

RECLAMATION

Managing Water in the West

Lower Reach Plan



**Middle Rio Grande Project
Albuquerque Area Office
Upper Colorado Region**



**U.S. Department of the Interior
Bureau of Reclamation**

June 2018

Mission Statements

The U.S. Department of the Interior protects and manages the nation's natural resources and cultural heritage, provides scientific and other information about those resources, and honors its trust responsibilities or special commitments to American Indians, Alaska Natives, and affiliated island communities.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.



BUREAU OF RECLAMATION

Albuquerque Area Office - Albuquerque, New Mexico

DRAFT Lower Reach Plan

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**U.S. Department of the Interior
Bureau of Reclamation**

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Executive Summary

As part of the *Joint Biological Assessment – Bureau of Reclamation, Bureau of Indian Affairs, and Non-Federal Water Management and Maintenance Activities on the Middle Rio Grande, August 2015* (BA), measures were proposed by the U.S. Bureau of Reclamation, Middle Rio Grande Conservancy District (MRGCD), State of New Mexico (State), and the U.S. Bureau of Indian Affairs to offset the effects of the Middle Rio Grande Proposed Actions and to provide conservation benefits. The proposed measures aim to (1) minimize and avoid existing and anticipated adverse effects from the Proposed Actions to listed fish and wildlife species and (2) address current river conditions, improve the status of the listed species, and contribute to their recovery. The measures described in the BA are reconfirmed in the December 2016 *Final Biological and Conference Opinion for Bureau of Reclamation, Bureau of Indian Affairs, and Non-Federal Water Management and Maintenance Activities on the Middle Rio Grande, New Mexico* (2016 BiOp).

One of the primary categories of the conservation measures is habitat restoration and enhancement in the Lower Reaches (Isleta and San Acacia Reaches, defined as Isleta Pueblo southern boundary to the headwaters of Elephant Butte Reservoir). Reclamation's goal is to improve habitat and enhancing flows in the Lower Reaches in line with the 2016 BiOp. The Lower Reach Plan documents those efforts and will be a living document that continues to incorporate strategies to further engage stakeholders, including other agencies, the public, and private landowners, as appropriate.

The 2016 BiOp set forth Reasonable and Prudent Measure 9, which specifies that Reclamation will minimize take of Rio Grande silvery minnow (*Hybognathus amarus*) (silvery minnow), the southwestern willow flycatcher (*Empidonax traillii extimus*) (flycatcher), and the western distinct population segment (DPS) of the yellow-billed cuckoo (*Coccyzus americanus*) (cuckoo) due to proposed water operations, maintenance, and habitat restoration activities. As part of this requirement, Reclamation is developing the Lower Reach Plan to coordinate Reclamation, State, and MRGCD activities from Isleta Diversion Dam downstream to the Elephant Butte headwaters and to discuss activities performed by other entities that are outside the BiOp in the area.

This Lower Reach Plan documents efforts to improve habitat and enhancing flows in the Lower Reaches in line with the 2016 BiOp, while managing sediment, increasing safe channel capacity, and maintaining or reducing overall depletions. The goal of projects in the Lower Reaches is to (1) improve silvery minnow, flycatcher, and cuckoo habitat, (2) significantly increase available overbanking habitat at lower spring flows, and (3) increase the amount of perennially wetted habitat.

This plan includes multiple planned river maintenance and endangered species habitat projects for this critical and complex reach of the Action Area. Project-level efforts will include agency

and stakeholder interactions and communications to engage government and private landowners. This initial plan lays out projects in their current planning state. It is anticipated that the Lower Reach Plan will be updated over time and will provide detailed information at the project level as it becomes available.

1. Introduction

As part of the *Joint Biological Assessment – Bureau of Reclamation, Bureau of Indian Affairs, and Non-Federal Water Management and Maintenance Activities on the Middle Rio Grande, August 2015* (BA), measures were proposed by the U.S. Bureau of Reclamation, Middle Rio Grande Conservancy District (MRGCD), State of New Mexico (State), and the U.S. Bureau of Indian Affairs (action agencies) to offset the effects of the Middle Rio Grande (MRG) Proposed Actions and to provide conservation benefits. The proposed measures aim to (1) minimize and avoid existing and anticipated adverse effects from the Proposed Actions to the Rio Grande silvery minnow (*Hybognathus amarus*) (silvery minnow), the southwestern willow flycatcher (*Empidonax traillii extimus*) (flycatcher), and the western distinct population segment (DPS) of the yellow-billed cuckoo (*Coccyzus americanus*) (cuckoo) (collectively “listed species”), and (2) address current river conditions, improve the status of the listed species, and contribute to listed species recovery.

The Conservation Measures proposed by the action agencies are described under four main categories; the anticipated benefits to listed species and their critical habitat are provided in Part IV of the BA. All the measures described in the BA are reconfirmed in the December 2016 *Final Biological and Conference Opinion for Bureau of Reclamation, Bureau of Indian Affairs, and Non-Federal Water Management and Maintenance Activities on the Middle Rio Grande, New Mexico* (2016 BiOp) (Service 2016).

One of the primary categories of conservation measures is habitat restoration and enhancement in the Lower Reaches (Isleta and San Acacia Reaches, defined as Isleta Pueblo southern boundary to the headwaters of Elephant Butte Reservoir) (Figure 1). Reclamation’s goal is to improve habitat and enhancing flows in the Lower Reaches in line with the 2016 BiOp. The Lower Reach Plan documents those efforts and will be a living document that continues to incorporate strategies within the entire reach to further engage stakeholders, including other agencies, the public, and private landowners, as appropriate.

The U.S. Fish and Wildlife Service (the Service) has identified four focus areas to improve the status of the silvery minnow as part of the Service’s silvery minnow survival and recovery strategy (SRS): (1) hydrobiological objectives (HBO), (2) large-scale habitat restoration and enhancement, (3) restoration of river connectivity, and (4) conservation storage of water. The measures proposed in the BA, including the use of adaptive management through River Integrated Operations (RIO) and other aspects, are intended to take these focus areas into account. The Lower Reach Plan provides details for the focus areas.

Lower Reach Plan Sites

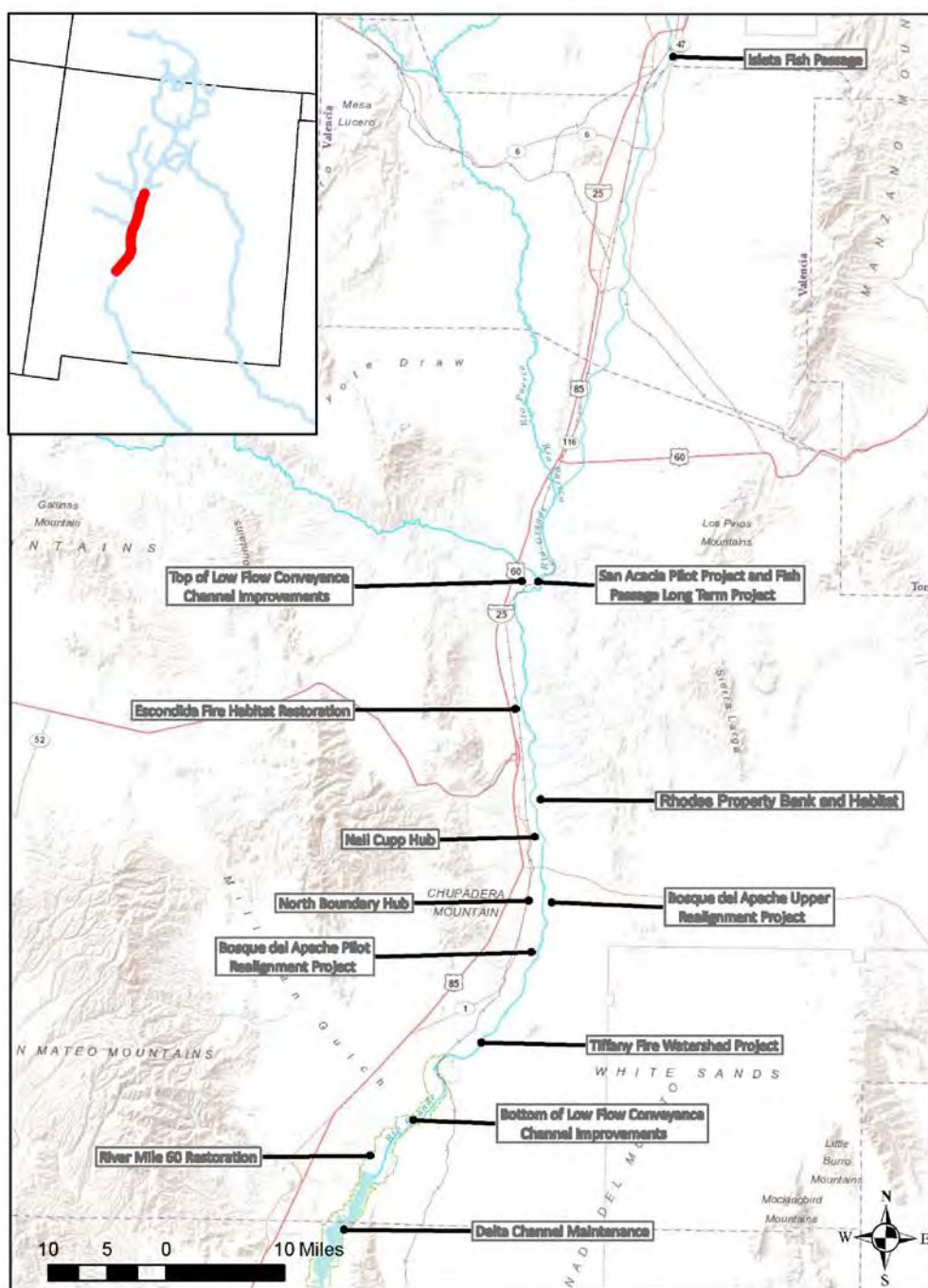


Figure 1. Map of the Middle Rio Grande Lower Reach Plan Project and Habitat Restoration Sites

2. Background and BiOp Requirements

The Proposed Actions covered in the 2016 BiOp consist of water operations, river and infrastructure maintenance and restoration, and conservation activities. These Proposed Actions represent a continuation of ongoing actions that were previously consulted on as part of earlier Biological Opinions (e.g., 2001 BiOp, 2003 BiOp), as well as various newly proposed Conservation Measures. Future effects of the Proposed Actions on listed species are analyzed in the 2016 BiOp, which contains the Reasonable and Prudent Measures (RPMs) and terms and conditions. RPM 9 contains terms and conditions specific to the Lower Reach Plan that provide a strategy to meet the majority of the RPMs that pertain to the Lower Reaches. Activities in the Upper Reaches (i.e. Cochiti and Angostura, and activities involving RIO) are outside the scope of this plan.

The following is a summary of RPM 9 as it relates to the Lower Reach Plan:

Reclamation will minimize take of silvery minnow, flycatchers, and cuckoos due to proposed water operations, maintenance, and habitat restoration activities.

Term and Condition 9.2 – Reclamation shall coordinate water diversions from the Low Flow Conveyance Channel (LFCC) during droughts or low-flow periods to minimize impacts to flycatcher breeding territories from river mile (RM) 67 to 54. The Lower Reach Plan shall include coordination with Bosque del Apache National Wildlife Refuge (BDA), as well as the U.S. Fish and Wildlife Service Ecological Field Office (NMESFO), to minimize effects on the species with potentially competing water needs (silvery minnow, flycatcher, and cuckoo).

Term and Condition 9.5 – Reclamation shall coordinate with the U.S. Army Corps of Engineers (USACE) to develop an elevation plan for sediment management purposes as part of the Lower Reach Plan.

Term and Condition 9.6 – Reclamation shall take up to 1.5 years to develop the Lower Reach Plan. This plan shall be reviewed and approved by the Service.

3. Objective

The objective for the Lower Reach Plan comes from both the 2015 BA and the 2016 BiOp. The Lower Reach Plan is included in Reclamation's stated commitments (see Reclamation's Memorandum to the Service dated July 20, 2016). The objective for the Lower Reach Plan is to improve habitat and enhancing flows in the Isleta and San Acacia Reaches, while managing sediment, increasing safe channel capacity, and maintaining or reducing overall depletions. The goal is to (1) improve silvery minnow, flycatcher, and cuckoo habitat, (2) significantly increase available overbanking habitat at lower spring flows, and (3) increase the amount of perennially wetted habitat.

The objective for the Lower Reach Plan also comes from the 2016 BiOp as part of RPM 9 (see Section 2).

As part of this requirement, Reclamation will develop a Lower Reach Plan to assist coordination of Reclamation, State, and MRGCD activities from Isleta Diversion Dam downstream to the Elephant Butte headwaters and to discuss activities performed by other entities that are outside the BiOp in the area. The Lower Reach Plan documents multiple planned river maintenance and endangered species habitat projects in this critical and complex reach of the Action Area. Project-level efforts will include agency and stakeholder interactions and communications to engage government and private landowners.

The goal is implementation of the Conservation Measures in the Proposed Actions that will result in an improvement in the status of the silvery minnow, flycatcher, and cuckoo. This plan will lay out implementation steps for the Lower Reaches, and is due to the Service 1.5 years after the issuance of the 2016 BiOp (no later than June 2018). This is an initial plan that lays out projects in their current planning state. It is anticipated that the Lower Reach Plan will be updated over time and will provide detailed information at the project level as it becomes available.

4. Lower Reach Plan Projects

4.1 Socorro Main Canal South Distribution (Neil Cupp) Hub (RM 90)



Figure 2. Primary project features of Socorro Main Canal South Distribution Hub

Using a Reclamation WaterSmart grant awarded to the MRGCD in 2016, the MRGCD will install the “Socorro Main Canal South Distribution Hub,” which includes construction of a dedicated pumping facility, check structure, and installation of pipelines to direct water to two discharge points (Figure 2). Reclamation’s memorandum to the Service dated July 20, 2016 states that this hub is expected to be completed within 24 months of the BiOp (December 2018).

The project will use the existing Neil Cupp check structure, along with a new check structure to be built in the Socorro Riverside Drain “A” to supply water to a new pump station. The pump station will lift water to two discharge points. The primary discharge point will be to the

MRGCD's Socorro Main South Canal, which is located about 50 feet west of the present discharge point but several feet higher in elevation. The second discharge point will be 840 feet to the southeast, inside the Rio Grande levee, to the river. Existing infrastructure through the spoil levee will be used to discharge flow to the Rio Grande to augment river channel flows for the silvery minnow, with possible benefits to flycatcher and cuckoo habitat, depending on water availability and river conditions.

The new pump station will be designed to provide an outflow discharge of 40 cubic feet per second (cfs) (approximately 18,000 gallons per minute [gpm]). Electrical requirements to service the pump station will require the extension of 3-phase power to the site. Appropriate safety and security barricades and fencing will be provided around the project. The new check structure within the Socorro Riverside Drain "A" will be designed to optimize water delivery to the pump station.

Milestones:

- Planning: September 2016 – September 2017
- Design/Compliance: September 2016 – April 2018
- Construction: January 2018 – February 2019
- Testing/Commissioning: February 2019 – March 2019

4.2 Bosque del Apache North Boundary Infrastructure (RM 84)

The MRGCD and BDA Boundary Hub Project is a joint effort between the MRGCD, the Service, and Reclamation to improve water management in the area of the boundary between MRGCD's delivery area and the BDA, near Rio Grande RM 84 (Figure 3). The Boundary Hub Project will include design and construction of infrastructure changes to the irrigation delivery and drainage system to meet the goals of the individual and collective parties.

The Boundary Hub Project will be constructed on the BDA in Socorro County, New Mexico. Depending on the ultimate design, part of the design and construction may cross the North Boundary of the BDA.

The Boundary Hub Project was described as part of the Conservation Measures in the *Final Biological and Conference Opinion for Reclamation, Bureau of Indian Affairs, and Non-Federal Water Management and Maintenance Activities on the Middle Rio Grande, New Mexico* (Consultation Number 02ENNM00-2013-F-0033). Specifically, Conservation Measure 13 and described benefits (p. 152) state:

Construction of a surface return flow collection system at [MRGCD] south boundary at River Mile 84 to aid in managing river recession and deliver return flows to the River. This includes [BDA] Infrastructure and River Realignment changes.

This Measure will return water from three MRGCD drains above RM 84. It will result in more water being returned to the river channel in support of the large-scale habitat restoration as part of the Conservation Strategy in the proposed action. This will help minimize the impact on hydrology and geomorphology that result in effects to silvery minnow, flycatcher, and cuckoo by increasing wetted river area in the San Acacia Reach. This Measure is reliant on the habitat restoration to be in place or this Conservation Measure will not otherwise be effective.



Figure 3. Boundary Hub - General project area near Rio Grande RM 84 in Socorro County, NM

In addition to implementing the conservation measure, the following goals were developed:

- Water delivery goals
 - Stable/steady supply of water to the BDA
 - Minimize impacts to or, if possible, improve water transport options to Elephant Butte Reservoir downstream
- Infrastructure goals
 - Reduce water levels in the Riverside Drain north of the BDA
 - Design water delivery via gravity to the BDA and the Rio Grande
- Listed species goals
 - MRGCD tailwater available for delivery to the Rio Grande for silvery minnow habitat
 - Seasonal water supply for the New Mexico meadow jumping mouse (*Zapus hudsonius luteus*) (jumping mouse) on the BDA
 - Seasonal water supply for nesting flycatchers on the BDA

This project is directly related to a proposal to (1) evaluate groundwater gradients on Reclamation's LFCC and modify them where feasible, (2) shift the Rio Grande channel to the east on the BDA, and (3) modify outfall features from the LFCC to the Rio Grande south of the BDA. By implementing this project, there would be greater water availability for ecological needs, and possibly more efficient downstream deliveries. By including this project with modifications to the LFCC and Rio Grande channel, this improvement is expected to aid in mainstem riparian and in-channel habitat for the area's species.

The irrigation infrastructure of the BDA is as complex as a small irrigation district. The BDA does not divert directly off of the Rio Grande, but rather relies on water supply from tailwater and drainage water from the MRGCD and Reclamation's LFCC. The MRGCD diverts water at San Acacia (35 river miles from the BDA), and tailwater from this Division supplies water to the BDA. The LFCC acts as a large drain along the western edge of the modern Rio Grande and farm land to the west, and this water provides supply for both Rio Grande environmental flow needs and BDA needs.

The BDA cannot actively control the amount of water it receives from MRGCD through the San Antonio Main and Socorro Main tailwater sources, and has limited control over diversions from the LFCC and Socorro Riverside Drain. These tailwater sources often provide a quantity of water that is greater than the BDA needs, as they route water to areas of lesser water demand. The diversion off the LFCC provides the most reliable surface water source for meeting BDA purposes. The BDA's primary surface water source is diverted from the LFCC and the Riverside

(San Antonio) Drain at “the Hub.” It is estimated that the water derived from the Hub supplies between 75% and 90% of BDA water demand, depending on the time of year. At the North Boundary of the BDA at the LFCC, water is diverted into a ditch that flows west, is siphoned under the Riverside Drain, and enters a pipeline that dumps into the BDA’s Riverside Canal at the Hub. A second source of water for the BDA’s Riverside Canal is diverted at the Hub from tailwater outflow from MRGCD’s Riverside Drain (Figure 4). This water source is much more variable than the water diverted from the LFCC.

