

Middle Rio Grande Conservation Initiative



*A Citizen's Report: Strengthening Our Heritage
in the Middle Rio Grande*



July 2012

Middle Rio Grande Conservation Initiative

Transmittal Letter

July 1, 2012

The Honorable Ken Salazar
Secretary
U.S. Department of the Interior
1849 C Street, N.W.
Washington, D.C. 20240

Dear Secretary Salazar:

The *Secretary's Committee for the Middle Rio Grande Conservation Initiative* hereby transmits the enclosed report for your consideration.

You appointed the Committee in January 2012, and charged it with developing recommendations to achieve the objectives of the America's Great Outdoors initiative by enhancing conservation, recreation and education in the Middle Rio Grande. Since then, we have conducted a wide-ranging review. We consulted numerous public and private organizations and also sought input from the general public, especially the people of New Mexico and the residents of the region. What we heard reflected the incredible importance of the river and the public's deep concern for its future.

Much has been accomplished to improve management of the Middle Rio Grande and a great deal of outstanding work is underway. This report builds on prior successes and achievements, including a variety of prior reports and plans. But much more is needed in order to expand the benefits of conservation, recreation, and education. Indeed, an unprecedented effort—based on partnerships among local, state, federal and tribal entities, and numerous public and private organizations—is essential if the Rio Grande is to endure as a vibrant, resilient system that sustains people, culture, and nature as our climate changes.

Thank you for commissioning this report and for your commitment to a healthy Rio Grande. We were honored to serve on the Committee and look forward working with you and many other partners to achieve an America's Great Outdoors vision for the Rio Grande, one of America's truly great rivers.

Sincerely,

Kelly Gossett
New Mexico Outdoors Coalition

Amalia Kenward
New Mexico Archaeological Council

Derrick Lente, Chairman of the Board
Middle Rio Grande Conservancy District

Matthew Schmader, Superintendent
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New Mexico Backcountry Hunters and Anglers

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Middle Rio Grande Conservation Initiative

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Acknowledgements and Abbreviations

The Secretary's Committee for the Middle Rio Grande Conservation Initiative wishes to extend special thanks to numerous organizations and individuals for their assistance in developing the Committee's report. The Secretary directed that the Committee's work be citizen-driven and we remained true to that intention. In addition to the outstanding public participation by non-governmental organizations and private individuals, the Committee would like to thank staff from three federal agencies in particular—Army Corps of Engineers, BOR, and the Fish and Wildlife Service—without whom this effort would not have been possible.

Abbreviations and Acronyms:

ABCWUA: Albuquerque-Bernalillo County Water Utility Authority

AGO: America's Great Outdoors

AMAFCA: Albuquerque Metropolitan Arroyo Flood Control Authority

BBMP: Middle Rio Grande Ecosystem Bosque Biological Management Plan

BCOS: Bernalillo County Open Space

BEMP: Bosque Ecosystem Monitoring Program

BLM: U.S. Bureau of Land Management

BOR: U.S. Bureau of Reclamation

CEDS: Comprehensive Economic Development Strategy

DGF: New Mexico Department of Game and Fish

DOI: U.S. Department of the Interior

EMNRD: New Mexico Energy, Minerals, and Natural Resources Department

EPA: U.S. Environmental Protection Agency

ESA: Endangered Species Act

FWS: U.S. Fish and Wildlife Service

NHT: National Historic Trail

ISC: New Mexico Interstate Stream Commission

LID/GI: Low Impact Development Green Infrastructure

LWCF: Land and Water Conservation Fund

MRG: Middle Rio Grande

MRGBI: Middle Rio Grande Bosque Initiative

MRGESCP: Middle Rio Grande Endangered Species Collaborative Program

MRGCD: Middle Rio Grande Conservancy District

MS4: Municipal Separate Storm Sewer System

MRCOG: Mid-Region Council of Governments

NAWCA: North American Wetland Conservation Act

NDC: North Diversion Channel

NHA: National Heritage Area

NMACD: New Mexico Association of Conservation Districts

Abbreviations

NMDOT:	New Mexico Department of Transportation	RTCA:	NPS Rivers, Trails, and Conservation Assistance Program
NMED:	New Mexico Environment Department	SFD:	New Mexico State Forestry Division
NPS:	U.S. National Park Service	SLO:	New Mexico State Land Office
NRCS:	USDA Natural Resources Conservation Service	SOBT:	Save Our Bosque Taskforce
OSE:	New Mexico Office of the State Engineer	SPD:	New Mexico State Parks Division
OSD:	Albuquerque Open Space Division	SWCD:	Soil and Water Conservation District
PCBs:	polychlorinated biphenyls	USACE:	U.S. Army Corps of Engineers
PES:	Payments for Ecosystem Services	USDA:	U.S. Department of Agriculture
RGT:	Rio Grande Trail	USDOE:	U.S. Department of Energy
RGVSP:	Rio Grande Valley State Park	USFS:	U.S. Forest Service
		YCC:	Youth Conservation Corps



Middle Rio Grande. © Marvin DeJong

Middle Rio Grande Conservation Initiative

Executive Summary and Major Recommendations

The Secretary's Committee for the Middle Rio Grande Conservation Initiative strongly affirms that the Middle Rio Grande is a region of profound importance to New Mexico. The combination of the MRG's natural and cultural resources are also nationally and globally significant.

Like many western river ecosystems, the MRG faces numerous challenges in balancing competing needs within a finite water supply and other resource constraints. Historical practices by our ancestors and immigrants to the MRG have established the conditions that we have inherited. Long-term drought exacerbated by climate change, however, is changing conditions that affect natural and human communities as we strive to improve our precious Rio Grande. The

needs of a growing populace must be met while still preserving natural systems, the agricultural economy, and the cultural practices of Pueblos and villages up and down the valley.

The Secretary's Committee found widespread efforts to address these challenges in the MRG, and many strong programs in the areas of conservation, recreation, and education. Numerous outstanding local, state, federal, tribal and private-sector programs are present; many of which have been underway for years (see Appendix A for maps that identify important sites and programs in conservation, recreation, and education).

This report strives to identify what a broad group of MRG valley residents—from farmers to kayakers to birders and teachers—would like to see considered as we build upon current



Sunset at Bosque del Apache National Wildlife Refuge. © Marvin DeJong

Executive Summary and Major Recommendations

efforts to develop long-term strategies for managing valued resources for the good of the whole while supporting existing communities and economies. There is an awareness that the river is the life blood of our region but also a realization that we can do better. This document speaks to the immense potential of the MRG; the report is a vision for improving conservation efforts on both private and public lands, improving sustainable agriculture and local food security, increasing recreation and educational opportunities, and ultimately improving the quality of life and economy for MRG residents through a comprehensive collaborative effort among the many stakeholders, agencies and communities that care deeply about the MRG.

Overall, the Committee saw the need for action and improvement in several key areas:

- **Water Management.** Increasing demands on a limited, and perhaps declining, water supply is the fundamental regional challenge. Existing water management systems are evolving to address these challenges, while maintaining and protecting vested water rights, yet actions that would conserve water, improve water management, and enhance river restoration efforts that have been identified and have yet to be acted upon or fully implemented.
- **Landscape Level Conservation and Restoration.** Effective, long-term conservation

Thousands of snow geese winter in the Middle Rio Grande
© Marvin DeJong



of the MRG requires: an ecosystem approach that addresses the entire 180-mile stretch; restoration of biological, hydrological, and geomorphological processes in the MRG to the extent feasible; conservation stewardship and landscape-level connections of publicly-owned protected areas and private working lands; and appropriate recreational use that allows the public to enjoy and connect with the resources. The notion of a living river and river restoration must work within the reality of the river's modern water supply and management and recognized and protect vested water rights in the MRG. All of these efforts must be guided by strong science-based adaptive management principles to address major conservation goals such as restoring the Middle Rio Grande to sustain listed species, other wildlife, and the ecosystem in general. Broad-based education efforts must be included as a key element for maintaining public involvement and support for the long-term.

- **Investment.** Programs focused on conservation, education, and recreation in the MRG must be viewed as community, regional, and national investments that will pay short- and long-term dividends to society. Funding for these programs at the local, state, federal, and tribal levels is presently inadequate across the board. The MRG should be a national priority area for federal funds from numerous applicable programs, but federal dollars must be leveraged with increased local and state funding.

Executive Summary and Major Recommendations

The average man, woman or child, is in need of a place within walking distance of the city where he can enjoy a breath of fresh air and a sight of a few trees, a few birds, and a little water.

*-- Aldo Leopold,
Albuquerque, 1917*

- **Governance and Coordination.** Past and present regional coordination structures, such as the MRG Bosque Initiative and the MRG Endangered Species Collaborative Programs, have achieved successes, but do not adequately integrate a broad ecosystem approach to conserving and restoring the Rio Grande nor do they address the needs for recreation and education identified in this report. Modifying the management structure to address connecting these initiatives in a comprehensive manner needs serious consideration.

The region—it's people, organizations and leadership—must affirm the vision of a healthy, integrated, living river and ecosystem along the entire middle Rio Grande (not just at isolated, separated sites). The Middle Rio Grande valley contains a precious network of traditional communities and life ways ways, and historic agriculture, and requires choices that respect and protect that cultural fabric.

Due to the scope of work that the Committee adopted, recommendations in this report are aimed mainly at the river corridor and its “greenbelt.” The Committee believes, however, that a watershed approach is the best framework

for planning and action. Recommendations and actions can and should be applied throughout the watershed.

Expanded, improved, reorganized, more efficient and better-funded programs are needed across all three major subject areas that the Committee considered—conservation, recreation, and education. Many efforts in these areas are complementary and should continue to move forward concurrently. While the Committee did not “rank” these three subject areas, the Committee does regard the progress toward meeting conservation/restoration objectives as the overriding concern. Without a healthy river ecosystem, irreplaceable natural and cultural values may be lost forever. Recreation and education based on a degraded and declining ecosystem can still occur, but these activities themselves will be reduced in quality and public benefits from them will be limited.

This is not to say, however, that major steps forward in recreation and education should be delayed until more plans are written or until broad-based, long-term conservation goals are fully achieved. Indeed, stronger educational efforts for people of all ages, coupled with appropriately managed recreation, are key to achieving conservation and restoration goals, and some appropriate actions that do not compromise conservation and restoration activities cannot and should not wait.

The Middle Rio Grande is indeed important to the entire nation; its enormous challenges are also worthy of an enormous effort. Efforts to restore the river, and deliver high quality recreation and education programs, will need to be on par with major campaigns aimed at other iconic American landscapes, such as the Florida Everglades.

Executive Summary and Major Recommendations

From surveying the scope of existing efforts and through the public input received, the Committee believes that there is a tremendous reservoir of public support for the bold actions necessary to maintain ecological and community health and secure diverse benefits for present and future generations. The Committee also believes that regular and extensive citizen stakeholder and community input and engagement is fundamental to moving forward on all recommendations identified in this report. Indeed, the Committee sees this report as the start of a process to further discuss, refine, and implement recommendations, develop consensus, and establish more specific funding needs and milestones for conservation, recreation, and education efforts in order to move forward with comprehensive programs in the MRG

Major Recommendations

The following are the most significant Committee recommendations. They are a subset of the complete list of recommendations for conservation, recreation, and education that appear at the end of each respective chapter.

Regional Collaboration, Interagency and Partnership Action:

- The region should embrace, promote, and invest in conservation, outdoor recreation/tourism and outdoor education.
- Building on the successes and lessons from the Middle Rio Grande Bosque Initiative, the Middle Rio Grande Endangered Species Collaborative Program, and relevant “adaptive management” programs, re-structure the inter-governmental communication and collaboration entities in the Middle Rio Grande (or establish a new structure entirely); establish mechanisms to better identify federal agency leads and coordinate conservation, recreation, and education

efforts across local, state, federal, tribal, and non-governmental organizations.

- Promote efforts to rethink water supply, demand, and quality. Educate the public about the long term water crisis challenges within the Middle Rio Grande and how it is being exacerbated by climate change. Proactively promote measures identified in the Middle Rio Grande Regional Water Plan as well as additional planning efforts to: use adaptive management to administer water in the Middle Rio Grande without an adjudicated system in place; use adaptive management to help administer water in the Rio Grande, expedite water right adjudication; quantify and protect Pueblo water rights; conduct aggressive water conservation in conjunction with mechanisms for putting the saved water to environmental beneficial uses; create enhanced upstream storage; improve linkages between land use/development decisions and water resources; and test “payment for ecosystem services” to promote protection of water quantity and quality.
- Develop and implement collaborative, voluntary, market-based water transaction programs, in collaboration with the Middle Rio Grande Conservancy District, the Office of the State Engineer (e.g. Strategic Water Reserve), federal agencies, Pueblos, and non-governmental conservation organizations, to acquire and dedicate water for environmental flows, ecosystem processes, streamside riparian and wetland habitat restoration, and recreation. Promote the Albuquerque-Bernalillo Water Utility Authority “Living River Fund” and expand on this concept region-wide in order to build public engagement and financial support for river restoration.
- Continue to implement the Bosque Biological Management Plan, which remains an excellent overall road map for the conservation

Executive Summary and Major Recommendations

and restoration of the river and bosque (the riparian forest). Strive to mimic and restore natural systems where feasible within current conditions and constraints.

- Complete and link a “String of Pearls” network of conservation, recreation and education sites along the Middle Rio Grande. Implement a program based on public and community involvement for increased recreational access within the MRG that is: compatible with the resources and ecological capacity and irrigation practices; avoids sensitive areas, based on biological and social indicators; and has careful management and monitoring. This program should include the planning, construction, and management of a land and water Rio Grande Trail through as much of the river corridor as is appropriate and feasible, utilizing local, state, and federal partnerships. Increased funding for trails is particularly important. Public access within the Middle Rio Grande Conservancy District Project lands requires that the BOR and MRGCD develop a clear procedure for granting use. Recreational access and use, including any river trail(s), must respect tribal sovereignty, private property and the preferences of local communities.

- State, federal, and private entities should coordinate and partner with local government efforts on more detailed implementation plans to improve land and water access and recreation in the MRG, such as efforts by the City of Albuquerque’s “River Corridor Improvement Plan” (part of “ABQ-The Plan”).
- Federal, state, and local entities should complete U.S. Fish & Wildlife Service acquisition and support restoration and management of the 570-acre Price’s Dairy property in Albuquerque’s South Valley to establish the Middle Rio Grande National Wildlife Refuge.
- Through public and private partnerships, serve 100% of school children within the Middle Rio Grande with outdoor/environmental education programs every year by 2022; establish a Middle Rio Grande Environmental/Outdoor Education Council to coordinate efforts; make a water resource management/water conservation education program mandatory for all water utilities in the MRG.
- Establish a regional “Rio Grande Conservation Corps” to engage young people in conservation projects, promote service learning, foster leadership, and create jobs.



Sandhill cranes feeding on the floodplain of the Middle Rio Grande. © Marvin DeJong

Executive Summary and Major Recommendations

- Develop consolidated, centralized public information sources on conservation, recreation, and education in MRG.

Local Action:

- To the extent feasible and consistent with local agencies statutory directives, utilize operating budgets, bonding capacity and new funding initiatives to generate funds to invest in conservation, recreation, and education, and to leverage federal matching funds.
- Link recreation in the MRG to community health and wellness programs.

State Action:

- Target state funds from existing programs on the MRG to enhance conservation, recreation and education (e.g. wildlife funds, boater access funds, Recreational Trails, outdoor education, and other programs).

- Increase and/or establish consistent sources of State funds for public and private land conservation, land and water trails, non-game/non-consumptive wildlife programs, State park and recreation management, and outdoor/environmental education that can leverage other local, federal, and private funds.
- Implement the intergovernmental model of the Rio Grande Valley State Park in Sandoval, Valencia, and Socorro counties (excluding Pueblo lands and private lands, and while maintaining hunting opportunities).
- Amend the New Mexico State Trails Act to facilitate the State's role in planning, construction, and management of a land and water Rio Grande Trail.



Sandhill cranes at Bosque del Apache NWR. © Marvin DeJong

Executive Summary and Major Recommendations

Federal Action:

Elevate the Middle Rio Grande as a National Priority:

- Authorize and fund a comprehensive Middle Rio Grande Restoration and Management Program tailored specifically to the region's needs that builds on the Middle Rio Grande Bosque Initiative, the Middle Rio Grande Endangered Species Collaborative Program, and other adaptive management programs, involves all key governmental and non-governmental entities, and encompasses aspects of conservation, recreation, and education.
- Increase funding of other federal programs that play a key role in conservation, recreation, and education in the Middle Rio Grande, including: Land & Water Conservation Fund (both federal and stateside elements); Department of Agriculture (Farm Bill) & Department of the Interior private landowner conservation assistance programs; NPS Rivers, Trails and Conservation Assistance Program; El Camino Real de Tierra Adentro National Historic Trail; and Department of Interior, Department of Education and Environmental Protection Agency environmental/outdoor education programs.
- Fund the USACE Bosque Revitalization program to expand work beyond the Albuquerque reach of the Rio Grande; reauthorize and fund the Rio Grande Environmental Management program; incorporate trail and other recreation components into future authorizations for USACE levee reconstruction projects; increase the limit for recreation components in USACE projects from 10 percent to at least 20 percent of the project budget.

- Increased funding directly to Pueblos to build their own conservation, outdoor recreation and education programs; ensure funding equity for the Pueblos in the application of state and federal funds for conservation, recreation and education in the MRG.
- Fund other key federal tribal partnership programs, such as the BOR efforts authorized by the “Rio Grande Pueblo Infrastructure Improvement Act of 2011” and the USACE program under the “Water Resources Development Act of 2007.”
- Authorize the National Park Service to conduct a National Heritage Area study for the Middle Rio Grande.

The Rio Grande is a treasure for New Mexico—it contains the economic engine of the State—but also provides for the heritage of New Mexico. We need to protect agriculture, hunters, anglers, outdoor recreation and tourism. I can see myself coming back in ten years and finding vibrant agriculture, great recreational opportunities, biking, riding horses, and watching the economic development that comes with a healthy river.

—Secretary of the Interior
Ken Salazar

Middle Rio Grande Conservation Initiative

Introduction

The Rio Grande is one of the world's great rivers. Over 1,800 miles in length, draining more than 273,530 km² of the southwestern United States and northern Mexico, the Rio Grande is the fifth longest river in North America. Over 500 miles of the Rio Grande form the heart of New Mexico—the state's primary drainage feature and most valuable natural and cultural resource. The Rio Grande is a precious lifeline that connects nature, history, culture and communities across millennia. It also supports a vital, and ancient, irrigated-agriculture system.



Sandhill cranes. © Marvin DeJong

The Rio Grande has sustained natural and human systems for thousands of years. The river corridor supports hundreds of species of birds, mammals, fish and reptiles. Today, its precious waters provide water for human consumption, agriculture, natural ecosystems, cultural and religious purposes, and other uses. The Rio Grande is a keystone in the future of New Mexico, even as demands and stresses on the river grow.

The Middle Rio Grande is the portion of the Rio Grande in New Mexico from the outflow of Cochiti Reservoir to the headwaters of Elephant Butte Reservoir. This stretch is roughly 180 river miles and spans Native American Pueblos, the urban center of Albuquerque, farm lands, and wild areas.

On January 5, 2012, Secretary of the Interior Ken Salazar visited Albuquerque and met with over 100 local community leaders to discuss strengthening existing collaborative efforts in the Middle Rio Grande region. Secretary Salazar challenged the attendees to develop a local partner-driven plan to enhance **conservation, education, and recreation** efforts in the Middle Rio Grande that would support the Department of Interior's *America's Great Outdoors* (AGO) initiative. Secretary Salazar appointed a six-member committee to develop the Report by July 2012 (with FWS and BOR in support).

The Secretary's MRG Conservation Initiative builds on ideas and priorities discussed in the AGO national and state reports to identify how

Secretary's Committee Mission Statement

"To seek long-term sustainability of cultural and ecological integrity of the Middle Rio Grande valley's riverine system by promoting responsible recreation, education, and conservation goals while maintaining the economic vitality of the region."

partnerships among local, state, federal, tribal, and non-governmental entities can improve conservation of America's natural landscapes, connect Americans to the outdoors, and create jobs.

Introduction

Among the key concerns that the Secretary's Committee addressed during its six-month process were questions such as:

- What programs, projects, and initiatives for conservation, recreation, and education exist now in the Middle Rio Grande region and are working well?
- What enhancements to existing efforts and/or what new projects and programs are needed?
- What are the highest priorities in each category?

The Middle Rio Grande

The MRG exemplifies New Mexico's natural and cultural diversity that exemplifies New Mexico. The MRG is a beautiful and dramatic mixture of urban and rural.

The Middle Rio Grande has supported people for thousands of years and is the foundation of indigenous Pueblo cultures that settled the region long ago. The Spanish entrada began in 1540 and European colonists began settling in the region in 1598.

The Rio Grande flows through the main population centers in the state; so the river is therefore close to most New Mexicans today. The 2010 census recorded two million people in New Mexico, of which 43 percent live in the four MRG counties of Sandoval, Bernalillo, Valencia and Socorro. The MRG includes Albuquerque and Rio Rancho, the first and third largest cities in the state. Population centers in City of Santa Fe and the counties of Tarrant, Sierra, and Doña Ana, however, are also all within a short drive of the MRG. Counting all seven counties, the MRG is extremely accessible to 1.2 million people (61 percent of the state's population).

Population trends show a pattern of metro-area population growth in central New Mexico, which continues to underscore the importance of the MRG to the state. The MRG contains three of the state's five fastest growing counties over the past decade: Sandoval, Bernalillo, and Valencia. From 2000 to 2010, these three counties combined captured two-thirds of the state's total population growth, while 14 of New Mexico's 33 counties lost population.

The MRG is home to eight Native American pueblos (Cochiti, San Felipe, Santo Domingo, Zia, Jemez, Santa Ana, Sandia, and Isleta), of which six are located directly on the Rio Grande. The Alamo Band of the Navajo Nation also occupies a small portion of Socorro County. The total resident population on the Pueblos and Alamo Band Navajo Nation is approximately 22,000.

In 2009, median household income in the MRG counties ranged from a high of \$56,703 (Sandoval County) to a low of \$32,387 (Socorro County). With the exception of Sandoval County, all MRG counties lag behind the U.S. national average for median household income (\$52,029).

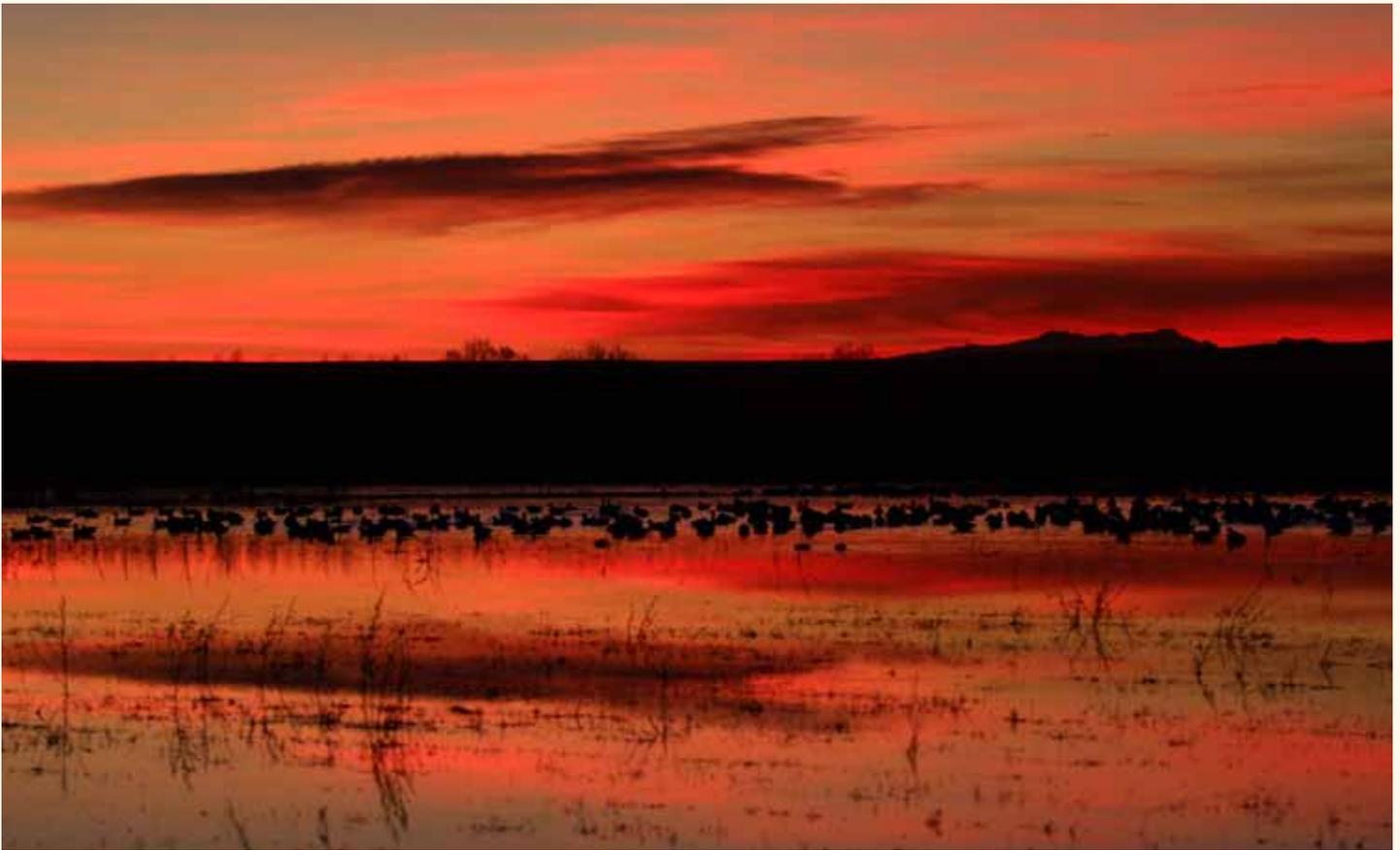
The Bernalillo County/southern Sandoval County is the principal trade and financial center for the State. This area has significant "high-tech" industry, strong government presence, a growing regional health care industry, the State's largest university, tourism, a growing film and arts industry, and serves as the main hub for rail, air and freight transportation. Further south, agriculture figures importantly in the local economy, supplemented by growth in regional housing markets, and employment related to the New Mexico Institute of Mining and Technology in Socorro. The MRG supports over 400,000 jobs.

America's Great Outdoors Initiative

America's Great Outdoors is an initiative by President Obama's administration to develop a 21st Century conservation and recreation agenda. AGO embraces the premise that lasting conservation solutions should rise from the American people—that the protection of our natural and cultural heritage is a non-partisan objective shared by all Americans. AGO looks to local communities for grassroots conservation initiatives and leadership. After a year-long process of listening sessions and outreach about the future of conservation in America, the report, "America's Great Outdoors. A Promise to Future Generations," was issued in February 2011. A subsequent state AGO report (identifying key projects in all 50 states) was issued in February

2012. The reports call for a grassroots approach to protect our lands and waters and connect all Americans to their natural and cultural heritage. AGO seeks to empower all Americans—citizens, young people, and representatives of community groups; the private sector; nonprofit organizations; and local, state, and tribal governments—to share in the responsibility to conserve, restore, and provide better access to our lands and waters in order to leave a healthy, vibrant outdoor legacy for generations yet to come. Complete information can be found at:

<http://americasgreatoutdoors.gov>.



Waterfowl resting for the night, Bosque del Apache National Wildlife Refuge. © Marvin DeJong

Introduction

The landscape variety of the MRG is stunning and includes the fertile river valley, high plateaus of rolling grasslands, and mountain ranges that reach to elevations above ten thousand feet at the crests of the Sandia and Manzano Mountains in the Cibola National Forest. An extensive amount of public land is present in the federal lands managed by the U.S. Forest Service, Bureau of Land Management, National Park Service, U.S. Fish and Wildlife Service, and in other types of state and local ownerships—including State wildlife management areas, State Parks, and municipal parks and open space.

Virtually the entire river and bosque in the 180 miles of the MRG is within the Middle Rio Grande Conservancy District. The MRGCD was created in 1923 to provide flood protection from the Rio Grande, drain swamplands and provide irrigation water to farmlands. The MRGCD includes 30,000 acres of bosque and manages nearly 1,200 miles of waterways and conveyance channels (a complex system of acequias, or irrigation canals) that deliver water to sustain Rio Grande Valley agriculture.¹ The presence of farming in the Rio Grande Valley gives the area a special aesthetic. A greenbelt of farms and irrigated lands parallels the river, mixing rural with urban and developed landscapes. These private lands are also important from a conservation perspective, as they provide a mosaic of habitats for wildlife.

The MRG is characterized by a rich indigenous and Hispanic heritage that is deeply rooted in the land and in the acequia culture that has provided a basis for agriculture and political organization for hundreds of years. Other residents who have come to the MRG relatively more recently experience and value this heritage as well, which is a powerful force that engenders respect

for the Rio Grande Valley and bonds people to the land. This deep sense of place, from which emotions and beliefs arise in a region such as the MRG, is often referred to as “Querencia.”

Water Right Regulation along the MRG

From a hydrologic, demographic and environmental perspective the Rio Grande forms a beautiful and complex hydro-commons. As proposed in this report, recreation, conservation and education can bring all inhabitants of this system in closer contact with its countless benefits. But in developing proposals, it must be recalled that existing legal systems and institutions form parameters for proposed actions. These legal entitlements begin with the first priority Pueblo Indian water rights dating to the 1500’s, they are followed by the prior appropriative water rights dating from well prior to the turn of the last century. In the nineteen twenties, the New Mexico Conservancy Code created and now regulates water rights held by the Middle Rio Grande Conservancy District; in the nineteen thirties, the Rio Grande Compact established fixed quantities of water for delivery to Texas and Southern New Mexico. There are also a host of state laws that demand, as they should, that groundwater pumping by municipalities not overdraft the aquifer and cause injury to the Rio Grande and its users. Finally, federal laws require protection of species dependent upon the flows of the Rio Grande.

Scope and Intent of the Report

The Rio Grande watershed encompasses portions of three U.S. states and two countries. In New Mexico, the Rio Grande watershed extends from the Colorado border to El Paso in west Texas. The portions of the Rio Grande north of Cochiti to the Colorado line are, of course, culturally, ecologically and functionally (from

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a water management perspective) connected to the MRG. In terms of the MRG, the watershed might be considered to include all lands from the crests of the Sandias and Manzanos on the east to the Rio Puerco in the west.

A watershed boundary is generally the most appropriate geographical framework for natural resource planning and management. Some members of the public urged the Committee to “take a watershed approach” to preparing this report for the MRG.

The Committee recognizes and endorses the concepts of watershed planning and management. The Secretary of the Interior’s charge to the Committee, however, was to focus more or less on the riparian corridor and its immediately adjacent lands in the Valley. Therefore, the Committee adopted an approach that defines the scope to the Report as basically the “greenbelt” – the river and the irrigated lands adjacent to it that generally overlaps with the Middle Rio Grande Conservancy District.

In adopting this approach, the Committee in no way intends that programs and efforts that affect the health and management of the MRG should be restricted to the greenbelt. Efforts should be conceived and implemented broadly to encompass both the riparian corridor and the uplands. Indeed, many of the Committee’s recommendations can be applied in that fashion.

