#  MRGESCP Multi-Year Plan (2023-2027)

On December 6-7, 2022, the Collaborative Program hosted its first biennial Collaboratory. Over the course of the two days, participants identified priority issues to inform a multi-year planning effort in service of the Collaborative Program’s mission. Two overarching themes emerged from these priority issues:

1. A need for climate scenario planning to manage adaptively in the face of increasing uncertainty; and
2. A need to organize endangered species management under an ecosystem approach within the Middle Rio Grande (MRG) Basin.

These two themes provide a framework for all of the topical areas that are included in the multi-year plan. Careful consideration of both themes will ensure the continued relevance of Collaborative Program initiatives and activities to the management priorities of its signatories.

Five critical focus areas identified from Collaboratory conversations were:

* Habitat restoration planning and assessment
* Management of vegetated islands and bank-attached bars
* Rio Grande silvery minnow (RGSM) management and science
* Water operations and flexibility
* Strategic planning for river drying in the MRG

These focus areas, in addition to climate scenario planning, organized and pursued under the ecosystem approach, inform the Collaborative Program’s planned direction for the next five years and beyond. Climate scenario planning, while an overarching theme that addresses each of the critical focus areas, will require significant effort from the Collaborative Program to undertake. The multi-year planning approach seeks to forecast the priority management issues and critical scientific questions that have the potential to support future management decisions.

The multi-year plan is organized into: 1) immediate priorities (to be addressed in 2023), 2) short-term priorities (to be addressed over the next 2-4 years), and 3) long-term priorities (to be addressed over five or more years). The levels of certainty and detail for the immediate and short-term priorities are greater than those for the long-term priorities. The end goal(s) of each focus area are stated in the sections below. Details for each focus area, as well as priorities regarding climate scenario planning, are organized in the tables below.

Each item in the tables is assigned an identification code. The first part of the code indicates to which focus area the item belongs. The second part of the code indicates whether the priority is immediate (I), short-term (ST), or long-term (LT). The codes are as follows:

* Focus area
	+ CS: Climate Scenario Planning
	+ HR: Habitat Restoration Planning, Design, and Assessment
	+ SM: Rio Grande Silvery Minnow Management and Science
	+ WO: Water Operations and Flexibility
	+ RD: Strategic Planning for River Drying in the Middle Rio Grande
* Timing
	+ I: Immediate (2023)
	+ ST: Short-Term (2024-2026)
	+ LT: Long-Term (2027 and beyond)

The multi-year plan is a means to organize complex initiatives that require longer implementation times and are interrelated. The multi-year plan will be supplemented by the Biennial Administrative Schedule and each year’s Annual Work Plan. The multi-year plan will be revisited after each biennial Collaboratory and revised, as needed, to ensure the Collaborative Program remains responsive to the signatories’ evolving needs and management priorities. The multi-year plan items will be linked to existing guiding principles (i.e., mission, goals, objectives, and strategies) and subsequently incorporated in the SAMIS following a scientific review. This review will assess the feasibility of each item and the linkages to existing Program efforts in order to inform new project development.

## Climate Scenario Planning

As the climate continues to change in New Mexico, impacts to the ecosystems in which listed species exist are apparent and likely to cascade and intensify over time. To that end, the Collaborative Program, in order to recommend management actions that will protect listed species and their habitats under this new paradigm, must cope with the uncertainty of climate change by exploring potential future conditions in the MRG Basin. The main 2023 effort related to this focus area will be a Climate Scenario Planning Workshop, which will inform many of the other activities in the multi-year work plan.

***End Goal***: Enable the Collaborative Program signatories and other resource managers to deal collectively with uncertainty of future conditions within the basin.