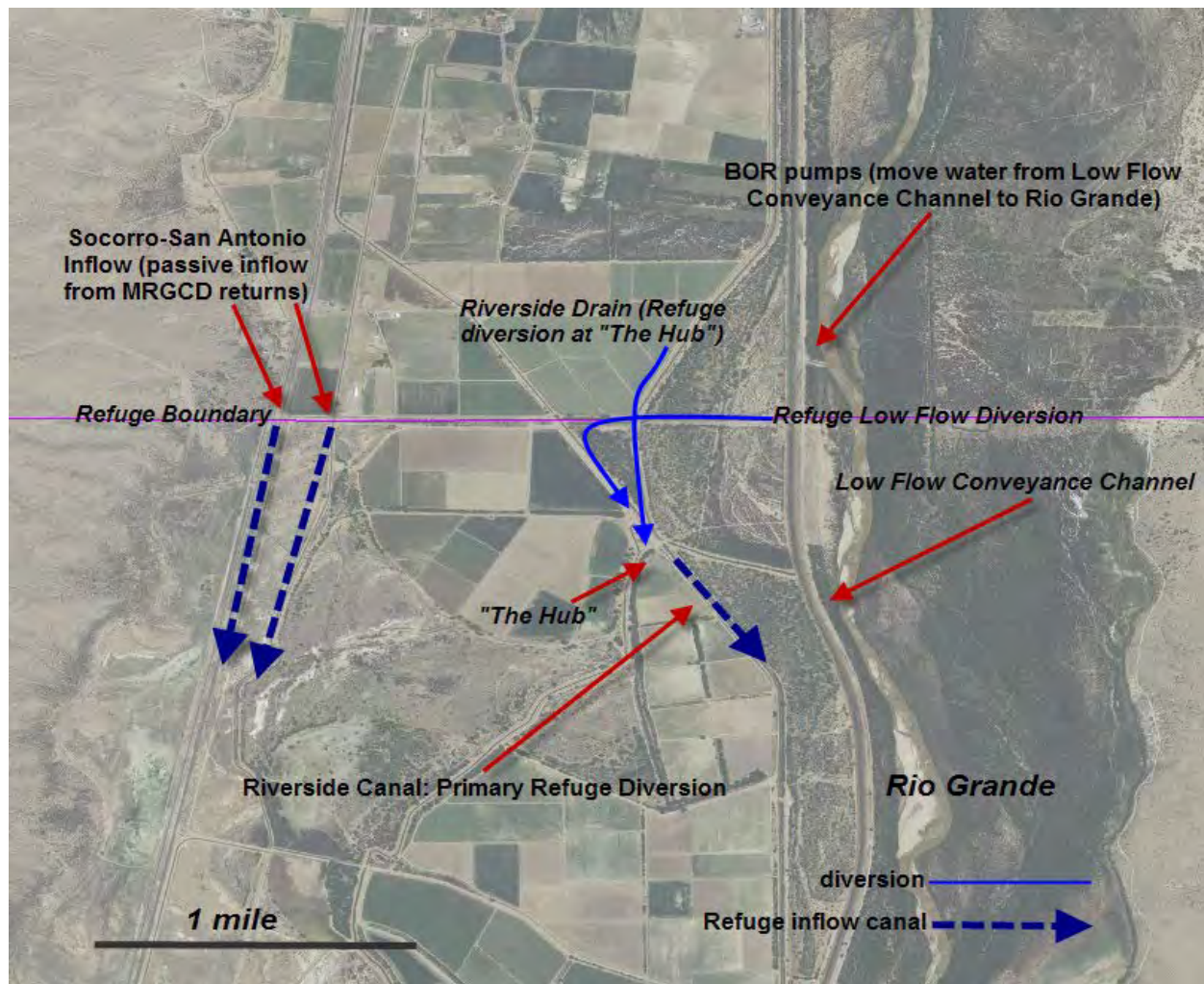


Figure 4. Current configuration of BDA North Boundary infrastructure

North of the LFCC diversion on the BDA is a set of pumps operated by Reclamation as a means of keeping flows connected in the Rio Grande. This area has been the location of water supply conflicts during recent years. Though the water is available from MRGCD tailwater from the west to meet demands during most times, this water is arriving in the wrong locations. Passive diversion structures do not allow for efficient delivery of water or precise water management.

This project consists of the following parts: (1) development of a Memorandum of Agreement between MRGCD, BDA, and Reclamation (Hub MOA) to replace the current agreements from 1940 and 1983 on maintenance, operations, and water delivery, (2) improvements to the BDA's north boundary irrigation infrastructure, and (3) improvements to infrastructure to deliver water to the river in the vicinity of the Hub. The project would re-engineer the ditch infrastructure associated with the LFCC and MRGCD drains and install additional Langemann gates that would allow more precise water management by the BDA, ensuring a steady flow for the jumping mouse and leaving greater supply for Rio Grande environmental flow needs. The details of the project design will be developed during the first year of the project.

Milestones:

- Planning: July 2017 – December 2017
- Design/Compliance: January 2018 – December 2018
- Construction: January 2019 – April 2019

4.3 Low Flow Conveyance Channel Improvements

The LFCC is 58 miles of channel constructed in 1951 that runs just west of the Rio Grande between the San Acacia Diversion Dam (SADD) and Elephant Butte Reservoir (Figure 5). The LFCC was originally designed to convey water from SADD to Elephant Butte Reservoir with minimal losses to evaporation and ground infiltration. Diversions to the LFCC were halted in 1985 due to increasing maintenance difficulties. The LFCC currently acts as drainage for irrigation return flows throughout the Lower Reaches and provides critical irrigation water supply for the MRGCD and BDA.

Reclamation will evaluate the effectiveness of pumping from the LFCC into the river for managing river recession, maintaining river connectivity, and providing wetted habitat. Reclamation will also assess and analyze 58 miles of the LFCC and determine any future management actions that can be taken to increase efficiency of water delivery, improve functionality of the LFCC, provide habitat for endangered species, protect existing uses of the LFCC, and reduce seepage to naturally occurring levels. Suggested modifications to the LFCC sections include, but are not limited to, temporary rock check structures, check structures, lining, partial fill, complete fill, and/or abandonment. In its memorandum to the Service dated July 20, 2016, Reclamation committed to completing evaluation of LFCC modification alternatives within two years of the BiOp (December 2018), with construction of chosen projects to be completed within five years after that (December 2023).



Figure 5. Typical view of the Low Flow Conveyance Channel

Reclamation will create a plan to determine the movement of groundwater through the LFCC/ River Channel System to include the LFCC, drains and canals, and the main river channel. Modeling will be used to identify the sections of the LFCC or the river channel where seepage is negatively impacting water delivery and habitat for federally listed species. The modeling will be used to determine efficient ways to minimize water loss throughout the system.

Prior to any major modifications to the LFCC, baseline data on groundwater interactions between the river and the LFCC will be obtained either through collecting existing reports or conducting internal studies. Once baseline data are established, Reclamation will form a team and include any stakeholders for a review of data and selection of alternatives. The project team will also analyze any impacts caused by other projects to identify any changes in the dynamics of the LFCC. Projects in the Lower Reaches include the BDA Pilot Realignment Project, the BDA Upstream Realignment Project, the Socorro Main Canal South Distribution Hub Project, the BDA North Boundary Hub Project, the Escondida Habitat Restoration (HR) Project, the RM 60 HR Project, and others. Steps to this project include the following:

1. Collect and analyze baseline seepage data of 58 miles of LFCC prior to any modifications to LFCC. The Project Team is still in the process of collecting data from other agencies to include state, federal, and private.
 - a. Previous LFCC work
 - i. *Assessment of Flow Conditions and Seepage on the Rio Grande and Adjacent Channels, Isleta to San Marcial*, Summer 2001 (S.S. Papadopoulos & Associates, Inc.)
 - ii. *Hydraulic Head Variance between the Rio Grande and the Low Flow Conveyance Channel below Highway 380 Bridge Crossing*, 2017 (Reclamation Technical Services Division)
 - iii. *Darcy's Calculation of Seepage Flow between the LFCC and Rio Grande Channel*, 2017 (Reclamation Technical Services Division)
 - iv. Pumping cost compared to fish CPUE evaluation – 2017 (Reclamation Technical Services Division, Environmental Services Division)
 - v. Ongoing LFCC maintenance to include mowing and sediment control
2. Monitor changes to the LFCC from adjacent projects to effectively create changes to the seepage rates throughout the system.
3. Identify high gaining sections of LFCC where Reclamation can use adaptive management and experiment with temporary rock check structures. These experiments will allow Reclamation to economically determine viable solutions to reduce seepage to naturally occurring levels.
4. The Reclamation project team will explore alternatives to operating the LFCC under its existing capabilities. The team will look at ways to improve the pumping from the LFCC to meet the obligations under the 2016 BiOp. The team will include Reclamation engineers, environmental specialists, and water operation specialists, as well as any Reclamation Partners (MRGCD and New Mexico Interstate Stream Commission [NMISC]). The criteria for determining viable alternatives will be operations, function, economics, partner buy-in, and benefits to species.
5. Use hydrostaff data (in annual flycatcher reports) to meet demands of flycatcher needs through the LFCC and within the historical delta of Elephant Butte Reservoir (i.e., RM 60).

Milestones:

- Planning: January 2017 – December 2018
 - Evaluation of Alternatives
 - Feasibility Study
 - Stakeholder involvement

- Design/Compliance: January 2019 – December 2019
 - Final Alternative Report
 - Project Description
- Construction/Evaluation: January 2021 – December 2023
 - Construction will be completed in phases to allow Reclamation to adaptively manage any results from significant changes in the LFCC operation.
- Post-Construction Monitoring: December 2023 – December 2028
- Develop Monitoring Plan: December 2023

4.4 River Connectivity (Fish Passage)

Reclamation will implement a program to facilitate fish passage at SADD with assistance from MRGCD and NMISC within the first 5 years of the 2016 BiOp. The San Acacia Pilot Study will test small-scale, lower-cost modifications to determine a feasible approach for a simplified full-scale fish passage.

Permanent options will be explored at SADD and lessons learned from the pilot study will be used to influence alternatives and designs at the other diversion dams. The intent is to improve river connectivity and minimize the impacts of drying in the river channel caused from storage and depletions. This project will attempt to give mobility to the minnow for movement between reaches water during times of drying, and to increase species distribution while providing genetic connectivity and interchange throughout the reach.

4.4.1 San Acacia Pilot Study (RM 116.2)

The San Acacia Pilot Study evaluates current conditions at SADD that may prevent movement of fish (especially silvery minnow) upstream past the diversion dam, assesses fish movement in key areas on and downstream of the dam, and designs and implements pilot projects to test the feasibility of a permanent in-channel fish passage by infrastructure and operational modifications. In 2017, Reclamation determined that placement of pilot fish passage structures, even if temporary, was of concern given the age and current condition of the diversion dam, and that maintenance efforts to fortify the downstream portion of the diversion dam needed to occur first. While the diversion dam and gates are in good condition, the rock material located below the diversion dam, which protects from undercutting due to continued channel degradation, must first be reinforced. As shown in Figure 6, the difference in height between the dam's concrete apron on and the river channel is currently about 10 vertical feet, and in many places the apron drops steeply off to the channel because rock material has been washed out.

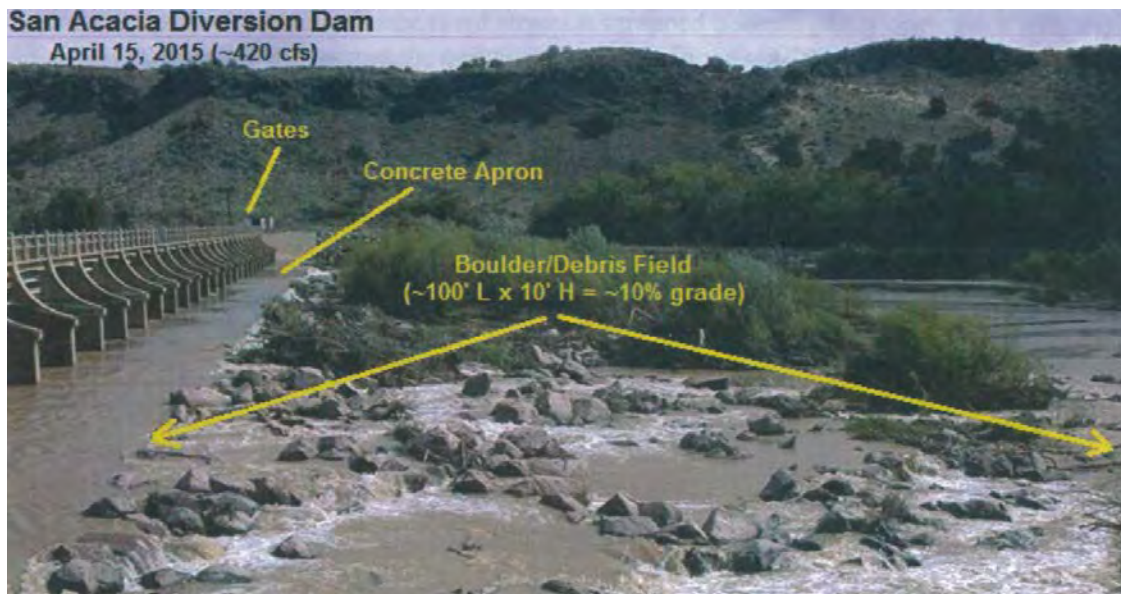


Figure 6. View of San Acacia Diversion Dam with gates, concrete apron, and the boulder/debris field that extends about 100 feet downstream of the dam over about a 10-foot vertical drop

The NMISC and MRGCD are managing the SADD in-channel pilot studies to determine a feasible approach for a full-scale fish passage at SADD. The 2016 BiOp and other literature indicate that the silvery minnow does not have the capacity to swim in strong current for a sustained period of time. Even with all gates open on the diversion dam, flows above 500 cfs are probably too high to allow fish to pass upstream. Therefore, the pilot studies will be focused on achieving passage at lower flows (50 to 500 cfs) and also warmer temperatures (spring-fall) when the fish are more active.

The schedule provided in the 2016 BiOp shows work beginning in 2017 and completion at the end of 2018. The NMISC and MRGCD anticipate that pilot studies are not likely to be completed until the end of 2019 given the need to reinforce the SADD structure before fish ladders or other devices can be placed and tested. In 2018, hydrologic monitoring and modeling and fish monitoring using pit tag technology will be conducted to further assess conceptual fish passage designs. By the beginning of 2019 and following installation of the rock reinforcement, the NMISC and MRGCD, in cooperation with the Service and Reclamation, will build and test various concepts for in-channel fish passage through SADD that uses the operational and fish behavior results from the 2018 studies.

A long-term monitoring approach will be developed to assess silvery minnow usage of any permanent fish passage. Permanent fish passage may be one or more of the pilot study concepts that was successful and could simply include reoperation of the diversion dam at critical times of the year.

Reclamation will assist NMISC and MRGCD in technical oversight, environmental compliance, Sec. 106 consultations, and construction of approved designs. Reclamation will only approve designs and construction as they pertain to the mission of Reclamation and the protection of federally owned facilities.

Milestones:

- Planning: January 2017 – February 2018
- Design/Compliance: February 2018 – January 2019
- Construction/Evaluation: January 2019 – January 2020

4.4.2 San Acacia Fish Passage Long-Term Project (RM 116.2)



Figure 7. San Acacia Diversion Dam

In accordance with the 2016 BiOp, Reclamation will implement effective long-term river connectivity measures at SADD within 5 years of the BiOp. To achieve this, Reclamation will use and integrate the results of the San Acacia Pilot Study into the long-term river connectivity measures.

To accomplish Reclamation's river connectivity goals at SADD, Reclamation will coordinate with the BiOp Partners (MRGCD and NMISC), as well as the Service, USACE, and other

stakeholders to implement the following major planning, permitting, design, analyses, construction, and post-monitoring tasks:

- Project planning and stakeholder coordination. This represents a series of activities for Reclamation to develop the details of the river connectivity scope of work, schedule, milestones, budgets, communication plans, and stakeholder engagement.
- Coordination with the NMISC on pre-project fish monitoring to ensure that the existing biological conditions (distribution and movement) are well understood and documented.
- Review and analysis of the results of the San Acacia Pilot Study for the benefit and optimization of the long-term river connectivity solutions.
- Engineering evaluation of the river connectivity alternatives and selection of a preferred alternative with a cost estimate in advance of a final design for construction.
- Initiation of compliance for the preferred alternative.
- Development of a construction design and cost estimate of the preferred alternative, including built-in internal Reclamation review cycles to vet the details.
- External review cycle for the benefit of the BiOp Partners, the Service, USACE, and other stakeholders.
- Completion of compliance efforts.
- Solicitation of the construction contractor and project construction.
- A post-construction biological monitoring program designed to monitor the success metrics of the river connectivity effort and identify potential opportunities for improvements through adaptive management.

Reclamation's goal will be to meet its obligations for the implementation of the 2016 BiOp by December 2021.

Milestones:

- Planning: July 2017 – February 2020
- Design/Compliance: February 2018 – December 2020
- Construction/Evaluation: December 2020 – December 2021
- Post-Construction Monitoring: December 2021 – June 2027

4.4.3 Isleta Fish Passage (RM 169.3)

On October 21, 2016, the Pueblo of Isleta (Pueblo), Reclamation, MRGCD, and the Bureau of Indian Affairs (BIA) signed the *Agreement of Compromise and Settlement regarding the Isleta Diversion Dam* (Settlement Agreement). One of the agreed upon terms was that Reclamation would provide funding to the Pueblo to restore bosque and riverine habitat on Pueblo lands, provide solutions for sediment transport management and fish passage, and dispose of “legacy spoil material” generated from the maintenance of the irrigation system on Pueblo lands. A grant has been issued to the Pueblo to contract a Preliminary Engineering Analysis Report (PEAR) by spring 2018. This first phase of this effort will assist in working toward an engineering and construction solution by December 2022. The 2016 BiOp also requires implementation of fish passage at Isleta Diversion Dam (IDD) (Figure 8) within 6 years of the BiOp issuance (i.e., by December 2022). A monitoring approach to assess silvery minnow usage of the fish passage will be developed with the Pueblo; ongoing collection standardized population monitoring data from upstream and downstream of IDD will also be used to determine effectiveness of the passage over time.



Figure 8. Isleta Diversion Dam

The PEAR will address the following:

- **Fish Passage.** Develop conceptual designs for multiple options for fish passage at the IDD. Develop a written plan for further evaluation of the conceptual designs and for development of a final design.
 - Evaluate the feasibility and effectiveness of various methods of allowing silvery minnow passage in both directions through the IDD with assistance from the Isleta Dam Technical Team, which consists of technical experts from Reclamation, MRGCD, Service, New Mexico Fish and Wildlife Conservation Office, and the Pueblo.

- Develop conceptual designs and cost estimates for the proposed options for fish passage. Periodically consult with the Isleta Dam Technical Team to ensure that all desired options are being considered and that the number of options is appropriate.
- Identify the potential for any conflict or positive synergy between designs for fish passage and designs for sediment management improvements.
- Provide a recommendation on whether further analysis should include physical modeling, numerical modeling, both, or neither.
- Produce a clearly stated ranking of the proposed options for fish passage, including an explanation of the basis for the ranking. Develop a statement of work for additional analysis, selection of a single preferred option, and design in 2019.
- Construct the preferred fish passage design at IDD by December 2022.
- A post-construction biological monitoring program designed to monitor the success metrics of the river connectivity effort and identify potential opportunities for improvements through adaptive management.

Bosque and Riverine Restoration Milestones:

- Planning: November 2017 – January 2019
- Design/Compliance: March 2019 – March 2020
- Construction: November 2020 – October 2022

Isleta Diversion Dam and Related Modifications Milestones:

- Planning: November 2017 – December 2018
- Design/Compliance: February 2019 – June 2020
- Construction: August 2020 – October 2023

4.5 River Maintenance and Restoration Program

4.5.1 River Mile 60 Restoration

The Rio Grande riverbed at RM 60 has degraded more than 10 feet below the LFCC. The proposed project area is located from the Rio Grande directly adjacent to Ft. Craig, to an S-curve in the river at RM 60 (approximately 4 miles downstream from Ft. Craig) (Figures 9 and 10). The project boundary includes 700 to 800 acres from the Power Line Road south to the LFCC outfall. This includes all of the riparian corridor, approximately 1.5 miles wide, from the northern boundary to the southern boundary of the proposed project area. The total project boundary area is estimated to be 7 square miles.



Figure 9. Photograph showing RM 60 HR proposed location of proposed control structure



Figure 10. Aerial photograph showing RM 60 HR proposed location of control structure

Reclamation's memorandum to the Service dated July 20, 2016 states that this project will be constructed within four to six years of the 2016 BiOp (December 2022). The proposed project is intended to improve water delivery from the LFCC to the river during winter months and improve existing habitat that is in decline due to age. Another benefit is improved sediment management from the LFCC to the river, which will reduce maintenance costs. Natural water movement will remove sediment down to the original rock lining. This will reduce both maintenance costs and negative impacts from the use of heavy equipment in critical habitat.

This work would include installation of a control structure from the LFCC into the Rio Grande at RM 60. Coordinated water releases from the proposed control structure, commensurate with seasonal changes and certain hydrologic conditions, may serve to aggrade the Rio Grande riverbed to its historical elevation prior to the LFCC construction. In addition, the infrastructure may augment habitat restoration efforts to improve ecosystem functionality/suitability for endangered species. Habitat restoration efforts included as part of this project may include, but are not limited to, the following:

- Chemical, mechanical, or prescribed burning treatments for invasive, nonnative vegetative species.
- Desirable, native vegetation (herbaceous, shrub, and/or tree) propagation efforts, with an emphasis on establishment of willow and cottonwood species for suitable flycatcher and cuckoo habitat.
- Seasonal inundation for organic material and mineral deposition would also provide spawning habitat for the silvery minnow and enhance breeding habitat for migratory birds such as flycatchers and cuckoos.