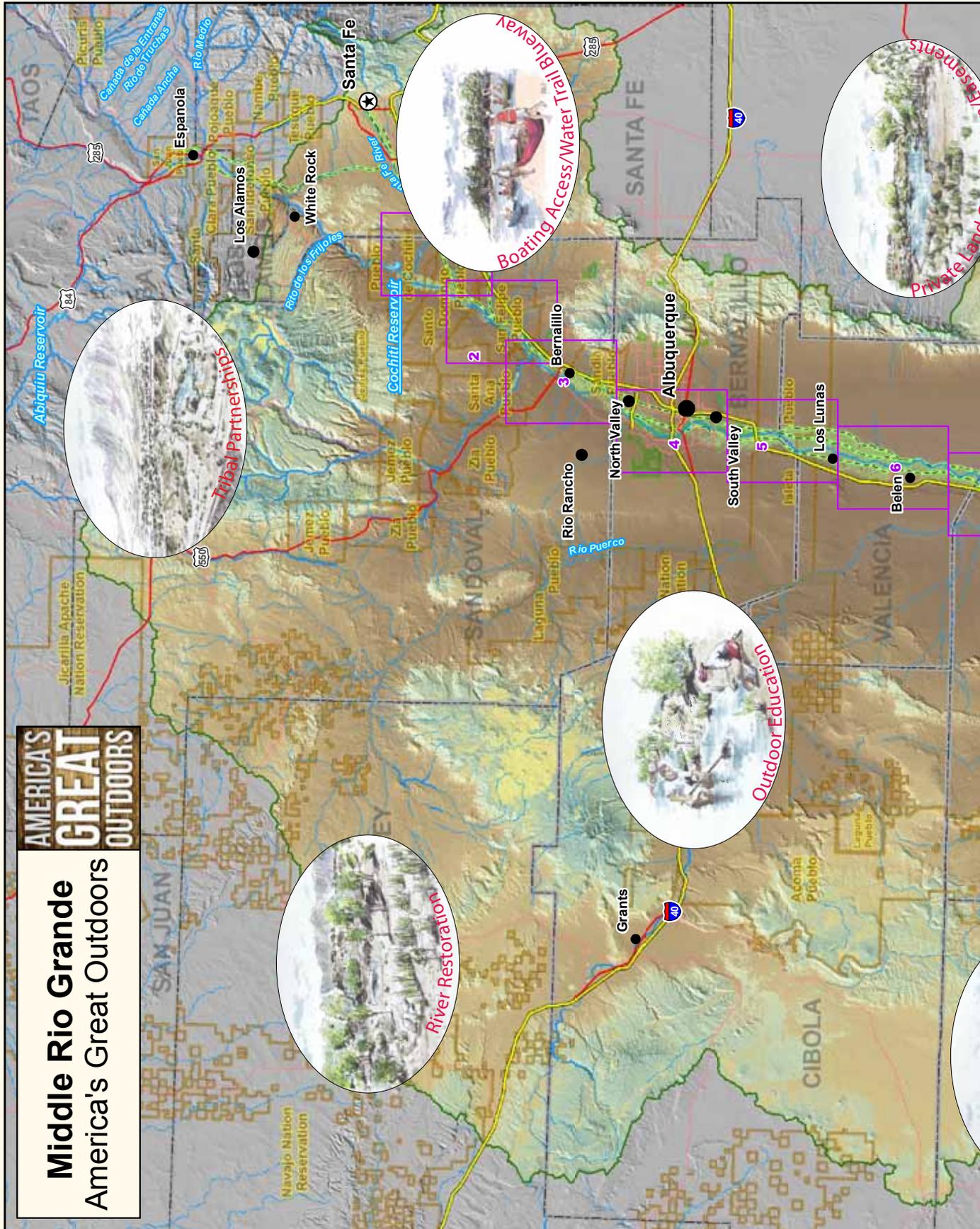
This Report is not intended to replace or supersede existing reports and management frameworks for the MRG or to interfere with historic irrigation practices. An enormous amount of outstanding work has been accomplished, and is ongoing, in the MRG. Local, state, federal, and tribal entities have done extensive scientific research and developed numerous plans

and programs for water/river management, habitat protection and restoration, wildlife management, agricultural production, public and private land protection and management, recreation, and education. Key plans include the Bosque Biological Management Plan, Rio Grande Valley State Park Management Plan, MRG Revitalization Project, and the MRG Water Bird Plan, while ongoing programs include the longtime efforts of the MRG Endangered Species Collaborative Program and Save Our Bosque Task Force. This Report will not replace those efforts in any way, but is intended to supplement and enhance them.

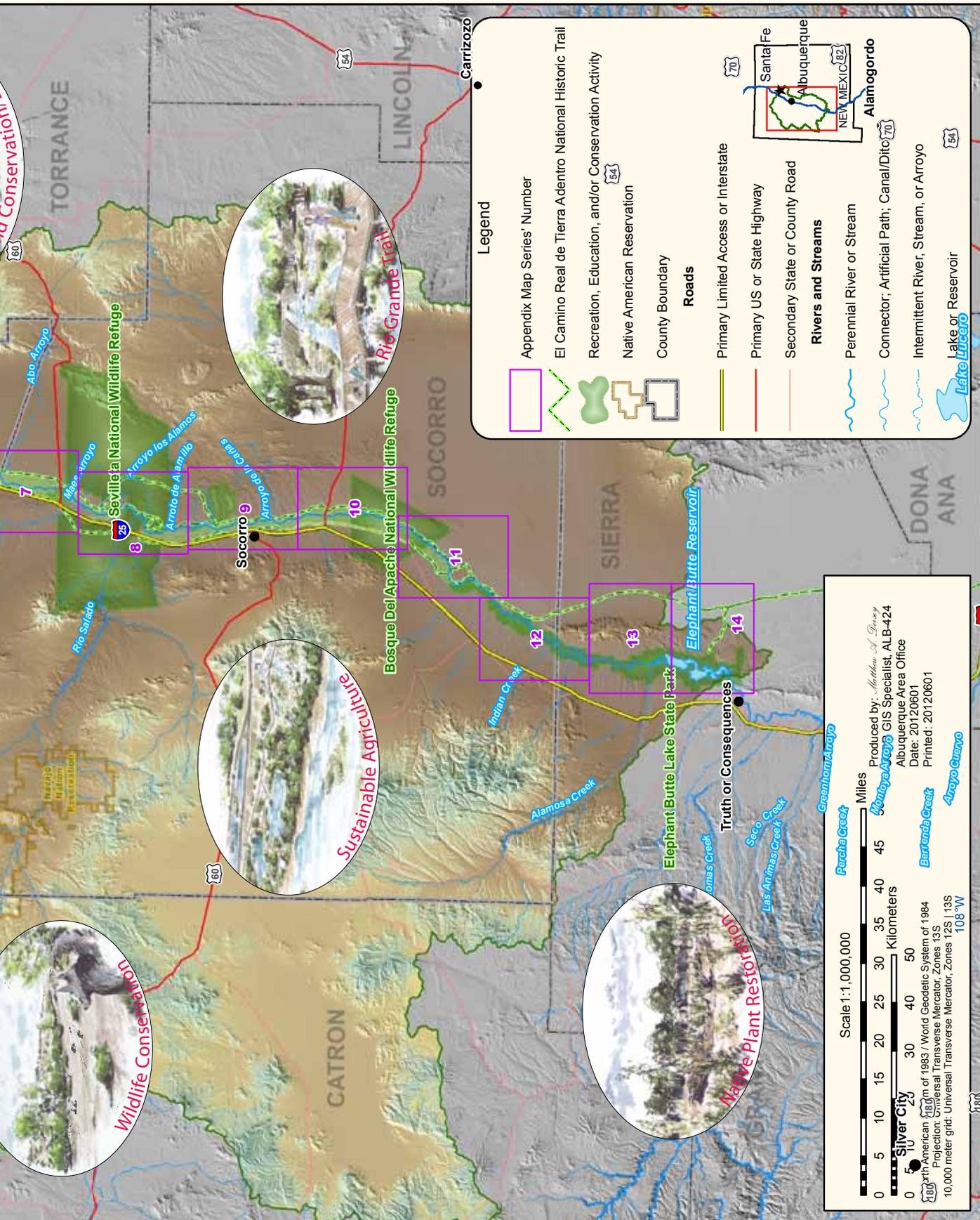
In addition, this Report is not a “decision document”; it will not bind any entity and will have no direct applicability or effect on private lands. Outcomes and implementation will depend on further collaborations among public and private entities and on available funding. At present, there is no dedicated budget to implement the Report, but present funding sources within the MRG will continue to support existing programs and could flow toward expanded or new projects and programs. The Report also is a positive opportunity for New Mexico; it will further encourage action and collaboration, it will put the MRG in a spotlight for attention, and it may also put entities within the MRG in a better position from which to compete for funding in the future.

Middle Rio Grande Conservation Initiative

Map



Map



Middle Rio Grande Conservation Initiative

Pueblo Perspectives and Issues

Cultural Landscapes and Lifeways

The Middle Rio Grande includes six Indian pueblos astride the river corridor: Cochiti, San Felipe, Santo Domingo, Santa Ana, Sandia, and Isleta. Together, the six pueblos comprise close to 500,000 acres,¹ which includes portions of the forested Manzano Mountains, the fertile Rio Grande Valley, and the desert grasslands and mesas east and west of the river. The pueblos include over 50 miles of river/bosque corridor—nearly one-third of the MRG. Pueblos engage in diverse conservation, recreation, and education efforts, and they help lead the way on these issues in the MRG.

The six MRG pueblos are the hearts of homelands and the centers of ancient traditional cultures. Pueblo lifeways are inseparable from the environment; land, air, and water are the lifeline. Respect for the Earth, wise resource stewardship, and maintaining balance and harmony are central elements of Pueblo religion and culture. This strong foundation has enabled the Pueblos to sustain farming, habitat, fishing, hunting, and their cultural traditions.

The Pueblos provide myriad benefits to their members and the general public in the MRG. Pueblos enrich the multi-cultural tapestry of New Mexico. Pueblo economic enterprises provide employment to thousands and Pueblo agricultural efforts support regional food security.

Pueblo lands are not “public lands,” as they are the lands of living historic communities of the Valley. But undeveloped Pueblo land provides open space, habitat, and watershed benefits shared by the region. The Pueblos help protect

magnificent vistas that make up the “Land of Enchantment.” Pueblos are also important refugia and sources for wildlife dispersal.

The river/bosque has been a crucial component for the Pueblos for hundreds of years. Pueblos view the river corridor fundamentally as a cultural resource. Sacred sites throughout the MRG are physically and spiritually connected to the river. The river and the vegetation communities it supports are important sources of plants and animals of cultural importance. Water quality and quantity are also especially important. All of these elements are critically related to the physical and spiritual health and well-being of Pueblo communities and their members.

Like elsewhere in the MRG, flood control, water diversions, drought, and other human-caused and environmental factors have changed river hydrology in Pueblo sections of the river. These changes have nearly eliminated overbank flows and facilitated encroachment by non-native plants and other species, leading to a loss of native wildlife habitat and to negative impacts on the pueblo’s cultural lifeways. Development outside the Pueblos has stressed regional water supplies, destroyed and fragmented wildlife habitat, and impacted sensitive cultural sites.

Self-Determination and Consultation

Under the laws relating to Indian self-determination and self-governance (beginning with Section 638 of P.L. 93-638 and its subsequent amendments), tribes and pueblos can administer and manage programs, activities, functions and services previously managed by federal agencies. In addition, a variety of state statutes and federal executive orders require consultation with the Pueblos.²

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Partnerships for Management and Restoration

The six MRG Pueblos have natural resource management programs and meet regularly to communicate and coordinate on water issues. Four of the six MRG Pueblos are members of the MRG Endangered Species Collaborative.

The major federal players in the MRG, including BOR, the USACE and the Fish & Wildlife Service, have active river- and water-related programs with the Pueblos. Other entities, such as the Albuquerque Open Space Division are making efforts to improve working partnerships with the Pueblos.

BOR coordinates the MRGESCP, which over the past decade (FY2001—FY2009) has funded 28 habitat restoration, planning, and research projects on the six MRG Pueblos at a cost of \$7.5 million. Also, the Rio Grande Pueblo Infrastructure Improvement Act (Section 9106, Public Law 111-11) authorizes up to \$4 million for BOR to conduct a study of Pueblo irrigation infrastructure. The study is to develop a list of

repair, rehabilitation, reconstruction, or replacement projects. The Act also appropriated up to \$6 million per year (from 2010-2019) for project construction. A tribal cost-share is required, but it can be satisfied by in-kind efforts and can be waived under certain circumstances.

BOR has entered into agreements with each of the MRG Pueblos to conduct these evaluations. Addressing the needs identified in these various plans can improve water conservation and irrigation efficiency and will protect and preserve the agricultural practices and cultural traditions of the Pueblos. So far, however, Congress has provided only \$247,000 for the studies, which will not move forward without additional appropriations.

The USACE is involved in partnerships with most of the tribes and Pueblos in the Rio Grande Basin. USACE tribal projects in the Basin have grown from none prior to 2000 to over \$25 million over the past eight years. The nature of these partnerships is primarily



Wild turkey release at the Santa Ana Pueblo. © USFWS

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determined by the needs of the individual Pueblos. The USACE has completed restoration projects with Isleta, Sandia, and Santa Ana. Sandia is a project sponsor under the MRG Bosque Revitalization Program.

One of the most popular USACE authorities to address restoration and water resource with Pueblos is the Tribal Partnership Program (Section 203, Water Resources Development Act of 2000, as amended). The Pueblos of Santa Ana and San Felipe, in addition to several other tribes, are developing broad watershed assessments to explore and prioritize water and natural resource challenges within their lands. In addition, Santa Ana has conducted two environmental restoration projects in the Middle Rio Grande under Section 1135 of the Water Resources Development Act of 1986.

USACE also partners with the Pueblos of Cochiti, Santo Domingo, and Santa Ana with the goal of cooperative management and stewardship at Cochiti, Galisteo and Jemez Canyon Dams respectively. In these cases, the three project facilities are located mostly, if not entirely, within the trust lands of the three Native American communities. The partnerships include the cooperative conduct of numerous natural resource identification, evaluation, and management activities.

From FY1994-FY2009, the period when it received appropriations, the FWS MRG Bosque Initiative expended significant funds on diverse research, restoration, and education projects at the Pueblos. While MRGBI no longer receives specific federal funding, a variety of other partnerships with the MRG Pueblos continue. The Partners for Fish and Wildlife program collaborated with Santa Ana to complete riparian restoration work on the Rio Grande and Jemez rivers,

to plan a wetland enhancement project at Santo Domingo, and to give a workshop at Sandia on rainwater harvesting for wildlife. The FWS also works with the Youth Conservation Corps program to employ youth from Isleta, Sandia, and Santa Ana during the summer.

Along with federal funds, Pueblos have made major contributions of their own funds to complete significant restoration projects. All six MRG pueblos have completed habitat projects, which have cleared non-native species and restored hundreds of acres. Many of the Pueblo projects are complex, have had multiple phases, and are major success stories that have advanced restoration knowledge and best practices. Other important scientific research, adaptive management, water, and wildlife projects at the Pueblos have been accomplished (and continue) through the Pueblos' own work and in partnership with federal agencies. Both Sandia and Santa Ana Pueblos have recently released wild turkeys on their lands.

At the same time, Pueblos are concerned about the impact of some federal regulations, such as Endangered Species Act rules, that may require providing or maintaining wildlife habitat that might affect tribes' ability to meet other needs.

The Pueblos also hold the most senior water rights in the MRG, which have yet to be fully quantified and adjudicated. The Pueblos' needs and goals are a major part of the equation for maintaining the Rio Grande as a vibrant, healthy river that also meets human needs. Confirming and protecting Pueblo water rights in perpetuity is extremely important to the Pueblos for cultural purposes as well as for maintaining diverse environmental and human uses.

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Education and Recreation

All Pueblos teach conservation through cultural traditions and indigenous knowledge. Some Pueblos participate in the Bosque Ecosystem Monitoring Program, which involves students in long-term scientific studies. Several Pueblos, including Santa Ana, Sandia and Cochiti, have established other excellent conservation education programs for their young people.

Pueblo lands support outdoor recreation for Pueblo members. Some of these activities, such as hunting and gathering, are connected to lifeways and maintaining spiritual health. Other outdoor recreation activities are components of the Pueblo efforts to enhance their communities, improve wellness, and reduce the incidence of chronic disease in their populations. Several Pueblos want to expand education programs that connect their members to the outdoors, but most lack sufficient resources to do so and many programs are forced to rely on grants.

Pueblos also offer recreation opportunities to the general public in some locations. Cochiti Lake is a major recreation area (but it came at a great expense to Cochiti Pueblo, which lost significant land as a result of the construction of Cochiti Dam and the filling of the reservoir). Cochiti Pueblo is also a partner in Kasha-Katuwe Tent Rocks National Monument. Santa Ana allows some public access to the bosque at its Tamaya Resort. Four MRG Pueblos operate golf courses. Both Sandia and Isleta offer recreational fishing waters (Sandia Lakes, Isleta Lakes); Isleta also operates a recreational vehicle campground.

For the most part, however, the Pueblos do not permit or encourage recreation on their lands by non-members. The river corridor is a cultural resource and all uses—by Pueblo members and non-members—are managed carefully. The

Pueblos are also regularly closed for cultural and religious purposes. The portions of the MRGCD ditch system within the Pueblos are accessible only to Pueblo members. In general, the Pueblos are not seeking to change this situation.

Similarly, current recreational use on the river sections traversing the Pueblos is light, but can lead to problems, such as trespass onto adjoining Pueblo land. Expansion of river recreation and recreational passage through Pueblos may in some cases be acceptable, and could even involve some social and economic benefits to the Pueblos, but it could also be problematic. Good communication, respect for tribal sovereignty, and careful management of river recreation is essential.

Priorities

The Pueblos are a voice for the Rio Grande and for wise environmental stewardship of the MRG region. While each Pueblo retains its individuality and has specific goals and objectives, the following items represent priority concerns that are of collective importance:

Sovereignty. The government-to-government relationship is paramount to the Pueblos. Pueblos want to maintain control and decision-making authority over their lands in all policy areas and seek an equal seat at the table in discussions and decisions that affect their communities. Pueblos also need support that allows them to adequately handle the numerous requests for participation and consultation in official proceedings that affect the MRG. In some circumstances, Pueblos also seek the return of ancestral lands.

Fair and Adequate Funding. Pueblos need resources, preferably provided directly to tribal governments and/or provided by federal agencies through Section 638 Indian self-government

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contracts, sufficient to meet the needs of fully professionalized programs in natural and cultural resource management, health and recreation, and education.

Consultation and Collaboration. Pueblos recognize the imperative of cooperation among the numerous entities and across the political boundaries that exist in the MRG. Whether it involves managing wild turkey populations in the bosque or sharing water resource data, the Pueblos seek the benefits of sharing key information and responsibilities. The Pueblos also seek communication and consultation that respects Pueblo rights, protocols, and processes. Pueblos want the State statutes and federal executive orders on consultation that are in place to be followed.

Sustainability and Sacredness.

The Pueblos care deeply about safeguarding land, air and water to sustain cultural traditions and cultural landscapes, keep human actions in balance with the natural world, protect species, and maintain healthy ecosystems.

Water and Community. In the arid MRG region, the Pueblos recognize water as a sacred community resource and as a source of life to be preserved and protected. The Pueblos have lived with water scarcity for centuries and see a need for more aggressive water conservation across the region. Protecting Pueblo water rights and water quality is essential to the physical and spiritual well-being of the Pueblo members and the cultures. Pueblos seek appropriate water accounting (not necessarily adjudication) that can facilitate

their role in water markets as well as other steps by water managers (such as stronger regulation of groundwater wells) to protect senior water rights.

Access and Connections. It is absolutely vital to their culture that the Pueblos have continued access to ancestral areas for traditional uses. Similarly, as development and urbanization continues in the MRG, the Pueblos see a critical need for the identification and protection of wildlife corridors—especially East-West corridors—that can maintain connections among mesas/grasslands, river, and mountains. Illegal trespass by humans and livestock has also created problems for the Pueblo communities.



Education and Ecological Literacy. The Pueblos learned long ago how to recognize and respect both the bounty and the constraints of their local environment. The Pueblos see the critical need to educate their children in Pueblo traditions, language, and cultural/ecological knowledge and see environmental literacy for all as an important area for collaboration.

See the **Executive Summary** and **Recommendations** sections in the Conservation, Recreation, and Education chapters for the Secretary's Committee suggestions for how to address these issues.

Snow geese. © Marvin DeJong

Middle Rio Grande Conservation Initiative

Middle Rio Grande Conservancy District

An Institution Preserving the Ribbon of Green in the High Desert

When Spanish explorers first entered the Middle Rio Grande Valley they were struck by its beauty and the breadth of its bosque forests. An additional striking feature was the extensive agriculture being carried out by the native peoples of the Pueblos. Agriculture in the middle Rio Grande Valley has continued from at least the 1500's and is promoted and supported by the Middle Rio Grande Conservancy District.

The MRGCD is a political subdivision of the State of New Mexico that is remarkable in its scope. It stretches across four counties—Sandoval, Bernalillo, Valencia and Socorro—and includes the irrigated lands of the six Middle Rio Grande Pueblos. Its governing board of directors is made up of three members from the more rural counties, three from the most populous County, Bernalillo, and one at large. This allocation of leadership serves to provide substantial input for the urban users who enjoy the recreational and stream related benefits of the river and the willow and cottonwood bosque, while at the same time providing input for the more rural agricultural counties. Finally, the Pueblos express their input not only through the at large member, but also through county representatives. The MRGCD Board is popularly elected from property owners within its political boundaries and thus provides direction for use of the land along the 160 miles of river and 1,200 miles of ditches.

MRGCD raises revenues through charges for the use of water and through ad valorem property assessments. It gives back to the assessed parties and the community by allowing for the generation of agricultural products sold within the four counties with a value of close to \$104 million dollars annually. The 60 to 70 thousand acres

of irrigated lands produce food supplies that sustain the millions of birds in the Rio Grande flyway. Add to this the tourist activity tied to the flyway and the riparian habitat created by ditches and drains, and the net value to the community of the green ribbon of agriculture is significant. But most significant is the continued agricultural way of life for the Pueblos, the acequia water users, and the agricultural users in general for a stretch of 160 river miles. As water flows through the 1,200 miles of ditches it is remarkable that the entire system operates by gravity without the need for the generation of electricity. This water is diverted by gravity onto soils that produce crops on a sustainable basis and provide food for the region. Virtually all unused irrigation water returns to the river. This hydrologic cycle repeats itself in succession as the river proceeds southward, resulting in the Rio Grande's waters being diverted four times before they finally reach Elephant Butte reservoir. The irrigation methods of the MRGCD have not, however remained static. As technology has improved so have the MRGCD efforts at water conservation.

MRGCD is actively involved in water and habitat-related conservation projects. It has, through an expensive system of automation and measurement, as well as advanced irrigation scheduling, reduced its historic diversions of water from its four diversion dams by 40 %. Because much of the water diverted by the MRGCD that is not consumed by crops is ultimately returned to the river for re-diversion, a 40% reduction in diversions does not translate directly into a 40% reduction in total water use by agriculture. Nonetheless, this modernization of the system has resulted in a reduction in total water consumption by many thousands of acre-feet per year. Both the reduction in diversions and

Middle Rio Grande Conservancy District

the reduction in actual consumptive use have yielded substantial benefits to the river and the ecosystem as a whole.

In addition to these water conservation projects, the MRGCD has engaged in numerous habitat restoration projects. It has, through various partnerships, removed fuels (non-native plants and excess dead wood) from about 4,000 acres of MRGCD property, and for many of those acres engaged in hydrologic restoration or restoration of native plants. The MRGCD has partnered with the Corps of Engineers for environmental restoration and recreation projects, including the 121-acre Bosque Revitalization project at Route 66 and the 900-acre Bosque Ecosystem Restoration project in Albuquerque, Corrales and Sandia Pueblos. Earlier this year, the MRGCD completed a post-fire restoration project for 120 acres in Belen, NM. The MRGCD has entered into management agreements for Bosque lands with Corrales, Albuquerque, Los Lunas and the Socorro Save our Bosque Task Force. Restoration plans have been completed for the Rio Grande Valley State Park in Albuquerque, the Corrales Bosque Preserve, the Socorro County Bosque south of San Acacia Dam, and the Boys Pond Wetland in Belen. The MRGCD completed a Bosque Landscape Alteration Strategy in 2005 and a Community Wildfire Protection Plan for the Middle Rio Grande in 2007.

The MRGCD also helps sustain federally listed endangered species living in the Middle Rio Grande, in particular the Rio Grande silvery minnow and the Southwestern willow flycatcher. Besides its intensive participation in the MRGESCP joining the major federal and non-federal agencies in species recovery efforts, MRGCD voluntarily modifies its operations to accommodate species needs and initiates new programs and activities to promote species

survival and recovery. The MRGCD engages in regular communication with the BOR and provides water managers with an extensive array of operational information to assist Reclamation in managing its supplemental water, “minnow water”, leased from San Juan–Chama water users.

The MRGCD routinely grants access to its lands, and often active assistance and equipment, for scientific and operational purposes involving the species, which is important in light of the fact that the much of the critical habitat for the silvery minnow and the flycatcher is located on lands within the boundaries of the MRGCD.

The way that the MRGCD manages its conveyance operations contribute to the optimization of the supplemental “minnow water” that can legally be dedicated exclusively to species conservation efforts. The MRGCD estimates that the Rio Grande itself is probably the largest single consumer of water within the MRG, through natural depletions due to evaporation, riparian consumption and aquifer seepage that probably exceed those attributable to agricultural or municipal and industrial consumption. The MRGCD has traditionally masked these natural losses through its normal operation of moving water through the system to meet irrigators’ needs. When “minnow water” entered the mix after the endangered species listings, the MRGCD agreed with the BOR to deliver that water free of losses to points of use below Albuquerque.

Return flows from the irrigation and drainage system also provide potentially important species habitat at its outfalls, and the MRGCD has proposed other conservation measures providing habitat and water conservation benefits in coordination with its Collaborative Program partners in order to advance the goal of recovering the listed species in the MRG.

Middle Rio Grande Conservation Initiative

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Vision Statement

A Middle Rio Grande watershed with integrated natural and cultural resource management for diverse uses and a balanced water use with renewable supply. This will ensure a vibrant, resilient, healthy ecosystem that supports biological processes, integrity, and diversity of the watershed in concert with sustainable human uses, cultural heritage, and thriving communities.

A Great River Facing Great Challenges

The Rio Grande is one of North America's most important rivers. The Rio Grande is New Mexico's most important natural and cultural resource. The future of the state depends on its wise stewardship.

Over thousands of years, this extensive river ecosystem evolved to support a remarkable and diverse web of life, including some 250 species of birds, dozens of native mammals, and many fish and reptiles. The human history and cultural

heritage in the Rio Grande Basin is as incredible as its natural legacy; it extends back in time for thousands of years. The availability of water and habitat along the predominantly north-south orientation of the continent's fifth largest river has made the Rio Grande an important migration and connection corridor between North and South America—for wildlife and humans alike. Pueblo Indians were already diverting the waters of the Rio Grande for irrigation when Spanish explorers arrived in the region



Private land stewardship project, Socorro County. © Doris Rhodes

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in the 1500's. Spanish colonists expanded upon that system and created an elaborate system of Acequias using the waters of the Rio Grande during the 17th and 18th centuries, so that irrigated agriculture in the Middle Rio Grande reached its greatest extent in the late 19th century.

The great river that supports this rich natural and cultural legacy continues to face numerous ongoing challenges—both to its status as a semblance of a dynamic, living river, and to its ability to provide support for human needs. Some of these challenges arise from natural environmental fluctuations (such as recurrent drought); others are anthropogenic—the results of population growth and increasing resource consumption in the Southwest and (in the case of climate change) around the globe.

Throughout the Rio Grande Basin, human actions have fundamentally altered the river's natural system and processes. In New Mexico, change accelerated at key points over the past 130 years: the arrival of the railroad in the 1880s, river aggradation and flooding due to increased diversions in Colorado by the 1920s; the creation of the Middle Rio Grande Conservancy District in 1925 to restore and protect sustainable regional agriculture, drain lowlands and tame floods in the 1920s and 1930s; the formation of the Rio Grande Compact in 1939 defining interstate water entitlements between New Mexico, Colorado and Texas; the post-World War II population boom; and the growing draw and growth of the Sun Belt states such as New Mexico from the late 20th century to the present.



Bosque del Apache NWR. © Marvin DeJong

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Since European settlers arrived and even before, the Middle Rio Grande has historically been utilized primarily to support New Mexico's heritage of irrigated agriculture. More recently, federal water and flood control projects have played a larger role. The Middle Rio Grande Project authorized under the Flood Control Acts of 1948 and 1950 allowed the BOR to enter into a contract to rehabilitate the MRGCD system and to maintain the river channel from Velarde, N.M. to Caballo Reservoir; the USACE was authorized to build four flood control dams (including Cochiti and Abiquiu) and levees; and BOR also constructed the San Juan-Chama Project to divert, store and deliver on average 110,000 acre-feet per year of imported Colorado River Basin water for use in the Middle Rio Grande (which is 10% of the average natural flow of the Rio Grande at Otowi gage.)

Channel and floodplain modification and water diversions have greatly altered the natural system. Dams, levees, and bank stabilization projects have throughout much of the Rio Grande's extent disrupted what was once a natural overbanking flood regime, disconnected the river from its larger floodplain, confined the river to a narrow corridor, and greatly altered discharge and sediment supply regimes.

Diversions from the river for Middle Valley agriculture continue to use large portions of the river's flow, although less than in previous decades. Groundwater pumping at unsustainable rates depletes aquifers that recharge the river. More recently, reliance on the river for drinking water has increased. Drought has decreased surface water flow and put increased pressure on groundwater supplies. The MRG is fully-appropriated; that is, there is not enough water to satisfy all senior and junior water entitlements.

Water quality is a concern throughout the MRG. In the meantime, a growing population along the Rio Grande, coupled with further projected reductions in surface flow due to long-term climate change, will place even more demands on increasingly limited water resources.

The combination of these significant changes has dramatically altered the functioning of key biological, hydrological, and geomorphological processes within the river corridor in all major "reaches" (stretches) of the MRG: Cochiti (Cochiti Dam to Angostura Diversion Dam), Albuquerque (Angostura Diversion Dam to Isleta Diversion Dam), Isleta (Isleta Diversion Dam to San Acacia Diversion Dam) and San Acacia (San Acacia Diversion Dam to the headwaters of Elephant Butte Reservoir).

What was once a rich mosaic of tree, shrub, and grass species—which even included hardwoods—has changed and become less diverse. The absence, or changed timing, of significant overbank flooding events, has interrupted the processes that promote regeneration of cottonwood and other native vegetation and encouraged the proliferation of invasive nonnative species such as salt cedar and Russian olive in the bosque (the riparian forest). The changed vegetation composition and structure, coupled with the proliferation of woody fuels, has made fire in the bosque a much more serious concern and has increased the intensity of fires.

The Rio Grande has always been a river of drought, subject to the vagaries of weather. Depending on the year-to-year snowpack and monsoon, the river can experience regular low flows and disconnectivity. The imperatives of the Rio Grande Compact can exacerbate chronic drought conditions by imposing upstream storage restrictions. Regular purchases and releases

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of water to maintain connection and flow have been needed over the past decade to comply with flow requirements negotiated in 2003 to resolve litigation under the Endangered Species Act.

The consequence has led to deterioration of both riparian and in-stream habitat for native plant and animal species. As a result, many plant and animal species have become extinct or extirpated from the region, and others are in decline. Three species found within the MRG, the Rio Grande silvery minnow and the Southwestern willow flycatcher, and the Pecos sunflower, are listed as endangered or threatened under the Endangered Species Act.

In 2003, the national organization American Rivers placed the Rio Grande on its list of Ten Most Endangered Rivers. The World Wildlife Fund listed the Rio Grande as one of the ten most endangered rivers in the world in 2007.

The rich and complex cultural heritage of the Middle Rio Grande continues to be linked to this great river of drought. Deep linkages to the land that are embedded in the Pueblo cultures and in 400+ years of agricultural-based Hispanic culture in New Mexico, as well as the vitality and sustainability of our modern communities, are all dependent on the health of the Rio Grande.



Mallard ducks. © Marvin DeJong

The Secretary's Committee supports a vision for a "living Rio Grande"—a river that carries a flow necessary to sustain the ecosystem and its natural processes, while also supporting human needs. The notion of a living river and river restoration must work within the reality of the river's anticipated water supply, its fundamental legal institutions protecting the Pueblos and New Mexico's agricultural heritage among other senior users, and its modern management to meet Compact, agricultural, municipal, and industrial needs.

Utilizing the public input it received, the Committee has approached these conservation challenges by considering five major aspects of the MRG that define the health of the ecosystem: water quantity; water quality; restoration efforts; stewardship of cultural landscapes, natural areas/private lands; and fire management. Each of these aspects must be addressed collectively for successful conservation and restoration of the MRG.

Water Quantity

A 'living Rio Grande' requires sufficient water in the river. At the same time, the Rio Grande is also a main source for legally protected senior agricultural, municipal, and industrial uses as well as many others. The New Mexico Office of the State Engineer has confirmed the main problem facing the region: "The key fact about our water: demand exceeds supply."¹

Governance of water in the arid West is extremely complex. The OSE and the New Mexico Interstate Stream Commission have the primary responsibility for administering water throughout the State. The OSE administers surface water rights and issues domestic well permits. The ISC must ensure that New Mexico complies with the Rio Grande Compact, the agreement that governs apportionment and sharing of Rio



Canada geese. © Marvin DeJong

Grande water by the states of Colorado, New Mexico and Texas. Water rights all have a date and a priority, which is intended to structure administration and create a hierarchy of seniority. Pueblo water rights have the most seniority, but they have not been quantified nor have the Pueblo's future water needs.

The MRG is one of 16 water-planning regions in New Mexico that have submitted Regional Water Plans to OSE. Technically, the MRG water planning region includes Sandoval, Bernalillo, and Valencia counties—an area covering more than 5,000 square miles, while Socorro County is covered in the Socorro-Sierra regional water plan. The MRG region is home to half of the state's human population, the largest base of urban water users in the state. Water rights in the MRG have not been adjudicated and the resulting uncertainty about the viability of junior rights presents challenges for a general water market to operate efficiently.

Major depletions of water in the MRG include: agriculture, urban uses (residential, municipal, industrial), riparian zone evapo-transpiration, evaporation, and ground water recharge.

Ground water resources supply most of the region's municipal and drinking water needs, with the exception of Albuquerque's recent shift from ground water to surface diversion of its San Juan-Chama Project water. Ground water resources are limited and not nearly as extensive, nor as renewable, as was believed just a few decades ago. Over time, overdrafting the aquifer depletes the river. "Overdrafting" aquifers by pumping at rates that exceed natural recharge, which is currently allowed by State administrative guidelines in the MRG, is not sustainable and cannot continue indefinitely without consequences. On average the region has been "overspending" its water budget, creating a "ground-water mining deficit" of about 55,000 acre-feet of water per year above what is renewable from various water sources.