***Program*** ***Goals Addressed:*** *A-G*

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| **ID** | **Priority** | **Informed By** | **Informs** | **Related Objectives** |
| ***Immediate (2023):*** |
| CS-I-1 | Develop likely future scenarios by applying current climate data and models to the MRG * Harness the expertise of regional climate scientists with experience in developing appropriate scenarios
 |  | CS-I-2CS-ST-2HR-ST-2HR-LT-3WO-I-2 | A-4, A-5.1, B-2, B-3.1, B-3.2, B-3.3, C-1.1, D-1.2, E-1.2, F-1 |
| CS-I-2 | Host a Climate Scenario Planning Workshop designed to:* Determine which key ecosystem functions are threatened by climate change
* Identify scientific uncertainties that influence management decisions
* Begin developing strategies to mitigate impacts of future changes in the system by targeting key ecosystem functions
 | CS-I-1 | CS-ST-2HR-ST-2HR-ST-4HR-LT-3WO-I-2RD-ST-1 | A-4, A-5.1, B-2, B-3.1, B-3.2, B-3.3, C-1.1, D-1.2, E-1.2, F-1 |
| ***Short-Term (2024-2026):*** |
| CS-ST-1 | Continue developing strategies to maintain ecosystem functions under different climate scenarios | CS-I-1CS-I-2 |  | F-1 |
| CS-ST-2 | Consider potential changes in hydrology and geomorphology, and associated impacts to the ecosystem and listed species | CS-I-1CS-I-2 | RD-ST-1 | A-3, A-4, A-5.1, B-2, C-1.1, D-1.2, E-1.2 |
| CS-ST-3 | Investigate the cultural and socio-economic impacts of the changing ecosystem |  | CS-ST-4WO-ST-5 |  |
| CS-ST-4 | Engage the public through outreach and education regarding climate trends and changes in the bosque* Identify actions that can be carried out by members of the public to help mitigate impacts
 | CS-I-2CS-ST-3RD-I-3 | WO-ST-5 |  |
| ***Long-Term (2027 and beyond):*** |
| CS-LT-1 | Continue to update ecological forecasts with latest climate models and data | CS-I-1CS-ST-2 |  | F-1, A-5.1 |
| CS-LT-2 | Refresh recommendations for management strategies to protect and maintain important ecosystem functions | CS-I-ICS-I-2CS-ST-1CS-ST-2 | HR-LT-1VI-LT-2 | F-1, A-5.1 |
| CS-LT-3 | Develop water conservation strategies |  | CS-LT-4 | G-1 |
| CS-LT-4 | Carry out public outreach and education around water conservation strategies | CS-ST-4CS-LT-3RD-I-3 | RD-I-3 | G-1 |
| CS-LT-4 | Explore the role of agricultural practices and irrigation returns in implementing strategies to protect MRG ecosystem functions | DR-ST-4 |  | Unsure |

## Habitat Restoration Planning and Assessment

Habitat restoration is an important conservation action for many Collaborative Program signatories, and will likely increase in importance in the future. Given the forecasted changes to the ecosystem, habitat restoration practices that were effective in the past need to be tested and refined, or replaced in order to preserve key ecosystem functions necessary to support the listed species. The priorities listed below relate to on-going habitat restoration efforts, including outcomes from the 2021 Habitat Restoration Workshop, and also items that address additional Collaborative Program planning and management requests.

***End Goals:***

* Develop restoration strategies that can provide habitat for listed species, maintain vital ecosystem functions, and contribute to ecosystem recovery.
* Recommend best practices for successful restoration planning, implementation, and monitoring (e.g., proper response metrics, maintenance thresholds, and assessment tools) for the MRG.

***Program*** ***Goals Addressed:*** *A-F*

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| **ID** | **Priority** | **Informed By** | **Informs** | **Related Objectives** |
| ***Immediate (2023):*** |
| HR-I-1 | Develop a standardized framework to guide restoration planning that includes identification of response metrics to measure and track progress/success | HR-I-3 | HR-ST-5HR-ST-7 | A-5.2, B-3.1, B-3.3, C-1.1, D-1.2, E-1.2 |
| HR-I-2 | Recommend updates to the habitat restoration geospatial database, “RioRestore” |  | HR-ST-1 | A-5.2, B-3.1, B-3.3, C-1.1, D-1.2, E-1.2 |
| HR-I-3 | Organize habitat restoration monitoring plans and protocols into a compendium for MRG restoration practitioners |  | HR-ST-5HR-ST-7HR-I-1 | F-1, E-1.1, D-1.1, C-1.3, B-1, A-1 |
| HR-I-4 | Investigate potential funding opportunities (especially long-term) and partnerships in support of habitat restoration projects |  |  | A-5.2, B-3.1, B-3.3, C-1.1, D-1.2, E-1.2 |
| ***Short-Term (2024-2026):*** |
| HR-ST-1 | Update RioRestore | HR-I-2 |  | A-5.2, B-3.1, B-3.3, C-1.1, D-1.2, E-1.2 |
| HR-ST-2 | Forecast expected changes to vegetative communities based on the climate scenarios | CS-I-1CS-I-2 | HR-ST-3 | F-1, F-2 |
| HR-ST-3 | Develop restoration strategies to maintain ecosystem functions, exploring the roles of both native and non-native species  | HR-ST-2 | HR-ST-7VI-LT-2 | F-2 |
| HR-ST-4 | Recommend modifications to habitat restoration practices to incorporate climate scenarios, targeting vital ecosystem functions | CS-I-2HR-ST-3VI-ST-3 | HR-ST-7 | F-1 |
| HR-ST-5 | Integrate signatories’ wildfire prevention, mitigation and restoration best practices  |  | HR-LT-1 | Unsure |
| HR-ST-6 | Investigate feasibility and value of disposing or repurposing of post-construction materials, such as vegetation and sediment  |  | HR-LT-1 | New obj? |
| HR-ST-7 | Develop strategies to adaptively manage habitat restoration  | HR-I-1HR-I-3HR-ST-3HR-ST-4VI-LT-2 |  | B-3.1, B-3.3, C-1.1, D-1.2, E-1.2 |
| ***Long-Term (2027 and beyond):*** |
| HR-LT-1 | Continue to update recommendations for habitat restoration best practices based on learning from project implementation and refined future scenario predictions | HR-ST-4HR-ST-5HR-ST-6HR-ST-7CS-LT-2 |  | A-5.2, B-3.1, B-3.3, C-1.1, D-1.2, E-1.2 |
| HR-LT-2 | Explore the value of applying an “integrated vegetation management plan” for the MRG | HR-ST-3HR-ST-4 |  | F-2, B-3.2, B-3.3, C-1.2, D-1.2, E-1.2 |
| HR-LT-3 | Apply the ecosystem approach to habitat restoration projects throughout the MRG | CS-I-2CS-ST-1HR-ST-2HR-ST-3 |  | F-1 |