Milestones:

- Planning: Project scoping meeting with all agencies, develop a detailed project description in coordination with NMISC by fall 2018
- Design/Compliance: Structure design completion by spring 2019
- Construction: Phased starting in winter 2019
- Monitoring: Currently through 5 years post final construction

4.5.2 Bosque del Apache Pilot Realignment Project (RM 79.3 – 81.5)

The Rio Grande between San Antonio and San Marcial, New Mexico has perched channel conditions where the floodplain is lower than the channel. Concerns associated with the perched river system include (1) difficulty maintaining continuous low flows during drought, (2) threats to existing infrastructure from an uncontrolled channel avulsion, (3) overbanking flows that are

disconnected from the main channel during flood events, (4) sediment transport imbalance leading to sediment plug formation, (5) stranding of aquatic species during high flows, and (6) loss of native riparian woody plant species. Damage to the spoil levee is of particular concern due to the potential for significant flooding onto adjacent BDA lands, the risk of damage to the LFCC, and the resultant depletions associated with both of these events.

The purpose of the BDA Pilot Realignment Project is to promote long-term effective conveyance of water and sediment through the reach while minimizing the potential for spoil levee and LFCC failure, which would lead to significant depletions. The project will also create and improve aquatic, wetland, and native riparian habitat that would benefit listed species such as the silvery minnow and flycatcher. The development of this habitat via this project would meet requirements specified in a 2008 BiOp related to Reclamation's sediment plug removal project and in the 2016 BiOp, which describes this project as beginning construction in 2018.

Monitoring will be conducted following project completion (for at least 5 years) that will determine how the project is functioning with respect to its stated purpose, as well as how the project is affecting habitat. These monitoring components will be incorporated into a monitoring plan to be completed by June 2018.

Alternative approaches to solving the sediment plug problem in this area have been analyzed in several reports, starting with a TetraTech report in 2004. In 2014, Reclamation completed a report for the BDA Sediment Plug and River Restoration Project (*Alternatives Analysis Synthesis Report*, March 2014) that analyzed and ranked the projects that had been proposed since the 2004 report. Two closely related alternatives to realign the river east of the current channel were rated much higher than all of the others in Reclamation's 2014 report. In one of these alternatives, a continuous pilot channel would be cut, while in the other, just the inlet and outlet would be cut; otherwise, the alternatives were identical. Project progress immediately following the alternatives analysis slowed because of other office priorities and lack of personnel. In late 2016, Reclamation was able to renew its focus on the project. At this time it was decided that the nearly 8-mile-long realignment would be split into two projects: the BDA Pilot Realignment Project and the larger upper realignment project. The pilot project is about 2.5 miles long and about half the size of the upper project (Figure 11). This smaller project will make construction more tractable, so any significant oversights can be remedied before commencing the larger upper project. Additionally, the entire pilot project will occur on BDA land, which will make landowner coordination much simpler. Again, any lessons learned during the construction of the pilot project will be used to refine the upper project.

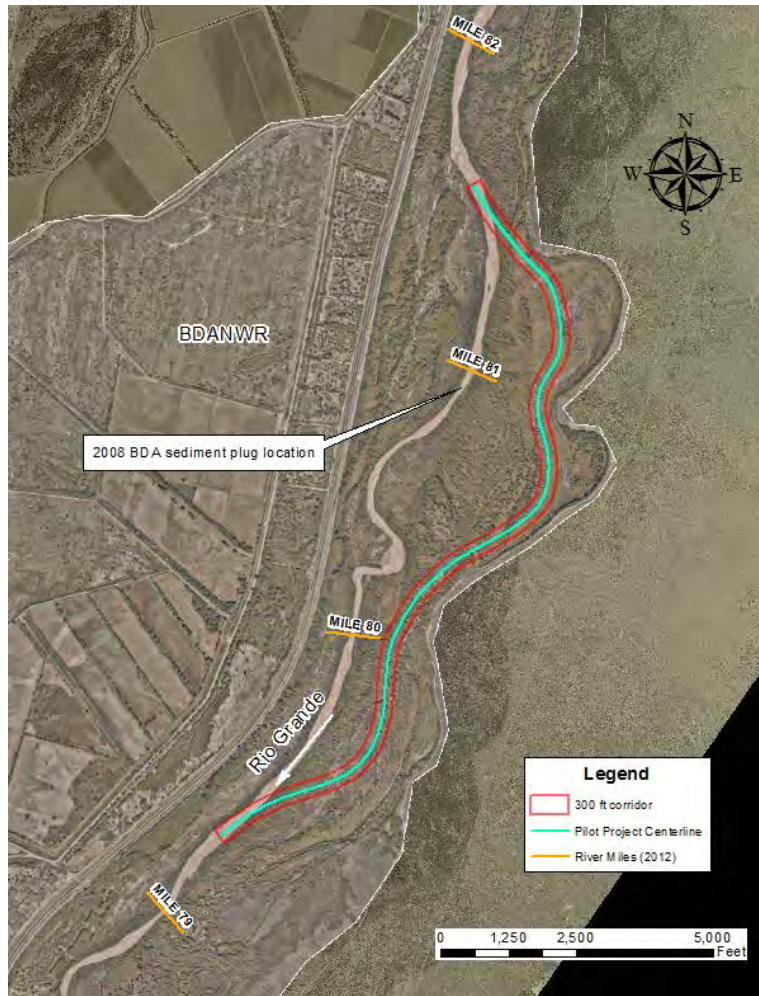


Figure 11. BDA pilot project centerline and 300-foot offset alignment. The background imagery is a combination of the 2016 and 2012 aerial photography (Reclamation).

After further analysis of floodplain topography using 2016 LiDAR data, it was determined that excavation of the inlet and outlet only was more appropriate than excavating a continuous channel. Sediment removal calculations for the two scenarios indicate that continuous excavation would require about twice the amount of material to be removed compared to the inlet/outlet excavation. Not only would this add to the most expensive part of the project, but sediment modeling did not indicate a significant difference in the channel response between the two excavation scenarios. Furthermore, the unexcavated section, which is less than one-third of the entire realignment, will still be cleared of vegetation and root-ripped to a width of 300 feet; in addition, a 50-foot-wide section will be smoothed along the centerline to provide a preferential flow path.

The realigned channel will address or bypass the area where the 2008 and 2017 sediment plugs occurred. The work will involve the following project elements:

- Vegetation removal and soil destabilization for the length of the realignment corridor
- Excavation at the inlet and outlet of the realignment corridor
- Vegetation removal, primarily of monotypic and exotic species, outside of and adjacent to the realignment corridor
- Conversion of the existing river channel into a floodplain, which consists of the following elements:
 - Diverting the river into the realignment corridor
 - Filling and stabilizing the existing channel

The expected disturbance area is about 330 acres, with a maximum project area of 850 acres. Roughly 175,000 cubic yards (CY) of material will be generated as a result of the project, and this fill will be used to fill in roughly half of the existing river channel. Of this volume, about 45,000 CY is from excavation at the inlet and outlet and 130,000 CY is from grubbing throughout the entire corridor.

Milestones:

- Planning/Compliance/Design: Complete by October 2017
- Construction: Complete by December 2018
- Monitoring: December 2018 – December 2023

4.5.3 Bosque del Apache Upper Realignment Project (RM 79 – 85.5)

The BDA Upper Realignment Project is the upstream portion of the original 8-mile project that was chosen as part of the alternatives analysis report completed by Reclamation in 2014. This 4.5-mile realignment is located just upstream of the pilot realignment (Figure 12).

The project goals are the same as those described for the pilot project. If the pilot project achieves its goals, the upper realignment will move forward and any lessons learned from the pilot project will be used to improve the design of the upper realignment project.

The ideal realignment path for the upper project (Figure 12) was designed based on the physical characteristics of the floodplain, and all but the upper mile of this path is within the BDA. The upper mile of the path is on private lands north of the BDA North Boundary; therefore, private landowner permissions will be needed in order to complete this project as currently designed. If permissions are not secured, it will be possible for the upper realignment to diverge from the current channel at the boundary within the BDA.

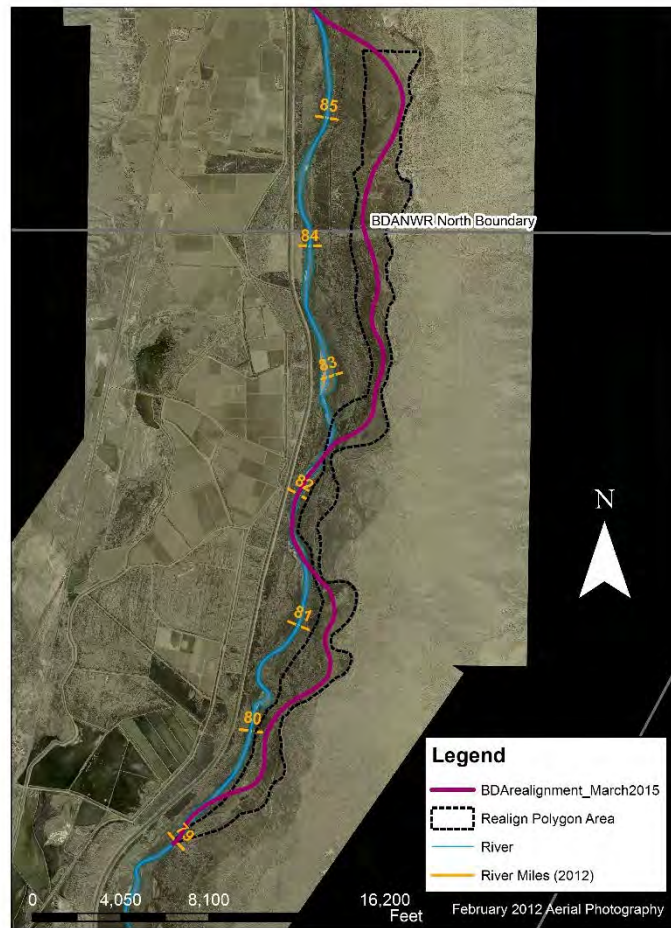


Figure 12. BDA pilot and upper project centerline (pink line) and current channel alignment (blue line). The background imagery is a combination of the 2016 and 2012 aerial photography (Reclamation).

Milestones:

- Planning/Compliance/Design: Complete by October 2019
- Construction: Complete by December 2020
- Monitoring: December 2020 – December 2025

4.5.4 Escondida Fire Habitat Restoration (RM 104)

In June 2016, a wildfire burned approximately 524 acres in the bosque near Escondida, New Mexico. The burn area extends from just upstream of the Nine Mile LFCC outfall to the North Socorro Diversion Channel, including the Rio Grande confluence with Arroyo de la Parida and the Escondida Bridge. The fire destroyed native vegetation, but also impacted areas of salt cedar, providing the opportunity to restore native vegetation within the burn area. Also, the river

channel through the burn area is narrow and deep and the floodplain is disconnected from the river, with inundation only occurring at very high flows. As a result, this portion of the river does not provide good nursery habitat for the silvery minnow.



Figure 13. Portion of Escondida burn scar, June 2016

The goal of this project is to rehabilitate the burn area and create nursery habitat for the silvery minnow, with some areas inundating at flows as low as 300 cfs. A target inundation elevation at 300 cfs would have flows through approximately 50% of the year that could mobilize sediments. In order to assess functionality, the project will be monitored for four years by surveys of depths, velocities, etc. at established cross sections to timely address sedimentation issues. As a natural function of riverine systems, sedimentation may be adaptively managed following monitoring analysis. The project will also possibly provide secondary benefits for the flycatcher and cuckoo. It is anticipated that gradual ecological successional processes will eventually transform the aquatic habit into avian habitat. To achieve these goals, Reclamation is working on this project with a variety of partners (e.g., New Mexico State Forestry, Save Our Bosque Task Force [SOBTF], Socorro County, and MRGCD) for trail rehabilitation, revegetation, and noxious weed management. Potential silvery minnow nursery habitat restoration could include reconnecting the floodplain with the main channel by terrace lowering, constructing near-bank slow-velocity side channels, reshaping steep banks with gradual slopes suitable for native vegetation plantings, and lowering inlets and outlets of existing side channels and abandoned channels.

Milestones:

- Planning/Compliance: 2016 – 2017
- Design: Fall 2017
- Construction: April 2018 – August 2018
- Monitoring: Fall 2018 through 5 years post construction

4.5.5 Tiffany Fire Watershed Restoration and Management Project (RM 68)



Figure 14. Tiffany Area, May 5, 2011 (Reclamation)

The Tiffany Fire started on June 26, 2017 from a single lightning strike near the Burlington Northern-Santa Fe Railroad bridge, San Marcial, New Mexico and spread quickly through the nearby Rio Grande bosque. The primary carrier of the fire was stressed tamarisk defoliated by the tamarisk leaf beetle. In total, an area of 9,200 acres was burned, making the Tiffany Fire the largest wildfire in the Middle Rio Grande Bosque in the past 20 years. A

diverse group of landowners was impacted, with 50.4% of the fire affecting private lands and 49.6% of the fire affecting federal (Reclamation/Bureau of Land Management [BLM]) land.

There is a grant proposal to address burned area rehabilitation, led by the Sierra Soil and Water Conservation District, requesting that NM State Water Trust Board funds be combined with other funds and in-kind services. The grant determination will not be made until June 2018. Collaborative partners include Sierra Soil and Water Conservation District, New Mexico State Forestry, private landowners, the SOBTF, Reclamation, the Service, and BLM. First, analysis will be conducted of (1) physical parameters including river morphology, (2) historical and predicted changes in river slope, sediment movement, and surface flows, (3) topographic and soil surveys (a level 1 soil survey and subset level 2 survey in priority areas), and (4) groundwater level modeling based on existing information and assumptions and limited monitoring well installation. Analysis will also include review of historical vegetation and, based on the river morphology information, the potential for reestablishing a more diverse assemblage of plant communities, including upland and floodplain grasslands, wetlands, and riparian forest patches. These analyses will look at the current infrastructure and potential improvements to watershed condition, water transport efficiency, and water use under different scenarios. An analysis of private landowner options for land protection and vegetation management will also be conducted. Existing information is available through agency partners to complete most of the needed analyses. Expertise and assistance for this project are available through agency and stakeholder involvement in the planning team.

The planning phase would then use results of the analysis to determine priority areas for infrastructure changes, plant community “patches,” and fuel breaks within the project area. Best management practices for each vegetation community patch will be developed based on this comprehensive look at the plant community potential, surface flow dynamics, and landowner options. Priority sites will be selected based on watershed restoration and management goals including water transport benefits and efficiency, plant community sustainability, and fire protection potential. Final products will include maps, alternatives developed, project implementation descriptions, and considerations for specific activities to be considered under federal and state regulations.

The project also includes site preparation to address the immediate need to control invasive plant regrowth and improve cost efficiency for the overall project. Proponents have developed a “triage” list of areas in which initial invasive plant control will be implemented. These areas are prioritized based on location (those areas that allow for immediate fire protection) and existing plant community (those areas that have a strong native component present). Use of techniques with limited ground disturbance and access restrictions will allow this work to proceed prior to compliance requirements for the larger project implementation. Consultation with the Service, the New Mexico State Historic Preservation Office, the USACE, and other entities will be required in order to meet the federal and state requirements to implement watershed

rehabilitation on the Tiffany Fire scar. Based on the analysis and planning results, an environmental assessment and biological assessment of the final project design will be completed. This compliance work will allow project proponents to seek funding for watershed restoration and management implementation.

4.5.6 Rhodes Property Bankline Habitat (RM 94)



Figure 15. Aerial photograph of Rhodes Property, upper third of photo, looking south

The Rhodes Property consists of 536 acres of floodplain area at RM 94 on the east side of the Rio Grande, directly across from Brown Arroyo. Owned by the Rhodes family for several decades, the property has been managed for numerous activities including farming, livestock grazing, and most recently native vegetation restoration. Choked with salt cedar, the site was first treated aerally in fall 2003. In spring 2006, much of the property burned from a lightning-caused wildfire. Significant efforts have been made to reestablish native vegetation on the site through work by the SOBTF, the Natural Resources Conservation Services, Socorro Soil and Water Conservation District, Reclamation Socorro Field Office, and the Wildlife Habitat Improvement Project.

As noted in the *Restoration Analysis and Recommendations for the San Acacia Reach of the Middle Rio Grande, NM* (Parametrix, 2008), field observations since 1992 indicate significant homogenization of the channel bed within the San Acacia Reach. The cumulative effect of aquatic habitat loss through the channel narrowing process, combined with a hydrologically disconnected floodplain, contributes to a severely degraded environment for the various life stages of the silvery minnow. To combat diminishing channel habitat diversity and nursery habitat availability for the silvery minnow, Reclamation is proposing a bank line lowering effort in partnership with the owner of the Rhodes Property.

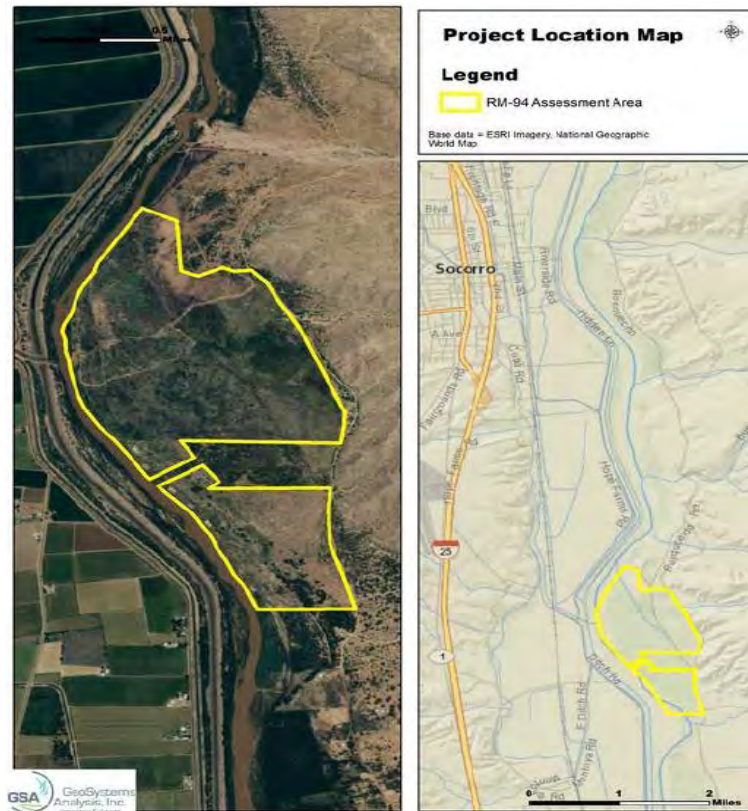


Figure 16. Map of Rhodes Property Boundaries

The project is in the early planning stages, and proposes to remove bank line material in a terraced fashion to allow for shallow inundation to occur at multiple river stages. Reclamation's Technical Services Division is developing an alternatives analysis that builds off the geomorphic analysis of the Arroyo de las Canas Reach (RM 101-89) (Holste and Aubuchon 2016).

Milestones:

- Planning/Design/Compliance: February 2017 – Fall 2018
- Construction: Fall 2018
- Monitoring: September 2017 – August 2023

4.5.7 Delta Channel Maintenance (RM 57.8 to Elephant Butte Active Pool)

Reclamation has authorization for river channel maintenance of the Rio Grande from Velarde, New Mexico south to the headwaters of Caballo Reservoir, as specified by the Flood Control Acts of 1948 and 1950. Under this authority, Reclamation monitors priority sites along the river, which are locations where channel conditions could damage infrastructure or impair or interrupt water delivery downstream. One such priority site is the existing San Marcial Delta Water Conveyance Channel (Delta Channel, formerly known as the Temporary Channel), located

within the boundaries of the Elephant Butte Reservoir between about 2002 RM 57.8 and the current reservoir pool (Figure 17). Reclamation, in cooperation with NMISC, maintains the existing Delta Channel to facilitate delivery of water and sediment, which also supports NMISC in meeting its water delivery obligations under the Rio Grande Compact.