As the human population of the MRG is growing, so is water demand. Without changes in the current approach to water use, the water deficit will continue to increase. Most of the growth in water demand comes from uses in urban areas. The Regional Water Plans that encompass the MRG estimate additional water demand between 95,000 to 120,000 acre feet per year within 50 years if steady population growth continues.

At the same time, there is a pressing need for MRG water users to partner their water uses with ecosystem restoration and maintenance goals. Water is an essential ingredient in key measures necessary to: allow fluvial processes to occur within the river channel and the adjacent bosque; support and improve the bosque's riverine and terrestrial habitats; benefit endangered species; mimic typical natural hydrographs; enhance and extend wetlands; and support some kinds of recreation.

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Perhaps overshadowing all concerns related to existing water uses is the potential for significant impacts from drought and climate change. In a model depicting a warming Southwest, all of the MRG's major categories of depletions are projected to increase while major water inflows, e.g. from tributaries and the San-Juan Chama Project, are projected to decrease—perhaps by 10 to 30 percent.

The OSE has declared the Rio Grande to be a “fully appropriated” basin, meaning there have been more water-use permits issued than there is actual water supply. Therefore, since rights to all of the surface water are spoken for, new users must acquire permits from existing users.

Agricultural water use is often discussed as an opportunity for water rights transfers. The MRGCD presently serves approximately 50,000-65,000 acres of irrigated agricultural land. To fulfill demand for either the existing water permits or future demands would require retiring a significant number of acres of water rights. If water rights are taken away from farm land, this would entail a loss of landscape mosaic, local food production/food security, aquifer recharge, wildlife habitat, scenic values, and deep cultural traditions based on agriculture.

The top priority overall for conservation, recreation, and education in the MRG is therefore to encourage water users to protect and conserve available water resources in order to balance current and future demands on freshwater supply and to better manage available water to serve river restoration purposes. Progress in water conservation must come from all major sources of depletions, including agriculture, urban uses, riparian zone evapo-transpiration, and evaporation.

The 2004 MRG Regional Water Plan included 43 recommendations. Many positive steps have been taken since adoption of that plan and in response to other local, state, and federal plans and strategies. (See end of this chapter). Much more remains to be done, however, to: create stronger economic incentives for efficient water use in all sectors of the economy; resolve water rights ownership uncertainties; better coordinate with other regional plans and with state and local institutions in the measurement and management of water; better link land use and energy decisions to water resources; and implement mechanisms to facilitate a market-based water transaction program to support environmental flows in the Middle Rio Grande needed for restoration programs.

Market-based water transactions can involve measures such as acquisition and leasing of water rights. For example, BOR (as part of the MRGESCP) acquired from willing lessors a total of 158,000 acre-feet of water between 2003 and 2009 to maintain flows to benefit endangered species in the MRG. Leasing prevents water rights from being severed from the land. The Committee heard from members of the public that feel strongly about preventing any transfer of water rights outside the MRG.

Government and the public sector must be driving forces behind implementing these measures and supply the bulk of financing for them. The private sector will respond to economic signals and incentives. Citizens can provide the political will and support for better water management and river restoration with their tax dollars, and make the decisions necessary to support sustainability in the MRG.

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Citizens should also be offered other ways to support a living river. For example, the Albuquerque Bernalillo County Water Utility Authority, in conjunction with six conservation groups, has established the “Living River Fund,” a special fund used to purchase water for environmental flows. Contributions can be made via the water bill. ABCWUA is also contributing \$225,000 to a program to lease water back from farmers so it can be kept in the river. The Living River Fund, however, is not widely known and does not encompass the entire MRG. Not surprisingly, at this point, the Fund only contains approximately \$20,000 from voluntary donations. By comparison, a similar program and fund established by the City of Santa Fe to support flows in the Santa Fe River has raised over \$103,000 in voluntary contributions, which have been matched dollar for dollar by the City. The ABCWUA Living River Fund should be

extensively publicized, and methods of contributing should be made more convenient in order to maximize its potential to generate resources and express public support for river restoration.

Additional resources also must be focused on regional adaptation to drought and climate change. The Secure Water Act (Public Law 111-11) directed the BOR to assess climate change impacts to adequate and safe supplies of water fundamental to the health, economy, security and ecology of the United States. In 2011, the BOR published a West-wide study that included a report discussing future changes and climate driven constraints to water supplies within the Rio Grande Basin.

The BOR’s West Wide Climate Risk Assessment Team has subsequently developed an alternative approach and begun a project focused on the Upper Rio Grande (which includes the



Gathering clouds above the Middle Rio Grande overflow channel. © Marvin DeJong

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entire MRG). The Upper Rio Grande Impact Assessment is using global climate models to develop stream-flow projections, which are then run through local operations models to predict impacts on specific hydrologic operations (including Reclamation operations, as well as those of other federal and non-federal water-management entities). The Impact Assessment report is scheduled to be completed in September 2012. The results are being leveraged to encourage local water-management entities to partner with Reclamation to develop adaptation and mitigation strategies for the projected impacts.

Policy makers need climate projections down-scaled further to assess impacts to sub-basins and key stretches of the river, such as the biologically significant San Acacia Reach.

Water Quality

New Mexico Environment Department, along with the U.S. Environmental Protection Agency, regulates and monitors water quality for various uses in the Rio Grande. The New Mexico Water Quality Commission issues New Mexico interstate and intrastate water quality standards.

Standards specify “Designated Uses” for the waters, which include warm-water and cold-water fisheries, livestock watering, wildlife habitat, fish culture, irrigation, water storage, irrigation, primary and secondary contact, domestic water supply, and municipal and industrial water supply. Primary contact includes recreational uses, such as swimming, in which a human has prolonged contact with water. Secondary contact refers to recreational uses, such as fishing, wading, and boating. A water body is considered “impaired” or polluted if the existing water quality is not sufficiently high to support the designated use. In designating uses for a water body, states and tribes examine the suitability



Rio Grande silvery minnow. © Marvin DeJong

of a water based on its physical, chemical and biological characteristics.

Impairments in the MRG, include acute aquatic toxicity, aluminum, *E. coli* bacteria, low dissolved oxygen concentrations, polychlorinated biphenyl, PCBs in fish tissue, and elevated temperature. In general, the main stem from the NM 550 Bridge in Bernalillo to the Isleta Pueblo boundary has the major impairments, which are largely the result of human (urban) impacts: impervious surface runoff, wastewater treatment plants, and septic systems. A 2009 NMED report prepared for the MRGESCP reported these impairments, but noted – at least with reference to ESA issues – that the most critical issue is “a lack/timing of adequate flows to maintain the needed habitat.”²

PCBs are almost certainly a largely local contribution from storm water runoff. A “do not eat” order is in place for channel catfish and white bass within the Albuquerque reach due to presence of mercury and PCBs. The largest sources of *E. coli* in the Albuquerque area are human related: sewage (15.9%), pets (24.1%) and livestock (11.5%). Wildlife (mostly avian sources) accounted for the remaining 48.5%. Pharmaceuticals and personal care products have been the subject of a number of studies, and have been implicated as causal factors in reproductive and developmental anomalies in fish,

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Northern leopard frog. © Bruce Christman

wildlife, and potentially, humans. These substances have been documented in the river, shallow aquifer beside the river, and in the east riverside drain from Angostura to the I-25 Bridge. NMED has identified wastewater treatment plants as a major source of these constituents.

The North Diversion Channel, part of the Albuquerque Metropolitan Flood Control Authority system, drains almost the entire city east of the river. The NDC has been linked to spikes in radionuclides, PCBs and turbidity, and related sags in dissolved oxygen concentration, especially after storm water events. AMAFCA is undertaking modifications to the NDC to help mitigate its impact. The same study also indicated decreasing primary production through the urban area; dramatically increased nutrient loads from wastewater treatment plants, and substantial salinity increases as the river heads south because of wastewater, irrigation returns, and natural sources.

The Rio Grande's waters should be clean and safe for people and wildlife. Clean water is especially vital to the Pueblo's religious and cultural traditions. To meet clean water standards

for designated uses will require prodigious new efforts to proactively reduce pollutant inputs to the river, especially from storm water systems and non-point sources.

In heavily urbanized areas of Bernalillo and Sandoval counties, Municipal Separate Storm Sewer System (MS4) permits issued by EPA are important to cleaner water. In July 2010, EPA announced plans for a pilot project for a watershed-based permit that would cover the entire Albuquerque urbanized area. The new watershed plan will replace the existing permits to discharge stormwater to the Rio Grande for all MS4 entities in both Bernalillo and Sandoval Counties. The selected MS4s involved in the watershed permit are: City of Albuquerque, Bernalillo County, New Mexico Department of Transportation, AMAFCA, University of New Mexico, Kirtland Air Force Base, City of Rio Rancho, Village of Los Ranchos de Albuquerque, Village of Corrales, Town of Bernalillo, Sandoval County, Southern Sandoval County Arroyo Flood Control Authority, Eastern Sandoval County Arroyo Flood Control Authority, Village of Tijeras, EXPO NM (State Fairgrounds), and Sandia National Labs. Other entities invited but who are not part of the permit include: Pueblo of Sandia, Pueblo of Isleta, Pueblo of Santa Ana, and Middle Rio Grande Conservancy District.

The new permit will place an emphasis on implementation of low impact development green infrastructure in all planning activities. LID/GI is a different way of viewing stormwater, not as something to be sent "down the river" in the fastest way possible, but as an asset to be utilized to enhance the environment and recharge the aquifer. LID/GI is an array of products, technologies, and practices that use natural systems

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– or engineered systems that mimic natural processes – to enhance overall environmental quality and provide utility services. As a general principal, LID/GI techniques use soils and vegetation to infiltrate, evapotranspire, and/or recycle stormwater runoff. When used as components of a stormwater management system in the arid Southwest, porous pavement, vegetated swales, tree basins, “brown roofs,” and water harvesting can produce a variety of environmental benefits. In addition to effectively retaining and infiltrating rainfall, these technologies can simultaneously filter air pollutants, reduce energy demands, mitigate urban heat islands, and sequester carbon while also providing communities with aesthetic and natural resource benefits.

The watershed based permit offers many benefits, but at the same time there are many challenges associated with the concept. Some of

those challenges include crossing federal, county, and municipal jurisdictions; cost sharing and cost allocation; key entities within the watershed have declined to participate, and lack of an umbrella organization to oversee and implement the program. But this watershed-based endeavor offers significant opportunities; entities in the MRG must try to make it work and learn from the process.

In rural areas dominated by agriculture, continued technical assistance and incentives for private landowners to implement best management practices, testing payment for ecosystem services approaches, and application of LID/GI approaches are all important opportunities for protecting and improving water quality in river.

A robust and effective MRG-wide stormwater management program to improve water quality

Major Middle Rio Grande Federal Programs

Project	Middle Rio Grande Bosque Initiative	Middle Rio Grande Endangered Species Collaborative Program	Middle Rio Grande Revitalization Project
Lead Agency:	US Fish and Wildlife Service	US Bureau of Reclamation	US Army Corps of Engineers
Operation dates:	1994-2011 (specific appropriations for the program ceased in 2009)	2001 - present	2004 - present
Focus:	“Big Picture”-all species ecosystem approach	Endangered species—Rio Grande silvery minnow, Southwestern willow flycatcher	Ecosystem restoration & recreational enhancements
Guiding Document(s):	1993 MRG Ecosystem Bosque Biological Management Plan; 2005 MRG Ecosystem Bosque Biological Management Plan Update	2001 and 2003 Biological Opinion	Middle Rio Grande Bosque Restoration Feasibility Report (2009)
Programs:	Research; Monitoring; Habitat Restoration; Education/Outreach	Habitat restoration; water management; population augmentation/propagation; water quality management; research, monitoring and adaptive management; public outreach	Habitat restoration; recreation
Total Funds Appropriated:	\$9.275 million (FY1994-2004)	\$115.8 million (FY 2001-2009)	\$20 million
Website:	http://www.fws.gov/southwest/mrgbi/	http://www.middleriogrande.com	http://www.spa.usace.army.mil http://www.bosquerevive.com

Benefits from Land/Water Conservation & Restoration in the MRG

Targeted investments in conservation and restoration can yield a wide array of dividends.³

✦ Restoration Creates Jobs. The U.S. Department of Interior estimates that every \$1 million invested in restoration creates an average of 30 jobs, which are mostly private sector jobs. Expanding efforts to the levels required for MRG restoration over a decade or two would create thousands of jobs.

✦ Restoration Attracts Federal Funds to New Mexico. Expenditures on many types of

conservation and restoration projects that enhance habitat and restore watersheds, both on public and private lands, can leverage federal funds and bring more dollars into the state.

✦ Conservation Supports New Mexico Industries. Bottom lines in major sectors such as agriculture and ranching benefit from programs to support producers on the land and keep land undeveloped, reduce soil erosion, control non-native species, and improve natural values. Investments in environmental assets also improve quality of life for residents and can attract new businesses through “amenity migration.”

could provide the basis for making the MRG a valuable and desirable river for all concerned: the river, wildlife, and people.

Rio Grande Revival: River Restoration

Riparian areas constitute less than one percent of New Mexico’s arid landscape, but 80 percent of the state’s sensitive vertebrate species depend on riparian or aquatic habitats during their life cycles. Conserving and restoring the riparian habitats of New Mexico are high priorities in the area of wildlife conservation, and the Middle Rio Grande is integral to such efforts.

After over a century of alteration and ecological decline, the Middle Rio Grande—and hundreds of miles of the river north and south—are in need of restoration. If key components of the river’s physical processes are not returned to the Middle Rio Grande, the bosque will deteriorate and may be extirpated in places within the next 50 years. Restoration efforts must take a system-wide view and approach.

Restoring the river’s key physical processes requires understanding how to balance sediment and river flow for dynamic creation of riparian

and aquatic habitat. Examples of physical restoration efforts are removing jetty jacks or lowering floodplains to better connect riparian habitat with river flows. Examples of flow augmentation efforts are providing additional water for limiting river drying and modifying reservoir releases to create increased spring peaks. River drying events are common on the modern Rio Grande. Flow augmentation can lessen the ecologic harm these events cause by both limiting their



Southwestern willow flycatcher chicks. © John Peterson, COE

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duration and amplifying important ecologic cues. The notion of a living river must work within the reality of the modern water supply and management.

The past two decades have seen growing focus on Rio Grande restoration, driven by citizen and agency and local stakeholder efforts to promote ecosystem management and in response to the mandates of the Endangered Species Act. Notable efforts began in September 1991 with the appointment of a citizen Rio Grande Bosque Conservation Committee by Senator Pete Domenici. This committee's June 1993 report made numerous recommendations and led to the completion of the Middle Rio Grande Ecosystem: Bosque Biological Management Plan. The 1993 BBMP (later revised in 2005) is a thorough analysis of the health of the MRG as well as a road map towards a healthier ecosystem. The BBMP set the stage for changes in how the biological resources of the riparian ecosystem were managed and led to federal funding for the MRG Bosque Initiative beginning in 1994.

Since the 1993 BBMP, there has been a surge of interest and activity among management agencies, stakeholders and the public based on the concept of the river/bosque as an ecosystem and driven by endangered species conservation efforts. The Rio Grande silvery minnow was listed as endangered in 1994 and the Southwestern willow flycatcher in 1995. This triggered difficult discussions and a variety of actions from 1995 to 2005 among federal agencies, water users, and other stakeholders. Litigation ultimately ensued. Outcomes from this period included initiation of a supplemental water program for both ESA and irrigation purposes, improved water management and water-use efficiencies, designation of critical habitat for the two species, and

Preserve the river for the sake of the river itself. From that act itself, people will benefit, species diversity will be protected. For people to connect to the river, it has to be there in the first place.

– A Valencia County citizen

Our vision should be unity through diversity, culture, and conservation.

– A Valencia County citizen

multi-party discussions culminating in the establishment of the Middle Rio Grande Endangered Species Collaborative Program in 2000, to promote the conservation and contribute to the recovery of the listed species while protecting existing and future water uses. The Collaborative Program and its key signatories—such as, the BOR, the New Mexico Interstate Stream Commission, the Middle Rio Grande Pueblos, the MRGCD, and the City of Albuquerque—have been the major drivers and the focus of river restoration activity over the past decade, having sponsored and funded more than 1,000 acres of habitat improvement and restoration projects in the MRG.

During this same period, the Alliance for the Rio Grande issued *Hope for Living River: A Framework for a Restoration Vision for the Rio Grande* (2003), a comprehensive look at the river as a whole. Other restoration plans have been completed, including the Conceptual

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Restoration Plan for the Active Floodplain of the Rio Grande, San Acacia to San Marcial, NM (2003), and detailed recommendations by U.S. Fish and Wildlife Service for several reaches of the river.

The Secretary's Committee saw no need to formulate entirely new recommendations as to how to maintain and/or re-establish the biological, hydrological, and geomorphologic processes necessary for the health of the MRG. Instead, the Committee has reviewed progress on and endorses the recommendations in the BBMP and the many successful approaches now being taken (see Appendix B).

Over the past 20 years, numerous local, state, and federal agencies have become increasingly engaged in river and bosque restoration efforts, all

of which are paying dividends. (See Appendix C). These efforts involve stakeholders and are excellent foundations to the Secretary's Committee assessment and recommendations. The Committee urges long-term continuation and support of these efforts at all levels of government.

While restoration work is required throughout the MRG, the San Acacia Reach is particularly important. This stretch of river encompasses approximately 40% of the river mileage of the Rio Grande silvery minnow's existing range. The San Acacia Reach contains some of the best habitat and largest contiguous potential habitat blocks for Southwestern willow flycatchers in the bird's entire range. This portion of the MRG contains diverse age classes of native cottonwood and willow and most closely resembles historic conditions.

Finally, the Secretary's Committee heard a great deal of public support for the Youth Conservation Corps program (and other similar programs that engage young adults in conservation work and service learning). The potential for YCC to play a larger role in restoration efforts in the MRG is substantial, provided that funding from the State of New Mexico (and project sponsor matching funds) is available. A MRG Conservation Corps could be established, which would lead to multiple benefits, including elevating youth engagement, education, and leadership in MRG restoration efforts.

Stewardship of Natural Areas, Private Lands and Cultural Landscapes

Protecting natural lands, enhancing habitat, and maintaining working landscapes are critical in the MRG. Degradation and loss of habitat are the greatest problems facing wildlife. Conversion and development of land also can impact scenic vistas, eliminate productive agricultural land,



Youth Conservation Crew working in the river corridor.
© Ariana Delmerico / Rocky Mountain Youth Corps.

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degrade cultural landscapes (special geographical areas that represent the combined work of nature and of man), and impose high costs on government to provide services. The best long-term “insurance policy” to benefit wildlife and maintain regional character is to create a system of connected public and private lands that provides conservation benefits at the landscape level.

Fortunately, the MRG already has substantial protected lands that form a foundation for such a system. The river itself, its pueblo and traditional communities, and lands within the MRGCD form a habitat “backbone.” As consistent with its own statutory directives and potentially as part of its intensive involvement in the Endangered Species Collaborative Program, the MRGCD can contribute to the preparation of a natural resources study that identifies sensitive areas, species distributions and conditions, and potential conservation actions.

Two national wildlife refuges, Sevilleta and Bosque del Apache, are located in the most ecologically intact and biodiverse reach of the MRG. La Joya Game Refuge Wetland Complex (a state Wildlife Management Area), two conservation areas operated by the Valencia Soil and Water Conservation District (Whitfield and Rio Abajo), as well as BLM, USFS, and SLO land along the river in the uplands and mountains, manage wildlife habitats in concert with the refuges. Rio Grande Valley State Park encompasses the bosque in Bernalillo County. The six MRG Pueblos include over 50 miles of river. (Though Pueblo land is not “public land,” the Pueblos offer strong habitat protection.)

Establishment of the Middle Rio Grande National Wildlife Refuge in Albuquerque’s South Valley, as well as expansion of the other National Wildlife Refuges (which might include

additional lands with water rights), are currently being pursued as strategies to improve habitat protection networks and to relieve pressure on migratory birds and other wildlife from land conversion, changes in cropping practices, and dewatering of the river.

Equally important, however, is the fate of private lands in the MRG. The Valley is largely comprised of privately-owned irrigated farmland, which provides public benefits, including local food production, wildlife habitat, and critical connectivity to protected lands. As the MRG will continue to host the majority of the State’s population growth, development pressure will increase on agricultural lands, including pressure to sever water rights from the land.

Some counties within the MRG, particularly those that lack proper zoning authority, have allowed development on agricultural lands and private lands within the active floodplain. There is also a lack of coordination among local, state, and federal regulations regarding development in the floodplain, which hampers activities such as restoring river-floodplain connectivity. Local entities that have open space and agricultural land protection programs should focus efforts and resources on the MRG and apply for federal grants and assistance. Local governments that lack such programs should establish them.

In addition, local, state, and federal entities should work together to prepare and implement a regional, watershed-based “greenprint” plan (or series of more localized plans) that identify where to invest in public and private land to protect and improve key habitats, maintain wildlife corridors (especially east-west corridors), and conserve agricultural lands that link the river to adjacent lands, maintain a landscape mosaic, and maintain viewsheds.

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Communities and private landowners also need options other than selling land and water rights to development. Some of the best ways to protect and maintain these privately owned lands and increase the chances of water benefitting agriculture and the river ecosystem are to protect them permanently and/or provide incentives and alternatives to development.

Important tools in this regard are conservation easements, natural resource management technical assistance programs, and habitat improvement programs. These programs allow participants to continue farming or ranching while improving efforts to recharge the aquifer, improve water quality, maintain open space, benefit wildlife, produce food for local markets, and keep cultural traditions alive.

Funding has been a major limiting factor for farmers interested in conservation easements. Because of this, the number of conservation

easements in the MRG is relatively low (less than two dozen). Federal land conservation programs that help protect farmland and wetlands, such as the USDA Farm and Ranchland Protection Program and the North American Wetland Conservation Act have benefitted the MRG, but these programs require a non-federal match. The MRG also has had difficulty competing for NAWCA funds against other areas in the United States that are important for bird conservation. The availability of more matching funds, as well as closer consideration of the MRG's significance by NAWCA decision-makers, could greatly assist local farmers who are interested in conserving natural resources on their lands. Other uncertainties, such as the permanency of conservation easements and changing economic conditions that may require adjustments in agricultural operations can also be limiting factors for some landowners entering into conservation easements.



Alfalfa field near Albuquerque. © Thomas Thorpe / Middle Rio Grande Conservancy District.

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Other private landowner assistance and habitat improvement programs are critical to the future of the MRG. Numerous programs authorized by the Farm Bill and implemented by Natural Resources Conservation Service can do wonders for conservation in the MRG (see Appendix C). NRCS programs are not tailored to the MRG and the lack of dedicated NRCS funding and on-the-ground capacity in the MRG, however, limits results. In 2008-2009, approximately \$2 million provided to New Mexico for the Wetland Reserve Program was returned unobligated due to limited landowner participation. NRCS should tailor a suite of Farm Bill programs for the MRG in other river basins, such as the Mississippi River Basin Healthy Watersheds Initiative and the Great Lakes Restoration Initiative. Similarly, lack of private and public funding, and on-the-ground capacity limits the ability of the FWS Partners for Fish and Wildlife program.



Red-tailed hawk. © Marvin DeJong

A successful model now underway is the Middle Rio Grande Partnership for Private Lands Conservation, in which New Mexico Game & Fish Department, New Mexico Association of Conservation Districts, the USDA Natural Resources Conservation Service, and FWS cost-share a full-time private lands biologist to assist with implementing the 2008 Farm Bill, FWS, and State wildlife programs. The program is in its third year and has numerous projects under development. This position needs to be supported long-term with dedicated federal agency funds along with additional staffing to scale up the beneficial impacts of this program for working lands and wildlife.

While some funding from the State of New Mexico was available in prior years, through one-time appropriations in the budgets of agencies such as the Department of Game and Fish and the Energy, Minerals, and Natural Resources Department, the State presently does not have a steady funding source to support private land conservation and match federal funds available for conservation easements and private landowner conservation assistance. The State should establish dedicated funding for this purpose.

The unique character blend of land and resources, rich customs of the region, the area's cultural history, pueblos, and traditional communities that all rely on the MRG constitute an integrated living landscape of national significance. The regional acequia system and the agricultural traditions it supports are highly valued cultural assets. Additional steps could be taken to support stewardship in the MRG. One is that MRGCD could participate in developing a cultural resource preservation plan for its system that recognizes the uniqueness of the area's system of ditches and acequias, the traditions based on it, and its role in world heritage.

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Another possibility is the applicability of the National Heritage Area program to the MRG. NHAs are designated by Congress as places where natural, cultural, and historic resources combine to form a cohesive, nationally important landscape. The NHA program is administered by the National Park Service, but NHAs are lived-in landscapes; they are not federally-managed protected areas nor subject to NPS regulation. Federal grants and technical assistance through NHAs, however, can support local initiatives. There are currently 49 NHAs across the United States, including the Northern Rio Grande National Heritage Area that encompasses Santa Fe, Rio Arriba, and Taos counties. The complex of resources in the MRG is significant and Congress should authorize a study of the region that considers it for designation as an NHA.

Fire in the Middle Rio Grande

Over the past decade, as drought in New Mexico has taken hold again, the number and intensity of wild fires within the MRG has risen. The



Gambel's quail. © Marvin DeJong

Albuquerque area experienced significant bosque fires in 2003 followed by the most active year in the decade (115 fires in 2006). In 2011, 60 fires burned close to 4,000 acres.

Wildfire threats and fire management issues in the MRG are embedded in the environmental history of the river. The loss of hydrological function and introduction of exotic species have resulted in widespread alteration to the ecological function and hazardous fuel loading in these riparian ecosystems. In the past, episodic flooding saturated soils and biomass, and micro- and macro-organisms more readily consumed the dead vegetation matter or fuels in these areas. This process without water is much slower, and fuels accumulate quickly. Lack of seasonal flooding has produced an unnatural accumulation of surface fuels and longer periods of dried-fuel availability. The vegetation is now also drought stressed and more fire prone due to declining water tables.

Native riparian species have been adapted to flooding as the primary agent of necessary ecological disturbance. Many exotic species have been introduced by humans over the past century and in recent decades (e.g., Chinese tamarisk, Russian olive, Siberian elm, elephant grass). Some of these species are very adapted to this new hydrology and they are also adapted to fire, allowing them to out-compete the native species across large areas.

If the threat of large, devastating wild fire in the bosque is left unchecked, future events will likely continue to convert large tracts of the bosque to degraded exotic scrublands that are more prone to fire, and less sustainable for the natural resource values, ecosystem services, and wildlife habitats that the bosque provides. Furthermore, many communities are at greatest risk from these

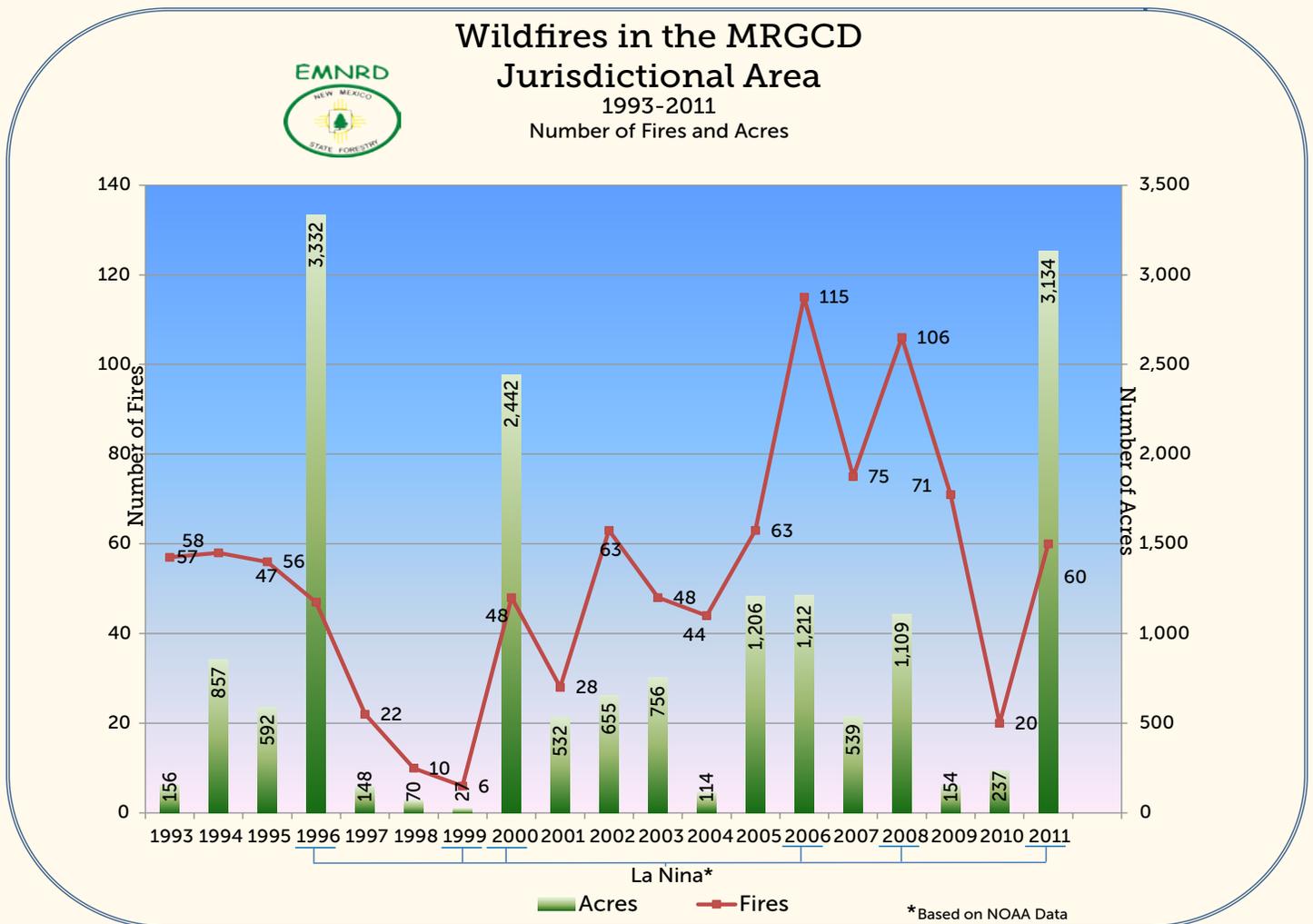
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intense wildfires in areas where these values all come together (i.e., river, water, wildlife habitat, wildlife, access to open space). This is because both humans and wildlife are attracted to these wilder places in the bosque, where fuel conditions are typically more prone to wildfires. These areas will logically also provide locations to demonstrate an improved fire management approach.

The MRG has a semi-arid climate, pre-monsoonal lightning storms, and is prone to both human and lightning-caused wildfires. These widespread forest ecology changes have now created conditions for high-severity fires that remove large portions of the vegetation and above ground biomass, leave the soils vulnerable to erosion, and leaves sites more susceptible to

colonization by exotic species. These fires impair recreational uses and wildlife habitat, and increase the potential for water quality degradation in the river.

The seasonal winds and La Niña drought periods can also provide conditions for record-breaking wildfires. Repeated wildfires can result in exotic species expansion and perpetuation. This progression has been exacerbated by increasing ex-urban and urban development, that have created new dispersal vectors for the latest exotic plant species (e.g., Ravenna grass) and increasing wildfire ignition sources. These converging socio-environmental factors along with climate warming forecasts, suggest the future will bear increasing trends in wildfire numbers and severity.



Conservation Recommendations



Western meadowlark at edge of MRG. © Marvin DeJong

A strategic approach to wildfire management is needed to better leverage limited economic resources, to provide a pragmatic balance between hazardous-fuel reduction and restoring riparian ecosystems for wildlife habitat, wildlife corridors, and other high-valued resources. To be effective, treatments require a multi-year approach. The cost of removal and control of exotic tree species, combined with sporadic funding, has resulted in mixed success, particularly in places where these projects have not been maintained. The long-term sustainability of any proposed habitat restoration or rehabilitation work must be considered and incorporated into the planning process.

The quandary is in places where the mix of native and exotics occur. These locations can provide habitat for rare species and patches of forest that support high biological diversity in

the absence of higher quality native vegetation. These areas exist throughout large expanses of the bosque. While it would be ideal to restore a native ecosystem, the current altered hydrology and widespread occurrence of exotics in tributaries make that unrealistic in many reaches of the Middle Rio Grande.

Effective management for multiple ecological and social values will require a strategic approach. Conditions in the bosque and adjacent communities constantly change, while the science of fire management in the bosque continues to improve. Sustained interagency collaboration to identify and implement the best balance of management practices over time is important. Just as learned knowledge about the importance of maintaining restored areas has improved management, other approaches can be tested and refined. For example, the increased use of “shaded fuel breaks” offers potential. Fuel breaks change vegetation structure to reduce fire behavior and severity. Shaded fuel breaks are conservation alternative to traditional fuel breaks (where the majority of vegetation is cleared), and are less costly to create. Shaded fuel breaks can be designed to directly affect only a small area, but can have positive effects over a large area.

Overall, the path to reducing the wildfire risk should take a comprehensive wildfire management approach, based on better fire prevention, public education, and intergovernmental coordination and planning. Planning around communities and utilizing Community Wildfire Protection Plans should be part of that strategy.