## Management of Vegetated Islands and Bank-Attached Bars

In 2022, the Collaborative Program hosted the Workshop on Management of Vegetated Islands and Bank-Attached Bars. While vegetated islands have always been a feature of the MRG ecosystem, changes in hydrology and geomorphology are contributing to changes in their number and permanence. Workshop participants raised questions about the effects these vegetated islands and bars are having on water conveyance and sediment transport processes, as well as the tradeoffs to consider regarding their value to species habitat. At the workshop, participants identified the need for better understanding of where vegetated islands and bars are (or are likely to occur) in the MRG. They also articulated a need for more clarity regarding the relationships between hydrology, ecological functions, and species’ responses in order to support management decisions related to island and bar management.

***End Goal:*** Balance the primary management priorities within the MRG (e.g., water delivery, flood control, and ecosystem management) while managing vegetated islands and bank-attached bars in a dynamic river system.

***Program*** ***Goals Addressed:*** *A-G*

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| **ID** | **Priority** | **Informed By** | **Informs** | **Related Objectives** |
| ***Immediate (2023):*** |
| VI-I-1 | Develop a glossary for terminology related to vegetated islands and bars, to improve communication and collaboration among stakeholders |  | VI-I-3 | A-3, A-5.1, A-5.2, B-2, B-3.3, C-1.1, C-1.2 |
| VI-I-2 | Clarify authorities and management roles related to vegetated islands and bank-attached bars |  | VI-LT-3 | A-3, A-5.1, A-5.2, B-2, B-3.3, C-1.1, C-1.2 |
| VI-I-3 | Begin developing a conceptual model representing ecosystem functions and physical river conditions related to vegetated islands/bars in order to:* Account for spatial and temporal successional changes
* Explore trade-offs regarding habitat formation/loss for different species
* Characterize trends and conditions
* Assess management alternatives
 | VI-I-1 |  | A-3, A-5.1, A-5.2, B-2, B-3.3, C-1.1, C-1.2 |
| VI-I-4 | Determine feasibility of developing a map of locations of vegetated islands and bank-attached bars in the MRG, with a plan for regular updates |  | VI-ST-2 | A-3, A-5.1, A-5.2, B-2, B-3.3, C-1.1, C-1.2 |
| ***Short-Term (2024-2026):*** |  |
| VI-ST-1 | Fill in critical data gaps for maps and models, where possible  |  |  | A-3, A-5.1, A-5.2, B-2, B-3.3, C-1.1, C-1.2 |
| VI-ST-2 | Update map of locations of vegetated islands and bank-attached bars in the MRG | VI-I-4 | SM-ST-3 | A-3, A-5.1, A-5.2, B-2, B-3.3, C-1.1, C-1.2 |
| VI-ST-3 | Refine conceptual model of ecosystem functions and physical river conditions related to vegetated islands/bars in the MRG to: * Inform further scientific research
* Recommend adaptive management strategies
 | HR-ST-9VI-ST-2 | HR-ST-4VI-ST-4VI-LT-1SM-ST-4SM-LT-2 | A-3, A-5.1, A-5.2, B-2, B-3.3, C-1.1, C-1.2 |
| VI-ST-4 | Investigate the effects of vegetated islands and bank-attached bars on water conveyance and sediment transport processes | VI-ST-3 |  | A-3, A-5.1, A-5.2, B-2, B-3.3, C-1.1, C-1.2 |
| ***Long-Term (2027 and beyond):*** |  |
| VI-LT-1 | Regularly update and revise the ecosystem-level conceptual model | VI-ST-3 | VI-LT-2 | A-3, A-5.1, A-5.2, B-2, B-3.3, C-1.1, C-1.2 |
| VI-LT-2 | Revise and update recommendations for management strategies related to vegetated islands and bank-attached bars | CS-LT-2HR-ST-4HR-ST-7VI-LT-1 |  | A-3, A-5.1, A-5.2, B-2, B-3.3, C-1.1, C-1.2 |
| VI-LT-3 | Develop recommendations for potential changes to authorities regarding wetlands within the MRG | VI-I-2 |  | A-3, A-5.1, A-5.2, B-2, B-3.3, C-1.1, C-1.2 |