Figure 17. Delta Channel at Nogal Canyon

Maintenance of the channel will focus on maintaining existing berms, managing sediment accumulation, and managing vegetation growth within the channel cross section to maintain a target conveyance capacity. The existing low-flow thalweg in this reach will remain, allowing low flows to meander within the boundaries of the channel. Disturbance during maintenance activities will be confined within the existing berm to the berm footprint of the channel.

The existing channel berm was constructed with a break at RM 54.7, at the current LFCC outfall. The constructed LFCC actually ends near RM 60, and discharge from that channel then follows a low point in the valley to the west of the river, returning to the river/Delta Channel at the

RM 54.7 outfall. Future maintenance of the Delta channel will include removal of sediment from the outfall area to allow LFCC discharge to re-enter the Delta Channel.

With the exception of the areas in the lowest reach (below RM 40), secondary channels protruding from the main temporary channel will not be excavated for the purpose of draining water from adjacent areas. Below RM 40, maintenance may include excavation of such secondary channels extending a short distance from the main channel for the purpose of reconnecting isolated side pools or side channels. These secondary channels extend a distance of no more than ½ mile from the main temporary channel, and the secondary channel construction will not be conducted in a manner that would completely drain the large isolated pool on the west side of the temporary channel near RM 40. However, if extremely dry conditions persist and the reservoir recedes, it is uncertain if groundwater flows will continue to keep the isolated pool wetted.

Breaks in the berms of the Delta Channel may be provided for the purpose of allowing natural drainage into the channel and to prevent water from accumulating behind the berms, thus compromising their stability. Additionally, these openings allow water from the river to inundate areas behind the levee during the snowmelt runoff, providing a measure of ecosystem function to those areas. These openings will be maintained as necessary within the limits of the existing channel footprint.

If the reservoir level continues to drop below RM 38, based on the reservoir slope below this point and field observations during 2012, it is anticipated that a natural dominant channel will form. Once the natural channel is formed, Reclamation will maintain the alignment of the natural channel below RM 38 until such time that the area is inundated by the rising pool elevation and destroyed. Reclamation will repeat this process below RM 38 as needed. Reservoir recession may expose cottonwood and saltcedar snags that will be removed during maintenance of the naturally formed channel. Prior to removal of such snags, a biological evaluation will be conducted to determine their significance for raptor use.

The staging areas in each reach are near existing equipment launching areas, which will be maintained to the general dimensions originally constructed. These launching areas consist of a ramp into a very short secondary channel, where equipment can be put into and taken out of the channel. Airboats are also typically docked in these areas when channel work is in progress. Maintenance of the launching areas will involve periodic removal of accumulated sediment.

Milestones:

- Planning/Compliance: Annual fall assessment with NMISC/Reclamation staff to determine needed maintenance
- Design: Not applicable

- Construction: Fall/winter annually

4.5.8 Potential Projects

The Lower Reach Plan identifies Reclamation activities and projects in the Isleta and San Acacia Reaches and also includes brief descriptions of the projects of other agencies and entities. It is expected to be a living document that will continue to evolve over time. As such, it will be updated on a regular recurring basis with additional new projects and activities, including input and feedback from stakeholders.

4.6 Hydrographic Data Collection and Modeling: Sediment Management/Elevation Plan

RPM 2 in the 2016 BiOp requires Reclamation to “develop a model on and use information about the elevations of ground, surface water, and groundwater levels, to increase overbanking.” Reclamation collects hydrographic data and performs hydrologic and hydraulic modeling as part of its established mission. Therefore, Reclamation develops and maintains hydrographic data collection and modeling efforts that either facilitate or can be adapted to the implementation of RPM 2 of the 2016 BiOp. This section describes Reclamation’s activities that support the intent of RPM 2.

Hydrographic data collection routinely occurs as part of Reclamation’s river maintenance activities. These data are collected for specific project purposes or more comprehensive reach evaluations and analyses. Project-specific data are typically collected during or immediately after peak flow conditions, as these time intervals represent the conditions for most projects. Reach studies occur one or more times a year under varying flow conditions depending on river behavior and trends. In the past, Reclamation has surveyed its hydrographic study range lines at varying intervals—from yearly to every 10 years—depending on specific needs and priorities. However, Reclamation is currently in the process of establishing a program that will survey most range lines every three years.

Hydrographic data collection includes:

- Site photographs
- Topography (underwater bathymetry, floodway, river cross sections, and longitudinal profiles)
- Global positioning system (GPS) points of interests and reference
- Hydraulic measurements (velocity, flow, and water surface profiles)
- River sediment sampling

- Geotechnical work (boreholes, test pits, and geophysical tests)
- Aerial photography (used to assess and document change in active channels)
- LiDAR survey (ground elevations, canopy heights, and vegetation surveys)

Reclamation uses the hydrographic data for river maintenance, geomorphic analyses, and habitat restoration activities. Specifically, Reclamation's data analyses include the comparison of river cross section geometry changes over time to assess lateral changes to channel depth, bank height, and floodplain terraces. Longitudinal changes are assessed by investigating slope changes in average cross section elevations, thalweg elevations, and energy slope changes. Another important metric to assess geomorphic conditions is the sediment size distribution. Reclamation's efforts to collect and analyze bed sediment samples facilitate investigation of how those distributions change—both spatially and temporally.

Reclamation uses geographic information systems (GIS) to analyze various spatially distributed variables over time. The hydrographic data collection efforts include the digitizing of aerial photography to identify active channel widths, vegetated bank-attached bars, vegetated islands, and recent channel change. These data, in addition to other spatially distributed data, are used as part of Reclamation's geomorphic, hydraulic, and sediment transport reports that are submitted with each project.

Reclamation constructs various hydraulic and sediment transport models, and uses them to design solutions to various river maintenance needs. They are also used to estimate likely or potential impacts to the river system's ability to convey water and sediment and to determine how those changes could result in geomorphologic changes in the vicinity of the project. Spatially distributed velocity, depth, and bed material sizes are then used to estimate the erosion/accretion potential—both within the project site and upstream and downstream, where potential impacts could result.

Reclamation is dedicated to using the most sophisticated tools, instruments, and methods to better understand the hydraulic and sediment transport conditions, trends, and dynamics of the river systems under Reclamation's jurisdiction and to meet the intent of the 2016 BiOp's RPM 2. Reclamation has completed and is currently implementing numerous projects and activities that will ultimately support Reclamation's efforts to understand and predict beneficial river overbanking to the benefit of endangered species while balancing Reclamation's other obligations for river maintenance and water delivery.

Selected examples of Reclamation's current work toward understanding hydraulic and sediment transport conditions and advancing the goals of RPM 2 include, but are not limited to, the following:

- ***Flow Duration Curve Analyses from Cochiti Dam to Elephant Butte Reservoir (2014).*** This report presents the results of a flow duration analysis over the period from 1993 to 2013 of the 13 U.S. Geological Survey (USGS) stream gages on the main stem of the MRG between Cochiti Dam and Elephant Butte Reservoir. The analysis was intended to provide a tool that could be used in the development of habitat restoration projects on the MRG. Two types of flow duration curves were developed for the period from 1993 to 2013 for the 13 gages: the flow duration curves from all discharge data points of the period and the seasonal flow duration curves. The flow frequency analysis resulted in the development of a design discharge envelope for the different life stages of the silvery minnow, with emphasis on the runoff season, the post-runoff season, and the winter season.
- ***Hydraulic Modeling in support of the BiOp for Water Management and Maintenance on the MRG (2016).*** Reclamation has developed a one-dimensional hydraulic model to identify the relationship between river discharge and river width for the MRG from Cochiti Reservoir to Elephant Butte Reservoir. The Service identified three critical habitat reaches:
 - Angostura to Isleta (approximately 40 river miles from Angostura Diversion Dam to IDD)
 - Isleta to San Acacia (approximately 54 river miles from Isleta Diversion Dam to SADD)
 - San Acacia to Elephant Butte Reservoir at EB-63 (approximately 78 river miles from SADD to the Powerlines at RM 62, just upstream of the Elephant Butte Full Pool Reservoir level)

With respect to these critical reaches, Reclamation has modeled and reported the relationships between discharge and river width. In addition, Reclamation continues to develop project-specific hydraulic models as required to support river maintenance and habitat restoration projects.

- ***Arroyos de Los Pinos Sediment Investigation.*** This investigation is ongoing with partners at New Mexico Institute of Mining and Technology, as well as international partners in Israel. Current conditions in the MRG are greatly impacted by the ephemeral tributaries that connect with the river throughout its course. Ephemeral tributaries are the sole source of sediment to MRG, and that sediment has both lateral and longitudinal impacts to river morphology. Understanding the quantity and characteristics of the sediment supplied by ephemeral tributaries is critical to developing a better understanding of geomorphic changes associated with aggradation/degradation, bed coarsening, and width changes. This investigation involves the construction of a very

sophisticated bed material sampler that includes both acoustic and physical sampling to measure hydrologic regimes and sediment yield from the Arroyo de Los Pinos watershed.

- ***Annual River and Levee Capacity Analysis RM 87 to Delta Channel.*** The very dynamic water surface elevation at Elephant Butte Reservoir has dramatic impacts upstream. Sediments deposited in the reservoir's delta when the water surface was much higher have created such low slopes through the delta that water was not conveyed through the delta, resulting in significant evapotranspiration and infiltration losses as water spread out across the delta. In order to mitigate this situation, Reclamation dredges a channel across the delta, allowing water to flow to the main reservoir pool. As the quantity of sediment delivered in this location is great, and the river does not have sufficient power to deliver that sediment, the delta channel requires regular maintenance. This maintenance activity permits Reclamation to assess changes in sediment supply and transport capacity in the lowest portion of the MRG. Planning for the maintenance of the delta channel is changed based on these assessments.
- ***Channel Conditions and Dynamics of the MRG Report and Seminar.*** Reclamation has prepared a comprehensive and thorough analysis of data and models for the entire length of the MRG. This report is in the process of being finalized and is going through peer review by scientists and engineers in Reclamation's Technical Services Center in Denver, Colorado. This report attempts to bring together a variety of data sources, including historical aerial photographs, long-term discharge and suspended sediment observations, distributed bed material sampling, thalweg elevation observations, cross section geometries, and planform characteristics over time. The results of this report will also be developed into a seminar for Reclamation staff and outside partners.
- ***River and LFCC Seepage Analyses.*** The MRG is losing river where water is lost to infiltration through its course. This has been well documented through various citations. Through approximately 50+ miles of the MRG south of SADD, the LFCC is the lowest point of the river valley. Therefore, Reclamation is investigating opportunities to reduce seepage, or infiltration, losses where the LFCC runs parallel to the river. This investigation is an opportunity for Reclamation to better understand the relationship between the river and shallow groundwater systems. The knowledge derived from these efforts can and will be used to inform other efforts where shallow groundwater plays an important role.

The general discussions that describe Reclamation's ongoing hydrographic data collection and the specific examples cited will be the foundation of a plan to address 2016 BiOp RPM 2. Reclamation has ongoing data collection, existing hydraulic models, and long-term planning activities that will contribute to optimizing river overbanking to benefit habitat. Reclamation

will develop and implement these activities to the benefit of endangered species of concern identified in the 2016 BiOp.

4.7 MRG Monitoring in the Lower Reaches

Numerous monitoring efforts are conducted in the Lower Reaches of the MRG, including efforts facilitated by Reclamation. Reclamation will continue to coordinate its monitoring with appropriate stakeholders in the Lower Reaches, including the SOBTF, the MRG Collaborative Program, and other entities including universities, agencies, and/or organizations. We look forward to exploring options for partnering on future monitoring efforts in the Lower Reaches.

Within the Albuquerque Area Office (AAO), Reclamation is currently developing a comprehensive MRG Monitoring Plan to better integrate the various monitoring efforts Reclamation conducts in the MRG. The MRG Monitoring Plan will serve as an overarching guidance document for AAO monitoring efforts, and will include monitoring conducted in the Lower Reaches. The focus will primarily be on coordination within the AAO and how monitoring data are integrated into the planning cycle for projects. Although the first step is to focus on Reclamation's monitoring efforts, future steps include enhancing coordination with other parties, seeking efficiencies, and integrating the MRG Monitoring Plan into the larger adaptive management effort. Adaptive management will help guide the collection of monitoring data in the Lower Reaches and will help to ground-truth the effects that result from these projects, to evaluate assumptions and determine if revisions or updates may be appropriate, and to inform future project designs.

More information on project-specific monitoring is located in the individual compliance and monitoring plan documents for each individual project. Monitoring can include pre-project monitoring, implementation monitoring, and/or post-construction effectiveness monitoring. River maintenance and restoration projects will have a monitoring approach tailored to the particular design and purpose of each project, including time frames and methods used. Project-specific monitoring plans are developed by Reclamation biologists, engineers, and/or geomorphologists with input from the Service, BiOp Partners, and applicable stakeholders. Collected data will be synthesized into measureable metrics for site management to establish and/or enhance riverine ecosystem functions and to create favorable conditions for the listed endangered species identified in the 2016 BiOp.

Monitoring also helps inform Reclamation's annual reporting required by the 2016 BiOp, which will document the specific activities conducted and their associated impacts, including beneficial effects and acreage. Although not detailed in this plan, it is important to note that cultural resources monitoring is also conducted in the Lower Reaches in association with Reclamation projects to ensure compliance with the National Historic Preservation Act (NHPA).

Fish Monitoring Sites

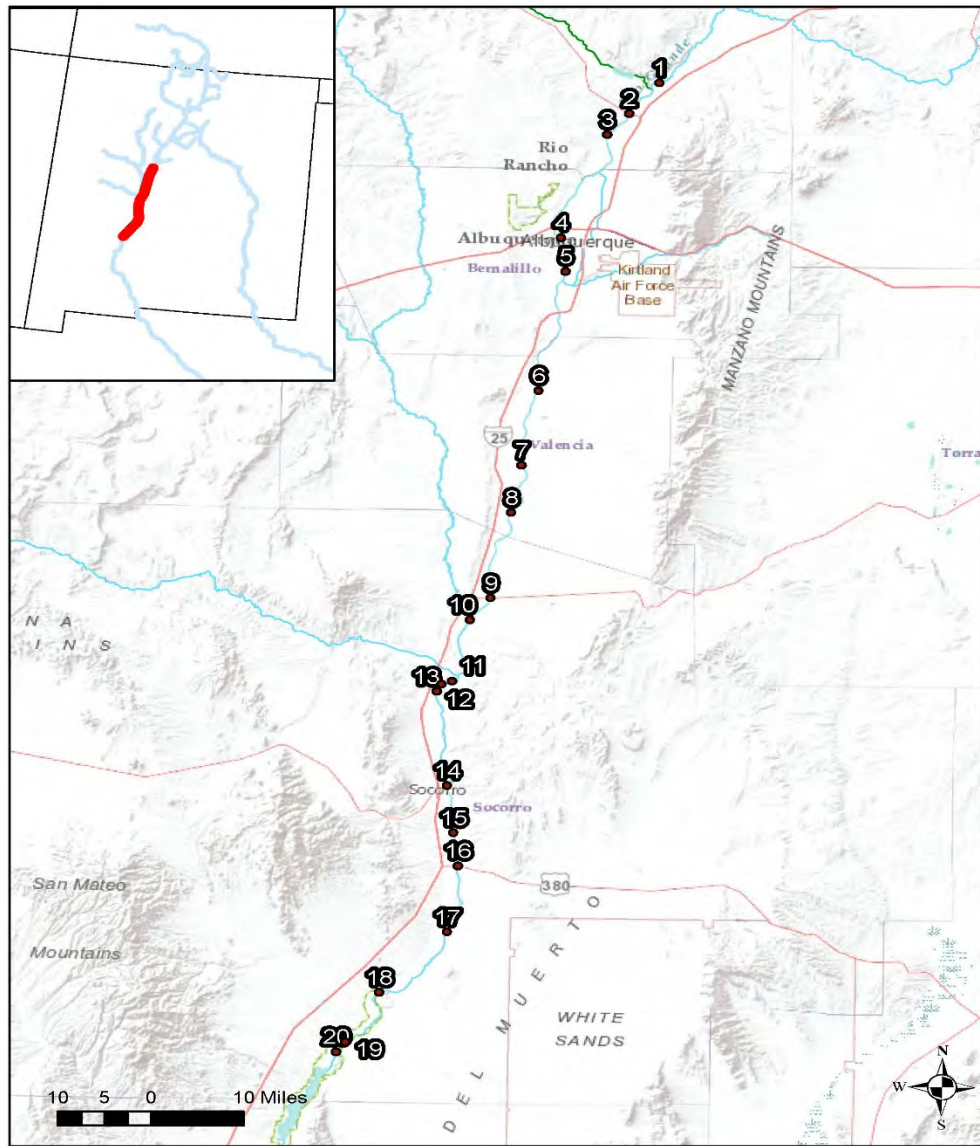


Figure 18. Current silvery minnow monitoring sites

Table 1. Coordinates of fish monitoring sites

Site ID	UTM Easting	UTM Northing
1	363811	3916006
2	358543	3909722
3	354772	3905355
4	346840	3884094
5	347554	3877163
6	342898	3852531
7	339972	3837061
8	338136	3827329
9	334604	3809726
10	331094	3805229
11	327902	3792603
12	326162	3791977
13	325263	3790442
14	327097	3771043
15	328140	3761283
16	328914	3754471
17	327055	3740839
18	315284	3728347
19	309487	3718178
20	307846	3716150

The following subsections summarize the general categories of water, river, and biological resources monitoring in the Lower Reaches.

4.7.1 Water Resources Monitoring

Ongoing water resources monitoring includes, but is not necessarily limited to (1) supplemental water management, (2) hydrographic monitoring, (3) photogrammetry/GIS, (4) water usage monitoring including USGS gage data, monitoring of river flows, and days of intermittency (e.g., River Eyes), (5) monitoring duration and scale of inundation and peak flows, (6) use of groundwater wells, (7) conducting site checks for current conditions, (8) monitoring of releases/diversions/returns, (9) monitoring reservoir levels, (10) use of ET Toolbox, and (11) refugia monitoring. Many of these are interagency monitoring efforts.

Reclamation participates in a cooperative interagency river monitoring effort with field observations of changing river flows that could lead to river intermittency and drying. This monitoring is typically provided via contracted services. Increases to river flows from discharge from projects will be tracked through this river monitoring.

4.7.2 River Resources Monitoring

In addition to the Sediment Management/Elevation Plan described earlier, ongoing river resources monitoring includes a range of hydrographic, hydraulic, hydrologic, and geomorphic monitoring (e.g., rangelines, sediment, GIS). These data are used for river maintenance analyses and determination of need for future river maintenance projects by Reclamation. For more information, see the Hydrographic Data Collection Report by Devergie (2016).

4.7.3 Biological Resources Monitoring

Ongoing biological monitoring by Reclamation includes activities in the Lower Reaches. Current monitoring efforts and associated datasets relevant to these Lower Reaches for the silvery minnow, flycatcher, and cuckoo can be found in Appendix A. These are the datasets of which Reclamation is aware; the full list of permitted activities conducted on these species is maintained by the Service's NMESFO.

These monitoring efforts provide data that are used for multiple purposes, including adaptive management through science-based hypothesis testing of management relevant uncertainties, agency decision-making, project compliance with federal laws and regulations (Endangered Species Act [ESA], Clean Water Act [CWA], National Environmental Policy Act [NEPA], etc.), project performance, and tracking project success for mitigation purposes (e.g., wetlands), as well as to identify the status of resources and overall compliance with the 2016 BiOp and/or the need to reinitiate ESA consultation if that occurs. The flycatcher and cuckoo management plan and the vegetation mapping conducted every 4 to 5 years are also used to inform which areas to target for habitat restoration and management.

Other ESA-listed species are located within the Lower Reaches; however, they are not the focus of these monitoring efforts. The BDA currently conducts the monitoring for the jumping mouse. Pre-project compliance requires Reclamation to evaluate the project area for the presence of habitat for ESA-listed species, which includes both the jumping mouse and the Pecos sunflower (*Helianthus paradoxus*).

Ongoing biological monitoring activities in the Lower Reaches include, but are not necessarily limited to, the following:

- Silvery minnow and fish community monitoring
 - A systematic population monitoring program has been conducted since 1993; this program also collects broader fish community data. This monitoring evaluates temporal trends in minnow abundance at standardized sites in the MRG, documents changes in relative abundance among fish species over time, and evaluates how flow patterns influence the population.