Conservation Recommendations

Improve and Increase Key Federal Programs that Benefit the Middle Rio Grande

✦ Congress should authorize and fund a comprehensive Middle Rio Grande Restoration

Conservation Recommendations

and Management Program tailored specifically to the region's needs that builds on the successes and lessons from the Middle Rio Grande Bosque Initiative, the MRG Endangered Species Collaborative Program, and relevant "adaptive management" programs, involves all key governmental and non-governmental entities, and encompasses aspects of conservation, recreation, and education.

✦ Congress should fully fund the Land and Water Conservation Fund. Congress and federal agencies should direct funds to critical projects in the MRG. Increased funding from the state-side program of LWCF should be targeted by the State to the MRG and can provide matching funds to state and local government for conservation and recreation projects.

✦ Congress should recognize the role of working landscapes for wildlife habitat, water recharge, food security, and ecological and economic benefits by increasing funds for Department of Agriculture and Department of the Interior programs that help protect and conserve private lands (ranches, farmland and wetlands) through habitat improvement, conservation easements, technical assistance, and other incentives and alternatives to development. Key programs that benefit the MRG include: Environmental Quality Incentives Program, Conservation Stewardship Program, Farm and Ranchland Protection Program, North American Wetland Conservation Act, Partners for Fish and Wildlife, Wildlife Habitat Incentives Program, Conservation Reserve Program, Working Lands for Wildlife, and Restore New Mexico.

✦ Congress should adequately fund the USACE Bosque Revitalization program so it can expand work beyond the Albuquerque reach; reauthorize and fund the Rio Grande

Environmental Management program; and fund projects on tribal lands authorized under the Water Resources Development Act of 2007.

World-Class, Science-Based Management to Restore the Rio Grande

✦ Key agencies, and the region as a whole, should continue implementation of the Bosque Biological Management Plan. The BBMP remains an excellent overall road map for the conservation and restoration of the river and bosque that strives to mimic and restore natural systems where feasible within current conditions and constraints; the biologically important San Acacia reach should get special focus. All entities engaged in restoration efforts in the Middle Rio Grande basin should enter into comprehensive planning and agreement to address goals, methods, locations, types, timing, and integration of those activities.

✦ Use a systems approach to land and water management and incorporate benchmarks, milestones, monitoring, assessment, and independent peer review into all programs and activities in order to build a strong adaptive management program.



Prairie dogs. © Marvin DeJong

Conservation Recommendations

✦ Prepare and implement a regional, watershed-based “greenprint” plan (or series of more localized plans) that can make recommendations, consistent with existing authorities, as to where to invest in public and private land to protect and improve key habitat, maintain wildlife corridors (throughout the MRG, but especially east-west corridors), and conserve agricultural lands that link the river to adjacent lands, maintain a landscape mosaic, and maintain viewsheds.

✦ Expand scientific efforts surrounding groundwater modeling and the impacts of climate change on water resources in the MRG; continue work under the BOR Basin Studies Program to project hydrologic impacts of climate change and partner with water-management entities, institutions such as New Mexico Institute of Mining and Technology, and other organizations to develop local and regional adaptation strategies.



✦ Develop a centralized source of conservation and research information or coordinate with such existing sources, such as the MRG Endangered Species Collaborative Program for the Rio Grande silvery minnow. Utilize existing research programs such as the MRG Endangered Species Collaborative Program, the Bosque Ecosystem Monitoring Program, and the University of New Mexico biology and engineering departments, as templates to gather science-based information for decision-making. The USACE should continue development of a database management system for MRGESCP as a repository for MRG conservation and research information.

Conservation Recommendations

Protect Natural Lands, Undeveloped Agricultural Lands, Open Space, and Cultural Values

✎ The State of New Mexico should establish dedicated funding sources to support land acquisition and private land conservation in order match all federal funds available for conservation easements and private landowner conservation assistance.

✎ The Middle Rio Grande Conservancy District should without duplicating its efforts in the Endangered Species Collaborative Program, assist with the preparation of a natural and cultural resource study for its system that recognizes the uniqueness of the area's system of ditches and acequias, its natural values and the traditions based on it, and its role in world heritage.



North of Alameda Bridge, willow thicket.

© Cirrelda Snider-Bryan /
New Mexico Museum of Natural History and Science.

✎ U.S. Fish and Wildlife Service should acquire Price's Dairy in Albuquerque's South Valley to establish the Middle Rio Grande National Wildlife Refuge; FWS should evaluate expansion of the existing National Wildlife Refuges in the Middle Rio Grande basin and submit preliminary planning proposals to the Secretary of Interior.

✎ Protect existing and potential high quality wildlife habitat areas through partnerships with agencies and individual landowners. Facilitate and secure resources for existing efforts (land trusts, non-profit organizations, and agency programs) that support conservation easement establishment and follow up habitat restoration along the MRG. Focus on sustainable river processes that will support wildlife habitat improvements.

✎ Local government (counties, municipalities) in the Middle Rio Grande should continue to take a significant role in conservation and management of the river and bosque, recognizing the success of efforts such as Rio Grande Valley State Park. Entities that have open space and agricultural land protection programs should focus efforts and resources on the MRG and apply for federal grants and assistance. Government entities that lack such programs should establish them, as there is a great need to consolidate development and/or reserve lands from development.

✎ Local, state, and federal entities should explore establishing a pilot program in the Middle Rio Grande that utilizes the concept of "Payments for Ecosystem Services," which reward landowners for the restoration and protection of critical natural resources and natural water infrastructure.

Conservation Recommendations

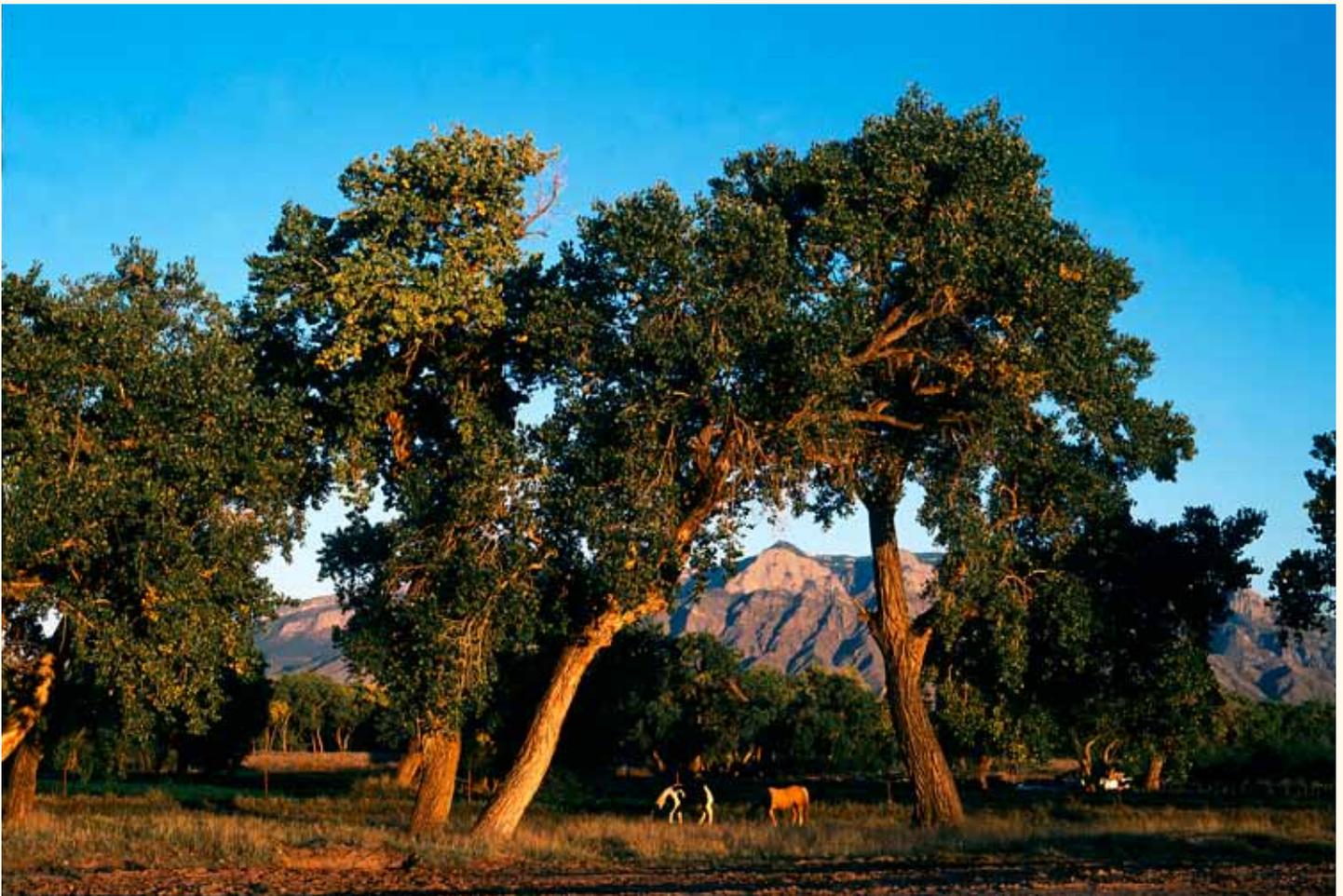
✦ Mitigate wildfire effects on the bosque and reduce the number and size of wildfires through public education, prevention, and better inter-governmental coordination and planning, such as the “Fire Wise Program”; Develop Community Wildfire Protection Plans in areas with heavy fuel loading and high natural resource values adjacent to the wildland urban interface; identify fuel breaks in plans, strategically located to minimize effects on wildlife habitats while enhancing defensible space and efforts of wildland firefighters.

✦ Establish a regional “Rio Grande Conservation Corps” to engage young people in conservation projects, promote service learning, foster leadership, and create jobs.

Rethink Water Supply, Demand, Quality, and Institutional Management

✦ The region must recognize and act on the fact that the Middle Rio Grande basin is fully appropriated and faces a long-term water challenges that will likely be exacerbated by the effects of climate change in the Southwest.

✦ Educate the public about the long-term water challenges within the Middle Rio Grande and how they are expected to be exacerbated by climate change. Explore measures identified in the Middle Rio Grande Regional Water Plan that are consistent with existing water entitlements as well as additional planning efforts to: better manage water in the Middle Rio Grande without an adjudicated system in place, expedite adjudications, quantify and protect Pueblo water



Cottonwood trees in the bosque. © Thomas Thorpe / Middle Rio Grande Conservancy District.

Conservation Recommendations

rights, conduct aggressive water conservation in conjunction with mechanisms for putting the saved water to environmental beneficial uses, create enhanced upstream storage, improved linkages between land use and energy decisions and water resources, and test payment for ecosystem services to promote protection of water quantity and quality.

✎ Develop and implement collaborative, voluntary, market-based water transaction programs—including acquisition, water banking, and leasing—in collaboration with Middle Rio Grande Conservancy District, Office of the State Engineer (through its Strategic Water Reserve), federal agencies, Pueblos, and non-governmental conservation organizations, and individual water rights holders to dedicate water for environmental flows, ecosystem processes, streamside riparian and wetland habitat restoration, and recreation; promote the Albuquerque-Bernalillo Water Utility Authority “Living River Fund” and expand on this concept region-wide in order to build public engagement and financial support for river restoration.

Develop Middle Rio Grande access promoting an appreciative understanding of the importance of the historical context, water usage, agriculture, wildlife conservation, recreation, education, economic impact, and the necessary funding streams to preserve the beautiful Rio Grande.

– Valencia County citizen’s vision for the Middle Rio Grande

✎ Meet or exceed Environmental Protection Agency water quality standards so that the Middle Rio Grande is clean and safe for people and wildlife; learn from the EPA pilot project



Rio Grande silvery minnow monitoring. © Glenn Harper / Pueblo of Santa Ana

Conservation Recommendations

to complete a regional storm water permit in the Albuquerque area; apply on-site best management practices, take a watershed approach, and emphasize partnerships to reduce pollution inputs to the Rio Grande.

Improve Management, Communication, and Partnership Structures

✦ Building on the Middle Rio Grande Endangered Species Collaborative Program and the Middle Rio Grande Bosque Ecosystem Initiative, re-structure the intergovernmental communication and collaboration entity in the Middle Rio Grande (or establish a new structure entirely) to better coordinate work across local, state, federal, tribal, and non-governmental organizations.

✦ Streamline and improve efficiency in the delivery of programs that provide technical and financial assistance to benefit working lands

and fish and wildlife, and help landowners and communities identifying sources of assistance. Work toward “one-stop shopping” and build on the Middle Rio Grande Partnership for Private Lands Conservation, in which state and federal agencies have collaborated to fund a private lands-focused biologist; if necessary, collapse available funding into the highest quality and best performing programs.

✦ Build on the success of local collaboration entities such Socorro County’s “Save Our Bosque Task Force;” expand its focus to the entirety of Socorro County and apply the model to other counties in the Middle Rio Grande.

✦ Increase communication and collaboration among local government open space and agricultural land protection programs in the Middle Rio Grande.



Old growth cottonwood along the Middle Rio Grande. © Cirrelda Sniderna

Middle Rio Grande Regional Water Plan

Key Actions Since the Plan's Acceptance in 2004

The 2004 Middle Rio Grande Regional Water Plan identified a 15 to 20% ongoing shortfall of renewable supplies of water relative to consumptive (evaporative and vegetative) uses of water. Numerous efforts have been expended and actions taken toward solving the Middle Rio Grande's water problems since the governmental acceptance of that Regional Water Plan. This 2010 note identifies the major events, projects, new information, and policy changes that have had an impact upon the Region's ongoing net deficit spending of water (both positive and negative). We also recognize the efforts of many other government entities, businesses, and non-governmental organizations that have exerted efforts toward meeting the mission and/or recommendations of the Regional Water Plan.

1. The Albuquerque/Bernalillo County Water Utility Authority developed the San Juan/Chama drinking water treatment plant and distribution system. The use of this new system permits a major reduction in the pumping from the aquifer. As a result, aquifer levels are expected to reverse their decline and rise for the near future time frames. Effect on consumptive use is seen to be minimal.

2. Several agencies including the City of Albuquerque and the Middle Rio Grande Conservancy District have conducted Bosque and ditch bank restoration projects, removing salt cedars in favor of cottonwoods, and creating more open parks. Some scientists believe that these projects will reduce consumption of water in the treated areas.

3. The Water Utility Authority and the City of Rio Rancho have aggressive conservation programs which have resulted in reduced numbers

of gallons per capita per day (10% and 21%). Total use by the Water Utility Authority was reduced by 5%, and was increased by 9% in Rio Rancho. Bernalillo County and many of the smaller municipalities have passed water conservation ordinances.

4. The Water Utility Authority and the City of Rio Rancho have experimented with and established plans for underground storage of water in the aquifers. If recovery fractions meet expectations, this storage approach will reduce evaporative losses from reservoirs, whose use could be reduced.

5. The Middle Rio Grande Conservancy District has reduced its irrigation diversion of river water by about 40%, as a result of major improvements in the distribution system. That substantial reduction in diversions will result in some, relatively small, fractional reduction in the Districts' consumption of water.

6. The City of Rio Rancho is pursuing a water reuse system which, when completed, is expected to reduce the City's pumping of the aquifer, but have minimal effect on the consumptive uses of water.

7. The University of New Mexico (among many others) has conducted studies that predict lower snowpack and increased evaporation. These studies suggest an ongoing adverse impact upon the Region's consumptive deficits.

8. Sandia National Laboratories, the BOR, and the Corps of Engineers have improved the modeling of the Rio Grande river system, which should enable more incisive management of the river. If wisely used, the improved modeling is anticipated to have a positive impact upon the Region's consumptive deficit.

Middle Rio Grande Regional Water Plan

9. The U.S. Fish and Wildlife Service is developing a revised Biological Opinion in support of the endangered species in the Rio Grande. The impact of the Biological Opinion on the Region's available supplies is unknown. Both positive and negative conjectures have surfaced.

10. The New Mexico Interstate Stream Commission, the City of Albuquerque, and others have developed refugia for the endangered silvery minnow. These will ease the pressure on the endangered species, and possibly mitigate effects from the new Biological Opinion.

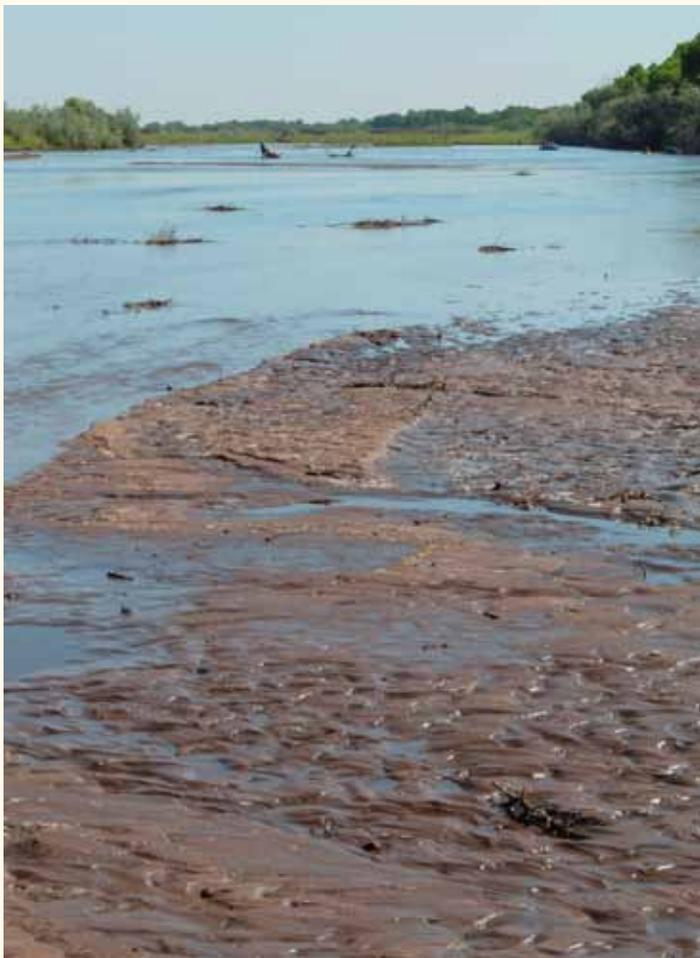
11. Many major and minor Court decisions and a few relevant legislative changes have occurred since 2004. It is not clear what their effect, if any, will be upon the Region's renewable-consumptive balance.

12. It has recently been recognized that prior commitments to obtain water rights to offset river effects from groundwater pumping ("dedications") exceed the total number of acres that are under non-native irrigation and thus could be retired.

13. The New Mexico Interstate Stream Commission built a conveyance channel through the marshes near Elephant Butte. This will surely allow better downstream deliveries against the Rio Grande Compact, and thus allow for more available supply.

14. Sandoval County is conducting a substantial experiment to determine the engineering and financial feasibility of pumping, cleaning, and delivering deep aquifer saline water. The aquifer under test appears finite and limited in size (not renewable), so the impact upon the Region's overall supply situation will be minor. However, if successful, this project could act as a buffer in times of drought, ease a little of the pressure on the Rio Rancho freshwater aquifers, and serve as a prototype for using saline waters elsewhere in the State.

15. Valencia County developed a political coordination process for distributing non-agricultural water among municipalities and rural areas across the County.⁴



Looking downstream on the Rio Grande as it flows through Albuquerque.

© Laura Paskus / Independent reporter and editor.

Payments for Ecosystem Service

Healthy lands and watersheds create value through what scientists call “ecosystem benefits”—positive outcomes such as natural flood control, purification of water, and carbon sequestration. “Payments for ecosystem services” (PES) is an innovative financing model that rewards landowners for the restoration and protection of critical natural resources and creates incentives to invest in “natural infrastructure” that benefit communities.

The most established and active PES markets in the United States are wetland, stream, and endangered species habitat mitigation banking. Carbon sequestration projects are another area of growing interest. Some private capital investment funds have even been established that provide market-rate returns for investors who fund PES approaches to land conservation priorities.

For example, healthy watersheds do much the same work as water treatment plants, levees, dikes, and other engineered solutions – without expensive equipment and with added benefits like protection of wildlife habitat and carbon sequestration. New York City famously uses a PES to protect its drinking water, which has saved the city a total of more than \$8 billion in treatment costs. More than 300 cities and towns around the world have tried similar approaches to watershed protection. The City of Santa Fe has now begun to invest in watershed management to protect of its main sources of drinking water.

In the MRG, recharge, food security and ecological and economic benefit of open space and fields are often not fully valued. “Preserving currently irrigated acreage through various incentives is an obvious nonstructural and low-cost alternative which should receive immediate attention from city, county, and state government.

Agricultural-related recharge amounts to about 31,000 acre-feet per year, and the consequence of losing this recharge source could be severe.”⁵

Like some private landowner technical assistance programs, PES can provide value to those who participate in certain programs (farming, wildlife habitat protection), thereby generating public goods and decreasing pressure to convert land to development uses. Given the importance of private lands to ecosystem conservation and restoration, and cultural values, the MRG would make an excellent location for a PES pilot project.

A PES approach might also be used to address the threats posed by damaging mega-fire in the forested watershed of the Middle Rio Grande (including its tributaries). The Las Conchas Fire in 2011 burned over 150,000 acres in the Jemez Mountains, which drain to the Rio Grande, and subsequent monsoonal rain events caused the deposition of 100,000 tons of ash and debris into the Rio Grande system. Funding from MRG water users can be combined with other sources for forest restoration in order to assist forest managers to increase forest resiliency through thinning and controlled burns. The end result would be better protection of water quality and increased water security in the Middle Rio Grande. The City of Santa Fe is, in fact, beginning to invest in such an approach to better protect and manage the Santa Fe Canyon watershed.



NM Chilies. Have a try. Muy caliente! © Thomas Thorpe

Middle Rio Grande Conservation Initiative

Recreation

Vision Statement

A Middle Rio Grande corridor that supports diverse land- and water-based outdoor recreation opportunities serving multi-generational and multi-cultural populations, and that are accessible to all economic levels and physical abilities. Recreation should facilitate low-impact, sustainable activities, promote enjoyable experiences, and support conservation, education, tourism and health/wellness goals—nourishing mind, body, and spirit.

Recreation is Integral to the Quality-of-Life in the Middle Rio Grande

In addition to sustaining natural systems and its critical role as a water source for human uses, the Rio Grande is an incredible recreation resource. Outdoor recreation opportunities within the Middle Rio Grande are outstanding and make a major contribution to the quality-of-life in the region.

Public sentiment is strong that further enhancing outdoor recreation should be a priority. While New Mexico already touts its mild four-season climate and recreation attractions, new

investments can better promote an outdoor recreation “brand” for the MRG that will benefit the region and state.

Efforts to expand and improve recreation opportunities in the Middle Rio Grande will meet multiple objectives of the “America’s Great Outdoors” initiative, such as: enhance urban parks/community green space, restore and increase access to rivers, increase Americans’ participation in outdoor activities, protect federal lands and increase access, and expand youth employment opportunities. The 2011 AGO report stresses in particular the need for additional river



Kayaking in the Middle Rio Grande as it flows through Albuquerque. © Kelly Gossett.

Recreation

protection and restoration measures nationwide and calls for more river-related recreation, including the establishment of new water trails (or “blue trails”).

The MRG is extremely accessible to 1.2 million residents and thousands more who visit New Mexico. The river is a major draw in an arid climate such as central New Mexico, where little water is available for recreational purposes. The river, bosque, and adjacent lands attract and sustain a wide variety of recreation: swimming, walking, biking, running, hunting, fishing, horseback riding, wildlife watching, and some water sports. Over 75 percent of Americans participate in active outdoor recreation each year and participation rates in New Mexico are similar.

Outdoor recreation use has grown tremendously, but the river corridor is underutilized in some senses and falls far short of meeting its potential to create social benefits. Outdoor recreation is joyful and fun. Recreation can connect people

of all ages to the river physically and emotionally, honor and perpetuate local traditions and cultural values, and be a powerful force for the awareness and education necessary for conservation stewardship.

Based on a growing body of research, health experts are also making the point that too little “green exercise”—physical activity in the great outdoors—is wreaking havoc on our health, especially the health of children. Contact with the natural world has been shown to reduce stress, enhance mood, and ease anxiety and depression. According to studies, simply strolling through a green, leafy park for five minutes calms worries and lowers blood pressure.

Outdoor recreation in the MRG supports healthy lifestyles and can play a larger role in reducing the \$324 million spent annually in NM on medical expenditures attributed to obesity and chronic diseases. Outdoor recreation appeals to all demographics. As the population of the U.S. ages, and the ‘baby boomers’ refuse the appeal of activities such as walking, bicycling and horseback riding as a way to enjoy the outdoors is expected to increase.

Outdoor recreation is an economic driver. Outdoor recreation creates high quality-of-life for local residents, attracts tourism, and supports sustainable green jobs and economic development that cannot be outsourced. The benefits can be considerable for the communities and regions that get it right. Outdoor recreation opportunities are important for low-cost, close-to-home leisure options, but also play a role in where individuals, companies and investment capital choose to locate—a phenomenon known as “amenity migration.”



Outdoor recreation is joyful and fun.
© Laura Paskus / Independent reporter and editor.

Economic Benefits of Outdoor Recreation

Simple, healthy outdoor activities such as hiking, biking, camping, horseback riding, canoeing, kayaking and other water sports or wildlife viewing generate enormous economic power.

- The economic impact of outdoor recreation, natural resource conservation and historic preservation activities in the U.S. contributes at least \$1.6 trillion to the U.S. economy and supports 9.4 million reliable American jobs that are not exportable and located largely in rural areas.²

- Tourism is already the largest non-governmental employer in New Mexico, contributing \$6.1 billion to the economy annually and supporting 110,000 employees.³

- Outdoor recreation contributes \$3.8 billion annually to New Mexico's economy, supports 47,000 jobs, generates \$184 million in annual State tax revenue and produces \$2.75 billion annually in retail sales and services—accounting for 4.6% of gross State product.⁴

- Non-motorized outdoor recreation generated over \$22 billion in economic activity in the Rocky Mountain states, while annual expenditures for hunting, fishing and wildlife watching in New Mexico are over \$807 million.⁵

- The total economic impact related to equestrian-recreation activities in New Mexico is \$209 million and supports 27,900 jobs.⁶

- The outdoor recreation sector continues to grow even during economic downturns and has large potential to create new jobs. The outdoor recreation industry in the United States grew at a rate of 4.1% in 2010 and 5.9% in 2011. The sector could create over 3 million jobs over the next seven years.⁷

- In a letter to the President and the governors of the Western states, 100 economists from universities and other organizations throughout the United States wrote: “The West’s natural environment is, arguably, its greatest long-run economic strength.”⁸

The 2010-2015 Comprehensive Economic Development Strategy for State Planning and Development District 3 identifies hospitality/tourism as one of five key focus areas for economic development in the region. District 3 is the Mid-Region Council of Governments area: Sandoval, Bernalillo, Torrance, and Valencia counties. Tourism is not a priority in the CEDS for District 7 (South Central Council of Governments: Socorro, Sierra, and Dona Ana counties), but outdoor recreation remains important in the area. Overall, recreation can contribute to the accomplishment of the CEDS goals to grow the regional economy. And, while maintaining healthy habitat does sometimes require water, most recreation activities by themselves do not consume water—an important factor in the Middle Rio Grande.

“The mark of a successful person is one that has spent an entire day on the bank of a river without feeling guilty about it” (Chinese philosopher)

– quoted in Paul Bauer (2011), The Rio Grande: A River Guide

Recreation

Economists have recognized a key connection, particularly in the American West. “Economic health and sustainable growth often are tied to the protection of the region’s abundant natural resources—a trend that will likely intensify in the coming years. Public lands, particularly protected lands which provide natural amenities and open spaces, are crucial to this economic equation...maintaining sustainable economies in many areas of the American West is directly linked to preserving natural resources and not exploiting them.”⁹

Recreation must be carefully managed to avoid or minimize negative impacts, including impacts on vested water rights and species. Issues such as vandalism, fire risk, illegal dumping, off-highway vehicle use, and effects on vegetation and wildlife along the river/bosque are presently concerns in the MRG. Appropriately managed public use, however, can focus use and reduce some impacts.

Recreation in the MRG should be based on a set of core concepts and principles:

- Coordination and partnerships among public and private organizations is critical.
- The MRG recreation system should provide for a wide spectrum of uses and offer great access, but protect irrigation uses, natural and cultural resources, preserve places that offer more solitude without crowds, and respect tribal sovereignty.
- Permits and regulations should not be excessive barriers to participation.
- Recreation systems and outreach efforts should support and encourage public health and fitness, and help address the obesity epidemic and fight chronic diseases.

- Recreation programs should continue to draw on a huge reservoir of volunteer support, but need dedicated support and funding.
- Recreation should encourage education and conservation stewardship, and be a gateway to citizen engagement and leadership.
- Recreation can be transformational and help create positive social and behavioral change.



Students hike through the Albuquerque reach of the bosque.
© Tish Morris.

Recreation

The Existing Situation

The Middle Rio Grande has a variety of public and private lands that support excellent outdoor recreation. Local, state, federal, and tribal agencies that own and/or manage these lands and facilities play varying roles in outdoor recreation at sites directly on or close to the river (see map).

- The six Pueblos in the MRG protect significant expanses of open space along the river and support outdoor recreation for Pueblo members and, in some places, for the general public at the Pueblos' discretion.
- The U.S. Fish & Wildlife Service manages Sevilleta National Wildlife Refuge and Bosque del Apache National Wildlife Refuge. A new Middle Rio Grande National Wildlife Refuge has been proposed at the site of the former Price's Dairy on 570 acres in Albuquerque's South Valley to promote environmental education and serve as a demonstration conservation site.
- USACE has responsibilities for flood control and civil works, and manages Cochiti Lake at the northern end of the MRG. USACE has significantly stepped up its recreation role lately, integrating recreation elements into habitat restoration projects along the Albuquerque reach (that are subsequently maintained by other partners), but USACE spending on recreation is currently limited to 10 percent of project costs.
- The National Park Service manages Petroglyph National Monument in Albuquerque and is a co-administrator of the El Camino Real National Historic Trail, which traverses large



Birdwatching is a major recreational activity in the Middle Rio Grande. © Karyn Stockdale / Audubon New Mexico.

Recreation

segments of the river corridor. The NPS Rivers, Trails, and Conservation Assistance Program also has been active on several trail and recreation projects in the MRG.

- The City of Albuquerque and Bernalillo County manage extensive open space systems. Rio Grande Valley State Park, which includes the entire bosque in Bernalillo County, is comprised mostly of City and MRGCD lands managed by the City's Open Space Division through a memorandum of agreement with the MRGCD and the State Parks Division. The City of Albuquerque is embarked on a significant effort (the River Corridor Improvement Plan, part of "ABQ—The Plan") to bring the river more into the daily lives of residents through increased access and new facilities. Bernalillo County has numerous open space sites in the Valley is also contributing \$5 million toward land acquisition for the Middle Rio Grande National Wildlife Refuge.
- Other local entities, including the Village of Corrales, the City of Rio Rancho, the Town of Bernalillo, the Village of Los Lunas, the Village

of Belen, the City of Socorro, and other communities have some ownership and various roles in bosque lands.

- The State of New Mexico has a role in MRG outdoor recreation through the programs of Department of Game & Fish; Energy, Minerals and Natural Resources Department (State Parks Division, State Forestry Division); Department of Cultural Affairs (State Monuments Division); and the Tourism Department. DGF manages wildlife throughout the MRG, operates the Ladd Gordon State Wildlife Management Area Complex (between Bernardo and La Joya), and stocks trout in the MRGCD system during winter. In addition to its role in Rio Grande Valley State Park and Rio Grande Nature Center State Park, the State Parks Division has overall responsibility for boating safety on the Rio Grande as well as statewide trails programs. Coronado State Monument in Bernalillo and the Camino Real International Heritage Center south of Socorro are two prime attractions.
- Private lands in the floodplain provide essential habitat for large populations of migratory waterfowl and other species, and support hunting opportunities and other forms of recreation.

The Middle Rio Grande Conservancy District, however, is by far the most important factor in recreation in the MRG. MRGCD has generally fulfilled its original mission of draining waterlogged lands, flood control (except in a few spots where issues with levees and interior drainage remain) and securing irrigation supply. The success of the MRGCD in realizing its original mission has created other values—riverine habitat, water recharge and filtering, and recreation—to name a few.



Biking in the Middle Rio Grande. © Diane Souder

Recreation

Recreation within the MRGCD plays a significant role in the lives of many valley residents. With increased urbanization, MRGCD is an oasis in the midst of the state's population corridor and its largest metropolitan area. Though delivering water to support agriculture is its principal purpose, recreation has become perhaps the most widely-recognized benefit provided by MRGCD. This is especially true in the Albuquerque metropolitan area, where 73% of the 316 miles of water conveyance channels are used recreationally. MRGCD ditches serve as horse trails, bike runs, wildlife habitat, fishing holes, running paths, and open space. For the MRGCD as a whole, 414 of the nearly 1,200 miles of district waterways are classified as having some recreational use.

The MRGCD tolerates non-motorized public use of the ditch system by the public and is a partner in important recreation efforts. MRGCD has entered into recreation partnerships with entities that will take on fiscal, management, and liability responsibility.

