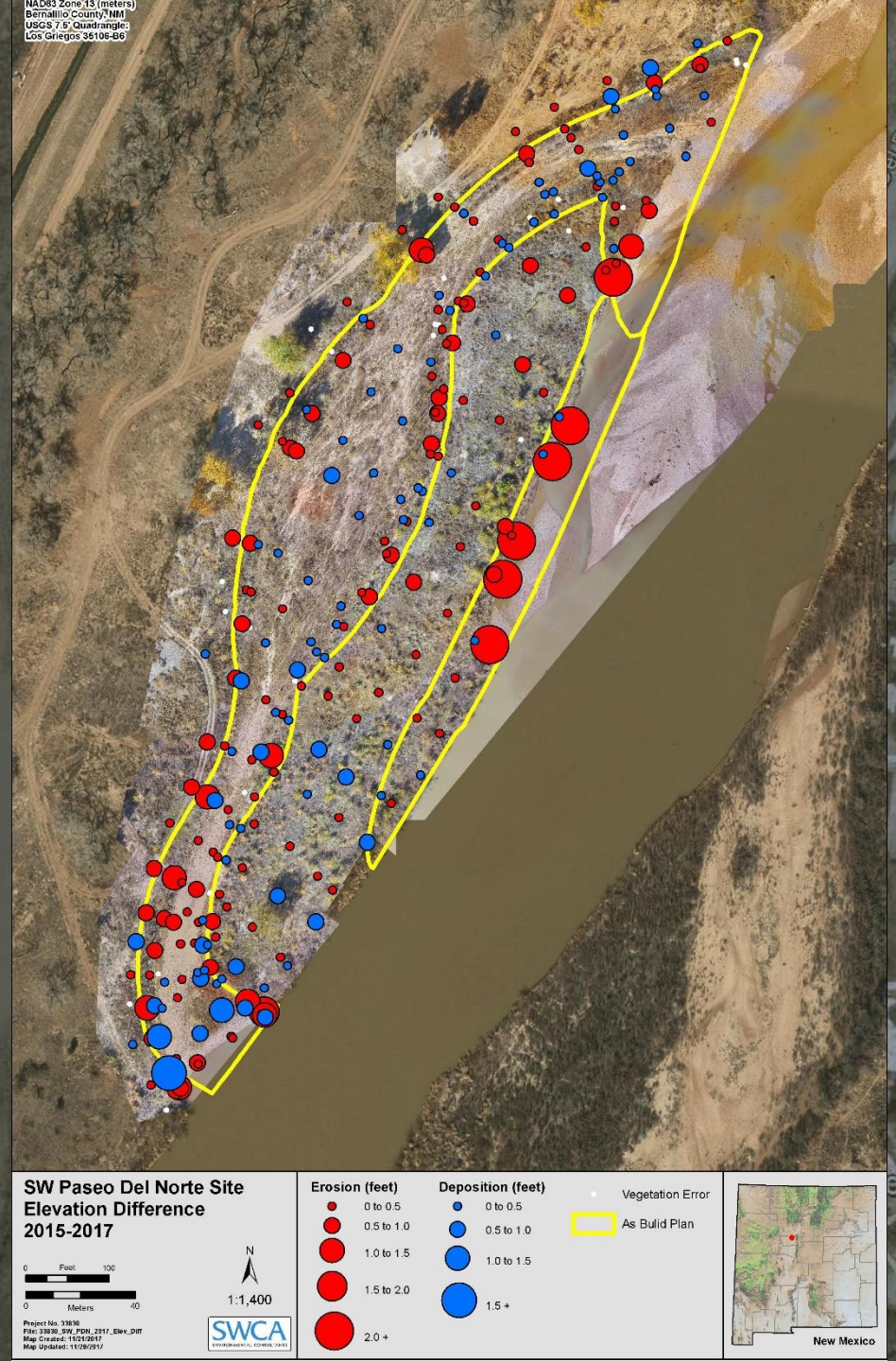
Difference Model 2015-2017 Southwest Area



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Conclusion and Recommendations

- Drone aerial photogrammetry was successful in showing changes in geomorphology
- Previous elevation work with the current digital surface models allowed for an analysis of deposition and erosion at the restoration sites
- A number of recommendations and improvements can be made to the methodology to produce even better results

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Future Work

- Evaluating site maturation (e.g., vegetation mapping, relative health, density)
- Incorporating fisheries data (e.g., effects of inundation on fisheries habitat and spatiotemporal distribution)

Habitat Restoration Applications

- Pre-construction site choice and planning
- Assessment of impacts for Agency decision making
- Construction monitoring during creation
- Post construction/restoration effectiveness monitoring
- Site maintenance

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