- A long-term genetics monitoring and assessment program has been conducted since 1999 to determine levels of genetic variability in the wild population relative to long-term trends, to assess impacts of captive propagation practices, and to provide recommendations on genetic management of the silvery minnow.
 - Annual spawning monitoring has been conducted since at least 2003, includes the Lower Reaches, and involves collection of egg data during spring runoff conditions to characterize the timing, duration, and magnitude of silvery minnow reproduction in the MRG.
 - Reclamation conducts fall fish sampling in the Delta Channel annually, as well as winter electrofishing surveys at several sites in the Lower Reaches, for supplemental silvery minnow data including presence/absence, water quality, and information on fish community composition.
 - As needed, Reclamation conducts site-specific pre-construction fish surveys (e.g., in drains and wasteways), to support ESA compliance on projects in areas that are not otherwise surveyed for fish.
 - Reclamation provides funding to the Service's New Mexico Fish and Wildlife Conservation Office to conduct silvery minnow sampling at specific locations in the MRG, including in the Isleta Reach. These data support up-to-date information on the status of the species to inform water management decisions, and provide additional opportunities to evaluate sample design and other adaptive management questions.
 - Silvery minnow monitoring data are also obtained as part of the rescue and salvage effort undertaken during river drying events, as well as from a mark-recapture study conducted as part of the augmentation program, releasing tagged hatchery-reared silvery minnows into the MRG.
 - Other parties also conduct silvery minnow monitoring, aside from Reclamation personnel and funded efforts. These include the NMISC and its contractors, the USACE, and others. The Service handles permitting for these efforts and maintains the full list of permitted entities.
- Flycatcher and cuckoo monitoring
 - Systematic flycatcher surveys have been conducted in the MRG since 1994, and support overall ESA compliance in the basin by providing baseline population data on flycatcher, population trends over time, current distribution of flycatchers, and nest monitoring for estimates of nest success rates.

- Systematic cuckoo surveys have been conducted in the MRG since 2006, and support overall ESA compliance in the basin by providing baseline population data on cuckoos, trends over time, and current distribution of cuckoos.
- Habitat suitability mapping has been conducted at several intervals over time, including 1998–1999, 2002–2004, 2005, 2008, and 2011–2012. Photostations at Elephant Butte have also been maintained and monitored from 2005–2015.
- Baseline studies using flycatcher and cuckoo survey data have been conducted for both the BDA sediment plug and the Elephant Butte sediment plug.
- Monitoring of the Los Lunas habitat restoration site for flycatcher habitat has been conducted since 2003.
- Separate research surveys are also conducted, including on the cuckoo to provide more information on home range, the type of habitat occupied, and distance traveled by the species (e.g., telemetry studies, geolocation studies). For the flycatcher, these studies have included long-term assessment of livestock impacts, review of vegetation and hydrologic parameters associated with the flycatcher, and vegetation quantification of nest sites.
- Pre-construction bird surveys are conducted in support of Reclamation projects in the MRG, including in the Isleta and San Acacia Reaches, where those areas are not typically surveyed as part of the systematic effort.
- Other parties aside from Reclamation may conduct site-specific bird surveys in the area. The Service handles permitting for these efforts and maintains the full list of permitted entities.

4.8 Adaptive Management

The complexity of the MRG system has left decision makers with a great deal of uncertainty about how to best manage available water to maximize benefits for endangered species within legal and regulatory constraints. To reduce uncertainty around species/hydrology relationships, Reclamation and the BiOp Partners will implement adaptive management processes with internal and external teams as appropriate. These teams will be composed of decision makers, stakeholders, legal experts, technical experts, modelers, and facilitators.

Under the 2016 BiOp, there are three interrelated categories that fall under the umbrella of adaptive management: water management, habitat restoration, and river connectivity. These categories are related by Reclamation's RIO (River Integrated Operations), which focuses on improving habitat and water management by optimizing water operations through the adaptive management process. The adaptive management approaches for each of these categories are currently at various stages of development; all stages are still in draft.

At this time, RIO is the most developed component of adaptive management under the 2016 BiOp. The goal of RIO is to reduce key uncertainties over time related to species/hydrology relationships and to improve our understanding of how to achieve sustainable management of the MRG by identifying optimal water management strategies, within legal and regulatory constraints. One of the objectives of RIO is to test and refine the Service's draft HBO (described in the 2016 BiOp) for the silvery minnow. To achieve this, the RIO process will integrate with the Minnow Action Team through an annual process that will consist of hypothesis development, implementation of management actions, monitoring, analysis, and hypothesis/model refinement (Table 1). There is also a component of RIO that addresses the flycatcher and cuckoo; however, a conceptual process for specifically addressing the flycatcher and cuckoo/water and vegetation management relationship is still being developed.

Table 2. Draft timeline of the annual RIO process

Task	Time Frame
Propose new hypothesis and discuss management actions	January
First water forecast is released, coordinate with Minnow Action Team (MAT) on possible water management options	February
Coordinate monitoring	February–March
Data collection begins	March
Coordinate with MAT on possible water management options, adjust monitoring as necessary	March–May
Fish monitoring data available	October
Perform analyses with new data	November–December
Present analyses with new data, hypothesis/model refinement based on results	January

As the specifics of each adaptive management category are developed, Reclamation, in cooperation with the BiOp Partners and the Service, will coordinate with stakeholders for input. Additionally, as required under the 2016 BiOp, Reclamation and the BiOp Partners will conduct an overall Adaptive Management Review with the Service every 5 years. The purpose of the 5-year review is to ensure that Reclamation and the BiOp Partners continue to work toward reducing uncertainty around our management actions, as well as to allow for evaluation, prioritization, and refinement of conservation measures. Each 5-year review will be followed by an independent science peer review. Results of the 5-year review, including appropriate peer review recommendations, will be discussed with the Service, BiOp Partners, and stakeholders and then incorporated into BiOp implementation plans for the next 5 years, after approval by the Service.

4.9 Lower Reach Management Plan For Downstream Deliveries

The New Mexico Office of the State Engineer (OSE) has had a policy in place since 2011 that governs permitting and river depletions due to river maintenance and habitat restoration projects

(OSE memorandum from J. D’Antonio, “Depletions Offsetting for Habitat Restoration Projects within the Middle Rio Grande Project,” October 28, 2011). In short: (1) permitting is not required for projects conducted by Reclamation, the USACE, or the NMISC “within the Middle Rio Grande floodplain (defined as levee to levee) between Velarde and Elephant Butte Reservoir because of their respective flood control authorities and/or compact delivery statutory roles. . . .the end result of the work is a functional MRG floodway and floodplain which is important to the State and it[s] citizens for a number of reasons” and (2) depletions caused by habitat restoration work outside of the river channel, defined as a 600-foot-wide corridor centered on the midline of the river, are subject to offsetting requirements set by the OSE. Compliance with the 2011 OSE policy is addressed on an individual project basis for habitat restoration projects, which is time intensive, costly, and often does not allow for flexibility and adjustment as the impacts of projects to depletions or downstream deliveries are realized and better understood.

Reclamation has long been committed to limiting the size and location of habitat restoration projects in the MRG such that there are no new depletions. However, this Lower Reach Plan includes habitat restoration projects that could occur outside of the river channel, as well as several non-habitat restoration projects intended to enhance flows, manage sediment, and increase safe channel capacity. Therefore, Reclamation will be pursuing a long-term, reach-wide management plan in coordination with the State that will provide for an assessment and accounting of the impacts of the Lower Reach projects to downstream deliveries as a whole, as opposed to an individualized project assessment approach. The management plan will describe how impacts to downstream deliveries will be monitored and assessed, for how long, and how offsets—if needed—will be acquired and accounted for.

5. Other Projects in the Project Area

5.1 Save Our Bosque Task Force Initiatives

5.1.1 Armendaris Ranch North Section Riparian Restoration Project



Figure 18. Armendaris Ranch North Section Riparian Restoration Project

Location: San Marcial, New Mexico, adjacent to the South Boundary of the BDA.

Approximate acreage: 250 to 300 acres.

Land status: Private, Armendaris Ranch held in trust by the Nature Conservancy.

Past efforts: Initial nonnative plant control was accomplished on some of the properties from 1999–2016.

Current efforts: Armendaris Ranch has developed potential grassland and riparian restoration projects in this area. To date, an experimental grassland planting and some limited riparian pole planting have been completed. Fencing is in place to allow for restoration without grazing damage or, in the case of grassland restoration, to use grazing as appropriate. This area was burned in the Marcial Fire (2006), but was not burned during the Tiffany Fire (late June/early July 2017).

Future plans: Armendaris Ranch and Turner Enterprises, Inc. developed this project as part of a strategic plan for the ranch's floodplain (2015). The project can be scaled a number of ways, but overall it is 1.5 miles long and covers approximately 250 to 300 acres. It is designed to benefit

the jumping mouse (federally listed as endangered), the flycatcher (federally listed as endangered), and the cuckoo (federally listed as threatened) by relocating and reconfiguring the Interior (Elmendorf) Drain through the North Section. Turner Enterprises, Inc. is currently seeking partners for this project.

5.1.2 Armendaris Ranch South Section Riparian Restoration Project



Figure 19. Armendaris Ranch South Section Riparian Restoration Project

Location: San Marcial, New Mexico, adjacent to the BDA South Boundary, west side of the river.

Approximate acreage: 107 acres.

Land status: Private, Armendaris Ranch, held in trust by the Nature Conservancy.

Past efforts: None.

Current efforts: Armendaris Ranch applied for funding through the North American Wetland Conservation Act (NAWCA) and received word that the project is funded. This project is within the South Section of the ranch's floodplain as designated in the strategic plan developed in 2015. Prior to the installation of the South Boundary pump station channel and weir, the floodplain in the project area flooded during higher spring flows and more intense, localized monsoonal rain events. The area currently rarely floods. These floodplain riparian areas were burned extensively during the Tiffany Fire (late June/early July 2017).

Future plans: Armendaris Ranch, Turner Enterprises, Inc., and Bosque del Apache NWR are proposing reconnecting the overbank flows through the project area (burned in the Tiffany Fire), burned vegetation removal, invasive species control, and native grass, shrub, and tree plantings to augment what should reestablish with periodic flooding. A thorough analysis of the Tiffany Fire footprint (see Section 4.5.5) should be conducted to determine the most feasible and beneficial options for riparian restoration over the 9,200 acres burned, including potential additional restoration in this project area.

5.1.3 Armendaris Ranch Tiffany Basin Project



Figure 20. Armendaris Ranch South Section Tiffany Basin

Location: San Marcial, New Mexico, approximately 1 mile south of the BDA.

Approximate acreage: 2,000 acres.

Land status: Private, numerous landowners (three large landowners including the ranch), Armendaris Ranch held in trust by the Nature Conservancy.

Past efforts: None.

Current efforts: Armendaris Ranch is currently seeking assistance with the analysis and determination of floodplain wildlife habitat improvements on approximately 2,500 acres of land owned by the ranch in the San Marcial area, including its holdings within the Tiffany Basin (Figure 20) (see Section 4.5.5). The Tiffany Basin is within the South Section of the ranch floodplain acres in the strategic plan developed in 2015. The property currently floods only on the active floodplain to the east and south of Tiffany Basin during higher spring flows and more

intense, localized monsoonal rain events. The basin is isolated from river flows by a spoil berm. The floodplain (both isolated and active floodplain) riparian areas were burned extensively during the Tiffany Fire (late June/early July 2017).

Future plans: Armendaris Ranch, Turner Enterprises, Inc., SOBTF, Sierra Soil and Water Conservation District, New Mexico State Forestry, Reclamation, and other partners are discussing a thorough analysis of the Tiffany Fire footprint to determine the most feasible and beneficial options for riparian restoration over the 9,200 acres burned, including portions of the Tiffany Basin not scheduled for sediment disposal.

5.1.4 Bosquecito Floodplain Project



Figure 21. Bosquecito Floodplain

Location: Bosquecito, New Mexico, approximately 2 miles north of Highway 380.

Approximate acreage: 520 acres.

Land status: Private, four landowners, under perpetual conservation easement.

Past efforts: Initial nonnative plant control was accomplished on the properties from 2003–2008.

Current efforts: The property currently floods during higher spring flows and more intense, localized monsoonal rain events. Socorro County (FEMA funded Wildfire Hazard Mitigation Project) will clear all tamarisk and Russian olive from the property through mechanical means and follow up with two seasons of nonnative control.

Future plans: The SOBTF and other partners will work with landowners to design restoration features on the site. These features could include a “ribbon” of native forest and shrubland following an old river meander and saltgrass meadow enhancement.

5.1.5 Socorro County North Bosque Wildfire Hazard Mitigation Project



Figure 22. Socorro County North Bosque Wildfire Hazard Mitigation Project Area

Location: East and west side floodplain, north Socorro County, New Mexico, from County line south to SADD.

Approximate acreage: 550 acres.

Land status: Private, four landowners.

Partners: Socorro County, New Mexico State Forestry, SOBTF, Socorro Soil and Water Conservation District (FEMA funded through the New Mexico Department of Homeland Security and Emergency Management [NMDHSEM]).

Past efforts: The four landowners have conducted some limited nonnative plant control on their properties in the past but no native plant establishment in the project area.

Current efforts: These lands are being cleared of nonnative plants to reduce hazardous fuels present in Socorro County. The goal of the project is to provide greater wildfire protection to homes, communities, infrastructure, and wildlife habitat. There will most likely be an environmental mitigation component to the project to provide additional flycatcher and cuckoo habitat.

Future plans: The SOBTF and other partners will work with landowners to design restoration features on their sites following nonnative plant control. These features could include planting trees and shrubs, seeding native grasses, or manipulating the topography on their lands. To date, design features for this work have not been developed.

5.1.6 Socorro Valley Wildfire Hazard Mitigation Project



Figure 23. Socorro Valley Wildfire Hazard Mitigation Project

Location: East side floodplain, Socorro Valley, New Mexico.

Approximate acreage: 1,350 acres.

Land status: Private, 25 landowners.

Partners: Socorro County, New Mexico State Forestry, SOBTF, Socorro Soil and Water Conservation District (FEMA funded through the NMDHSEM).

Past efforts: Some of the 25 landowners have had initial nonnative plant control on their properties, but there has been limited native plant establishment.

Current efforts: These lands are being cleared of nonnative plants to reduce hazardous fuels present in the valley. There is also defensible space work around homes for some landowners in the area. The goal of the project is to provide greater wildfire protection to homes, communities, infrastructure, and wildlife habitat. There will most likely be an environmental mitigation component to the project to provide additional flycatcher and cuckoo habitat.

Future plans: The SOBTF and other partners will work with landowners to design restoration features on their site following nonnative plant control. These features could include planting trees and shrubs, seeding native grasses, or manipulating the topography on their lands. To date, design features for this work have not been developed.

5.1.7 Central Socorro Bosque Severance Project

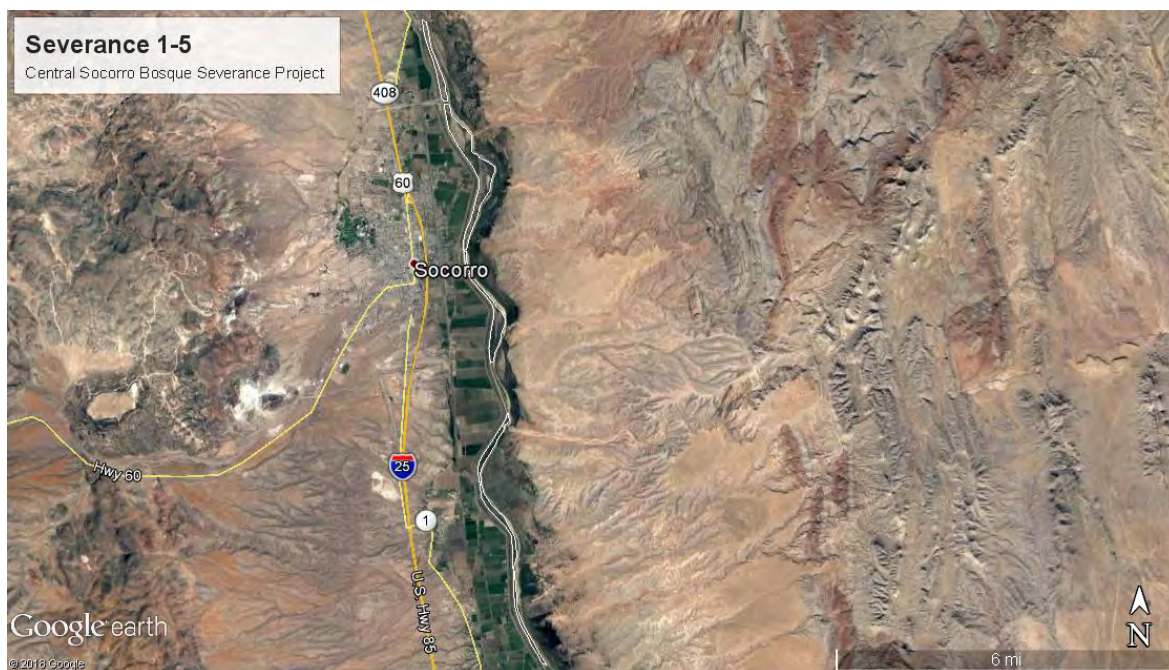


Figure 24. Central Socorro Bosque Severance Project

Location: Socorro, New Mexico, west side of Rio Grande from Escondida Bridge to Neil Cupp.

Approximate acreage: 740 acres.

Land status: MRGCD/Reclamation lands.

Partners: New Mexico State Forestry, MRGCD, SOBTF, and Reclamation.

Past efforts: Some understory clearing has occurred in the riverine parks.

Current efforts: Clearing of tamarisk and Russian olive was conducted with mechanical treatment (hand treat, mastication, pluck and pile) from spring 2017–spring 2018 with a follow-up treatment within 6 months. The goal of the project is hazardous fuels reduction.

Future plans: Native plantings will tentatively occur in spring to summer of 2018 and 2019. Plants will be established in areas to provide foraging and nesting habitats for cuckoos.

5.1.8 Partners for Fish and Wildlife and Save Our Bosque Task Force Projects



Figure 25. Aerial photograph of Project Area

Location: Along Rio Grande from San Marcial, New Mexico to La Joya, New Mexico

Approximate acreage: 397 acres.

Land status: Private lands, some under conservation easement with Rio Grande Agricultural Land Trust.

Partners: Socorro Soil and Water Conservation District, SOBTF, Service's Partners for Fish and Wildlife.

Past efforts: On past projects, 257 acres on 5 properties was cleared of tamarisk and Russian olive to improve riparian habitat, especially for migratory songbirds, and to reduce hazardous fuels. Follow-up treatments and native plantings occurred on these projects in the following years.

Current efforts: There are three projects, accounting for 77 acres (3 properties), that are currently underway. These projects include invasive species control, establishment, and maintenance of native vegetation, and fence construction and maintenance to keep cattle off of these restoration areas.

Future plans: There are 63 acres (2 projects) in the planning process. Some tasks under these projects will be funded with the Socorro Valley Wildfire Hazard Mitigation Project. Plans for

these projects include removal of invasive woody species for fuels reduction. The SOBTF and Service's Partners for Fish and Wildlife will work together to develop and implement restoration and native plantings following the invasive wood species removal to improve riparian habitat. Maintenance will be occurring on all of the projects that have included woody species removal.

5.1.9 Other Save Our Bosque Task Force Projects



Figure 26. Bottomly Project Site

Location: Along Rio Grande from San Antonio, New Mexico to Lemitar, New Mexico.

Approximate acreage: 101 acres.

Land status: Private (3 under conservation easement with the Rio Grande Agricultural Land Trust), fuel breaks and riverine parks on MRGCD/Reclamation lands.

Partners: Socorro Soil and Water Conservation District, SOBTF, New Mexico State Forestry.

Past efforts: These areas were cleared of nonnative plants to reduce hazardous fuels and to improve riparian habitat. Cottonwoods and willows were planted following removal through the work of different partners. For example, Socorro Soil and Water Conservation District planted

native plants at the Bottomly project and other sites. The Conklin project was included as a New Mexico Tree Farm project. There are 16 riverine parks with invasive plant treatment completed, and gallery cottonwood forest with a native understory from San Acacia to San Antonio on the west side of the river. There is also the BLM's Socorro Nature Area, which provides an outdoor classroom to the local area.

Current Efforts: These projects are now being considered under the initial design of an extended trail system in the Socorro Valley for improved outdoor education opportunities and as demonstration areas for bosque restoration techniques.

Future Plans: Continued maintenance will be needed on these and all projects to some extent. The SOBTF is currently evaluating its role assuring successful restoration through maintenance of projects for its and other stakeholders' projects within its focus area.