Some noteworthy partnerships include: Rio Grande Valley State Park, the extremely popular Paseo del Bosque Trail (16-mile paved path from Alameda to Rio Bravo in Albuquerque/Bernalillo County), Tingley Beach, “pocket parks” in the Socorro area, and recent bosque revitalization projects completed by the USACE in Albuquerque that have recreation elements.

But MRGCD does not fully embrace, prioritize, or deal consistently with recreation. This situation is due to a combination of land patterns (MRGCD has a complicated combination of fee simple ownership and easements) and MRGCD choices (including concerns with issues such as liability and maintenance costs). While a great deal of recreational use is tolerated, much of the MRGCD system is posted with no trespassing signs and river/bosque access is often behind locked gates. Informal trail uses are widespread, but there are few sanctioned trails. A lack of bridges over the “clear ditch” (which run parallel to the river) limits access to the river/bosque in many places. Specific recreation improvements,



Birding is major source of recreational tourism dollars in any community. © Karen Stockdale / NM Audubon

Recreation



Birdwatching is enjoyable at all ages. © Karyn Stockdale / Audubon New Mexico.

such as appropriately spaced access points with sufficient parking and room for horse and boat trailers, along with safety and educational interpretive signage, are not widespread.

As a result, there is a great deal of variation and inconsistency in public recreation access within the MRG. Public access in Sandoval County and around Bernalillo is limited; the Corrales—Albuquerque stretch has relatively good access (though formal parking lots are few, bosque gates are often locked, and there are no formal boat access points); from Albuquerque south to Bernardo and San Acacia, public access is relatively limited compared to other sections; and the stretch south of San Acacia Dam has lots of access sites with fewer locked gates, a network of 13 bosque “pocket parks,” and a short designated bosque trail segment around Socorro.

Formal boating access points within the MRG are virtually non-existent. While there are places to access the river, most require significant walks/portages and are not well-designed for boating. In addition, in the river channel itself some river obstacles (such as dams, diversion structures, and jetty jacks), pose serious safety

issues as well as impediments to fish passage and sediment transport important to the river ecosystem. MRGCD diversion dams (e.g. at Algodones and Isleta) were built over 70 years ago without features to accommodate paddle sport recreation and habitat concerns. Even the recently-built Albuquerque-Bernalillo County Water Utility Authority adjustable height diversion dam south of Alameda also did not incorporate a creative boat passage feature. These types of hazards require a portage.

There is only a single public campground near the river (Coronado Campground, operated by the Town of Bernalillo) in the entire Middle Rio Grande. While lodging is available in Valley communities, the lack of access points and designated camping facilities spaced regularly along the MRG bosque limits opportunities for campers, hikers, bikers, paddlers and equestrian users to plan and enjoy overnight experiences and longer trips. In addition, there is no comprehensive public information source that enables the public to understand the recreation opportunities in the MRG.

Other places that have similar river “greenways” have turned these corridors into major conservation-recreation-economic development



Hiking benefits everyone. © Ed Radoslovich



National Recreation, National Water, and National Historical Trail emblems

attractions. Communities along major sections of the Rio Grande area and the public agencies that manage these areas, however, have not fully capitalized on the river and bosque's vast potential to deliver outdoor recreation-based benefits.

A "String of Pearls" Park and Trail Network

The MRG should have an integrated network of parks, recreation sites, and other attractions that are connected by formal land and water trail routes with regularly spaced access and stopping points: a "String of Pearls." Increased recreational access to and use of lands within MRGCD is essential to develop the park network. Over time, it may even be possible to develop the concept of a program that allows for seamless

general access to sites along the MRG; this kind of "MRG Pass" would be make it easy for the public to experience and enjoy the entire region.

A park network connected by land and water "Rio Grande Trail" along as much of the river as feasible and appropriate makes intuitive sense. The MRGCD and other uses of the bosque are not a monolithic system; they vary greatly by county. Creation of an effective dialogue with users and categorizations of the needs of these areas as they relate to the MRGCD mission could increase recreational opportunities in other counties. The basic infrastructure of a RGT already exists in the river itself, on the levee systems of MRGCD and on publicly-owned land. The "main stem" of a RGT could also create opportunities to interconnect trails to the uplands on both sides of the river. An RGT must, however, respect tribal sovereignty and community preferences with respect to the issues of access, specific routes, and trail surfacing. (Pueblo preferences to keep their lands closed to the general public may make a RGT non-continuous.) An RGT should provide balance between improved paved all-access trails and more sustainable, unimproved earthen trails that provide less-intensive recreational opportunities.

Paddle Sports Show Growing Participation

Paddle sports are among the fastest growing segments of the outdoor recreation industry. A 2010 study by the Outdoor Industry Association reported the following key findings about paddle sports in the United States:

- 27.8 million Americans participate in paddle sports. Paddling participants made 280 million outings in 2010 (average of 10 days/participant).

- Canoeing is the most popular type of paddling. Approximately 10.5 million Americans participated in canoeing in 2008.
- Kayaking is enjoying steady growth, with 10.4 million Americans participating in 2010.
- Stand Up Paddling was the # 1 outdoor activity in terms of new participants in 2010, and total participation broke 1 million for the first time.

Recreation

The RGT concept is also popular; it was the most common recreation recommendation for the MRG made in public input to this report. This is not surprising, since the 2004 New Mexico Statewide Comprehensive Outdoor Recreation Plan identified trails as the public's #1 recreation priority. Public meetings conducted by New Mexico State Parks in 2008 along the river valley also found strong support for the RGT concept.

A multi-use, non-motorized RGT could help people re-discover the river and become a powerful force for conservation, recreation, education, and economic development. A continuous Rio Grande Trail, or various segments of land trails and water trails, could replicate similar long-distance trails elsewhere that have been highly successful. Long-distance trails are destination tourism attractions that create jobs and economic activity along their route. Trail users in need of equipment, supplies, food and lodging could boost the economies of Valley communities.

Trails highlight points of interest that embody a region's heritage, get people outside and increase opportunities for active, healthy living, and create a sense of community. Long-distance trails often serve as venues for community activities,

fundraisers and other special events. Trail-based interpretation efforts could reconnect the public to the significance of the river and support restoration and beautification of the riparian corridor. Indeed, more land and water trails can turn the entire river corridor into a giant linear outdoor classroom.

Paddle Sports

It is legal to float down the Rio Grande in kayaks, canoes, rafts and other non-motorized water craft. Despite the river's variable hydrograph and low-flow conditions during parts of the year, a water-based element, or "Blue Trail" element of an RGT is both real and exciting. Paddle sport use, such as rafting, kayaking, and canoeing, currently take place on the MRG in low numbers and has significant potential for expansion.

Paddle sports are low-impact, healthy recreational activities that appeal to a wide demographic and can be enjoyed for a lifetime. Some characteristics of the MRG make it quite suitable for increased paddle sports recreation, for example:

- The protected bosque and lack of riverside development supports an exceptionally scenic and peaceful paddling experience, especially in a major metropolitan area such as Albuquerque.



Kayaking on the Middle Rio Grande north of Albuquerque. © Kelly Gossett



Junior Rangers at the Rio Grande Nature Center State Park. © Karen Herzenberg / Rio Grande Nature Center State Park.

- The Middle Rio Grande is a gentle, beginner-friendly Class I river suited to many people, especially kids, families and older, active adults.

The most important steps to support increased paddle sport opportunity is to increase the number of well-designed, well-managed publicly-accessible river points. In 2012, the USACE will construct two improved access points in the Albuquerque section of the river (at Alameda and at Central). Other candidate sites for improved access include: Algodones at Angostura Dam, Bernalillo, several additional sites within the Albuquerque reach, the I-25 area north of Isleta Pueblo, Los Lunas, U.S. 60 east of I-25, NM 408 at the Escondido Bridge, and the U.S. 380 river crossing. Projects at high priority locations, such as Algodones and Bernalillo, will immediately improve the functionality of an access point network and dramatically expand public opportunity to experience beautiful sections of the river.

The two national wildlife refuges in the MRG should establish a consistent policy for non-motorized boating access through the refuges. Under some managers, the river through Bosque del Apache NWR has been open for recreation; under others, it has been closed. Paddle sport recreation during the spring runoff period should be allowed if it does not conflict with habitat concerns. In addition, any approach to expanded paddle sport recreation in the MRG must recognize tribal sovereignty and respect the wishes of the Pueblos. (see Pueblo Perspectives and Issues Section).

In addition, two other efforts that would enhance paddle sport recreation in the MRG should be explored:

1. Evaluate opportunities to retrofit/re-engineer certain in-river features to improve white-water recreation, water safety, habitat/fish passage, and sediment transport. The Angostura

Middle Rio Grande Birding Trail

Observing birds is an incredibly popular activity in the United States. In 2006, some 48 million Americans observed birds around the home or on trips, including nearly 20 million U.S. residents who traveled away from home to view birds.⁹ An even broader definition of the activity suggests that over 81 million Americans participate in birding.¹⁰

Birding also means sustainable economic development. The development of “avitourism” has been a remarkable phenomenon over the past 30 years. Beginning with the establishment of the Great Texas Coastal Birding Trail, a state-designated system of trails, bird sanctuaries, and nature preserves along the Gulf Coast that links 308 birding sites, some 25 other states have developed birding/wildlife trails. Countless communities specifically cater to birders and hold annual birding/nature festivals. From the 100,000 visitors and \$14 million in spending at Santa Ana National Wildlife Refuge near McAllen, Texas¹¹ to the 38,000 visitors to two southeast Arizona birding “hotspots” (Ramsey Canyon and San Pedro Riparian National Conservation Area), birding injects millions of dollars into communities. The best avitourism approaches promote sustainable economic development while also conserving bird habitat.

Since the state hosts 500 bird species, New Mexico and the Middle Rio Grande region can share in these benefits, and already do to a certain extent. Bird watching alone is significant for New Mexico, and the state ranks fifth nationally with 46 percent of its birders coming from outside its borders. The annual six-day Festival of the Cranes at Bosque del Apache National Wildlife Refuge pumps more than \$2.2 million into the region’s economy. Over the course of the year, the Refuge brings in \$13.7 million from non-residents to the Socorro, Bernalillo, and Sierra counties; along with \$4.3 million in regional tax revenue.¹² New Mexico has also established the Southwest New Mexico Birding Trail, which highlights 40 of the most attractive birding locations in Luna, Hidalgo, Grant, Doña Ana, and Sierra counties.

But more can and should be done, both to protect bird habitat in the Middle Rio Grande and to promote avitourism. National wildlife refuges and other sites may qualify for recognition as Audubon “Globally Important Bird Areas.” A Middle Rio Grande Birding Trail would complement existing habitat management, education and marketing efforts. Restoration projects on public and private lands would improve wildlife habitat and recreation opportunities, benefit agriculture and ranching, and provide local employment.



Sandhill cranes at Bosque del Apache National Wildlife Refuge. © Marvin DeJong

Recreation

Diversion Dam at Algodones is a prime candidate for evaluation, as the drop in gradient at the dam offers a golden opportunity to create a whitewater feature.

2. Evaluate utilizing a small portion of the MRGCD drain system for paddle sport activity. Worldwide, paddlers use watercourses where found. With minor modification a drain can be a canal and be safely used. While there are significant safety issues associated with this concept, an pilot project approach and limiting activity to a defined section of the system could be workable. This concept would have to be carefully designed to not be inconsistent with the use of the drains by MRGCD, would require substantial indemnification responsibilities and could not require minimum quantities of water in drains to support the efforts.

A land and water RGT is a realistic goal. Significant planning for the land trail element of RGT has already been done. Studies completed by the Mid-Region Council of Governments

and New Mexico State Parks have identified a route from Bernalillo to Sunland Park that does not require access to any private property, traversing lands controlled by governmental entities (such as BOR, Middle Rio Grande Conservancy District, U.S. Fish and Wildlife Service, Bureau of Land Management, Pueblos, International Boundary and Water Commission, Elephant Butte Irrigation District). Some trail segments are already complete. In addition, in 2007, the New Mexico State Legislature amended state law to give irrigation districts (including MRGCD) greater protection from trail-related liability in an effort to encourage them to support more trail projects, such as the RGT.

If the RGT is to become a reality, it will require a multi-year effort. Numerous issues, such as routes, access points, and funding for trail design, maintenance and management must be resolved. Interagency cooperation, including partnerships for trail construction and management among local, state, federal (and possibly tribal) entities, citizens, and the private sector



Junior Rangers at the Rio Grande Nature Center State Park. © Karen Herzenberg / Rio Grande Nature Center State Park.

Recreation

will be required. Plans for land and water trails can be implemented gradually if community support and partnerships take root, and public and private resources are brought to bear.

Management and Investment

Recreation in the MRG involves a great number and diversity of agencies and organizations in the public and private sectors. Perfect coordination among these players is perhaps impossible—but better management structures and increased collaboration for funding, management, and promotion of recreation among local, state, federal, tribal and private sector organizations is essential.

Rio Grande Valley State Park is one existing model that has relevance for the entire MRG. Over nearly 30 years, RGVSP has become a significant achievement and a strong basis from which to build recreation partnerships among MRGCD, federal, state, and local governments, and other organizations.



Sandhill cranes at Bosque del Apache National Wildlife Refuge. © Marvin DeJong

Established in 1983, the 4300-acre RGVSP is comprised of the bosque lands in Bernalillo County, extending from Sandia Pueblo through Albuquerque to Isleta Pueblo. The park features several parking lots/trailheads, picnic areas, the 16-mile Paseo del Bosque Trail, some universally accessible trails, and about 30 miles of other interior natural surface trails.

RGVSP is not owned or operated by the State of New Mexico. By direction of the Rio Grande Valley State Park Act, the park is managed cooperatively by the Albuquerque Open Space Division and the MRGCD. The State Parks Division is, however, a signatory on a three-way Memorandum of Agreement and Management Plan that outline the management partnership and the Act does authorize State Parks to expend funds throughout the park as appropriate.

RGVSP has been a good model of MRGCD—local collaboration. It can be emulated in other places in the MRG where local park and recreation departments have the ability to craft agreements with MRGCD and take on additional responsibility. The model also includes a mechanism for State Parks to be involved as a partner with MRGD and local government. State Parks involvement throughout the MRG can have certain benefits, such as: access to capital funds; selective support for operations and management; encouraging consistency in policies, programs, and signage; and leveraging federal funds. In addition, State Parks already has a partnership agreement in place with the BOR, a major player in the MRG. This relationship could serve as the basis for further federal-state-MRGCD collaboration on recreation programs.

Some are of the view that to facilitate better overall recreation management of the MRG, the New Mexico State Legislature should implement

Recreation

the intergovernmental model of the Rio Grande Valley State Park in Sandoval, Valencia, and Socorro counties (excluding Pueblo lands and private lands, and while maintaining hunting opportunities). The success of broader efforts will depend greatly on the RGVSP collaborative model. Multiple agencies at all governmental levels, non-governmental organizations, and the public coming together will need to combine available resources to create better recreational and educational programs in the MRG.

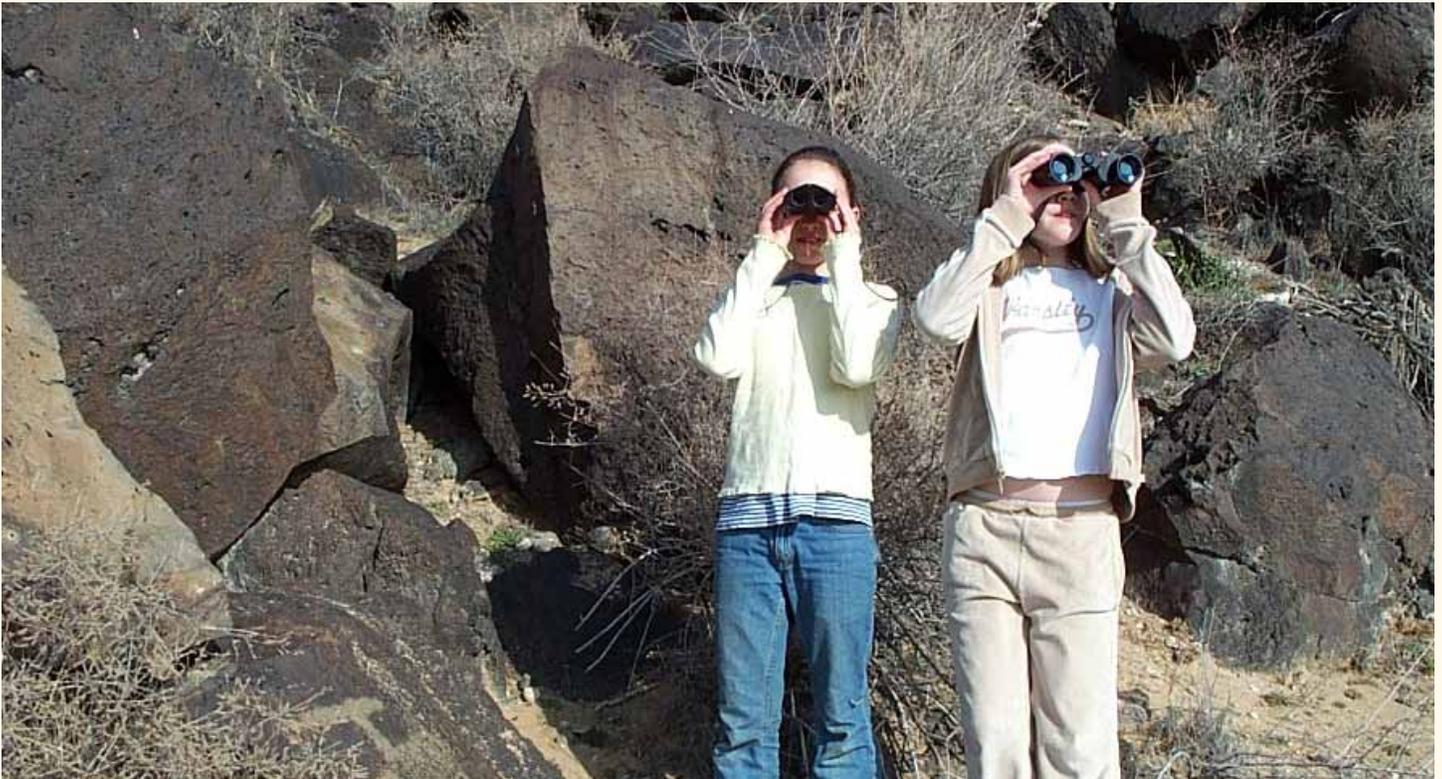
The existing 35 state parks have been negatively affected over the past four years by significant cuts to capital and operations budgets. These cuts should be restored and any expanded State Park role in the MRG must be accompanied by increased funding.

Another important step at the state level that could be important for recreation in the MRG, and for the success of the RGT concept in

particular, involves State Parks and statewide trail programs.

The State Parks Division is the lead state agency for trails. SPD administers the Recreational Trails Program (RTP). This is a “pass through” program that distributes approximately \$1 million in federal funds annually through grants. RTP funds could be an important source for a RGT project and a portion of RTP funds could be prioritized for the land and water trail project in the MRG.

The RTP program requires a match to federal funds of at least 20 percent. While other governmental organizations and local trail project sponsors supply this match, the State of New Mexico itself has no statewide source of trail funds that can be used for project construction, management, and match for federal funds. Creating such a state funding source for trails would be extremely useful in the MRG



Children thrive in nature-based recreation and education programs. © Diane Souder

Recreation

and statewide. SPD also administers the New Mexico State Trails System Act, which was passed in 1973. However, State Parks lacks sufficient authority under the Act, however, to oversee construction and management of longer, regional-scale trails that may extend beyond the boundaries of state parks, and lacks the authority to play a strong partnership role in a regional trail project like the RGT.

Even if sufficient authority did exist, it is not recommended that a single State agency be the lead on this effort. There are numerous examples throughout the nation of successful long distance trails projects that were led by either non-profit organizations and/or an assortment of both non-profit organizations and a collection of agencies. Such examples include, but are limited to, the Continental Divide Trail, the Arizona Trail and the Ozark Trail. These successful models for long distance trail development and management should be emulated in order

to facilitate the success of the of the RGT. The RGT effort should also leverage the strength and knowledge of the National Parks Service, as they currently have the El Camino Real trail that would roughly parallel the RGT. By combining the available resources along the lines of an existing model, the chances of success of the RGT initiative will likely greatly improve.

Finally, the future of the National Park Service in MRG recreation offers interesting potential. NPS is the most important federal conservation and recreation agency that lacks a truly large role in the MRG. While no sites within the MRG are currently being considered for establishment as formal units of the National Park System, there are at least three excellent NPS programs that can do more for the MRG provided sufficient resources are made available:

- **National Historic Trails Program.** El Camino Real de Tierra Adentro National Historic Trail, which is co-administered by the



Rio Grande Nature Center State Park. © Karen Herzenberg / Rio Grande Nature Center State Park

Recreation

Bureau of Land Management and the National Park Service, has a major role to play in the network of conservation-recreation-education sites in the MRG. Protection of irreplaceable trail resources should remain foremost, but there are also immediate opportunities to enhance several extremely significant sites for more public enjoyment and education. (See end of the chapter.)

- **Rivers, Trails and Conservation Assistance Program.** RTCA is the community assistance arm of the National Park Service, supporting community-led natural resource conservation and outdoor recreation projects. RTCA staff provides technical assistance to communities so they can conserve rivers, preserve open space, and develop trails and greenways. RTCA is also playing a growing role in national efforts to connect healthy physical activity/recreation to parks and green spaces. NPS has supported several local trails and open space projects in the MRG and with adequate funding can continue and expand these efforts.

- **National Heritage Area Program.** (See Conservation Chapter).

Based on all of the region's assets and present conditions, the MRG has the potential to support significant new recreation/tourism-related activity and replicate economic benefits that have been achieved on other river corridors across the United States. The Middle Rio Grande is ripe for efforts to increase land- and water-based recreation.

Success in this endeavor will require public investments and extensive partnerships. Most citizens agree with the concept that recreation programs should be supported by a combination of government tax dollars, recreational user fees and permits, and commercial use fees. Many existing local, state, federal and non-governmental funding sources could play a role in the MRG recreation investments.



Chupadera National Recreation Trail at Bosque del Apache National Wildlife Refuge. © Daniel Perry / USFWS.

Recreation Recommendations

Existing programs within agencies such as BOR, USACE, FWS, BLM, and NPS can channel federal funds into recreation. State agencies such as DGF and SPD administer funds for boater access, trails and local recreation improvements that can be targeted to serve the MRG. The State of New Mexico can also contribute capital outlay appropriations and marketing efforts by the Tourism Department. Indeed, promoting outdoor recreation is completely consistent with the State's new tourism branding campaign ("True"), which emphasizes opportunities for active, authentic experiences. Local entities should determine from a polling of their constituencies whether they would like to utilize budgets and bonding capacity to generate funds that can be used to match federal and state funds.

New funding initiatives will, however, be necessary for the MRG to reach its potential for outdoor recreation. In addition to the capital investments necessary for land and water access points, increased operating funds for recreation management are essential. Of critical importance is increased, dedicated funding for the state and local park and recreation agencies that are likely to be the primary partners with MRGCD in managing recreation in the MRG.

Recreation Recommendations:

The Middle Rio Grande Region Should Embrace, Promote, and Invest in Outdoor Recreation

 Rio Grande-based recreation should be integrated into the daily life of area residents. A wide spectrum of public and private interests, from government agencies to health care organizations, should collaborate to maximize the Middle Rio Grande's enormous potential for recreation/tourism-related activity and to replicate social and economic benefits that have been achieved along other river corridors. Civic

leadership should prominently embrace the recreation agenda and lead by example.

 Increased resources and investment at the local, state, federal, and tribal levels is necessary to develop and manage a world-class recreation system in the MRG. Federal agencies with a role in the MRG should request funds for recreation investments and management; local and state entities should target certain existing federally-funded programs on the MRG, and if it is the will of their constituents, utilize operating budgets, bonding capacity and new funding initiatives to generate new funds for recreation and leverage federal matching funds. Funding for trails is particularly important.

 Agencies and organizations within the Middle Rio Grande should work together to regularly quantify the social and economic benefits of recreation to the region.

Ensure a Healthy, Living River

 While a great deal is yet to be known as to what characteristics make up a "healthy" Rio Grande, working with the endangered species experts, the New Mexico State Department of Fish and Game and other experts within the MRGCD and other political institutions, the goal should be to develop ecosystem processes that sustain habitat and wildlife on public and private lands, hunting opportunity, birding, paddle sports, and other recreation activities. To the extent that water conservation and water rights purchases from voluntary sellers can generate water for supporting natural systems that support recreation leases and systems, this should be carried out.

 Consistent with the existing law of the river and vested rights in water, should assess options and implement

Recreation Recommendations

 Water owners and managers should assess options and implement steps to better manage river flows to support paddle sport recreation.

Complete and Link a “String of Pearls”

 Complete and link a “String of Pearls”—a world-class park network of publicly accessible sites along the MRG that offer conservation, recreation and education activities and benefits. Implement a program based on public and community involvement for increased recreational access within the MRG that is: compatible with the resources, avoids sensitive areas, based on biological and social indicators, and has careful management and monitoring. This program should include the planning, construction and management of a land & water Rio Grande Trail through as much of the river corridor as is appropriate and feasible, utilizing local, state, and federal partnerships. Public access within the Middle Rio Grande Conservancy District Project lands requires that the BOR and MRGCD develop a clear procedure for granting use. Recreational access and use, including

any river trail(s), must respect tribal sovereignty, private property, and the preferences of local communities.

 Based on public input, local, state, federal (and where appropriate, tribal) entities should identify existing and proposed new access points, recreation sites, and points of interest, focusing especially on sections of the MRG (a) that have less public access opportunities and that have favorable conditions for activities such as walking, biking, boating, birding, hunting & fishing, equestrian uses, and camping, and (b) locations where access is critical to make land and water trail connections. Where appropriate, access points should generally be designed to offer restroom facilities and to accommodate horse and boat trailers.

 Consistent with the law of the River, the Endangered Species Act and the MRGCD primary statutory responsibilities, MRGCD should further enhance support for recreation as a core responsibility, priority management function, and budget item.



Albuquerque is considered one of the best bicycle cities in America—Bosque Bike Path. © Tom Spross

Recreation Recommendations

 Federal agencies should help establish a vision for public access, work with local partners to utilize state-of-the-art design standards for universal access, resource protection and recreation management, and should play a leadership role to enhance and manage recreation in the MRG.

Expand Connections: A “Rio Grande Land and Water Trail”

 A non-motorized, multi-use “Rio Grande Trail” should connect the network of recreation, conservation, cultural, and educational sites and other points of interest in the Middle Rio Grande. This main “backbone” trail should traverse as much of the river corridor as appropriate and feasible, while respecting tribal sovereignty, private property and the preferences of local communities. The “main stem” of a RGT could also create opportunities to establish a system of interconnected trails to the uplands on both sides of the river.

 Evaluate certain areas for additional recreational activity, including hiking and equestrian trail access, such as Bosque del Apache NWR, Sevilleta NWR, and the northern end and western side of Elephant Butte Lake.

 A companion water-based “Water Trail” or “Blueway” also should be implemented and promoted along the Middle Rio Grande to capitalize on the significant underutilized potential for the river to support water-based recreation, tourism, and education.

 A comprehensive “paddle sports plan” should be implemented. This plan should prioritize formalized river access improvements at key sites, examine the potential for in-stream features to improve recreation, water safety, and habitat/fish passage (e.g., at the Angostura and/or other diversion dams), and identify a location for a pilot project to test paddle sport use at a location on MRGCD drain system.

 Target state funds from existing programs on the MRG to enhance conservation, recreation and education (e.g. wildlife funds, boater access funds, recreational trails, outdoor education, and other programs), and establish new sources of state funds for recreation investments.

 The New Mexico State Legislature should amend the New Mexico State Trails Act to facilitate the state’s role in planning, construction, and management of a Rio Grande Trail.

 Boating safety education efforts, river search and rescue capacity, and signage should be improved and strengthened in association with increased paddle sport recreation activity.

 Identify an existing non-governmental organization, or create a new organization, to partner with government agencies on the development of the RGT.



Horse use along the Rio Grande. © Steve Komadina

Albuquerque River Corridor Improvement Plan

The City of Albuquerque is embarked on a process to identify and complete several large capital investment projects that will shape the future of the community. This effort, lead by Mayor Richard J. Berry, is called “ABQ—THE PLAN.” The objectives of the effort are to “build on city assets, leverage public/private partnerships, take a regional approach, and invest in the future while honoring the past.” The City intends to use general obligation bond funding, as well as seek other funding, for these investments.

Not surprisingly, a focus on the defining natural and cultural feature of the City—the Rio Grande—was identified early on as a priority project. During 2012, the City will spend \$150,000 to prepare an “Albuquerque River Corridor Improvements Plan,” which will propose enhancements to areas along the Rio Grande for visitors to Albuquerque and to improve access and quality of life for local residents, focusing on seven major river crossings.

On the Albuquerque reach of the Rio Grande, the bosque between the levees is designated as Rio Grande Valley State Park, which is managed by the City under an agreement with the Middle

Rio Grande Conservancy District and New Mexico State Parks. The immensely popular 16-mile Paseo del Bosque Trail parallels the river on the east side and the City Open Space Division maintains other trails and several popular access points on both sides. Overall, direct access to the river should be greatly improved and expanded, and there is much potential to achieve recreation, education, and economic benefits through careful improvements.

“My whole goal is to bring the river more into our daily lives,” says Mayor Berry, an outdoor recreation enthusiast. “The best way to protect something is to have someone fall in love with it.”

Detailed proposals for improvements will be forthcoming, and will be reviewed by the community and affected entities, but the general objectives of the Albuquerque River Corridor Improvements Plan are consistent with those of the America’s Great Outdoors initiative and this Middle Rio Grande report. Appropriate state and federal agencies should coordinate and collaborate with the City as the process moves ahead.¹³



Bridge access point concept. © City of Albuquerque

Recreation Recommendations

Support Sportsmen and Non-Consumptive Wildlife Opportunities

 Hunting and fishing opportunity on public and private lands in the MRG should be enhanced through improving wildlife habitat and increasing access. Some public protected lands, such as the Ladd Gordon Wildlife Complex (La Joya, Bernardo, Casa Colorado, and the Belen Wildlife Areas) have potential for wildlife enhancement projects that would benefit year-round wildlife (such as wild turkey, quail, pheasants), and provide new hunting and wildlife watching opportunities in addition to maintaining the areas' principal purpose as migratory bird habitat. FWS should evaluate expanding hunting opportunities on Bosque del Apache NWR.

 Consistent with the law of the River, the Endangered Species Act and the MRGCD primary statutory responsibilities, MRGCD should increase access and the New Mexico Dept. of Game & Fish should increase stocking efforts in the irrigation network to enhance angler opportunity; emphasis for increased stocking should be on trout so as to avoid increasing populations of fish species that are predators on the silvery minnow.

 A Middle Rio Grande Birding Trail should be established and promoted to capitalize on the outstanding birding opportunities in the region.



Hunters in the La Joya Game Refuge Wetland Complex. © NMGF

Recreation Recommendations

Improve Partnerships and Communication

 Recreation programs throughout the Middle Rio Grande should be coordinated among local, state, federal, tribal and private sector organizations. State and federal agencies and the private sector should coordinate and partner with local government efforts on more detailed implementation plans to improve land and water access and recreation, such as the City of Albuquerque’s “River Corridor Improvements Plan” (part of “ABQ-The Plan”).

 Increased collaboration with the Middle Rio Grande Conservancy District is the highest priority for recreation. Local, state and federal entities should expand partnerships with MRGCD to improve and manage recreational sites and

activities, amending existing agreements and creating new agreements where necessary.

 USACE should continue to incorporate recreation components into its MRG revitalization/restoration projects and should include trail and other recreation features in any future levee reconstruction projects. Congress should reauthorize and fund the Rio Grande Environmental Management program, which will also benefit recreation programs; USACE should increase spending limits on recreation features in projects from 10 percent to at least 33 percent without affecting funding for levee projects. Local sponsors also have the option of constructing additional recreation features within their authorities, and should do so to the extent of their ability.



A mosaic panel in the Protect Our Wildlife Corridors Community Mosaics, Placitas, NM. © Cirrelda Snider

Recreation Recommendations

-  Implement the intergovernmental model of the Rio Grande Valley State Park in Sandoval, Valencia, and Socorro counties (excluding Pueblo lands and private lands, and while maintaining hunting opportunities).
-  Congress should appropriate the funds necessary to address immediate needs and opportunities to enhance public engagement with El Camino Real de Tierra Adentro National Historic Trail within the MRG.
-  Congress should request the National Park Service study the MRG's significance and feasibility for designation as a National Heritage Area and should adequately fund the NPS Rivers, Trails, and Conservation Assistance Program to provide continued technical assistance throughout the MRG.
-  A consolidated, centralized information source on recreation in the MRG should be developed (such as a comprehensive website, along with other modern technology and information sources), along with a comprehensive system of way-finding and interpretive signage. This effort could dovetail with efforts by the federal agencies under the America's Great Outdoor initiative to combine various types of public lands information into centralized sources.



Equestrian recreation is popular in the Middle Rio Grande. © Steve Komadina

Camino Real de Tierra Adentro National Historic Trail

El Camino Real de Tierra Adentro (Royal Road of the Interior) National Historic Trail recognizes the primary route between the colonial Spanish capital of Mexico City and the Spanish provincial capitals at San Juan de Los Caballeros (1598-1600); San Gabriel (1600-1609); and then Santa Fe (1610-1821). This road served as New Mexico's lifeline with Mexico for 223 years.