## RGSM Management and Science

RGSM science and management has always been a focus of the Collaborative Program, and will continue to be a priority in the multi-year plan. With climate change creating more variability in the system and uncertainty in the future, the Collaborative Program’s work will focus on tracking RGSM population trends under different climate scenarios, and evaluating and improving the efficacy of management actions into the future.

***End Goal:*** Develop collaborative, multi-year adaptive management strategies for RGSM.

***Program*** ***Goals Addressed:*** *A-G*

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| **ID** | **Priority** | **Informed By** | **Informs** | **Related Objectives** |
| ***Immediate (2023):*** |
| SM-I-1 | Finalize the revisions to the RGSM conceptual ecological model to include the genetics and propagation/augmentation programs, and undertake a peer review of the revised model |  | SM-ST-1SM-ST-3 | A-1, A-2, A-3, A-4, A-5.1, A-5.2, A-6.1, A-6.2 |
| SM-I-2 | Provide guidance on recently published RGSM population models, including data inputs, model assumptions, and appropriate application of each model |  | SM-I-3SM-ST-1 | A-1, A-2, A-3, A-4, A-5.1, A-5.2, A-6.1, A-6.2 |
| SM-I-3 | Develop a plan to update and refine the RGSM integrated population model based on new data | SM-I-2 | SM-ST-1 | A-1, A-2, A-3, A-4, A-5.1, A-5.2, A-6.1, A-6.2 |
| SM-I-4 | Incorporate the following questions into the climate scenario planning effort:* How will RGSM habitat availability be affected by climate change?
* How will forecasted shifts in the hydrograph impact RGSM population trends?
 |  | CS-I-1 | A-3, A-4, A-5.1, A-5.2, G-1 |
| ***Short-Term (2024-2026):*** |
| SM-ST-1 | Use the RGSM population models to evaluate RGSM management actions under different conditions projected for climate scenarios, if feasible | SM-I-1SM-I-2SM-I-3 | SM-LT-1SM-ST-4 | A-6.1, A-6.2, A-2s |
| SM-ST-2 | Consider RGSM management in the development of the ecosystem-level conceptual model for the MRG |  | SM-ST-4 | A-1, A-3, A-4, A-6.1, A-6.2 |
| SM-ST-3 | Identify the sites in the MRG to target with habitat restoration for RGSM | VI-ST-2SM-I-1 |  | A-5.2 |
| SM-ST-4 | Identify vital ecosystem functions related to RGSM life history and management strategies  | SM-ST-1SM-ST-2VI-ST-3 |  | A-3, A-4, A-5.1, A-5.2 |
| SM-ST-5 | Investigate the feasibility of a 10(j) population outside the current RGSM range |  | SM-LT-4 | A-6.1, A-6.2 |
| ***Long-Term (2027 and beyond):*** |
| SM-LT-1 | Continue to evaluate RGSM management actions as future scenarios and models are updated | SM-ST-1 |  | A-2, A-6.1, A-6.2 |
| SM-LT-2 | Recommend adaptive management actions for RGSM, taking into consideration effects of climate change and maintenance of ecosystem functions important to RGSM survival and recovery | VI-ST-3 |  | A-2, A-6.1, A-6.2 |
| SM-LT-3 | Investigate the need for a new RGSM propagation facility and, if supported, provide recommendations for design and construction  |  |  | A-6.1, A-6.2 |
| SM-LT-4 | Provide recommendations for implementing a potential 10(j) RGSM population, if determined to be feasible | SM-ST-5 |  | A-6.1, A-6.2 |

## Water Operations and Flexibility

Given that the Collaborative Program focuses on listed species that utilize the riparian zone, adjacent wetlands, floodplain and mainstem of the Rio Grande, water operations are integral to management of the species and their habitats. With changes in the hydrograph due to increasing variability and uncertainty in snowpack runoff and monsoon precipitation, water operations are already impacted by climate change. The Collaborative Program’s focus will be to assess the effects of climate change on water operations and identify opportunities for flexibility.