6. Lower Reach Plan Updates

The Lower Reach Plan is a *living document* in that it is a document that is continually edited and updated. We intend to update this document on a biennial basis (every other year), incorporating updated project planning information, as well as adaptive management information. Adaptive management focuses on learning and adapting, through partnerships of managers, scientists, and other stakeholders who learn together how to create and maintain sustainable resource systems. More current updates can be obtained from project managers on individual projects.

7. References

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Appendix A. Monitoring efforts for several ESA-listed species in the Lower Reaches

The tables in this appendix provide information on several ESA-listed species in the Lower Reaches of the MRG, and the datasets that are known to Reclamation. This information is generally uploaded into the database management system (DBMS) for access by the MRG Collaborative Program as well as the public (<http://mrgescp.dbstephens.com/#Home>). The responsible agency is also a point-of-contact for each listed project. The Service's NMESFO maintains a current list of permit holders and receives annual reports for activities conducted. Therefore, the tables in this appendix may not contain the full list of available data on these species.

For all efforts that were conducted through contract with Reclamation, all required data have been provided. For the silvery minnow, the RGSM Data Acquisition effort has been completed, and it acquired additional data from various historical field monitoring efforts ranging from 1993 to 2014.

Please note: For appropriate use, “raw data” should have undergone processing and quality checks for accuracy to represent valid data before being shared or uploaded to DBMS. Any requests for raw data from Reclamation will need to be specific and may not be achievable after the fact if those data were not the subject of the scope of contract requirements. Requests for raw data from other parties listed below should be directed to those entities.

Table A-1. Rio Grande Silvery Minnow

RGSM Data/Project	Date Range	Data Format	Data/Report Location	Contact Agency
RGSM Population Estimation Program	2006–2011	PDF reports (and see <i>Data Acquisition</i> below)	DBMS	Reclamation
RGSM Population Monitoring Program	1993–2013	PDF reports (and see <i>Data Acquisition</i> below)	DBMS	Reclamation
	2013–present	Excel data files; PDF reports	DBMS	Reclamation
RGSM Data Acquisition effort (2014–2017)	All data beyond original contracts (2013 and earlier) for population monitoring, spawning monitoring, mark-recapture, replication studies, river intermittency analysis	Pending	Pending receipt in late 2017; then DBMS	Reclamation
RGSM Spawning Monitoring	2003–2012	PDF reports and Excel data files (see <i>Data Acquisition</i> above)	DBMS	Reclamation

RGSM Data/Project	Date Range	Data Format	Data/Report Location	Contact Agency
RGSM Spawning Monitoring	2013–present (includes RGSM egg entrainment in canals 2013–2016)	PDF reports and Excel data files	DBMS	Reclamation
RGSM Egg Entrainment in Canals	2003–2012	PDF reports	DBMS and contact NMFWCO	NMFWCO
RGSM Egg Monitoring in the Albuquerque Reach	Multiple years (~2008–2015)	Egg listserv reports; PDF reports	DBMS or contact NMISC	NMISC
RGSM Egg and Fish Monitoring at the ABCWUA	Multiple years (~2010–2017)	PDF reports	Contact ABCWUA	ABCWUA
RGSM Egg Collection for Hatcheries	2003–present	Not published	Information available from USFWS and BioPark	USFWS
USACE fish Sampling Data (various projects)	Multiple years	PDF reports	DBMS or contact USACE	USACE
NMISC Fish Monitoring at Habitat Restoration Projects	Multiple years (~2007–2017)	PDF reports	DBMS or contact NMISC	NMISC
USFWS – NMFWCO Fish Sampling Data	Multiple years	PDF reports and memoranda	Contact NMFWCO	NMFWCO (USFWS)
RGSM Sampling in Refugial Outfalls	2014–2016	PDF reports	DBMS	MRGCD
RGSM Genetics Monitoring and Assessment	1999–present	PDF reports and Excel files with full data	DBMS; also full dataset up to 2010 available on Dryad at http://datadryad.org/resource/doi:10.5061/dryad.p57j80c4?show=full	Reclamation
RGSM Larval Sampling in Floodplain	2016–present	Pending	Contact the NMISC or USACE	NMISC, USACE
RGSM Sampling in the Delta Channel (formerly Temp Ch.)	2010–present	Excel data files (reports pending)	DBMS and contact Reclamation; recent reports once completed will go on DBMS	Reclamation
RGSM Electrofishing Surveys (Feb/Mar)	2001–present	PDF reports (2001–2011); Excel data files (2012–present, reports pending)	DBMS and contact Reclamation; recent reports once completed will go on DBMS	Reclamation
RGSM Salvage and Rescue	2003–present	PDF reports	DBMS	NMFWCO (USFWS)
RGSM Augmentation	2005–present	PDF reports	DBMS	NMFWCO (USFWS)
RGSM Egg Habitat	2003–2004	PDF reports	DBMS	Reclamation

RGSM Data/Project	Date Range	Data Format	Data/Report Location	Contact Agency
Big Bend 10(j) RGSM Monitoring	2008–present	Not published	Contact USFWS	USFWS
RGSM Life History and Habitat Studies (Scientific Literature)	Various	PDF reports and published papers	Contact authors; many of these documents are on DBMS	Various authors

Table A-2. Southwestern Willow Flycatcher

SWFL Data/Project	Date Range	Data Format	Data/Report Location	Contact Agency
SWFL Presence/Absence Protocol Survey Program (Annual Reports)	1994–present	PDF reports	DBMS and Reclamation/ AAO	Reclamation/USACE
SWFL Habitat Suitability (mapping)	1998; 2002; 2005; 2008; 2012; 2016	PDF reports	Reclamation/AAO	Reclamation
SWFL Rangewide Database – New Mexico	1994–present	Access database	Reclamation/AAO/ USFWS – sensitive data (restricted)	Reclamation
SWFL Bosque del Apache Sediment Plug Baseline Studies (annual reports)	2010–present	PDF reports	Reclamation/AAO	Reclamation
SWFL Elephant Butte Sediment Plug Baseline Studies (annual reports)	2011–present	PDF reports	Reclamation/AAO	Reclamation
Elephant Butte Reservoir Delta Photostations (SWFL/YBCU Habitat) (annual reports)	2005-Present	PDF reports	Reclamation/AAO	Reclamation
Monitoring of the Los Lunas Habitat Restoration (annual reports)	2003-Present	PDF reports	Reclamation/AAO	Reclamation/USACE
Long-term Assessment of Livestock Impacts on Riparian Vegetation (SWFL habitat; Elephant Butte Project Lands)	1997-2008	PDF reports	Reclamation/AAO	Reclamation
Review of Vegetation and Hydrologic Parameters Associated with SWFL (Elephant Butte Reservoir Delta)	2002-2008	PDF report	Reclamation/AAO	Reclamation
Vegetation Quantification of SWFL Nest Sites (La Joya to Elephant Butte)	2004-2006	PDF reports	Reclamation/AAO	Reclamation
Brown-headed Cowbird Control Program (annual reports)	1996-2001	PDF reports	Reclamation/AAO	Reclamation

SWFL Data/Project	Date Range	Data Format	Data/Report Location	Contact Agency
Brown-headed Cowbird Radio Telemetry Study – Annual Reports (Daily and Seasonal Movements)	1998-1999	PDF reports	Reclamation/AAO	Reclamation
Riparian Obligate Nest Success (summary report)	1999-2005	PDF report	Reclamation/AAO	Reclamation
Monitoring of Defoliation by the Tamarisk Beetle (annual reports)	2016 - Present	PDF reports	Reclamation/AAO	Reclamation
SWFL Life History and Habitat Studies (scientific literature)	Various	PDF reports and published papers	Contact authors	Various authors

Table A-3. Yellow-Billed Cuckoo

YBCU Data/Project	Date Range	Data Format	Data/Report Location	Contact Agency
YBCU Presence/Absence Protocol Survey Program (annual reports)	2006–present	PDF reports	DBMS and Reclamation/AAO	Reclamation
YBCU Radio Telemetry Study	2007–2008	PDF report	Reclamation/AAO	Reclamation
Elephant Butte Reservoir Delta Photostations (SWFL/YBCU habitat) (annual reports)	2005–present	PDF reports	Reclamation/AAO	Reclamation
YBCU Habitat Suitability Model	2016	(In process - draft)	Reclamation/AAO	Reclamation
YBCU Rangewide Database – New Mexico	2017	Access database (in process - draft)	Reclamation/AAO/USFWS – Sensitive Data (Restricted)	Reclamation
YBCU Geolocation/ Migration Study	2009–2010	Published paper – <i>Western Birds</i>	Reclamation/AAO	Reclamation
YBCU Radio Telemetry Study – Home Range and Habitat Use	2007–2008	Published paper – <i>The Southwestern Naturalist</i>	Reclamation/AAO	Reclamation
YBCU Life History and Habitat Studies (Scientific Literature)	Various	PDF reports and published papers	Contact authors	Various authors

Appendix B. Reclamation's Memorandum to the Service dated July 20, 2016



IN REPLY REFER TO:

ALB-611
ENV-7.00

United States Department of the Interior

BUREAU OF RECLAMATION
Upper Colorado Region
Albuquerque Area Office
555 Broadway NE, Suite 100
Albuquerque, NM 87102-2352

JUL 20 2016

MEMORANDUM

To: Field Supervisor, U.S. Fish and Wildlife Service
New Mexico Ecological Services Field Office
2105 Osuna Road NE, Albuquerque, NM 87113
Attn: Mr. Wally Murphy

From: Jennifer Faler
Area Manager

Subject: Progress update for Consultation on Bureau of Reclamation, Bureau of Indian Affairs, and Non-Federal Water Management and Maintenance Activities on the Middle Rio Grande, New Mexico (Cons. #02ENNM00-2013-F-0033)

Introduction/Purpose

At the request of the U.S. Fish and Wildlife Service (Service), the Bureau of Reclamation, the Bureau of Indian Affairs (BIA), the Service, the U.S. Army Corps of Engineers (USACE), the New Mexico Interstate Stream Commission (NMISC), the Middle Rio Grande Conservancy District (MRGCD), and the Albuquerque Bernalillo County Water Utility Authority (ABCWUA) have been meeting in 2016 to discuss and clarify the Offsetting Measures and the Conservation Measures proposed in the 2015 *Revised Joint Biological Assessment (BA) for Bureau of Reclamation, Bureau of Indian Affairs, and Non-Federal Water Management and Maintenance Activities on the Middle Rio Grande, New Mexico* (2015 BA). This memorandum is intended to summarize key aspects of those discussions and provide a progress update on specific measures, thus increasing the reasonable certainty of occurrence to be attributed to these measures.

It is important to note that most of the Proposed Actions in Reclamation's BA are generally already occurring, in some cases for several hundred years. Along similar lines, many of the proposed Offsetting and Conservation Measures described in the 2015 BA have been set in motion already. Significant changes in how operational decisions are made by Rio Grande water managers began more than 15 years ago, in direct response to listing of the Rio Grande silvery minnow (silvery minnow), and continue to evolve today. As early as 1996, Reclamation and the MRGCD responded with specific measures to address concerns over river intermittency and its effects on the silvery minnow. Subsequently, such measures as coordinated multi-agency water management, changes to timing of release and storage of water, Reclamation's Supplemental Water Program, management and conveyance of species water, New Mexico's provision of Rio Grande Compact relinquishment credit to augment flows; water measurement, substantial increases in irrigation water efficiency, and the enhancement of many acres of habitat, specifically for listed species, have occurred. The past activities of the BA Partners and other entities are the principle evidence of reasonable certainty of occurrence and Rio Grande water managers intend to continue their efforts for the conservation of the listed species and to seek innovative solutions that can be adapted to the highly variable hydrologic conditions of the basin. The Service can look to the long history of voluntary modifications to water operations that have been done specifically to support efforts to conserve and recover the listed species.

- 1) Implement River Integrated Operations (RIO) (Table IV-1, page IV-8): RIO is an element of the overall AM program, which focuses on improved water and species management relationships, specifically testing and modifying the Service's draft Hydrological/Biological Objective (HBO) over time so that it can more accurately and consistently describe the needs of the silvery minnow.

For the last four years, the BA Partners have voluntarily convened the Minnow Action Team (MAT) to incorporate species and ecosystem needs through annual hydrologic evaluations and water management. The MAT, which includes BA partners and other Collaborative Program/RIP signatories, proposes how to best utilize available resources for the upcoming year with the goal of meeting the HBO. Recommendations based on the hydrologic outlook, available water supplies, and species status among other conditions are prepared in collaboration with the Service and water management agencies. The BA Partners have found that coordination with the Service on annual water management options is beneficial. AM principles are applied to MAT recommendations and monitoring/evaluation/reporting through integration of the HBO evaluation and AM Committee. Beginning in the spring of 2017 and continuing for the life of this BO, Reclamation will work with the BA Partners to continue to evolve the MAT to address species needs using a focused science-based AM approach.

- 2) Water Management Tools: Authorizations, agreements, commitments, and projects are in effect that allow water to be stored and released to adaptively support the silvery minnow for several years, at the minimum. Beginning in the spring of 2017 and continuing for the life of the BO, the following commitments will apply. The MRGCD Board will commit to collaboratively and adaptively managing the available supplies to more effectively meet endangered species purposes while delivering its water to its farmers; Reclamation's Supplemental Water Program which will continue to make on the order of 10,000 acre-feet per year of leased San Juan Chama Project water available for species purposes; and the Emergency Drought Water Agreement of 2016 (2016 EDWA), which allows the storage and release of over 100,000 acre-feet of water when such storage would otherwise be prohibited by the Rio Grande Compact. In addition, Reclamation and the NMISC continue to conduct projects to maintain the river channel through the Middle Rio Grande into Elephant Butte Reservoir so that New Mexico remains in a Credit status under the Rio Grande Compact. That, in turn, allows for continued flexibility in operation of the Rio Chama reservoirs and it may provide the opportunity for future Credit Water relinquishment and additional storage when otherwise prohibited by the Compact. The following sections describe new individual water storage agreements and activities in more detail, that have been developed in the past year, but that are tied to one or more of the 2015 BA commitments.
 - a) El Vado Reservoir has been used to retine spring flows, providing improved conditions for spawning and recruitment in years when natural flows do not produce optimal conditions. The MRGCD committed to the Service as far back as 2007 flexibility in spring operations at El Vado to do this. The MRGCD is supportive of this use, within the limits of its own storage needs, available natural flows, and downstream channel conditions. El Vado storage can, and often is, restricted by Rio Grande Compact Article VII restriction, and such operations are not allowable without the express permission of the Rio Grande Compact Commission (RGCC). This will continue in the future, as committed to in Part IV of the BA. In keeping with their resolutions in Appendix G, MRGCD will, as in years past when Article 7 Rio Grande Compact Restrictions are not in effect, support a modification of El Vado Reservoir operations when possible, to attempt to better meet the needs of the species (Part IV, Table IV-1, page IV-8).
 - b) For 2016, the RGCC passed the attached Resolution on March 31, 2016, authorizing Reclamation and the MRGCD to temporarily modify operations at El Vado Reservoir in 2016, in cooperation and at the direction of the Engineer Advisors, to aid in creating a spawning flow, should the Article VII storage restriction go back into effect.

- c) Reclamation and the BA Partners have asked the RGCC to enact a measure allowing the storage/retiming of native Rio Grande water in El Vado Reservoir under similar conditions as approved by the RGCC in 2016 for 15 years. Reclamation will send the RGCC an official request in the near future.
- d) New Mexico Allocated Relinquishment Credits (Table IV-1, page IV-8; Table IV-2, page IV-17): On April 25, 2016, the BA Partners entered into the Emergency Drought Water Agreement of 2016 (2016 EDWA) to satisfy MRGCD irrigation demands and to provide additional water for threatened and endangered species. The signed 2016 EDWA is attached.
- e) As part of the ABCWUA efforts to obtain approval for native water storage, the ABCWUA plans on continuing efforts towards finding opportunities to support spawning and recruitment of the Rio Grande silvery minnow, including as approved by the ABCWUA Board, a commitment to move, when appropriate, up to 10,000 acre-feet of SJC water from Abiquiu Reservoir to Elephant Butte Reservoir in coordination with BA Partners and the US Army Corps of Engineers. Such movement of SJC water would occur at the ABCWUA discretion and would follow certain terms and conditions agreed upon prior to such movement.
- f) Water Conservation Storage (Table IV-2, page IV-18):
 - i) MRGCD's discussions with ABCWUA are on-going regarding the completion of agreements for 50,000 acre-feet of storage space in Abiquiu, to enable MRGCD to expand its opportunity for storage to manage through drought. This agreement will be for storage of MRGCD San Juan Chama (SJC) water. It provides the District with added flexibility during a series of wet years, and more certainty of MRGCD operation during dry years. It is a benefit to the species by enhancing MRGCD's drought resiliency, increasing the ability to maintain normal operations (water delivery to Isleta Dam and irrigation return flows below Isleta) and, in so doing, providing wetted habitat for species when drying would otherwise occur.
 - ii) At present, the ABCWUA has a storage agreement with Wild Earth Guardians for supplemental water storage space (30,000 acre-feet) in Abiquiu designated as the Environmental Pool. At the present time, this storage must consist only of SJC water until native water authorizations and permitting issues are addressed. Reclamation will help supply water for this environmental pool from unused supplemental water.
 - iii) The ABCWUA will submit the requisite permits and begin authorizations and environmental compliance for native water storage in Abiquiu with support from the BA partners and others. Potential supplies for this pool could be acquired native water rights, including Strategic Water Reserve rights. BOR has committed to assist the ABCWUA as needed, including a letter of support to the ABCWUA Board of Directors in the near future.
- g) Native Water Acquisition Program (Table IV-2, page IV-19): As stated in the BA, Reclamation will work with the MRGCD on a pilot native water leasing program and feasibility assessment, which is anticipated to begin in 2017. Reclamation will provide partial funding for these activities.
- h) NMISC MRG Strategic Water Reserve (Table IV-1, page IV-14): Reclamation has proposed to NMISC with MRGCD support to use the 154 ac-ft/year formerly known as Price's Dairy water rights (currently under lease to NMISC from Reclamation) for river augmentation for fish and wildlife purposes, more specifically to benefit threatened or endangered, aquatic or obligate riparian species, beginning in the spring of 2017 and continuing for the life of this BO.

Lower Reach System Reconfiguration

Lower Reach Plan (Table IV-2, page IV-21): The Lower Reach Plan will be developed within 1.5 years of the final BO by Reclamation. This conceptual planning approach for the river and bosque is intended to improve habitat and enhance flows in the Isleta and San Acacia Reaches, while managing sediment, increasing safe channel capacity, and maintaining or reducing overall depletions. Components include, but are not limited to, several different projects (see below) which will be implemented in accordance with the Lower Reach Plan, and include the River Maintenance and Restoration Program. The goal of this plan will be to improve silvery minnow, southwestern willow flycatcher, and yellow-billed cuckoo habitat, significantly increase available overbanking habitat at lower spring flows and increase the amount of perennially wetted habitat.

- 1) The Bosque Del Apache River Realignment project (Table IV-2, page IV-21), which may require an EIS, would begin construction in 2021/2022, depending on the results of the EIS.
- 2) The MRGCD has received a WaterSMART Drought Resiliency grant for the Socorro Main Canal South Distribution Hub Project. The Project will increase the reliability of water supplies and application efficiency for irrigators through the installation of the Distribution Hub, with discharge points to the Socorro Main South Canal, the Mosely Lateral, and an outfall channel to the Rio Grande. This will help achieve a tangible annual water savings of up to 5,000 acre-feet and also provides benefits for fish and wildlife with the ability to directly deliver excess irrigation returns or Supplemental Water to the Rio Grande. The proposed Distribution Hub will directly benefit Bosque del Apache National Wildlife Refuge (BDANWR) by stabilizing the flow arriving at the BDANWR, reducing the portion that enters via the Socorro Main South Canal, and increasing the portion arriving via Socorro Drain/LFCC. The Hub is expected to be completed within 24 months of the BO.
- 3) The MRGCD south boundary/ Bosque del Apache north boundary collection system (Table IV-1, page IV-10) will be constructed within the first three years following BO issuance. Reclamation, the Service's New Mexico Ecological Services Field Office, the Bosque del Apache National Wildlife Refuge, and MRGCD met on May 18th for an initial discussion of the current water infrastructure and the Refuge's needs.
- 4) Modification of the LFCC includes evaluation of LFCC pumping (Table IV-2, page IV-19), which would begin in 2017 with Reclamation funding. The Fort Craig to RM 60 Restoration (Table IV-2, page IV-21) includes improvements to the LFCC and would be constructed within four to six years of the final BO. Evaluation of other possible modifications including, but not limited to, filling, checking up, or realignment of selected portions of the LFCC would be completed within two years of the final BO, with construction of chosen projects completed within the five years after that.
- 5) Other projects identified in the Lower Reach Plan will be implemented on an agreed upon schedule with the Service.