Congress added El Camino Real to the National Trails System in October 2000. The historic trails generally consist of remnant sites and trail segments and thus are not necessarily contiguous. Such is the case with El Camino Real NHT, which traverses the dramatic desert landscape of the Rio Grande Valley, past numerous prominent natural landmarks and historic sites, and through some urban areas.

El Camino Real NHT extends 404 miles from El Paso, Texas, to Ohkay Owingay, formerly San Juan Pueblo, New Mexico (the total is 654 miles when all variant/alternative trail routes are included). Approximately 205 miles of the NHT are within the Middle Rio Grande region. Bureau of Land Management and National Park Service are charged with joint planning and administration of the trail. A Comprehensive Management Plan/Final Environmental Impact Statement for the NHT was finalized in September 2004.

El Camino Real NHT is an ideal framework for America's Great Outdoors efforts in the Middle Rio Grande. The NHT connects places, landscapes, and cultures across time better than virtually any other single program. As such, conservation, education, and recreation activities associated with El Camino Real NHT can play a significant role in efforts to protect this regional landscape and make it accessible and meaningful

to the public. It is important to remember, however, that the NHT's purpose is to link activities to authentic, well-protected trail resources and that there is a key distinction between El Camino Real NHT and other places where the primary focus is active, multi-use trail recreation (such as the proposed Rio Grande Trail).

Since the designation of El Camino Real NHT in 2000, a great deal has been accomplished to identify, document, map and interpret the trail. Enhanced efforts and support are needed, to maximize benefits of the trail under the umbrella of America's Great Outdoors and Middle Rio Grande Conservation Initiative. Priorities include:

Raise Awareness. Public recognition and awareness of El Camino Real NHT is increasing, but should be dramatically improved. The public lacks understanding about where to experience the NHT within the Middle Rio Grande, especially north of the El Camino Real International Heritage Center (the facility along I-25 operated by the New Mexico State Monuments Division). Better awareness will translate into more tourism, public education, and care for the NHT.

- Improve "way finding:" Local and federal entities need funding for better signage.
- Emphasize more accessible local tour routes: the long "auto tour" route approach is not working well; shorter side trips will encourage drivers to exit I-25 to see NHT-related sites.
- Take the Trail on the Road: A full-time education specialist with NPS or BLM would increase programming and establish a strong awareness/presence for the NHT throughout the region.

Camino Real de Tierra Adentro National Historic Trail

Fund Enhancements at a Network of

“Exemplary Places: There are immediate opportunities to improve a network of “exemplary places” along the NHT route for the public to learn about and appropriately “touch” the trail without adversely impacting historical resources. The communities that contain these sites would benefit, but must decide if they want to host more NHT visitors (and then be integrally involved in planning and programs if they chose to). A few priorities for investment in the MRG (listed from south to north), include:

- **Fort Craig:** This BLM-managed site is open 7 days/week, but gets only 250 visitors per month. Fort Craig offers outstanding views of key features the NHT story and is a perfect location to increase emphasis on El Camino Real.
- **Point of Lands (Bosque del Apache NWR).** USFWS will complete upgrades and add new interpretive features to a scenic overlook that views the west branch of Camino Real.
- **Socorro Area.** The “Middle Road” in Socorro and the “Bosquecito Road” (a 12-mile segment between Escondido and San Antonio) have excellent trail resources, outstanding educational opportunities and convenient access from I-25.
- **Tome Hill (north of Belen).** NM 47 and NM 123 provide great access to this site, which has great cultural significance and natural history interest, but little NHT educational information.
- **Isleta Pueblo:** The Plaza and church area is a well-documented site in the history of the Camino Real, and the Pueblo was on the retreat path during the 1680 Pueblo Revolt. With the Pueblo’s blessing and involvement, interpretive/educational features could dramatically enhance this location to tell the Pueblo’s story and the Camino Real story.

- **Price’s Dairy (Albuquerque South Valley):** This 570-acre property is slated to become the Middle Rio Grande National Wildlife Refuge. The exact location of the NHT in the area is not known, but it may have in fact crossed the property. This location is a perfect place to interpret Camino Real NHT as the refuge project moves forward.

Protect the Past for the Future. The smartest approach is to work with private land owners and public land management agencies that own NHT trail segments and sites to avert impacts and enhance protection/education.

- **Support the Certification and Challenge Cost Share Programs.** Privately owned high-potential historic sites and segments can be recognized and enhanced through these two voluntary programs. Challenge Cost Share leverages partnership contributions.

- **Address Threats.** El Camino Real NHT faces some significant threats, including impacts associated with off-highway vehicle use, unmanaged public access (which can bring vandalism), general land development, and energy development. (The projected impacts from the proposed Sun Zia power line could be particularly problematic in the Socorro area and east of the river). Local, state, and federal entities should plan and act to avert such impacts. In some cases, mitigation of unavoidable impacts offers potential funding for protection and education elsewhere along the NHT.

Improve Coordination and Partnerships.

BLM and NPS are co-administrators of the NHT, but broader, more integrated efforts are needed. Local, state, federal, tribal and non-governmental organizations should come together into a Trail Consortium or Trail Alliance in New Mexico—which could be based solely on NHTs or could possibly be broader and include other trail constituencies and the proposed Rio Grande Trail as well.

Middle Rio Grande Conservation Initiative

Education

Vision Statement

An educated citizenry that understands, values, and protects the Middle Rio Grande; a population that at all ages is engaged with the natural and cultural resources of the region and that is guaranteed universal access to lifelong, experiential learning opportunities that promote stewardship and inform organizational and community decision-making in the region to foster sustainability.

The Middle Rio Grande: A Vast Outdoor Classroom
Few regions of the world—let alone major cities and population centers—are as blessed as the MRG to have such natural resources and beauty. The ancient Rio Grande and the majestic cottonwood forest that lines the river are a priceless resource. The river corridor is also an incredible, 180-mile long outdoor classroom that offers immense educational opportunities.

The 2011 America's Great Outdoors report put a focus on outdoor/conservation education, especially as it relates to youth. A major goal of AGO is to "cultivate stewardship and appreciation of America's natural, cultural, and historic resources through innovative awareness-raising, partnership initiatives and through education."¹ Achieving that goal will require building programs in environmental and outdoor education, both formal and informal.



Students in the BEMP measure groundwater levels in the MRG bosque. © Kimi Scheerer / Bosque School

Education

The Secretary's Committee endorses the AGO goals with respect to education and public engagement in the outdoors. The Committee recognizes that outdoor/environmental education in general can be accomplished in myriad ways—through personal experiences, formal programming, volunteering, and service learning. The Committee also believes that conservation, recreation, and education programs in the MRG are intertwined and that they should be mutually supporting.

Educational programs in the MRG must provide life-long learning opportunities that serve all ages and demographics. Part of the Committee's charge, however, was to focus especially on the role of school-related education in the Middle Rio Grande and in particular, on education in the outdoor setting.

The Middle Rio Grande is a tremendous learning laboratory. The challenges of managing this important natural resource provide a real world learning context for students of all ages. Proponents of Science, Technology, Engineering and Mathematics (STEM) Education, Environmental Literacy, Outdoor Education, and 21st Century Learning Skills can utilize the MRG as a rich learning environment that crosses all disciplines. Students learning along the MRG will come face-to-face with the very same challenges scientists and resource managers are focusing on today.

Environmental education (also referred to as "outdoor/environmental education in this Report) emphasizes the study of the relationships and interactions between dynamic natural and human systems. Environmental education teaches children and adults how to learn about and investigate their environment, and to make intelligent, informed decisions about how they

can take care of it. It is taught in traditional classrooms, in locations throughout communities (e.g., at businesses, water treatment facilities, and recycling centers), and in settings like nature centers, museums, parks, zoos, farms, ranches, and school gardens. Environmental learning locations can be a bus ride away or right outside the classroom door. No matter the setting or the subject, environmental education should take a non-partisan approach.

Outdoor/environmental education reaches across the spectrum of humans' relationship to the Earth—from energy issues to food/agriculture to conservation biology. Understanding how the environment works, and keeping it healthy, involves diverse knowledge and skills. Outdoor/environmental education is often interdisciplinary because learning about the environment involves many subjects—earth science, biology, chemistry, social studies, even math and language arts.

Outdoor/environmental education is best often accomplished through student-centered, inquiry-driven, experiential learning that engages higher level thinking skills and is relevant to everyday lives. Environmental education works extremely well with outdoor, place-based learning approaches and when it is taught in an organized sequence. Curriculum approaches that involve regular, repeat visits to outdoor classroom locations as part of hands-on, field studies are especially effective. These experiences help students learn to observe and measure the functioning of natural ecosystems over time, pursue more involved studies, and develop a "sense of place," appreciation for special places and a community orientation. Done right, outdoor/environmental education correlates to state and national learning standards, and assists classroom teachers meet their basic learning objectives.

Education

Rio Grande Children's Forest

The U.S. Forest Service Southwest Regional Office, National Hispanic Cultural Center (NHCC) and Coronado Elementary School (Coronado) will designate 20 acres of forest along the Rio Grande within the City of Albuquerque as a Children's Bosque (forest).

The purpose of the Children's Bosque and its future programs is to develop these 20 acres, which are adjacent to the NHCC, as an attractive and known outdoor destination for children and families and to link that space and the urban community that uses it with the National Network of Children's Forests. This project was developed by local parents and community leaders committed to community revitalization

and creating culturally-relevant, meaningful, healthy, outdoor experiences for urban kids and families.

The Children's Forest project is the embodiment of America's Great Outdoors vision. The Children's Forest designation will be used as a springboard to involve other federal agencies and local partners in its successful and sustained implementation. The goal of the Children's Bosque, and the innovative partnership that will support it to reconnect underserved, urban youth and families to healthy, outdoor activities within walking distance from their home or school in a way that is culturally relevant and meaningful given downtown Albuquerque's diverse culture and landscape.

Problem based learning in this real world context increases student motivation, improves higher-order thinking skills, increases collaboration, supports growth in self-direction, and leads to academic gains.² In addition to the "3Rs" needed

as a necessary foundation for all learning, student achievement in the areas of critical thinking and problem solving, communication, collaboration, creativity and innovation are being recommended as critical education and workforce skills.³



Children's forest. © Karyn Stockdale / Audubon New Mexico.

Education

Informal educational experiences along the MRG, activities that are self-directed and outside the formal educational system, are also important learning opportunities in the 21st Century. Education researchers have found that important elements in science learning environments:

...engage participants in multiple ways, including physically, emotionally, and cognitively; encourage participants' direct interactions with phenomena of the natural and designed physical world largely in learner-directed ways; provide multifaceted and dynamic portrayals of science; and build on learners' prior knowledge and interests.... [and that] Members of cultural groups develop systematic knowledge of the natural world through participation in informal learning experiences and forms of exploration that are shaped by their cultural-historical backgrounds and the demands of particular environments and settings. Such knowledge and ways of approaching nature reflect a diversity of perspectives that should be recognized in designing science learning experiences. ⁴

Thus the MRG can support a wide variety of educational activities appealing to learners across all ages and cultural backgrounds.

Environmental education is relevant to all age groups. The pre-K through 12 age range is of special concern, however, due to long-term influences of learning on children and young adults and the urgency of improving America's educational system. The America's Great Outdoor report also noted the importance of school-based programming:

Many comments noted that particularly in fiscally challenging times like today, programs that promote environmental education are pushed aside. Therefore, our children are losing a primary point of early exposure to nature and natural systems that can spark their imaginations and drive them to become a scientist, innovator, conservationist, poet, or community leader. Nongovernmental organizations, religious institutions, and others are stepping in to provide varied environmental education opportunities, but, participants said, as wonderful and effective as some of these programs are, they cannot reach all the children who would benefit from them, as school programs would.⁵

Why is outdoor/environmental education important? Our nation's future relies on a well-educated public to be wise stewards of the environment that supports us today and must sustain future generations. It is environmental education which can best help us as individuals make the complex, conceptual connections between economic prosperity, benefits to society, environmental health, and our own well-being. Ultimately, the collective wisdom of our citizens, gained through education, will be the most compelling and most successful strategy for environmental management. Environmental education is therefore essential to develop awareness, increase knowledge, build skills, and create the capacity for the resource stewardship, good citizenship and decision-making that is required by individual citizens and the broader society.

Outdoor/Environmental Education in New Mexico
Perhaps due to the beauty of our state, the economy's connection and reliance on natural resources, the popularity of the outdoors, and the good fit between nature and learning, New

Education

Mexico has recognized the importance of outdoor/environmental education.

The MRG has a network of outstanding outdoor/environmental learning locations, facilities, and programs. Many schools, government agencies, and non-profit organizations have strong efforts in place (see list of outdoor environment education providers at the MRG at the end of this chapter, and Appendix D).

Local, state, and federal agencies deliver on-site programming at parks, forests, refuges, open space, gardens, farms, and other types of natural lands, historic and cultural sites, and conservation areas. A good network of outstanding outdoor classroom locations already exists in the MRG corridor. These types of locations are critical to delivery of environmental education programming because they have the resources and facilities that provide the basis for learning, as well as staff and volunteers to deliver programming. Non-profit and for-profit organizations also bring programming to public lands and facilities through partnerships with host agencies. The private sector network, along with many government agencies, delivers programming to a wide variety of locations, such as schools, camps, community centers.

Some truly outstanding programs are operating in the MRG. Educational programs at national parks, forest, refuges, and other public land sites serve tens of thousands of people of all ages. The Open Space programs for both Albuquerque and Bernalillo County have top notch visitor centers and top-notch programming. Rio Grande Nature Center State Park serves over 12,000 people annually with its education programs. Thousands of school children every year attend programs at the New Mexico Museum of Natural History and Science, and the Museum's

Sandia Mountain Natural History Center serves about 12,000 students annually (mostly 5th graders in Albuquerque Public Schools). The Albuquerque-Bernalillo County and Rio Rancho water utilities offer water conservation and management education. Organizations such as Audubon New Mexico and the New Mexico Department of Game and Fish emphasize wildlife-related education, delivering programs throughout the region.

Both MRGBI and MRGESCP, the two largest federal MRG restoration programs, have played a significant role in education. From FY1994-FY2009, MRGBI funded 76 educational/outreach projects, including the development of the Bosque Education Guide, support for the Bosque Ecosystem Monitoring Program (BEMP), programs at some of the Pueblos, and other projects—including an excellent 30-minute educational video about bosque restoration.

MRGESCP facilities regarding listed species have done some education and outreach, which includes the USFWS operated Silvery Minnow Sanctuary Outdoor Education Center near downtown Albuquerque. In addition, some MRGESCP member agencies provide funding support to exemplary education programs such as BEMP, and the Bosque Education Guide (e.g. FWS, MRGCD, USACE).

The Bosque Ecosystem Guide, developed with funding from the MRGBI and supported by FWS and partners, has trained over 1,500 teachers in how to utilize the bosque for learning. BEMP, a joint effort coordinated by the University of New Mexico and Bosque School, uses students to monitor and collect long-term data at 25 research sites within the MRG. Over 5,000 students have participated in the BEMP program.

Education

According to the New Mexico Public Education Department, of the 337,225 students in public and charter schools in New Mexico, 146,350 (43%) are in the five school districts within the MRG (Bernalillo Public Schools, Rio Rancho Public Schools, Albuquerque Public Schools, Belen and Socorro Consolidated Public Schools). The Albuquerque Public School system alone has almost one-third (approximately 90,000) of the state's K-12 students. Unfortunately, it is not known exactly how many students in the MRG get some form of outdoor/environmental education, or how many teachers get training in this area. But it is clear that many do benefit from classroom programs and placed-based learning.



Hiking through willows along the Santa Fe River.
© Karyn Stockdale / Audubon New Mexico.

The reality is, however, that the extent and quality of environmental education in the MRG (and New Mexico generally) is widely variable and the subject lacks sufficient support overall. The Golden Apple Foundation of New Mexico, which recognizes teachers at the top of their profession, recently convened a workshop of master teachers and other education practitioners that focused on the status of environmental education in New Mexico. The report from the workshop stated:

Many New Mexico students at various grade levels do currently benefit from excellent and diverse environmental education programs, which are offered by schools, government agencies, and non-profit organizations. But while some outstanding efforts are in place and great strides have been made, current efforts are not sufficiently supported, nor does New Mexico have a truly universal and coordinated program that provides opportunity and education value to all students from K-12. In fact, New Mexico is now slipping from the front rank in this subject area, as other states complete environmental literacy plans, implement more robust and consistent efforts, and devote more resources to this subject.⁶

Experts commonly agree on the basic obstacles to expanding and improving the quality of outdoor/environmental education programs. The Golden Apple report, along with a survey of educators and a report completed by New Mexico State Parks in 2004, identified core challenges that need to be addressed, which include:

- Lack of funding, especially for transportation to support study trips and field-based learning.

Education

- Lack of classroom materials and supplies.
- Lack of adequate teacher training—many teachers lack the depth of knowledge necessary to teach environmental education using an integrated, inquiry-based approach.
- Lack of staff and skilled educators who can deliver high quality programs in partnership with teachers, both in schools and outdoor classrooms, so that teachers do not bear the entire burden.
- Lack of support from the state Public Education Department, districts, schools, and teachers.
- Too much attention to Standards-based Assessment, which requires considerable time for testing, places too much emphasis on reading and math instruction in isolation, imposes

scripted programs, and diminishes attention to science/social studies—subjects necessary for a deep understanding of the world.⁷

Public input to this Report confirmed all of these issues as the primary hindrances. Plus, the current educational effort in the MRG has room for improvement in other areas.

Water resources and water conservation education in the MRG, which are fundamental long-term to the health and restoration of the river, are uneven across the region. Implementation of difficult choices in State and Regional Water Plans will require an informed citizenry. If there is to be environmental literacy in the MRG, it needs to start with water resource literacy.

The State of New Mexico does not have an approved Environmental Literacy Plan (ELP). An ELP creates the framework for standards,



Junior Rangers explore the Rio Grande Nature Center State Park. © John Peterson / U.S. Army Corps of Engineers

Education

achievement, professional development, assessment, and leadership for individuals and organizations to thrive and achieve innovation in education. ELPs typically describe how state agencies will measure the environmental literacy of students, assess curriculum content standards for adequacy, outline professional development programs for teachers, address the relationship of environmental literacy to graduation requirements, and describe how the plan will be implemented. Having an approved ELP may also qualify states for new federal support for outdoor/environmental education if the proposed “No Child Left Inside Act” (S. 1372, H.R. 2547) becomes law and is funded.

Federally- and state-funded water resources and river restoration projects do not all include education elements; they should, and they should automatically devote a percentage of project budgets to education components.

The lack of some recreational access to the river and bosque limits educational opportunities. The MRG also lacks a comprehensive system of educational/interpretive signage that can serve the general public.

An Educational Effort to Match the Scenery

There is a pressing need to expand and improve environmental education throughout New Mexico’s schools in pursuit of environmental literacy for children and adults. This literacy is key to the successful enjoyment, conservation and restoration of the natural and cultural resources of the MRG.

The Secretary’s Committee sees immense potential for the natural and cultural assets in the MRG to support lifelong learning. With almost 50 percent of New Mexico’s school children, and 50 percent of the State’s population in the MRG, the opportunity to have a major impact on learning and academic advancement through outdoor/environmental learning is immense.

In the schools, as current curriculum standards are replaced by the new Common Core Standards and more emphasis on Project Based Learning, it will be easier to incorporate outdoor/environmental education and the discipline is well-positioned to help teachers deliver results.



Environmental education is a major component of the Youth Conservation Corps program. © Ariana Delmerico / Rocky Mountain Youth Corps

Middle Rio Grande National Wildlife Refuge (Price's Dairy)

The 570-acre property known as Price's Dairy is slated to become the first urban national wildlife refuge in the Southwest. The property is located in the South Valley of Albuquerque, five miles south of downtown, 1.7 miles north of the Pueblo of Isleta, and directly adjacent to the river and bosque in Rio Grande Valley State Park. The site is the largest remaining agricultural parcel in the area.

Establishing the Middle Rio Grande National Wildlife Refuge (tentative refuge name) will encompass virtually every major goal of the America's Great Outdoors program and will significantly enhance conservation, recreation, and education in the region. In September 2011, Secretary of the Interior Ken Salazar signed the Land Protection Plan authorizing acquisition of the land.

The site is an important waypoint on the Rio Grande flyway for migratory birds such as sandhill cranes, snow geese, and duck species. Permanently safeguarding the land will add to the network of protected areas along the river and contribute to landscape-level conservation, protecting values that would be lost to development. The property has extensive senior water rights, which can be used for on-site restoration and Rio Grande environmental flows.

A visitor center and programs will bolster environmental education for students and visitors of all ages. Hands-on agricultural programs and demonstration projects can sustain an important connection to the area's agricultural traditions. Diverse programming will connect young people and urban residents to the natural world.

The Refuge will offer recreation opportunities of its own, and could be a prime recreation access point to the bosque and the proposed Rio Grande Trail (RGT). The RGT is envisioned to parallel the river and connect to the existing paved Paseo del Bosque Trail, which now terminates north of the property. It may also be feasible to establish a boating access point on the river in this vicinity. The new Refuge will stimulate economic benefits as a regional and national tourism attraction and through local spending on operations.

Acquisition costs are expected to be \$15—23 million. The County of Bernalillo has committed \$5 million toward acquisition. The balance of funds will come from federal Land and Water Conservation Fund appropriations, support from other federal agencies, and additional local and state partners. For more information: www.fws.gov/southwest/refuges



Price's Dairy. © USFWS

Education

The linear corridor, where the public is never far from an outdoor classroom location, makes outdoor/environmental education in the MRG well-suited to have a large impact. When accompanied with the right interpretation and educational elements, recreation and conservation activity along the MRG can also help connect the public of all ages to learning and to the significance of the river. In addition, since the evidence is that “restoration-based education” works well to support individual learning, enhance biodiversity, and foster community participation across all ages,⁸ the MRG—with its restoration needs—has numerous opportunities on which to build educational programming.

The Secretary’s Committee sees several crucial areas where action is most important:

Sustain and expand outdoor learning locations along the MRG. The MRG should have a linked system of outdoor classrooms and other places that support education, just as it should have a network of conservation and recreation sites linked by road and trail. In some places, new conservation reserves should be established to add more “pearls” to the string, as is the case with the new Middle Rio Grande Wildlife Refuge. (See inset box.) In others, better access to existing lands for educational purposes—within the MRGCD, for example—is necessary. At the same time, operations at the existing locations that are key portals and already serve large numbers of the public with programs must be adequately supported.

Complete the New Mexico Environmental Literacy Plan and link it to the MRG. Some 47 states and the District of Columbia are now

actively developing new or revised ELPs. The Environmental Education Association of New Mexico is using an inclusive stakeholder process to complete the first ELP for our state.

Develop new resources and funding partnerships for outdoor/environmental education.

Federal agencies individually need to step up their support for environmental education, and work with and provide resources to local, state, and non-governmental organizations to serve more people and magnify impact. Plus, any comprehensive federally-authorized Middle Rio Grande program that builds upon the MRGBI and MRGESCP should include an education

Comments from Students

“We need to learn more and more about our world.”

- Belen 4th grader on why their environmental education experience at Whitfield Wildlife Conservation Area is important.

“I learned that I am responsible for the Rio Grande of the future and it is my job to keep the bosque clean.”

- Fourth grade student at Ernest Stapleton Elementary School, Rio Rancho after his class learned using the Bosque Education Guide.

Education Recommendations

component. The State is the primary support for school district budgets, spending over \$2 billion annually. Over the past few years, new outdoor/environmental education programs have received strong support from the Legislature. Unfortunately, the recession forced this funding to decrease—along with severe contraction in the core budgets for key state agencies that deliver outdoor/environmental education programs. As state budgets recover, new dedicated funding for these agencies and for environmental education specifically should be explored, and efforts should be made to secure leveraging support from the private sector as well.

In summary, the Secretary's Committee endorses a statement from the Golden Apple teachers, who represent top educators in our state:

New Mexico should have the nation's best K-12 environmental education program. With its unmatched beauty, huge expanses of open space and natural areas, strong presence of leading scientific institutions, populations and cultural traditions that are tied to the land, legacy of conservation, and the critical importance of wise resource management and the environment to quality of life issues, New Mexico is one of the best places in the U.S. to demonstrate the overall academic, educational, and social value of such a program. New Mexico's environmental education program can and should recognize the state's diverse geography, cultures, and economic activities and it should integrate subjects and perspectives on the environment from numerous points of view.⁹

The Committee urges all MRG stakeholders, but especially the political, educational, and organizational leadership that shape budgets and programs, to dramatically increase

their commitment to environmental education in order to share more widely the wonders of the MRG with the public, and to protect and sustain the MRG for present and future generations.

Education Recommendations

Improve Connections and Partnerships between Schools and Outdoor Classrooms Locations

 Get children to the Rio Grande—via regular, structured, supervised study trips and learning programs.

 Increase capacity to get children into and benefiting from outdoor classrooms: expand transportation programs for study trips, utilize trained and experience educators that work with teachers to lead field study programs, enhance teacher training, and support school-based program developers/coordinators so that classroom teachers are not expected to carry the entire burden themselves.

 Begin with early grade levels and continue with tiered educational efforts that build on prior learning and experiences; every child at certain grade levels should benefit from river-related programming—strongly target 4th and 5th grades.

 Deliver programs aligned with state curriculum requirements that address the new Common Core Standards and take advantage of hands-on, experiential, Project Based Learning strategies.

 Link the MRG to the New Mexico Environmental Literacy Plan as it develops, implementing the Environmental Literacy Plan in the MRG as appropriate.

 By 2017, reach 50 percent of K-12 students every year in the five MRG school districts with environmental education programming; by

Education Recommendations

2022, reach 100 percent of students within the MRG school districts every year.

🚌 The Committee recommends educational programs that focus on agriculture in the MRG. Education that highlights the importance of agriculture to the MRG and surrounding areas, that exposes the public of how their food is grown and to the areas where their food is grown.

Coordinate and Expand Federal Agency Education Efforts

🚌 Congressional statutory authorization for a comprehensive, inter-agency Middle Rio Grande Management and Restoration program that specifically includes education as a significant program element. Integrate significant education components, including a specific funding percentage, into all MRG bosque/habitat restoration and water resource projects.

🚌 Expand federal support for outstanding, successful field-based, experiential learning

programs, such as the Bosque Education Guide program (teacher training), Bosque Ecosystem Monitoring Program, and Project WET.

🚌 Expand federal support for transportation to facilitate field study trips, and establish a robust federal grant program that can support educational programs and partnerships delivered by local, state, and non-governmental organizations.

🚌 Designate a lead agency for coordination of MRG federal agency education programs.

🚌 Use more river/habitat restoration sites, water resource management project sites, and agricultural lands as outdoor classrooms.

🚌 Deploy agency scientists and experts to partner with educators.

🚌 Improve mechanisms for connecting current scientific work to classrooms.



University of New Mexico biology students participate in BEMP. © Kimi Scheerer / Bosque School.

Education Recommendations

 Pursue the Middle Rio Grande National Wildlife Refuge (Price's Dairy), making it a new, exemplary center for environmental education in Albuquerque's South Valley that creatively leverages resources and partnerships.

Strengthen the Network of Governmental and Non-Governmental Environmental/Outdoor Education Providers

 Catalog all existing program and establish a central information point and resource for Middle Rio Grande educational program information.

 Establish a MRG Outdoor/Environmental Education Council that meets regularly to coordinate efforts.

Integrate Outdoor/Environmental Education into Community Life and Lifelong Learning

 Use the MRG and its watershed to create excitement for lifelong learning that engages the

entire community in diverse programs; bring elected officials and decision-makers in as partners in community environmental learning.

 Link outdoor educational efforts throughout the MRG to high priority community education needs regarding water conservation, water quality protection, and fire protection; all water utilities serving the MRG should also be required to implement a water resource management/water conservation education program.

 Link education with recreational activities and opportunities throughout the MRG.

 Implement a comprehensive program of educational interpretive signage throughout the MRG region.

 Celebrate the MRG through regular Rio Grande festivals, river and bosque clean-up days, "community reads," and other community events.



Junior Rangers do science in the Middle Rio Grande. © Karen Hertenberg / Rio Grande Valley State Park

Education Recommendations



Sustainable Funding for Middle Rio Grande-related Education Facilities and Programs

🚌 To implement the above recommendations, increased local, state, federal, tribal and private funding is essential to expand capacity to serve more children and adults and to leverage partnerships.

🚌 Solid operational funding is also critical for sites and facilities that already serve as key portals for the public's outdoor experience and learning in the Middle Rio Grande, for sites operated by City & County Open Space, Whitfield Wildlife Conservation Area, Rio Grande Nature Center and other New Mexico State Parks, New Mexico State Monuments, New Mexico Museum of Natural History and Science, Sandia Mountain Natural History Center, National Hispanic Cultural Center, National Parks, National Forests, National Wildlife Refuges, and BLM sites, Soil and Water Conservation Districts, and tribal education programs. Places such as these are absolutely critical to delivery of environmental education programming.



Top: YCC crew works at the Rio Grande Silvery Minnow Refugia. Right: USFWS Regional Director Tuggle and students release silvery minnows. © USFWS

Benefits of Outdoor/EE and “Environmental Literacy”

Environmental education programs can have tremendous benefits for U.S. society. For example:

Environmental education improves student achievement in core subject areas and supports educational reform. Research has shown enormous beneficial outcomes from environmental education when it is integrated into the core curricula. Schools that integrate environmental education into their academic programs, or use outdoor/environmental subjects as an integrating theme across the curriculum, frequently show better academic performance across the entire curriculum and see reading, science, social studies, and mathematics scores improve.¹⁰ The 2005 Report to Congress submitted by the National Environmental Education Advisory Council on the status of environmental education in the United States finds that “environmental education with its emphasis on critical thinking, interdisciplinary teaching, and learner achievement is also helping to meet educational reform goals.”¹¹

Outdoor/environmental education programs are also perfectly positioned to help schools meet the new Common Core Standards for schools—which emphasize broad concepts, essential questions, inquiry, and critical thinking more than subject-by-subject knowledge prescriptions and sets of facts. The new Common Core Standards will replace many existing curriculum standards in schools over the next few years. Curriculum will be driven by larger essential questions, not subject by subject specific knowledge prescriptions

Environmental education improves the overall approach to learning. Even more importantly for many, environmental education employs and enhances critical thinking and basic life skills. Schools that teach the core subjects using

the environment as an integrating context have also reported: reduced discipline and classroom management problems; increased engagement and enthusiasm for learning; and greater student pride and ownership in accomplishments. The National Science Board of the National Science Foundation confirmed the importance of environmental education to student learning in their 2000 report, “Environmental Science and Engineering for the 21st Century”

The twin goals of learning are to acquire knowledge and gain skills such as problem solving, consensus building, information management, communication, and critical and creative thinking. Environmental issues offer excellent vehicles for developing and exercising many of these skills using a systems approach...changes should be made in the formal educational system to help all students, educators, and educational administrators learn about the environment, the economy, and social equity as they relate to all academic disciplines and their daily lives.¹²

Environmental education gets more students excited about learning who can then use critical thinking skills to become real-world problem-solvers.¹³ Schools that utilize outdoor/environmental based programs can enjoy more support from parents and the community. The Corporation for National and Community Service reports that more than 50 percent of the service-learning programs they fund are focused on the environment.

Environmental education provides critical tools for a 21st century workforce and increases student interest in STEM subjects and careers. Outdoor/environmental education connects classroom learning to the real world. Hands-on and nature-based environmental

Benefit of Outdoor/EE and “Environmental Literacy”

education programs for young students can stimulate interest in science, technology, engineering and mathematics—the “STEM” subjects that are critical to solving global problems and to maintaining America’s competitiveness. Business leaders also see an environmentally literate workforce as critical to their long term success and profitability. Making education relevant to young students is particularly important in attracting more minorities to STEM disciplines and careers.

Environmental education creates an informed citizenry. The vast majority of Americans are convinced that the environment will become at least one of the dominant issues and challenges of the 21st century, as the growing needs of the growing global population increasingly presses up against the limits of the earth’s resources and ecosystems. The National Science Foundation’s Advisory Committee for Environmental Research and Education confirmed this in a 2003 report, noting that “in the coming decades, the public will more frequently be called upon to understand complex environmental issues, assess risk, evaluate proposed environmental plans and understand how individual decisions affect the environment at local and global scales. Creating a scientifically informed citizenry requires a concerted, systematic approach to environmental education.”¹⁴

Environmental education connects youth to the outdoors and can lead to healthier children. Today’s children are spending less time in nature than their parents or grandparents. Children today spend an average of 6 hours each day in front of the computer and TV but less than 4 minutes a day in unstructured outdoor play. This extreme emphasis of indoor time spent in front of screens versus outdoor play

and discovery has been correlated with negative psychological and physical effects. Due in part to the effects of diet and lack of physical activity, one in three American children is overweight or obese. Instances of attention deficit disorders are on the rise; and stress, anxiety and depression rates among youth are increasing. (Some researchers call this phenomenon “nature deficit disorder.”)