***End Goal:*** Plan for a water future that balances the needs of all users, including humans and listed species, and maintains ecosystem functions. [Addresses Program Goal G]

***Program*** ***Goals Addressed:*** *A-G*

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| **ID** | **Priority** | **Informed By** | **Informs** | **Related Objectives** |
| ***Immediate (2023):*** |
| WO-I-1 | Using the responses from the survey of water managers on their roles in managing drying in Angostura Reach and additional signatory input, document the roles, responsibility, and available flexibility in water operations in the MRG | RD-I-1 | WO-ST-1 | G-1 |
| WO-I-2 | Based on likely climate scenarios, project potential effects on water operations related to changes in the hydrograph | CS-I-1CS-I-2 |  | G-1 |
| ***Short-Term (2024-2026):*** |  |
| WO-ST-1 | Identify opportunities for coordination and flexibility regarding water operations | WO-I-1RD-I-1 | WO-ST-2WO-ST-3 | G-1 |
| WO-ST-2 | Identify flexibilities and multiple-use benefits of any changes to water operations  | WO-ST-1 |  | G-1 |
| WO-ST-3 | Identify research needs regarding conservation improvement to water operations  | WO-ST-1 | WO-LT-1 | G-1 |
| WO-ST-4 | Tie Collaborative Program planning efforts into external planning efforts (e.g., 50-Year Water Plan, Rio Grande Basin Study, ABCWUA’s 100-Year Plan, NM Water Resources Research Institute) |  | WO-ST-5WO-LT-1 | G-1 |
| WO-ST-5 | Stakeholder and public outreach and education on conservation strategies and benefits of changes to water operations | CS-ST-3CS-ST-4WO-ST-4 |  |  |
| ***Long-Term (2027 and beyond):*** |  |
| WO-LT-1 | Revise and update recommendations for changes to water operations regarding conservation needs | WO-ST-3WO-ST-4RD-ST-3RD-ST-4RD-ST-5 |  | G-1 |

## Strategic Planning for River Drying in the Middle Rio Grande

This focus first emerged in response to drying in the Angostura Reach, which occurred for the first time in nearly 40 years in 2022. Drying has been a regular and common occurrence south of Angostura and the Collaborative Program is working to develop a strategic plan for management of drying in the Angostura, Isleta, and San Acacia Reaches.

***End Goal:*** Develop a multi-reach decision support tool to inform adaptive management related to drying in the MRG.

***Program*** ***Goals Addressed:*** *A-G*

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| **ID** | **Priority** | **Informed By** | **Informs** | **Related Objectives** |
| ***Immediate (2023):*** |
| RD-I-1 | Describe the decision environment for management of drying in the MRG using the ad hoc group’s survey and summary report |  | WO-I-1WO-ST-1 | G-1 |
| RD-I-2 | Identify research questions related to drying in the MRG |  |  | Unsure |
| RD-I-3 | Develop public messaging strategies related to conservation actions and monitoring during river drying |  | CS-ST-4CS-LT-4 |  |
| ***Short-Term (2024-2026):*** |  |
| RD-ST-1 | Where appropriate, include and update river drying considerations in ecosystem-level and species-level conceptual models | CS-I-2CS-ST-2 | RD-ST-5 | A-2, A-3, A-4, A-5.1, G-1 |
| RD-ST-2 | Create a decision tool to assess management alternatives regarding drying in the MRG | RD-ST-3 | RD-ST-5 | A-2, A-3, A-4, A-5.1, G-1 |
| RD-ST-3 | Document lessons learned regarding management response to drying, in years when the opportunity arises |  | RD-ST-2WO-LT-1 | A-2, A-3, A-4, A-5.1, G-1 |
| RD-ST-4 | Incorporate findings from studies of the use of outfalls and irrigation infrastructure to affect the rate, duration and extent of drying, into recommendations |  | WO-LT-1 | A-2, A-3, A-4, A-5.1, G-1 |
| RD-ST-5 | Continue to refine the strategic plan for management of drying  | RD-ST-1RD-ST-2 | RD-LT-1WO-LT-1 | A-2, A-3, A-4, A-5.1, G-1 |
| ***Long-Term (2027 and beyond):*** |  |
| RD-LT-1 | Continue to refine the strategic plan for management of drying | RD-ST-5 |  | A-2, A-3, A-4, A-5.1, G-1 |