MRG Large-Scale Habitat Restoration

River Maintenance and Restoration (Table IV-1, page IV-11) and Habitat Improvements (Table IV-2, pages IV-21 – IV-23): Reclamation and NMISC have worked cooperatively on several habitat restoration projects in 2015 in evidence of our continued commitment to developing quality habitat for years to come. The agencies worked with the Sevilleta National Wildlife Refuge to complete construction on approximately 16 acres of minnow habitat. Also, NMISC constructed Phase II of the Rio Rancho Open Space habitat restoration project, with Reclamation's assistance with compliance, for a total of 22.5 acres of minnow habitat. The Pueblo of Sandia utilized Reclamation funding to construct Phase I (3.3 acres) of a minnow habitat restoration project, with Phase II (2 acres) funded and scheduled for construction in fall 2016. Reclamation and NMISC also completed compliance on the fast track for habitat restoration on 5

sites in the San Acacia Reach, with the assistance of the Service and the U.S. Army Corps of Engineers. Construction of the project will begin in fall 2016. Furthermore, Reclamation has committed in the BA to fund habitat restoration at approximately \$1 to \$5 million per year (Table IV-2, page IV-21) as part of a combined River Maintenance and Restoration Program, constructing large habitat projects that will result in a landscape-scale effect over the term of the BO. Reclamation, NMISC, and the District will continue to work cooperatively with other Collaborative Program signatories and other interested entities on habitat restoration.

Habitat restoration conducted since 2003 will continue to be evaluated in future years for function, occupancy, and sustainability. In the San Acacia and Isleta Reaches, habitat restoration must address a range of existing geomorphic conditions that create different challenges than those in the Albuquerque reach. The primary approach within the upper reaches is to create connection between the channel and floodplain during spring runoff. Creation of backwaters, bankline and bar lowering, high flow channels, and removal of jetty jacks have resulted in spawning and recruitment habitat for silvery minnow during moderate to high flows. Monitoring of the 2016 operations will be assessed by the BA Partners to determine the effects on species. In the lower reaches, the BA Partners will work to address conditions such as persistent drying and unpredictable variation in flows due to unregulated ephemeral tributaries. Planning efforts will be completed and submitted in the future.

River Connectivity

San Acacia Diversion Dam Fish Passage Pilot Study (Table IV-2, page IV-20): The initial design for the pilot project for river connectivity at San Acacia Dam will be completed in 2017 in coordination with Reclamation, MRGCD, Service (Fisheries Group), and NMISC, to allow the compliance process to begin in 2018 with the goal of constructing the test configurations testing in 2018. Reclamation will implement effective long-term river connectivity measures at San Acacia Dam within 6 years of the date of the final BO.

Isleta Diversion Dam (Table IV-2, page IV-20): It is anticipated that Isleta Pueblo will be an effective partner in implementing river connectivity at Isleta Dam. Reclamation is working with the Pueblo to develop an Indian Self-Determination 638 agreement to begin work on a feasibility assessment for river connectivity at Isleta Diversion Dam, with implementation within 5 years of the final BO.

Plan and Implement for the next set of consecutive drought years

The BA Partners have a significant amount of experience managing water in the Middle Rio Grande during extended drought and have learned how to better manage for multiple needs, including endangered species needs, during such periods. One of many highly significant examples is the near 50% reduction in river diversions needed by MRGCD to meet its farmers' demands. The reduction has had multiple benefits; it extends the irrigation season for MRGCD farmers, which means river flows are maintained to the Isleta Diversion Dam and additional water reaches the river downstream of Isleta from MRGCD facilities, all of which provide habitat for the silvery minnow. It also has reduced MRGCD's need for supplemental water from El Vado reservoir, allowing MRGCD to minimize the effects of spring storage operations at El Vado on RGSM spawning and recruitment.

Beginning in the spring of 2017 and continuing for the life of this BO, the BA Partners recognize the value of further improving operations and refining projects, to reduce large fluctuations in silvery minnow numbers between years. They intend to do so by 1) improving habitat in areas that normally have perennial flow (such as from Hwy 60 to near Socorro) such that low magnitude snowmelt runoff can result in good recruitment of silvery minnow, 2) seeking authorizations and operating upstream reservoirs so that the runoff that does occur can be re-regulated to pass through the Middle Rio Grande in a manner that benefits the species while not harming water users or compact deliveries, 3) allowing for movement of silvery minnow past the San Acacia and Isleta Diversion Dams, 4) using the Middle Rio Grande

Strategic Water Reserve and other means to operate MRGCD river outfalls to maintain habitat, both off-channel and in the river, and 5) maintain the propagation and augmentation program as a backstop.

We look forward to continuing to work cooperatively with the Service through this Endangered Species Act consultation process. Please direct any questions to Ms. Leann Woodruff of my staff at 505-462-3579.

Attachments – 3

cc: Mr. William Walker Regional Director Bureau of Indian Affairs 1001 Indian School Road, NW Albuquerque, NM 87104	Mr. Christopher Banet Trust Resources and Protection Manager Bureau of Indian Affairs 1001 Indian School Road, NW Albuquerque, NM 87104
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Mr. Ryan Ward New Mexico Department of Agriculture P.O. Box 30005 Las Cruces, NM 88003	Mr. Matthew Wunder New Mexico Department of Game & Fish 3841 Midway Place NE Albuquerque, NM 87109
Ms. Deborah Dixon Director New Mexico Interstate Stream Commission P.O. Box 25102 Santa Fe, NM 87504-5102	Mr. Bill Grantham New Mexico Attorney General P.O. Drawer 1508 Santa Fe, NM 87504-1508
Mr. Mike Hamman Chief Engineer Middle Rio Grande Conservancy District P.O. Box 581 Albuquerque, NM 87103	Mr. John Stomp Chief Operating Officer Albuquerque Bernalillo County Water Utility Authority P.O. Box 568 Albuquerque, NM 87103
Mr. Matt Schmader City of Albuquerque P.O. Box 1293 Albuquerque, NM 87103-1293	The Honorable Leroy Arquero Governor Pueblo of Cochiti P.O. Box 70 Cochiti, NM 87072
The Honorable E. Paul Torres Governor Pueblo of Isleta P.O. Box 1270 Isleta, NM 87022	The Honorable Daniel Coriz Governor Pueblo of Kews P.O. Box 99 Santo Domingo Pueblo, NM 87052

Continued on next page.

cc: Continued from previous page.

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(w/att to each)



Memorandum

To: MIKE HAMMAN, AREA MANAGER – US BUREAU OF RECLAMATION
From: SUBHAS K. SHAH, CE/CEO *SKS*
Date: JULY 24, 2012
Re: PROPOSED BA CONSERVATIONS MEASURES

Attached are the proposed Conservation Measures to the Biological Assessment that were approved by the Middle Rio Grande Conservancy District Board of Directors at their regular meeting on July 23, 2012.

Please contact me if you have additional questions.

SKS/eb

Attachment

Attachment 1

Proposed MRGCD Conservation Measures

Preamble

1. Pursuant to its statutory general grant of powers (NMSA 1978, § 73-14-48), MRGCD has authority to enter into an endangered species Recovery Implementation Program (RIP) and to undertake certain species survival and recovery actions to be incorporated within the MRGRIP Action Plan. However, MRGCD has no authority to violate its statutory obligations and MRGCD is specifically prohibited from relinquishing control of the waters or lands of the District or from administering or managing District waters in such a way as to impair the private water rights of individual irrigators or its own statutory water rights (NMSA 1978, § 73-14-47).¹
2. MRGCD has the authority to develop an Operating Plan to carry out some of the programs within the RIP that will benefit listed species (NMSA 1978, §§ 73-14-48 *et seq.*), but MRGCD has no authority to relinquish its authority to implement the terms of such an Operating Plan to any third party, particularly when such implementation may involve control of the use of the District waters or lands (NMSA 1978, § 73-14-47).
3. MRGCD has the authority to lease or otherwise provide reservoir storage space for a “supplemental water pool” and to assist in developing programs for use of that storage to provide protection for the RGSM consistent with the RIP, and as a contribution to cost-share, but it cannot do so in a way that reduces storage for persons entitled to receive water from the MRGCD (NMSA 1978, § 73-14-47).

Consistent with the above limitations, the MRGCD proposes the following actions for conservation of the species:

- A. The MRGCD recognizes the need for ESA compliance and the need to continue to cooperate with Reclamation in future compliance efforts, which include the conjunctive management of water for species needs, municipal withdrawals, RGC obligations, and irrigation needs. The MRGCD will develop annually an Operating Plan. This Plan will coordinate the delivery of irrigation water to water rights holders and water users within the MRGCD. The Plan will also assist in meeting the needs of the listed species for population survival and recovery, including spawning, recruitment and survival habitat needs as determined by using the best available scientific information. The development and implementation of this MRGCD

¹ See *Gutierrez v. MRGCD*, 34 N.M. 346, 282 P. 1 (1929) (citing the full protection of private water rights afforded by Section 316 of the Conservancy Act).

Operating Plan will be incorporated into the Middle Rio Grande Recovery Implementation Program (MRGRIP) Action Plan as part of the conservation actions and/or tasks which are expected to permit the MRGRIP to attain and maintain compliance with the ESA.

B. The MRGCD will cooperate with state and federal agencies in creation and operation of a "supplemental water pool" consisting of up to 30,000 AF to be stored in available space in Abiquiu reservoir. Water stored for ESA purposes may, subject to ISC approval, be stored under the authority of the Strategic Water Reserve. Water stored separately by MRGCD for irrigation purposes will be managed by the MRGCD under its authority contained in the Conservancy Act. The conjunctive management of MRGCD water will provide some environmental and biological benefits to RGSM. The creation of the SWR was authorized by the NM Legislature in 2005, for the purposes of providing a water reserve to help New Mexicans manage through drought periods. In addition to meeting the needs of water users and NM's delivery obligations under the RGC, a goal of the pool will be to assist in providing flows needed for ESA purposes, and in so doing, to protect the rights of existing water users. Storage space at Abiquiu Reservoir for the pool was set aside by the ABCWUA as a result of a settlement between ABCWUA and Environmental groups when the ABCWUA was seeking to permit and construct its SJC Diversion works.

Water supply for the pool may come from a variety of sources including uncontracted SJC water and purchases of SJC water by the Federal Government from willing sellers. The use of surplus SJC water would be a primary choice for development of water supply, along with RG water stored as a result of NM having relinquished credit water in Elephant Butte reservoir to Texas under the Rio Grande Compact. Use of this water would be subject to the limitations of New Mexico water law. MRGCD is largest and most likely recipient of credit water stored as a result of relinquishment and in the absence of ESA requirements would logically be the recipient of most of this water. Relinquishment credit water (more correctly stated as the right to store water against relinquished NM RGC credits) is made available by the New Mexico Rio Grande Compact Commissioner. MRGCD will urge that a percentage of water resulting from credit relinquishments to the pool be allocated for ESA purposes. MRGCD will cooperate with appropriate entities to maximize NM credit status under the RGC, and increase the opportunities for future credit relinquishment to benefit both the ESA needs and MRGCD water supply. Concurrently, MRGCD will expand its opportunity for storage to manage through drought by completion of agreements with ABCWUA to store up to 50,000 AF of water at Abiquiu Reservoir. Space at Abiquiu reservoir for this purpose was pledged by ABCWUA as a result of MRGCD withdrawing its objections to permitting and construction of the ABCWUA SJC diversion works. While MRGCD has authority over water it holds in storage, MRGCD will

cooperate and coordinate with NMISC, ABCWUA, BOR and other appropriate entities to conjunctively manage releases from storage and releases from the pool to maximize flexibility in Rio Chama water operations for the benefit of environmental/recreational concerns, and to minimize evaporative or conveyance losses.

C. Depending on the available water supply and consistent with its primary statutory mission of conveying and delivering water for its use in agriculture, when MRGCD has water surplus to the needs of its irrigators within its canal system, the MRGCD will manage its diversions and outfalls to return excess flows to the Rio Grande for habitat areas and other designated sites, as determined by, and consistent with tasks identified within the MRGRIP Action Plan. The MRGCD will participate with other MRGRIP entities, in particular with the U.S. Fish and Wildlife Service, the MRGRIP Science Coordinator and scientific workgroups, and the MRGRIP management and Executive Committee, to identify and study key habitat areas to which water can be returned, especially during critically dry periods, to serve species population needs for survival and recovery, as determined by the best available scientific information, by maintaining wetted habitat for silvery minnow when drying is occurring elsewhere in the river. This commitment will not compel the District to deliver water to habitat or other sites when it is needed to serve irrigators' requirements.

When the MRGCD determines that water surplus to irrigation needs is not available within the MRGCD system, and flow to designated habitat or other areas for species needs is desired, MRGCD will convey water to these areas from available species water resources. MRGCD's contribution will be to bear the conveyance loss from point of release at a reservoir to point of delivery at habitat area, if MRGCD is delivering water along these same pathways for irrigation purposes. An exception may occur if delivery of water to a designated habitat area requires the use of a canal or other water pathway which is not normally or currently in use, in which case species water would be required to incur actual conveyance losses.

D. The MRGCD will cooperate and assist with the creation and enhancement of specific habitat areas, the so-called "String of Pearls" to provide a series of refuge areas where RGSM populations may be maintained during normal periods of low and intermittent flow in the MRG. These areas tend to be located near MRGCD outfalls which typically discharge excess water, or which can be readily used to convey species water with minimal losses. These areas are located in the Albuquerque, Isleta, and San Acacia reaches of the Rio Grande. The MRGCD will maintain its outfalls and, consistent with existing agreements, the federal agencies will provide

maintenance and enhancement of river areas through channel shaping, bank modification, vegetation management, food management, and biological management (non-native or predator removal) to provide conditions suitable to preserving maximum numbers of RGSM in good health for extended periods of time. The "String of Pearls" will provide RGSM refugial habitat between Cochiti reservoir and Bosque del Apache. The locations of the pearls are illustrated in the following map:

E. To allow more precise control and management of water supply to San Acacia dam, MRGCD will pursue construction of a siphon near Bernardo, NM to deliver excess irrigation returns from the San Juan Riverside Drain system directly to the Unit 7/Socorro Main Canal system. This is envisioned to allow for more reliable water supply to the MRGCD Socorro division while simultaneously reducing the total annual volume of water required for diversion at San Acacia dam. This would be anticipated in turn to benefit peak flows through San Acacia dam, and sediment movement and river morphology upstream and downstream of San Acacia dam with associated benefits for RGSM. During times of low or no flow, the Bernardo siphon could be envisioned to assist with management of the "String of Pearls" by creating a refugial area downstream of the siphon itself, and creating a more dependable water supply at San Acacia dam for the maintenance of a refugial area downstream of the dam. It is anticipated that costs of this project operations will be borne in part by the MRGCD, and in part by the federal government. Once the anticipated water supply benefits of the Bernardo Siphon Project have been realized, distribution of water supplies resulting from the Project could be directed by the District to meet the needs of water users in the MRGCD Socorro division in conjunction with those of the listed species.

F. To provide a water supply for the last pearl on the string, MRGCD will construct a return flow collection system at its southern boundary. Excess water from the San Antonio Acequia, the Socorro Main South Canal, the Socorro Riverside Drain, and the Elemendorf Drain will be routed to a central collection/distribution point. At the distribution point, water will be directed into the Low Flow Conveyance Channel and will be lifted back to the Rio Grande through a permanent electrically powered pumping station to be constructed by the MRGCD and operated and maintained by the BOR. It is anticipated that costs of these operations will be supported as cost-share by the MRGCD, and also by the federal agencies and the MRGRIP. Distribution of water at this point will be to meet the needs of the listed species, the water rights of the Bosque del Apache National Wildlife Refuge, and RGC delivery obligations.

G. Recession Management

During inevitable low and intermittent flow periods on the RG, RGSM mortality may be greatly reduced by controlled rates of recession, allowing individuals to move to suitable habitat locations (the String of Pearls). Controlling this rate of recession can be challenging, and has in the past resulted in usage of large amounts of species water. This may be at the conclusion of the spring snowmelt period, or after periods of heavy precipitation. To the extent permitted by the Rio Grande Compact, a controlled rate of recession may be produced by USACE reducing releases from Cochiti reservoir in a series of small steps. As a part of the conservation measures to the MRGRIP, the MRGCD will establish a policy where during times of floodwater storage and managed recession for RGSM, MRGCD available natural flow will be determined by the theoretical release from Cochiti reservoir in the absence of any such managed recession. In this way, USACE may have greater flexibility in controlling the rate of recession for RGSM without affecting NM's RGC deliveries to Elephant Butte. This mechanism would require an update to the Water Control Manual for Cochiti reservoir.

H. The MRGCD will actively participate in the creation of habitat to benefit the lifecycle of the RGSM. Habitat creation will be the responsibility of an interagency team consisting of MRGCD, the NMISC, BOR, USFWS, and USACE. The MRGCD will provide assistance in obtaining funding (cost share, etc.) and/or land for habitat restoration. Habitat restoration may be focused on enhancing the interconnection between active river channel and floodplain, as well as other types of restoration. Habitat restoration will be engineered to provide progressively greater levels of inundation at increasing flows, resulting in a range of habitat types. An initial goal over a XX year period will be 75 acres of RGSM habitat across the range of discharges.

I. To the degree permitted by New Mexico water law, the MRGCD will cooperate with efforts to establish a program whereby groundwater users within the MRGCD may offer water for lease to BOR or other groups for the express purpose of providing flows from wells for endangered species. Water provided to this program will be from willing lessees with pre-1907 or pre-basin groundwater pumping rights for agricultural use. Transfers of use of irrigation wells to instream uses will need to go through the OSE application and permitting process. Administration of this program must necessarily involve close coordination with the NMOSE and MRGCD to establish appropriate volumes of water and rates of flow, and to insure and verify that land from which pre-1907 water rights have been transferred for species use do not continue to be irrigated (absent an MRGCD water bank withdrawal).

J. While the development of new modeling and analysis continues to assist in addressing species management uncertainties, the MRGCD will continue to fund the current PVA and statistical data analysis efforts through a research agreement as a contribution to the scientific understanding of the RGSM.