What do increased study of science and nature and its increased outdoor time accomplish? Especially in the very young, it has proved in studies extremely beneficial for cognitive functioning, reduced symptoms of attention deficit disorder, increased self-discipline and emotional well-being. Outdoor/environmental education, with its links to outdoor play and activity, can help reduce the disconnect between children and the outdoors, and lead to a healthier population.

Outdoor experiences, including education, also connect people to special places—the forests, parks, rivers, wetlands, mountains and deserts that comprise our public land system, which is one of America’s treasures and a legacy that is owned and entrusted to all Americans.

The product of strong education efforts is a population that is “environmentally literate.” Such persons know:

- That their daily choices affect the environment;
- How those choices can help or harm the environment; and
- What they need to do—individually or as part of a community—to keep the environment healthy and sustain its resources, so that people enjoy a good quality of life for themselves and their children.

Outdoor Environmental Education Providers in the MRG

Albuquerque Bernalillo County Water Utility Authority

- Water Festival
- Around 300 other presentations/year to schools and other groups

Albuquerque Public School District

Audubon New Mexico

Belen Public Schools

Bernalillo County Open Space

- Open Space properties
- Master Naturalist Program

Bernalillo Consolidated Schools

Bosque Ecosystem Monitoring Project (BEMP)—monitors 27 sites; also off-site programs

Bosque School (BEMP and Black Institute)

City of Albuquerque

- BioPark (Zoo, Aquarium and Botanical Garden)
- Open Space Division/Open Space Alliance

Coronado State Monument

Environmental Education Association of New Mexico

Experimental Program to Stimulate Competitive Research (NM EPSCoR)

Greater Rio Grande Watershed Alliance (10 Soil & Water Conservation Districts)

Los Lunas Public Schools

Middle Rio Grande Bosque Initiative

- Bosque Hydrology Group
- Various education programs/projects/publications

Middle Rio Grande Conservancy District

Middle Rio Grande Endangered Species Collaborative Program

National Hispanic Cultural Center

New Mexico Department of Game & Fish

- MRG Game Management areas (La Joya, Bernardo)
- Project WET, Project WILD, Project Learning Tree

New Mexico Office of the State Engineer/ Interstate Stream Commission

- Water conservation education

New Mexico Museum of Natural History and Science—exhibits and education programs

- Sandia Mountains Natural History Center (on-site in East Mts. and off-site programs)

New Mexico State Forestry Division

New Mexico State Land Office

New Mexico State Parks

- Rio Grande Nature Center State Park
- Friends of RGNCSP—docents, festivals
- Bosque Education Guide (teacher training)
- Kids 'n' Parks (transportation grants)
- Elephant Butte Lake State Park

Pueblo of Cochiti

Pueblo of Isleta

Pueblo of Kewa

Pueblo of Sandia

Pueblo of San Felipe

Pueblo of Santa Ana

Outdoor Environmental Education Providers in the MRG

Rio Rancho Parks and Recreation/Friends of Rio Rancho Open Space

Rio Rancho Public Schools—partnership with Southern Sandoval County Flood Control Authority

River Source

Sandia National Laboratories

Soil & Water Conservation Districts

- Watershed Watch
- Rolling River

Socorro Save Our Bosque Task Force

Socorro Consolidated Schools

Storm Team (AMAFCA, NMDOT)

Tree New Mexico

University of New Mexico (BEMP, field work, Natural Heritage Program)

U.S. Bureau of Indian Affairs



Southwestern willow flycatcher.
© Glenn Harper / Pueblo of Santa Ana

U.S. Fish & Wildlife Service

- Bosque del Apache National Wildlife Refuge
- Friends of Bosque del Apache—Eco Lab program
- Middle Rio Grande National Wildlife Refuge (Price's Dairy project)
- Sevilleta National Wildlife Refuge
- Silvery minnow sanctuary/fisheries programs

U.S. Army Corps of Engineers

- Bosque Revitalization Project

U.S. Bureau of Reclamation

- Water Smart Program
- BOR supports ESA Collaborative, helps fund Rolling River program

U.S. National Park Service

- Petroglyph National Monument

U.S. Partnership/Education for Sustainability (UN Program)

U.S. Forest Service

- Proposed Childrens' Forest adjacent to Hispanic Cultural Center

Village of Corrales

Whitfield Wildlife Conservation Area (Valencia Soil & Water Conservation District)

Middle Rio Grande Conservation Initiative

Moving Forward in the Middle Rio Grande

Coordinating America's Great Outdoors Efforts in the Middle Rio Grande

The size and complexity of the Middle Rio Grande has brought a myriad of stakeholders into the region's conservation, recreation, and education issues. This complexity has also bred a variety of formal and informal collaboration, and governance structures related to river/bosque management.

Coordination is a goal and practice among many MRG interests; indeed, it is a necessity. It remains extremely difficult and time-consuming, however, to achieve perfection regarding information sharing, shared management objectives, and program delivery. Nonetheless, coordination efforts have proven extremely valuable in the MRG. There is a compelling need to improve upon them.

Beginning about twenty years ago, new coordinating entities focused on the Rio Grande started to develop. The Rio Grande Joint Initiative, a working group of scientists, water managers, and other agency personnel, was established in 1990. This was followed in 1995 by the Bosque Improvement Group (BIG), a component of the FWS-led MRG Bosque Initiative. BIG met regularly to exchange information and prioritize projects and still meets annually, though the MRGBI has not received federal funding since FY2009. BIG invited wide participation from government and non-government organizations. MRGBI also funded the Bosque Hydrology Group, an interagency effort to coordinate hydrologic information and physical restoration of hydrologic processes.

Following several years of contentious events and legal battles surrounding the endangered species listings of the Rio Grande silvery minnow and Southwestern willow flycatcher, a variety of ad hoc entities attempted to address Endangered Species Act and water management issues. From these efforts emerged the Middle Rio Grande Endangered Species Collaborative Program. Formalized by a memorandum of understanding in 1997, the MRGESCP is currently a partnership of 16 signatories organized to protect and improve the status of the two endangered species while also protecting existing and future water uses. The MRGESCP is currently in the process of considering a transition into a recovery implementation program to expand efforts to recover the two endangered species: Rio Grande silvery minnow and Southwestern willow flycatcher. The MRGESCP supports efforts in water management, species management, habitat restoration, scientific research, and monitoring. It has an extensive committee and work group structure and operates by consensus decision-making. Federal funding for the program is passed by Congress through the BOR which also administers the program. The MRGESCP is managed under an Executive Committee co-chaired by one federal (Department of Interior) representative and one non-federal (State of New Mexico) representative. The MRGESCP involves most, but not all, major players in MRG water and ESA issues. For example, two of the six Pueblos in the MRG are not signatories and some land management agencies that are not closely involved in ESA matters, do not participate.

The Bosque Initiative and MRGESCP, as water and river restoration focused collaborations, generally place more emphasis on conservation

Moving Forward in the Middle Rio Grande

efforts than on recreation and education. However, between 1994 and 2009, The Bosque Initiative funded 76 educational/outreach projects, including the development of the Bosque Education Guide, support for the Bosque Ecosystem Monitoring Program, programs at some of the Pueblos, and other projects. But irrespective of these efforts, of the 22 recommendations in Initiative's Bosque Biological Management Plan, only one is focused on education and one on recreation. Similarly, the MRGESCP does some education and outreach regarding the listed species and some of its members provide funding support to exemplary education programs such as the Bosque Ecosystem Monitoring Program. But the MRGESCP in general, does not devote substantial attention to education and recreation within its organization, decision-making and coordination functions.

In addition, some conservation efforts that are river-related, but are carried out beyond the immediate riparian zone, are less integrated into the existing MRG structures. For example, the diverse agencies and programs that provide conservation assistance on private lands have no formal coordination mechanism. However, the Middle Rio Grande Partnership for Private Lands Conservation has recently brought together several key agencies in this program area (see Appendix C).

There are other multi-program coordination entities, along with vibrant networks of outdoor/environmental education providers and recreation managers, in the MRG. The Save Our Bosque Task Force is a non-profit organization of landowners, citizens, and agency representatives. The Task Force has focused on restoration, education, and recreation in the San Acacia reach of the MRG since 1990, but its efforts are focused more locally.

The Environmental Education Association of New Mexico promotes programs, facilitates information sharing, and is active on policy issues. Governmental and non-governmental members of the Association, along with other education providers, do a substantial amount of partnering. Coordination mechanisms across the MRG for education programs (e.g., to allocate resources and efforts to provide the best coverage possible) could use improvement, however.

Similarly, agencies that manage recreation in the river corridor often have good bilateral relationships (e.g., MRGCD and Albuquerque Open Space Division; Albuquerque Open Space and Bernalillo County Open Space divisions; BOR and New Mexico State Parks), but not integrated coordination. The federal agencies coordinate on specific projects but have no overarching collaborative structure for their recreational programs. The New Mexico Outdoors Coalition also emerged in 2011 as a network focused on a broad range of issues involving connecting people to the outdoors, but the entity is primarily a forum for communication and dialogue. Broader mechanisms for recreation planning, decision-making, and management throughout the MRG do not really exist.

The advent of the America's Great Outdoors Initiative, with its focus on recreation and education and anticipated changes in some of the MRG river-related entities, means that the time is right to re-structure communication and collaboration approaches in the Middle Rio Grande.

The MRGESCP is approaching an inflection point of sorts. As the Program transitions into a Recovery Implementation Program, it is considering inclusion of a stakeholder committee in the governance structure to help inform its Executive Committee as they develop and

Moving Forward in the Middle Rio Grande

implement recovery actions for the minnow and flycatcher. This will be a good opportunity to ensure that recreation or education elements developed through a larger partnership are compatible with the conservation and recovery objectives of the new Recovery Implementation Program. There may also be opportunities to identify collaborations for funding new programs with compatible objectives.

Improving coordination on conservation, recreation and education in the MRG could also involve some other existing organizations and hybrid approaches.

For example, the Mid-Region Council of Governments is the main coordinating structure for political jurisdictions and other local government entities in Sandoval, Bernalillo, and Valencia counties. (Socorro County is a member of the South-Central Council of Governments.) State and federal agencies that play lead roles in the management of the river and bosque, however, are not MRCOG members. MRCOG has an active coordination role in regional transportation and planning issues (including trail issues),

but otherwise does not play a large role in river- and bosque-related resource management issues. There might be an appropriate way for MRCOG to support that kind of role.

Separate coordinating councils for education and recreation that involve government and non-governmental players are an option. The step of extending the partnership approach of the Rio Grande Valley State Park to include more of the bosque in Sandoval, Valencia and Socorro counties would provide a method for integrating recreation management across jurisdictions.

The MRGESCP could also be fundamentally restructured to serve as the umbrella for diverse programs in the MRG, though the program it would need to be broadened, renamed, and its governance structure reshaped to encompass recreation, education, and a wider ecosystem conservation focus while still maintaining the endangered species element. Whether to adapt the MRGESCP or establish a new coordinating structure (or structures) entirely is an open question. Overall, efforts should build on lessons learned from MRGBI and MRGESCP to establish



The Middle Rio Grande Valley. © Marvin DeJong

Moving Forward in the Middle Rio Grande

mechanisms to better identify federal agency leads and coordinate conservation, recreation, and education efforts across local, state, federal and tribal and non-governmental organizations.

Conclusion

There has never been a more critical time to reassess and improve efforts in the MRG. The challenges posed by population growth, persistent drought, climate change, land development, budget pressures and other factors—as well as the opportunities to enhance society through positive conservation, recreation and education programs—make it imperative that all stakeholders better collaborate to improve land and water management.

The MRG is a truly special region with irreplaceable natural and cultural values; it should be a national model for the integration and success of

conservation, recreation, and education programs under the America's Great Outdoors concept. Indeed, the general public wants and demands nothing less than our best efforts. The Secretary's Committee confirmed broad support for comprehensive efforts to protect and restore the natural values of the river, while maintaining centuries-old agricultural traditions/lifeways and expanding diverse recreation and education opportunities.

The conservation issues and challenges facing the MRG are not new, but the times demand new efforts, new resources, and new leadership at the local, state, and federal levels. Like the region itself, our approaches must constantly blend the deep roots of the past with the knowledge and innovation of today. This is the way forward for the MRG, now and forever.



Sandhill cranes at dusk. © Marvin DeJong

Middle Rio Grande Conservation Initiative

Appendix A: Conservation, Recreation and Education

Appendix Map Series Legend

<ul style="list-style-type: none"> • Bridge Over Riverside Drain <p style="text-align: center;">Sites of Interest *</p> <ul style="list-style-type: none"> Conservation Conservation; Also Education Conservation; Also Recreation Conservation; Also Education and Recreation Education Recreation Recreation; Also Education Recreation; Also Conservation Recreation; Also Education and Conservation Bosque Ecosystem Monitoring Program Conservation Education Recreation El Camino Real de Tierra Adentro National Historic Trail Albuquerque Trails Paved Multi-Use Trail Unpaved Trail 	<p style="text-align: center;">Transportation</p> <ul style="list-style-type: none"> Interstate Ramp Primary US or State Highway Secondary State, County, or Local Road or Street Other Road Railroad <p style="text-align: center;">Lakes, Rivers, and Streams</p> <ul style="list-style-type: none"> Perennial River or Stream Connector; Artificial Path; Canal/Ditch Intermittent River or Stream River or Stream Lake or Reservoir City Limit County Boundary Native American Reservation National Forest
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*Index Guide to Numbered Features following maps on Map Series Appendix Pages 15-18.

Data Sources:

The background for the map is a hill shade fused with a cross-blended hypsometric elevation tint. Both the hill shade and elevation component of the hypsometric tint were derived from the National Elevation Dataset 1 arc-second gridded raster. The hypsometric tint was then cross-blended with data derived from the National Land Cover Database (NLCD) of 2006, wherein the NLCD was classified into three different regions: High-elevation Vegetation (coniferous, deciduous, and mixed forests), Low-elevation Vegetation (Herbaceous Wetlands, Emergent Herbaceous Wetlands, and Cultivated Agriculture as well as Pasture), and Middle-elevation Dry (all remaining NLCD classes). The elevation derivatives were then combined with the green band of the 2011 National Agriculture Imagery Program (NAIP) 1-meter imagery. The background is for cartographic purposes only, and therefore no elevation key is provided.

Hydrology consists of data from the National Hydrology Dataset and Conveyances were provided by the Middle Rio Grande Conservancy District.

The El Camino Real de Tierra Adentro National Historic Trail was provided by the National Parks Service. Albuquerque Trails were provided by the City of Albuquerque or collected from 2011 NAIP.

Bridges over riverside drains were derived from 2011 NAIP. Transportation data and incorporated places boundaries consist of ESRI® 2011 Street Map Premium m[ajor] roads, railroads, and city[]im[en]t smart data compression feature classes respectively.

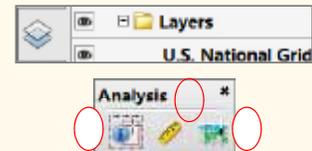
Native American Reservations are derived from multiple sources including the Bureau of Land Management and Bureau of Indian Affairs.

National Forests were provided by the U.S.D.A. National Forest Service. National Wildlife Refuges were provided by various entities within the U.S. Fish and Wildlife Service.

Finally, the Sites of Interest is a compilation of data provided by or derived through sources provided by the following: The Bosque School and Bosque Ecosystem Monitoring Program (BEMP), Benalillo County, the City of Albuquerque, the Indian Pueblo Culture Center, the Mid-Region Council of Governments (MrCOG), the National Parks Service, the New Mexico Department of Game and Fish, the New Mexico State Parks Division, the Save Our Bosque Task Force, the U.S. Army Corps of Engineers Albuquerque District, the U.S. Bureau of Land Management New Mexico State and Socorro Field Offices, the U.S. Bureau of Reclamation Albuquerque Area Office, the Whitfield Wildlife Conservation Area / Valencia County Soil and Water District, and the combined knowledge of the authors of this report.

North American Datum of 1983 / World Geodetic System of 1984
Projection and 1,000 meter grid
Universal Transverse Mercator, Zone 13S

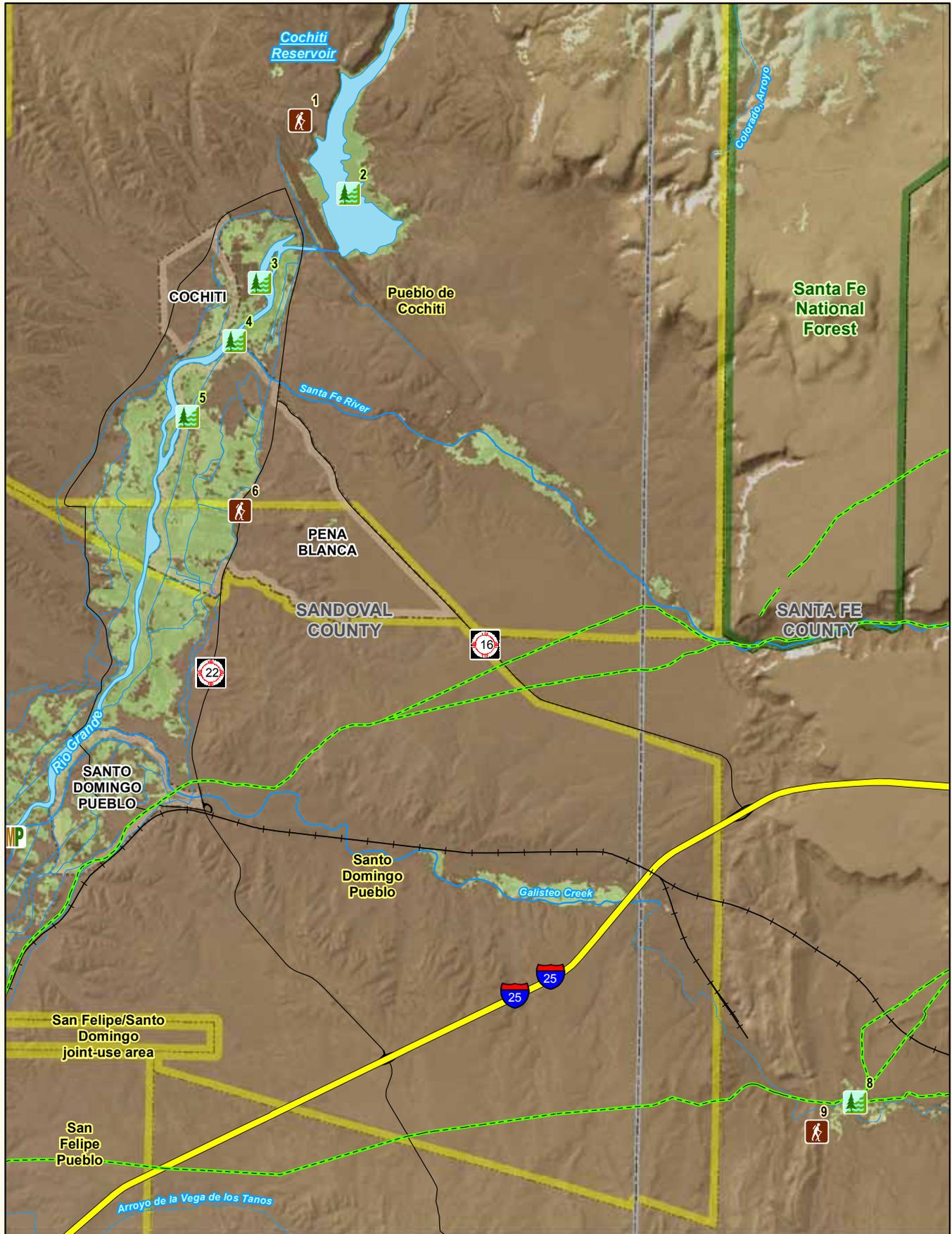
U.S. National Grid
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3900 BV CV
3800 BU CU
3700 BT CT
3000 BS CS
30
Grid Zone Designation
13S



Maximum functionality for the Map Appendix is achieved using [Adobe Reader](#) or Adobe Acrobat. Map layer visibility can be toggled using the Layer Panel. Sites of Interest can be investigated with the 1) Object Data tool and distances and coordinates can be derived with the 2) Measuring and 3) Geospatial Location tools on the Analysis Toolbar (Acrobat) or Edit>Analysis> menu (Reader).

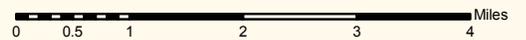
No warranty is made as to the accuracy, reliability, or completeness of data used herein. This product was produced using the best data available at the time of production; however, spatial information may not meet national map accuracy standards. The information depicted, though derived from authoritative sources, should not be considered authoritative with respect to boundary delineation. Sites of Interest point features are displayed using cartographic representations where data density clustering prevent the features from being depicted in their precise location, and therefore may be displayed up to 1 kilometer from their actual location. This map series is not intended for navigation. Refer all inquiries about this product to:

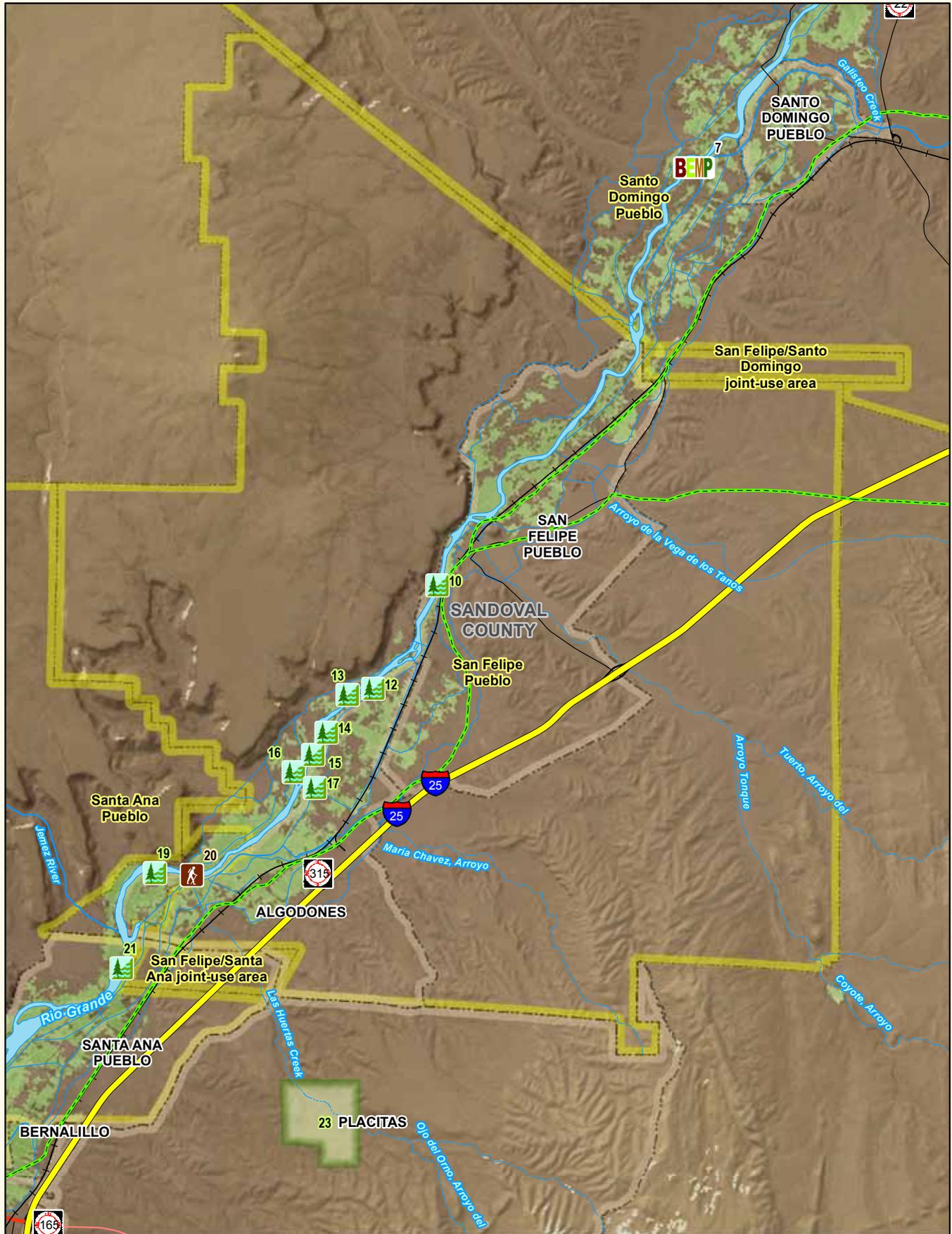
U.S. Bureau of Reclamation, Albuquerque Area Office
ATTN: Facilities and Lands Division
Contracts & Lands Group, Mail Stop ALB-424
555 Broadway NE
Albuquerque, New Mexico 87102



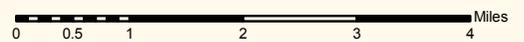
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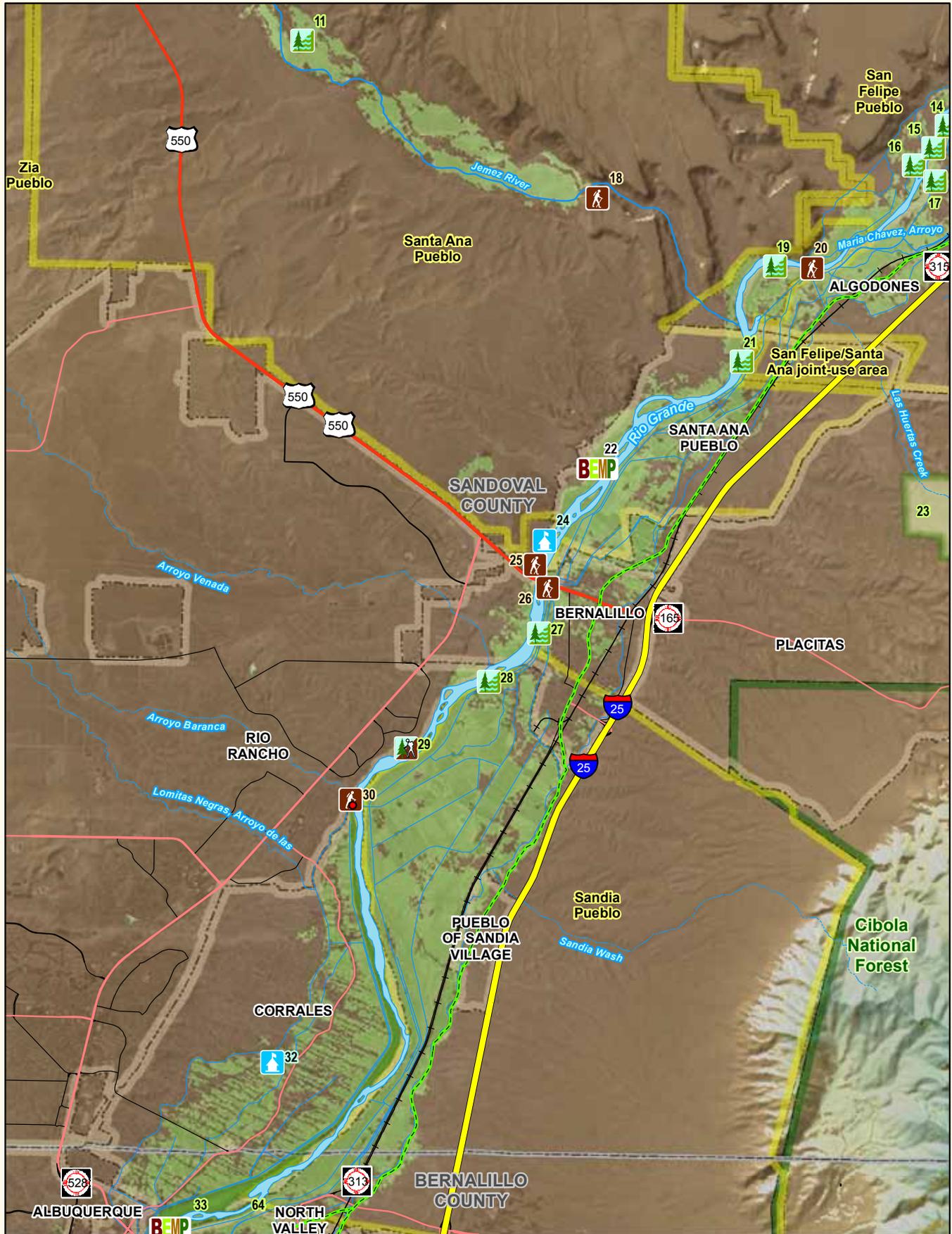
▼ San Felipe Pueblo ▼



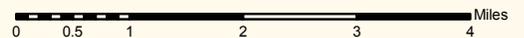


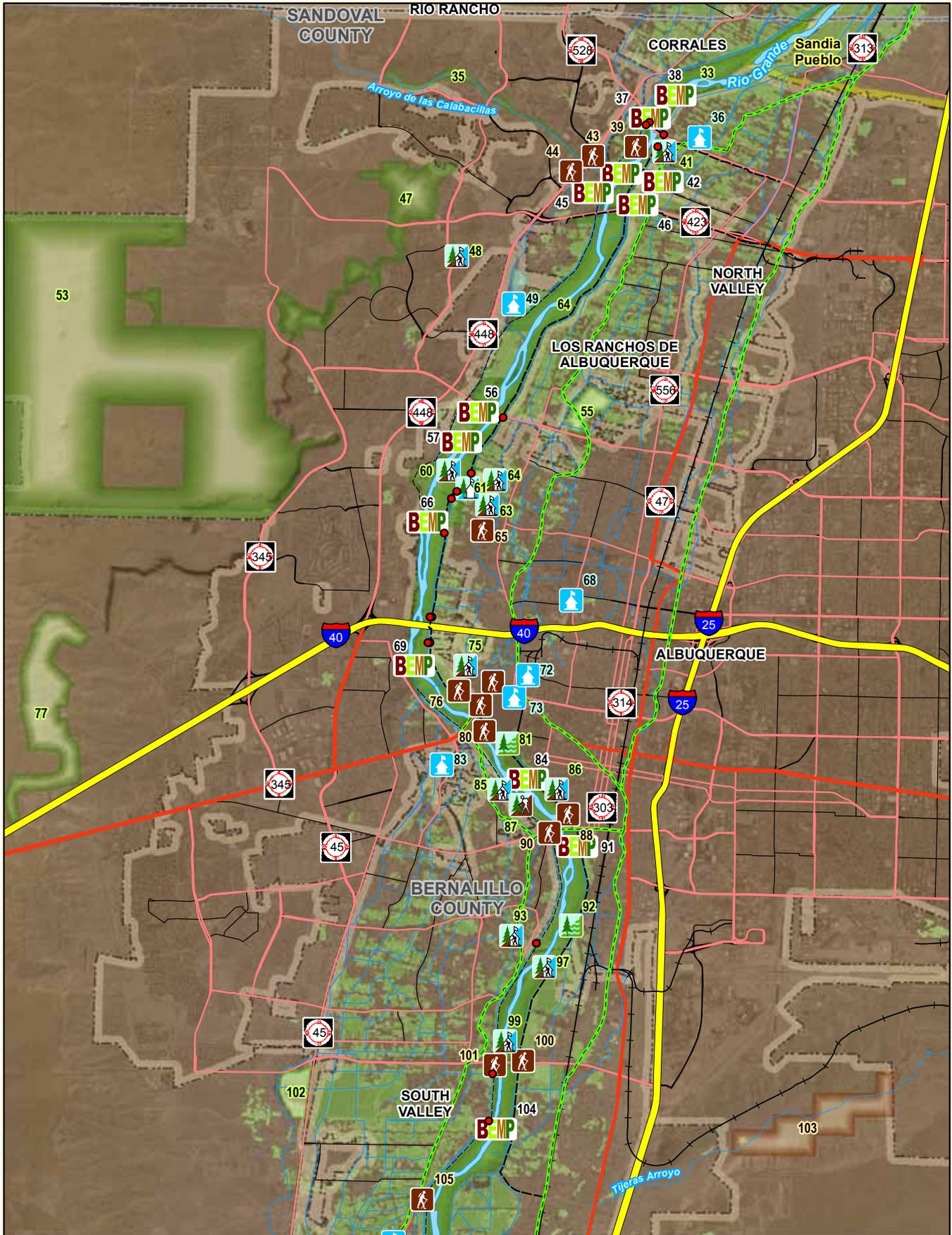
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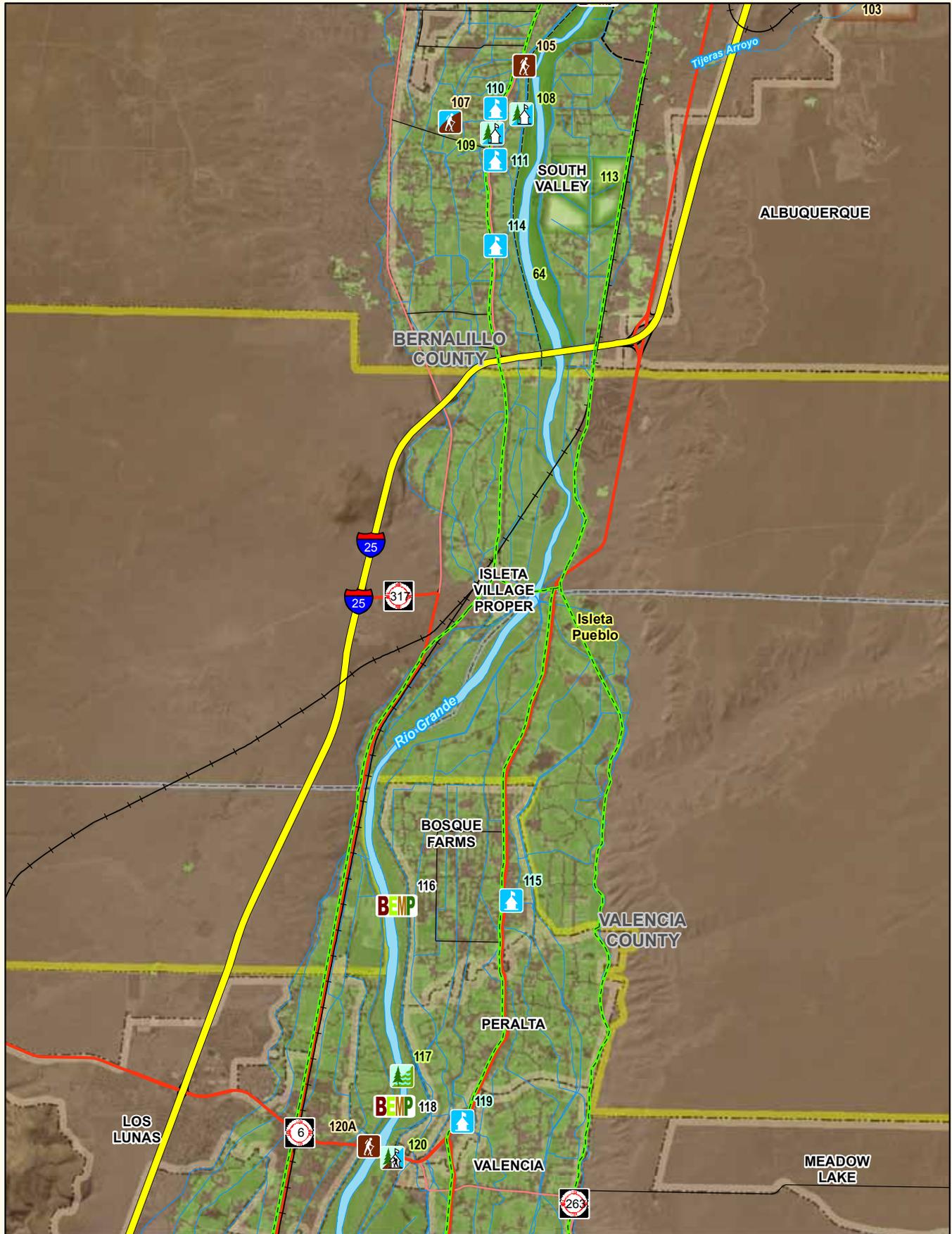
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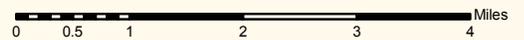