**RESOLUTION OF BOARD OF DIRECTORS
OF THE MIDDLE RIO GRANDE CONSERVANCY DISTRICT**

**Resolution Adopting Additional MRGCD Offsetting Measures and Conservation Measures
for Inclusion in the 2015 Biological Assessment Re-Submittal, to Supplement Those
Measures Already Adopted By the MRGCD Board in 2012**

M-07-13-15-139

WHEREAS, the Middle Rio Grande Conservancy District ("MRGCD" or "District") is an actively participating member of the Middle Rio Grande Endangered Species Collaborative Program's Executive Committee ("Collaborative Program EC"), which was created by Congress to ensure compliance with the current Biological Opinion issued in 2003 by the U.S. Fish and Wildlife Service ("Service") covering federal and non-federal water operations in the Middle Rio Grande, including the District's; and

WHEREAS, in July 2013, the Collaborative Program EC voted to endorse the Program's transition to a Recovery Implementation Program ("RIP") to serve the goals of contributing to the conservation and recovery of listed species and simultaneously protecting existing and future water uses, and the District has played a leading role in crafting the RIP's foundation documents, such as its Program Document and its Five-Year Action Plan, in particular to include a commitment to implement an adaptive management program to resolve significant scientific uncertainties affecting species management decisions so that resources can be committed to species conservation efforts in the most effective and resource-efficient manner; and

WHEREAS, as part of this RIP effort, aimed at implementing the RIP commitments, MRGCD is evaluating its ongoing and prospective contributions to the Collaborative Program and to the RIP species conservation and recovery efforts, including its water management efforts and provision of access to District lands, and has concluded that implementation of these measures would cost multiple millions of dollars; and

WHEREAS, the MRGCD is participating in a Section 7 consultation along with the U.S. Bureau of Reclamation and the State of New Mexico and the New Mexico Interstate Stream Commission (collectively, the "BA Partners"), and is proposing a set of water operations and river maintenance actions to be included in a Biological Assessment ("BA") that is expected to result in an Incidental Take Statement within a biological opinion that will protect the District from Endangered Species Act ("ESA") "take" proscriptions; and

WHEREAS, this Biological Assessment, through a July 2015 submittal of additional information, will be relying on an approach utilizing an action-by-action analysis of the BA Partners' proposed water operations and river maintenance actions for the Service's consideration; and

WHEREAS, development by the District of offsetting measures to be undertaken as part of the District's proposed actions, and implementation of conservation measures that support

species recovery, will support the District's and the BA Partners' conclusions that these offsetting measures and conservation measures will avoid or minimize potential adverse species effects caused by the District's actions; and

WHEREAS, this Biological Assessment, as re-submitted in 2015, will contain a clarified and more focused analysis of species effects of the actions being analyzed in the consultation process, with particular focus on the effects on the endangered Rio Grande silvery minnow ("minnow") and its habitat; and

WHEREAS, in response to that more focused analysis, the District is proposing to implement targeted offsetting and conservation measures that will create and maintain habitat to offset reductions in minnow habitat that might occur as a result of the District's on-going diversions during specific environmental conditions; and

WHEREAS, the District, with the goal of becoming a full partner in the protection of the minnow and other species, while protecting the needs of its constituents, considers that it should develop its own set of offsetting and conservation measures, that are: a) consistent with its primary mission of ensuring the delivery of water to its irrigators, and b) will avoid conflict over measures that might be proposed by the Service that could needlessly pit the interests of irrigation, recreation and cultural preservation against the needs of the minnow; and,

WHEREAS, the District's proposed set of offsetting and conservation measures, because they provide the optimal balance of interests, should become part of the 2015 Biological Opinion and upon incorporation will satisfy the regulatory obligation of the Service for protection of the listed species while at the same time assuring the District, its Board and the District's constituents that those measures will provide protection of the interests of Rio Grande water users; and

WHEREAS, since late 2014, the District has been engaged in the BA Partners' critical efforts to reframe the analysis of effects on the minnow of ongoing District actions presented in the proposed BA re-submittal, by providing more refined and additional carefully crafted offsetting and conservation measures to address the impacts of particular categories of water operations actions, and by providing a more rigorous analysis of the effectiveness of the proposed offsetting measures; and

WHEREAS, on July 23, 2012, the District Board of Directors, in consideration of the Collaborative Program's transition to a Recovery Implementation Program, and subject to statutory limitations on its authority described in a "Preamble," endorsed a suite of MRGCD Conservation Measures "a" through "j" that have now been incorporated into the 2015 BA re-submittal and refined analysis; and

WHEREAS, the District Board of Directors views the final stage of assembling this 2015 BA re-submittal as an opportunity to approve commitment to additional offsetting and conservation measures representing the limit of the contributions that the District can provide given the impact on its resources; and

WHEREAS, the District is confident that the programs and projects will avoid or minimize any adverse effects that the District's ongoing actions may have on listed species and will support conservation and recovery of these species.

NOW, THEREFORE, BE IT RESOLVED by the MRGCD BOARD OF DIRECTORS, that the following initiatives be adopted by the MRGCD for inclusion in the 2015 BA Submittal to the Service as additional Offsetting Measures and Conservation Measures, subject to the limitations described in the following "Preamble" repeated from the 2012 MRGCD Conservation Measures, to supplement those measures already adopted by the MRGCD Board in 2012.

PREAMBLE

1. Pursuant to its statutory general grant of powers (NMSA 1978, § 73-14-48), MRGCD has authority to enter into an endangered species Recovery Implementation Program (RIP) and to undertake certain species survival and recovery actions to be incorporated within the MRGRIP Action Plan. However, MRGCD has no authority to violate its statutory obligations and MRGCD is specifically prohibited from relinquishing control of the waters or lands of the District or from administering or managing District waters in such a way as to impair the private water rights of individual irrigators or its own statutory water rights (NMSA 1978, § 73-14-47).
2. MRGCD has the authority to develop an Operating Plan to carry out some of the programs within the RIP that will benefit listed species (NMSA 1978, §§ 73-14-48 *et seq.*), but MRGCD has no authority to relinquish its authority to implement the terms of such an Operating Plan to any third party, particularly when such implementation may involve control of the use of the District waters or lands (NMSA 1978, § 73-14-47).
3. MRGCD has the authority to lease or otherwise provide reservoir storage space for a "supplemental water pool" and to assist in developing programs for use of that storage to provide protection for the RGSM consistent with the RIP, and as a contribution to cost-share, but it cannot do so in a way that reduces storage for persons entitled to receive water from the MRGCD (NMSA 1978, § 73-14-47).

Proposed Supplemental Offsetting Measures:

- k) For MRGCD's operation of the District Diversions, the District will maintain selected MRGCD drain and waste way outfalls to keep sites viable and productive for targeted species, as well as for overall ecosystem health. This program will be managed in a manner consistent with the overall purposes of the MRGCD.
- l) For MRGCD's operation of the Isleta Diversion Dam, and specifically related to possible impacts on minnow population viability due to the inability of the minnow to pass from below the Dam to upstream of the Dam when the gates are lowered and checked, MRGCD will implement a program to facilitate fish passage at San Acacia Dam, with assistance from Reclamation and the State, within the first five years of the new BO period. An initial pilot study will test small-scale modifications, to determine a feasible approach for a simplified full-scale fish passage. This is expected to require in-channel grade control structures,

along with modification of gates and the apron of San Acacia Dam. This simplified approach will entail that San Acacia Dam remain unchecked (gates raised) for much of the year, requiring concurrent construction of a siphon near the Rio Puerco to deliver a portion of east side drain returns to Drain Unit 7 and provide an alternate source of water supply for the Socorro Division. Under certain conditions, including but not limited to water supply, water quality, and sediment management, San Acacia Dam will require checked operation. Fish passage through San Acacia Dam will remain secondary to the original operational purpose of San Acacia Dam, but the District will strive to maximize the time throughout the year that fish passage is possible, and particularly with the construction of the proposed siphon, operation of San Acacia Dam in the checked condition is expected to be infrequent and of short duration. The District will provide the local cost-share necessary to build these projects, subject to the availability of funds and the other priorities of the District for capital construction and infrastructure rehabilitation projects, with the expectation of federal cost-share also being provided. The construction of the siphon will benefit both the minnow and the irrigators below San Acacia Dam.

As both an Offsetting Measure and an additional Voluntary Conservation Measure:

- m) For MRGCD's operation of the District Diversions, the District will provide a minimum of \$150,000 in annual ESA and science related funding, a portion of which may support San Acacia reach habitat projects, and may include additional funds for specific habitat projects identified as priorities in the Program.

As additional Voluntary Conservation Measures:

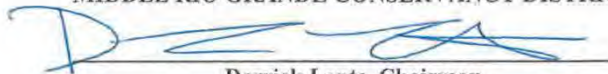
- n) Efficiency Improvements: MRGCD will provide a minimum of \$500,000 annually toward improving existing water delivery systems to increase flexibility in water operations, for managing during drought, and to improve efficiencies for the dual purposes of better service to water users while incrementally reducing diversions, particularly during spring spawn and recruitment events and to reduce the impact of water withdrawal and effects on species habitat (river drying). These funds will be leveraged with federal and state water conservation and infrastructure programs to accelerate system-wide improvements.
- o) Cochiti Reauthorization: The District will utilize MRGCD's extensive lobbying capacities and political capital to encourage the development of federal legislation that reauthorizes Cochiti Dam and Reservoir as a dual purpose facility for both flood control and for up to 60,000 af of conservation storage. The MRGCD will work closely with the federal and state agencies as well as the MRG Pueblos to coordinate this effort during the two to four years this may take to get the legislation passed.
- p) RIP Science and Habitat Funding: A portion of MRGCD's \$150,000 in annual ESA and science related funding cited in Measure "m" may support the process of

revising and refining the minnow population monitoring program, as determined through a population monitoring workshop and other forums, to provide reliable indices to track the status and trend of the population and to inform management decisions, and may include additional funds for specific habitat projects identified as priorities in the Program.

- q) RIP Adaptive Management: A portion of MRGCD's \$150,000 in annual ESA and science related funding cited in Measure "m" will also include support for seeking experts to contribute to the RIP's diverse scientific efforts, including helping to develop and achieve the envisioned adaptive management procedures.
- r) Minnow Sanctuary: MRGCD will assist with operation and maintenance of the Minnow Sanctuary, up to an annual expenditure not to exceed \$50,000, upon completion of system improvements by others and development of a facility operational plan in coordination with other entities. The facility operational plan, which shall include a detailed forecast of operational and maintenance costs, shall be approved by the Board of Directors prior to final design of the project and at least one fiscal year prior to construction activities.
- s) RIP Science Support: MRGCD will continue to work with its BA Partners and other RIP participants to collectively provide scientific and related support with the goal of developing a better understanding of the synergistic needs of both the species and the agricultural community.
- t) Water Leasing Program: MRGCD will take the lead in establishing a pilot water leasing program aimed at providing an alternative for pre-1907 water rights owners to selling rights that results in permanently dry associated lands. A wet water pool would be developed for both farm and environmental uses to be allocated in a manner consistent with the needs of the MRGCD's diverse constituents.

PASSED, APPROVED AND ADOPTED this 13th day of July 2015.

MIDDLE RIO GRANDE CONSERVANCY DISTRICT



Derrick Lente, Chairman

ATTEST:



David Fergeson, Secretary-Treasurer

RESOLUTION
RIO GRANDE COMPACT COMMISSION

**REGARDING TEMPORARY MODIFICATION OF OPERATIONS AT EL VADO
RESERVOIR IN NEW MEXICO DURING MAY AND JUNE 2016**

March 31, 2016

WHEREAS, the states of Colorado, New Mexico, and Texas, in 1938, signed the Rio Grande Compact apportioning the waters of the Rio Grande above Fort Quitman, Texas; and

WHEREAS, the Rio Grande Compact was passed as Public Act No. 96 by the 76th Congress of the United States and approved by the President on May 31, 1939; and

WHEREAS, the agencies of the United States operate numerous reservoirs and other water-related facilities in the Rio Grande basin; and

WHEREAS, the U.S. Bureau of Reclamation (Reclamation) operates El Vado Reservoir on the Rio Chama, a major tributary to the Rio Grande in New Mexico, in coordination with the Middle Rio Grande Conservancy District (MRGCD); and

WHEREAS, El Vado Reservoir is a post -1929 reservoir and is required to be operated in compliance with the Rio Grande Compact; and

WHEREAS, storage of native Rio Grande water in El Vado Reservoir is prohibited under Article VII of the Rio Grande Compact when either Usable Water in Rio Grande Project Storage is less than 400,000 acre-feet and New Mexico has not made relinquishment credit available to store, or the Rio Grande Compact Commission has not specifically authorized such storage; and

WHEREAS, while the Article VII storage restriction of the Rio Grande Compact is not currently in effect, it has been in effect for much of the past five years, and is projected to go back into effect in May 2016; and

WHEREAS, the Engineer Advisers to the Rio Grande Compact Commission propose to coordinate with Reclamation and the MRGCD to modify operations at El Vado Reservoir in 2016 for the limited purpose of creating a spawning flow for the benefit of the Rio Grande silvery minnow in the middle Rio Grande in accordance with the Rio Grande Compact and the Resolutions set forth herein,

NOW, THEREFORE, BE IT RESOLVED, the Rio Grande Compact Commission authorizes Reclamation and the MRGCD to temporarily modify operations at El Vado Reservoir in 2016 to aid in creating a spawning flow for the benefit of the Rio Grande silvery minnow in the Middle Rio Grande should the Article VII storage restriction go back into effect (Temporary Modification). For purposes of this Temporary Modification, determination of the date Article VII goes back into effect shall be based on the later of either of the two Article VII triggering dates for Article 7 storage restrictions under the Compact accounting Methods 1 or 2; and

Attachment 2

BE IT FURTHER RESOLVED that once the New Mexico Engineer Adviser determines that Article VII is back in effect, he will coordinate with the Engineer Advisers, and notify Reclamation and the MRGCD to undertake the Temporary Modification by storing and releasing water from El Vado Reservoir. The operation will be conducted to match the timing, fill low flows, and/or augment the natural peak snowmelt runoff from the mainstem Rio Grande at the Otowi gage as measured by the 30-year average; provided:

1. The United States Fish and Wildlife Service (Service) indicates this modification will provide a definite benefit for the Rio Grande silvery minnow;
2. Reclamation and the MRGCD will not store native water for any other purpose than to aid in creating a spawning flow for the benefit of the Rio Grande silvery minnow in the Middle Rio Grande while conducting the Temporary Modification;
3. All actions related to the Temporary Modification will be completed prior to June 15, 2016; and,
4. Reclamation will provide detailed daily accounting in weekly reports to the Engineer Advisers during the Temporary Modification.

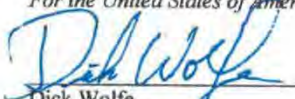
BE IT FURTHER RESOLVED that since New Mexico is not in an Accrued Debit under Article VI, the Rio Grande Compact Commission hereby advises and consents to the Temporary Modification during 2016 to aid in creating a spawning flow for the Rio Grande silvery minnow; provided, however, that the Temporary Modification will in no way negatively affect the timing of Article VII (prevent Usable Water in Project Storage from rising above 400,000 acre-feet), and that any and all additional depletions resulting from the Temporary Modification shall be offset using rights in the New Mexico Strategic Water Reserve; and

BE IT FURTHER RESOLVED that Reclamation, New Mexico, and the Service must report the details of the Temporary Modification to the Engineer Advisers and the Rio Grande Compact Commission at its 78th annual meeting; and

BE IT FURTHER RESOLVED that the New Mexico Engineer Adviser to the Rio Grande Compact Commission shall transmit copies of this resolution to the Albuquerque Area Office Manager of Reclamation, the Regional Director of Reclamation, the New Mexico Ecological Services Field Office Supervisor of the Service, the Regional Director of the Service, and the Chairman of the Board of the Middle Rio Grande Conservancy District; and,

BE IT FINALLY RESOLVED that nothing herein represents a waiver or admission of any legal or factual matter by any Commissioner, Engineer Adviser, the states of Colorado, New Mexico and Texas or the United States.


Hal Simpson
Chairman and Commissioner
For the United States of America


Dick Wolfe
Commissioner for Colorado


Tom Blaine
Commissioner for New Mexico


Patrick R. Gordon
Commissioner for Texas

Emergency Drought Water Agreement of 2016

This Emergency Drought Water Agreement of 2016 (EDWA or "Agreement") is made and entered into by and between the State of New Mexico ("State") acting through the New Mexico Interstate Stream Commission ("NMISC") and the New Mexico Attorney General ("NMAGO"), the Middle Rio Grande Conservancy District ("District"), and the United States of America ("United States"), acting through the Department of Interior, Bureau of Reclamation ("Reclamation") and Office of the Solicitor, collectively referred to as the Parties. The purpose of this agreement is to describe the coordinated management of relinquishment credit water to be stored and released by the District and the United States in a manner consistent with the November 2012, February 2013, and March 2015 letters of the New Mexico Rio Grande Compact Commissioner, attached hereto as Exhibits "A", "B" and "C."

In consideration of the mutual benefits and obligations set forth in this Agreement, the Parties agree as follows:

1. The Parties recognize the hydrologic realities and limitations on the water supply in the middle Rio Grande basin and plan to collaboratively provide for the coordinated storage, release and management of water in the amount of relinquishment credit allocated by the New Mexico Rio Grande Compact Commissioner to the Parties in 2012, 2013 and 2015 (herein "relinquishment credit water") in order to provide benefits to species listed under the Endangered Species Act ("ESA") while also satisfying Middle Rio Grande ("MRG") Project irrigation demands.
2. Subject to the completion of all necessary approvals and regulatory requirements, the District and the United States will seek to capture, store, and release up to 110,000 acre-feet of relinquishment credit water, designated as "Emergency Drought Water," over the term of this Agreement, to be allocated as follows: 78,000 acre-feet to the District; 19,000 acre-feet to the United States; and 13,000 acre-feet to be used by the District, or the United States, consistent with the State's commitments in the 2015 Biological Assessment, at the direction of the NMISC. The allocations are subject to the following requirements:
 - a. All relinquishment credit water stored and released pursuant to this Agreement shall be beneficially used, consistent with New Mexico law, to satisfy MRGCD irrigation demands while also providing benefits to species listed under the ESA and their critical habitat, as required by the 2003 Biological Opinion or any subsequent Biological Opinion and/or as part of the planned Middle Rio Grande Endangered Species Collaborative Program Recovery Implementation Program (Recovery Program);
 - b. A maximum of 10,000 acre-feet of Emergency Drought Water made available by New Mexico to the United States may be stored and released in any one calendar year.
 - c. For the purposes of this Agreement only, the United States agrees that the value of the Emergency Drought Water provided to the United States is \$1.9 million, to be paid to the NMISC in two equal annual installments by July 1, 2016 and July 1, 2017, and the Parties agree that the relinquishment credit water allocation that is the subject of this Agreement will be considered a combined contribution to the 2015 BA offsetting and conservation measures;

- d. The District agrees to limit its storage and release to a maximum of 45,000 acre-feet of relinquishment credit water, made available through this Agreement, in any one calendar year;
 - e. The District agrees to manage the Emergency Drought Water allocated to the United States (up to 14,000 acre-feet) for the sole purpose of ESA compliance;
 - f. The District will direct release of its relinquishment credit water conditioned upon the following: (a) The District will direct its best efforts to meeting the flow requirements of the 2003 Biological Opinion, any subsequent Biological Opinion, and to supporting the Recovery Program while it has stored native Rio Grande water available; and, (b) the District and the United States agree to continue to work with the NMISC to aid the NMISC in its Rio Grande Compact compliance activities.
-
- 3. The Parties agree that this Agreement does not create a water right or storage right for any party. The Parties further agree that this Agreement is not a water right permit or storage right permit and that, pursuant to this Agreement, no water rights or any other interest in water is being created.
 - 4. Notwithstanding Section 5, the right to store and release allocated relinquishment credit water may continue, in accordance with this agreement, after the termination of this Agreement even if not stored at the date of termination; provided that the United States and the District notify the NMISC in writing of the same; and provided further that the United States has made payment in full in accordance with Section 2.c.
 - 5. Nothing in this Agreement shall affect or be construed or applied in a manner that is inconsistent with New Mexico law, including the State's authority to administer depletions as provided in the Constitution and the statutes of New Mexico. Nothing in this Agreement shall affect or be construed or applied in a manner that is inconsistent with federal law, or the Rio Grande Compact of 1938, which states:

"Nothing in this compact shall be construed as affecting the obligations of the United States of America to Mexico under existing treaties, or to the Indian tribes, or as impairing the rights of the Indian tribes."
 - 6. This Agreement shall not be construed or implemented in a manner that affects or impairs rights of the Pueblos or the obligations of the United States to the Pueblos. This Agreement does not affect the United States' existing obligations with respect to storage and delivery of water to the six Middle Rio Grande Pueblos.
 - 7. This Agreement shall not be altered, changed or amended except by written instrument executed by the parties hereto. This Agreement incorporates all agreements, covenants, and understandings between the parties concerning the subject matter hereof, and all such covenants, agreements, and understandings have been merged into this written Agreement. No prior agreements or understandings, verbal or otherwise, of the parties or their agents shall be valid or enforceable unless embodied in this Agreement.

8. The Parties agree that the NMISC may use the funding provided under this Agreement for any and all purposes other than as the State's 25% cost share for the Middle Rio Grande Endangered Species Collaborative Program.

9. Except as explicitly provided herein, this Agreement shall expire on June 30, 2019.

IN WITNESS WHEREOF, the parties herein hereby execute this Agreement dated this 25th day of April, 2016.

NEW MEXICO INTERSTATE STREAM COMMISSION:

Deborah K. Dixon
Deborah K. Dixon, P.E. Director
New Mexico Interstate Stream Commission

NEW MEXICO ATTORNEY GENERAL'S OFFICE:

Amy I. Haas
for Stephen R. Parris, Assistant Attorney General
New Mexico Attorney- General

UNITED STATES BUREAU OF RECLAMATION:

Brent Rhee
Brent Rhee
Regional Director, Upper Colorado Region
Bureau of Reclamation

UNITED STATES OFFICE OF THE SOLICITOR:

Christopher B. Orr
Christopher B. Orr
Intermountain Regional Solicitor's Office

MIDDLE RIO GRANDE CONSERVANCY DISTRICT

Mike A. Hamman
Mike A. Hamman, P.E.
Chief Operating Officer
Middle Rio Grande Conservancy District