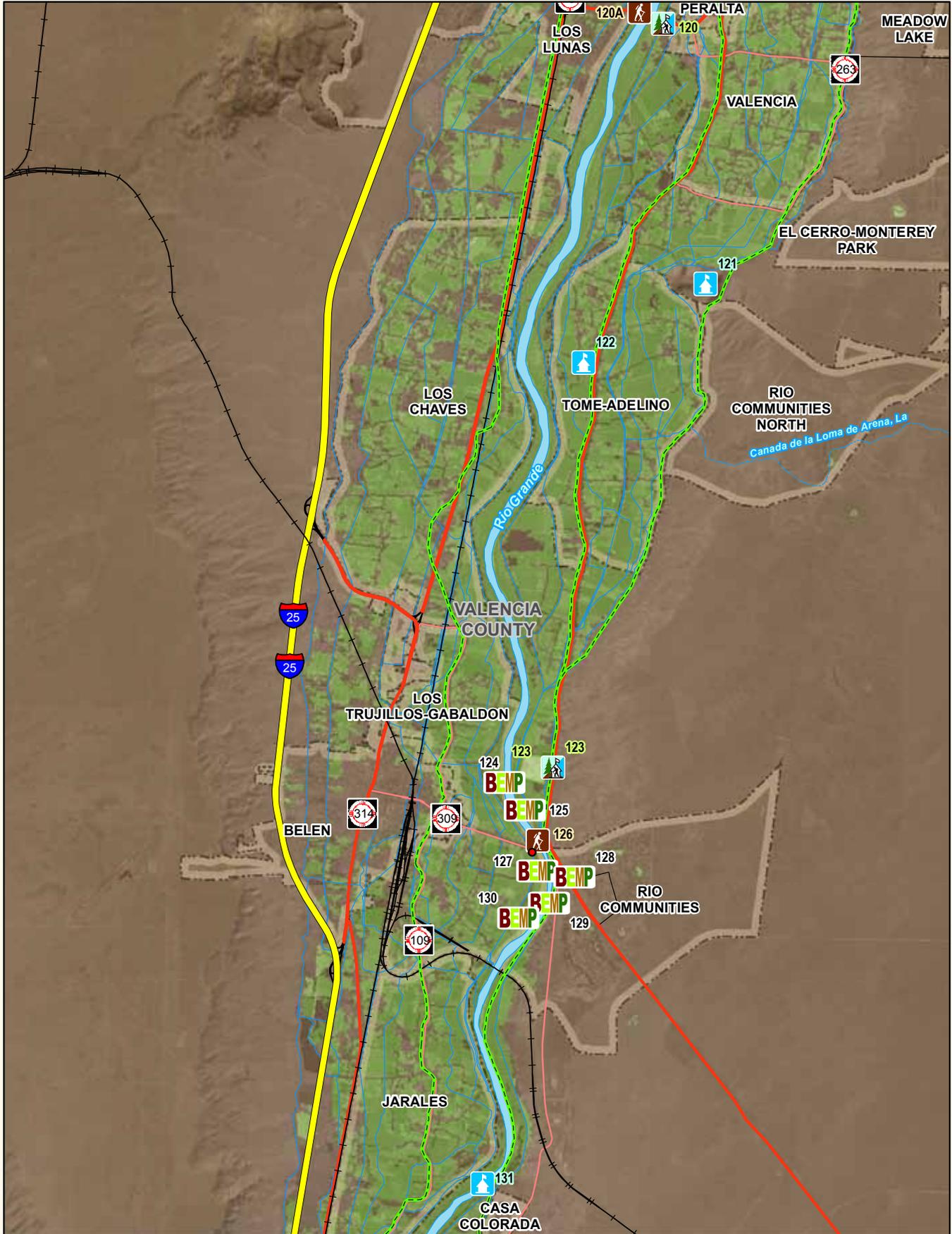
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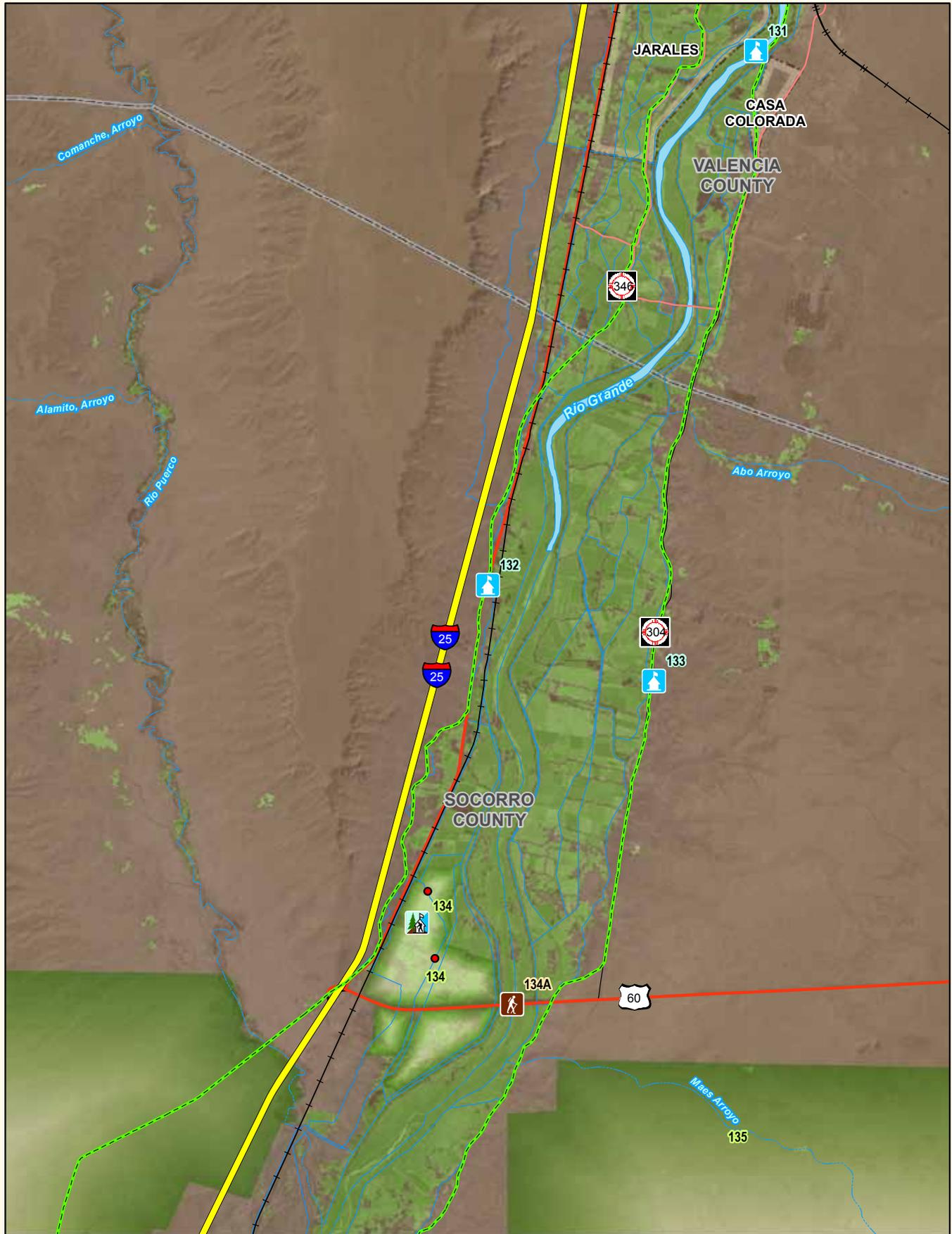




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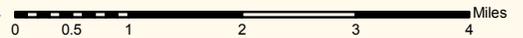


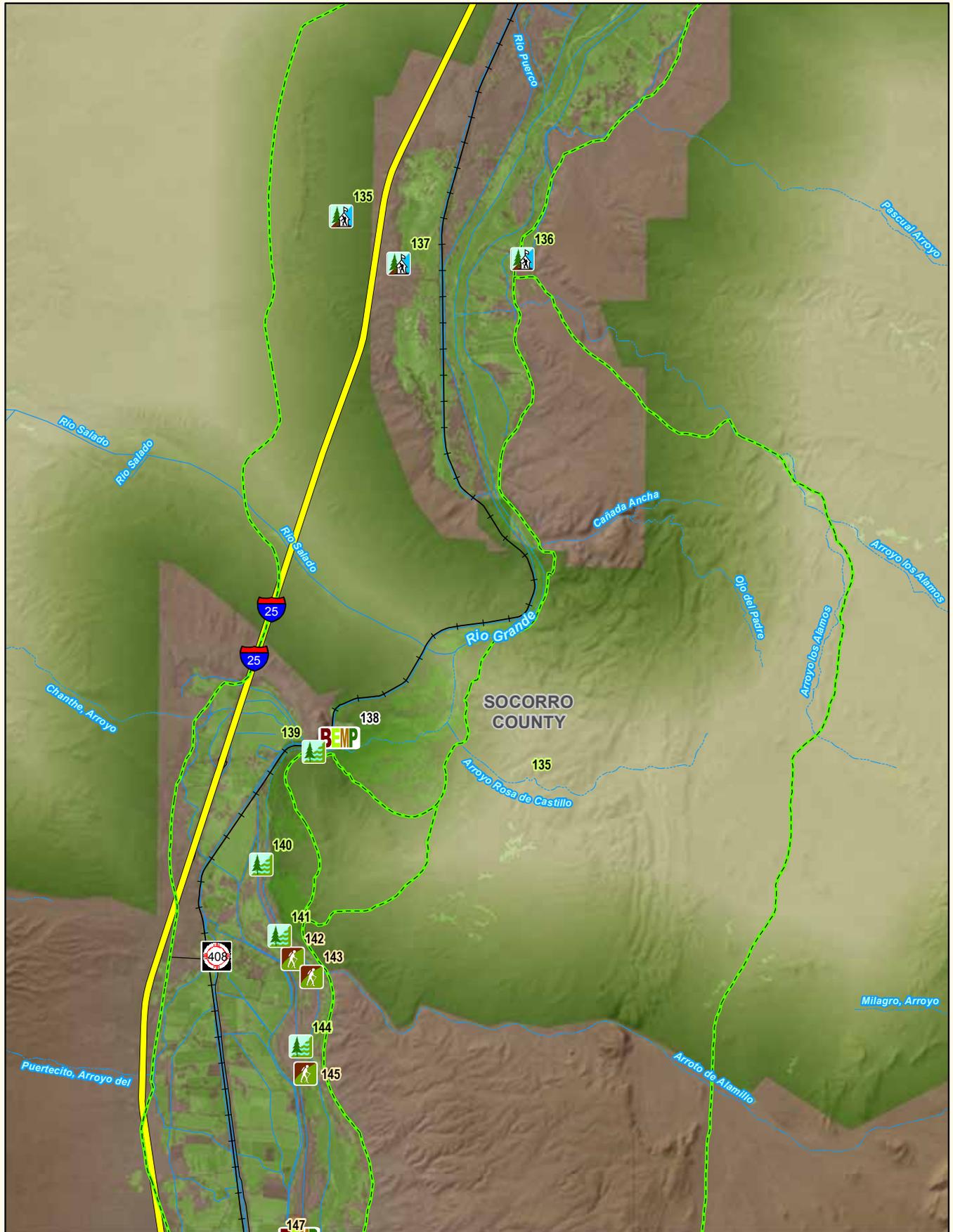




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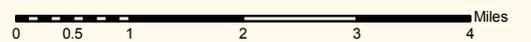
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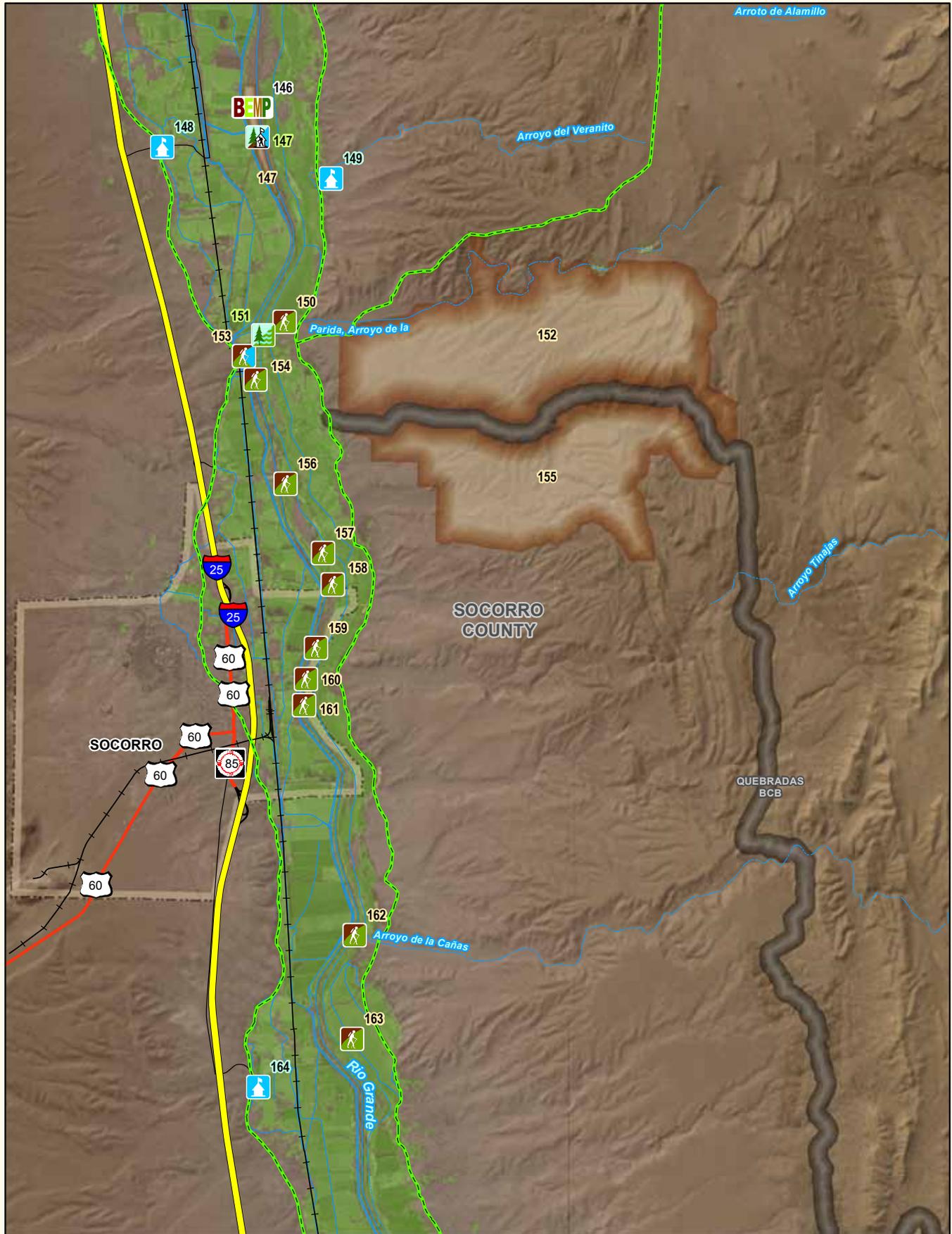




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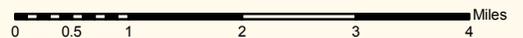
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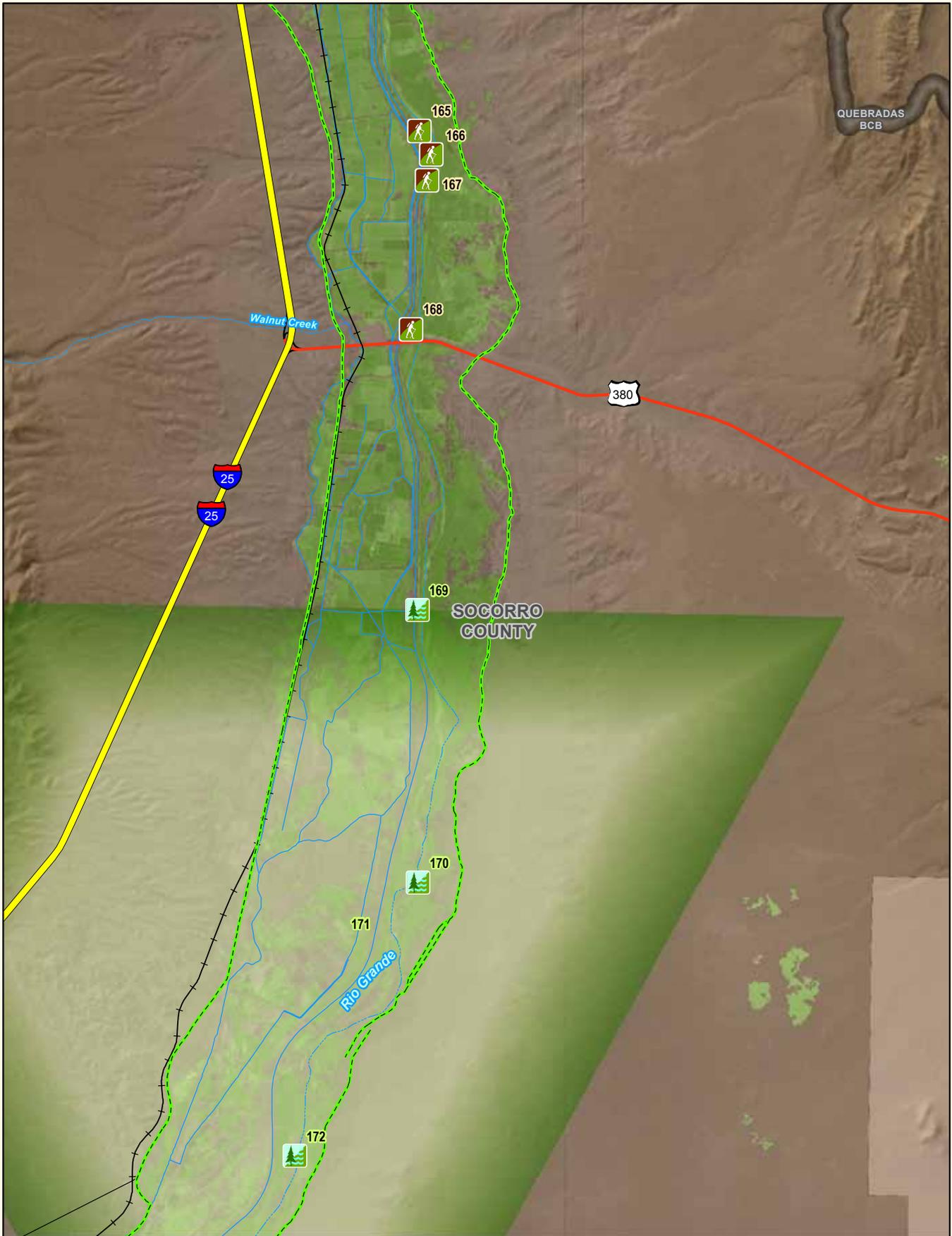




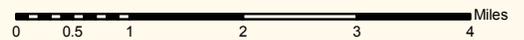
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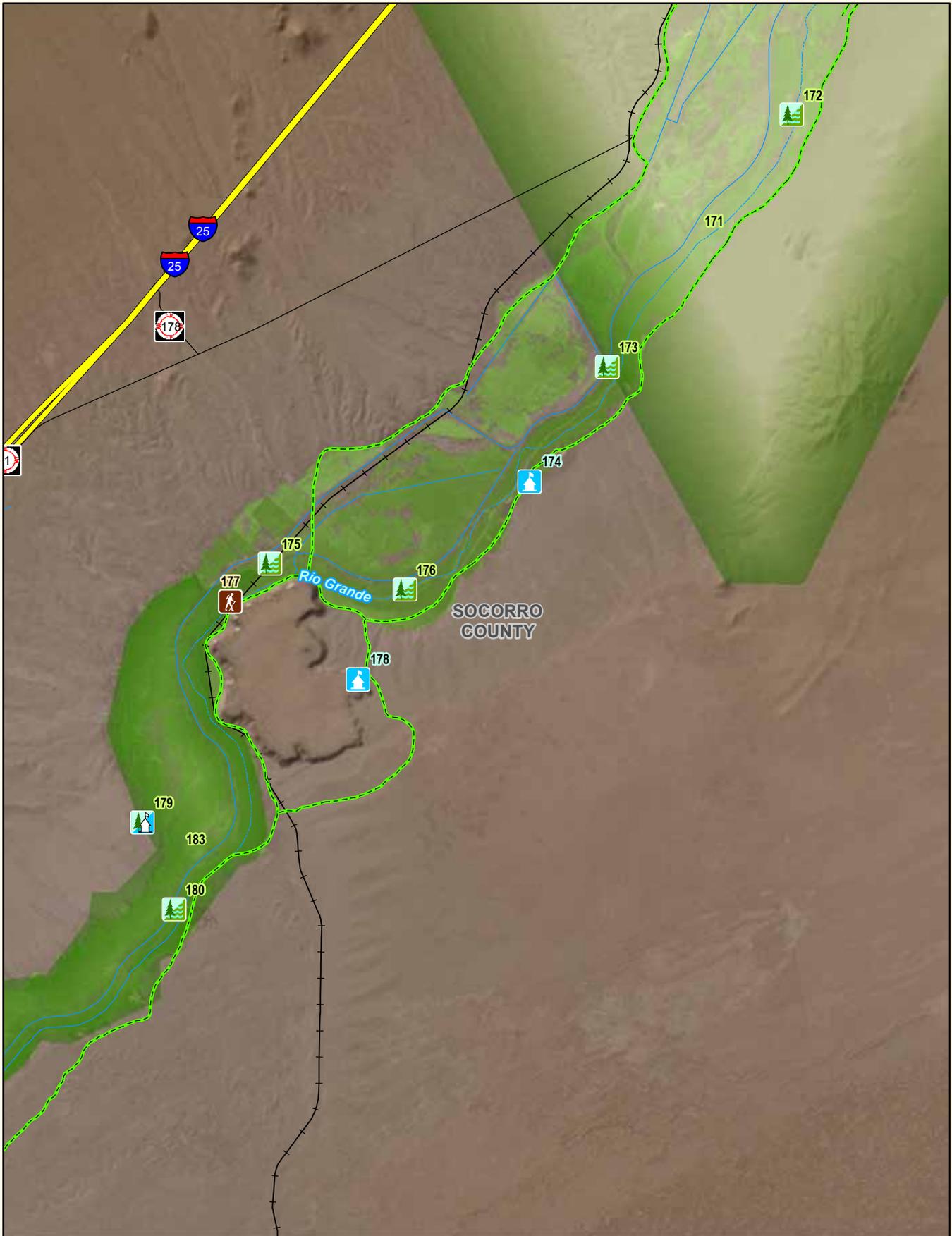
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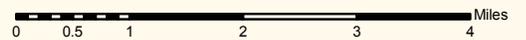
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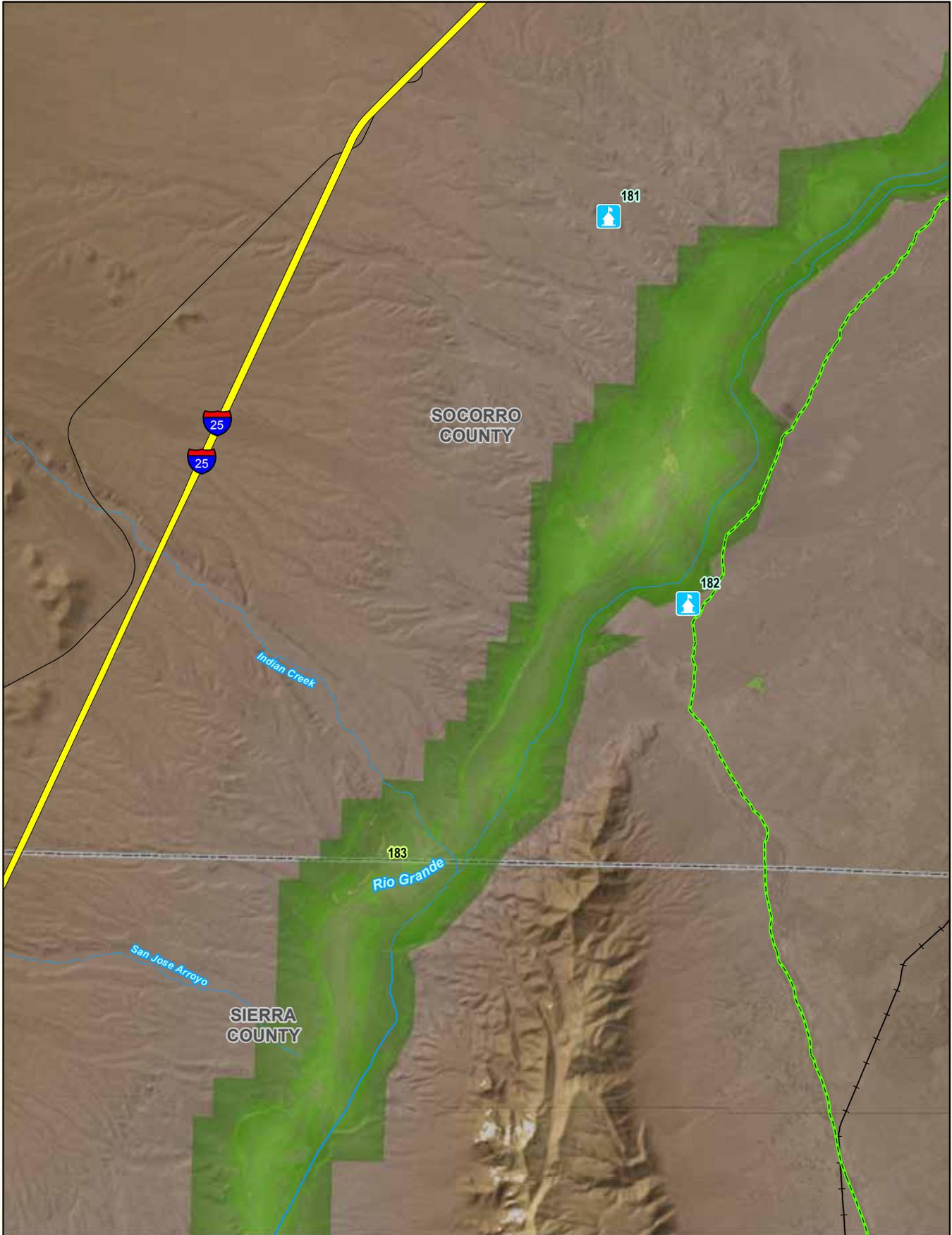




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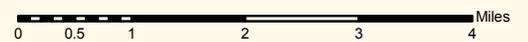
▼ Elephant Butte Headwaters ▼





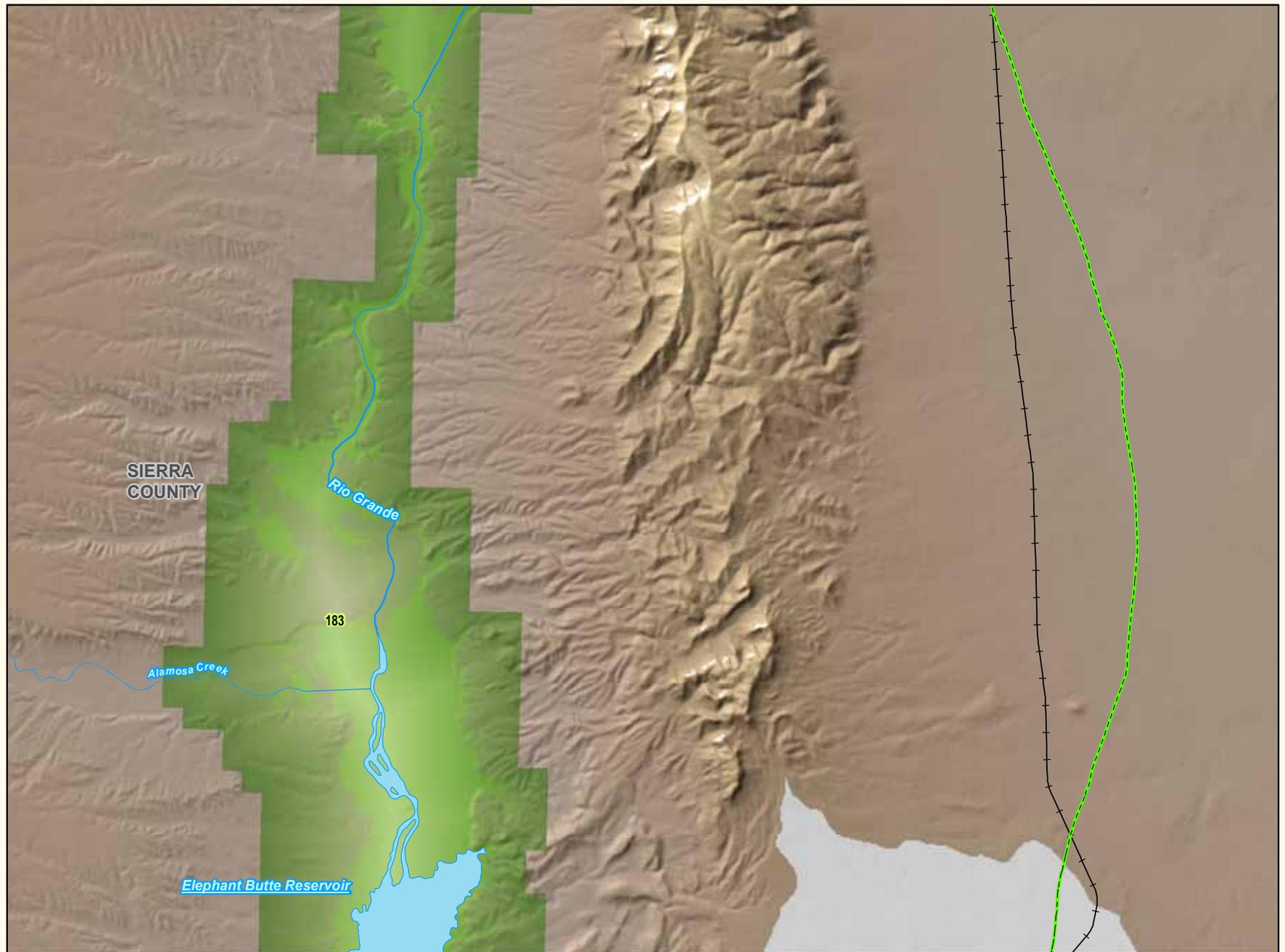
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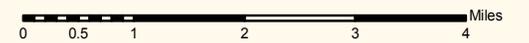
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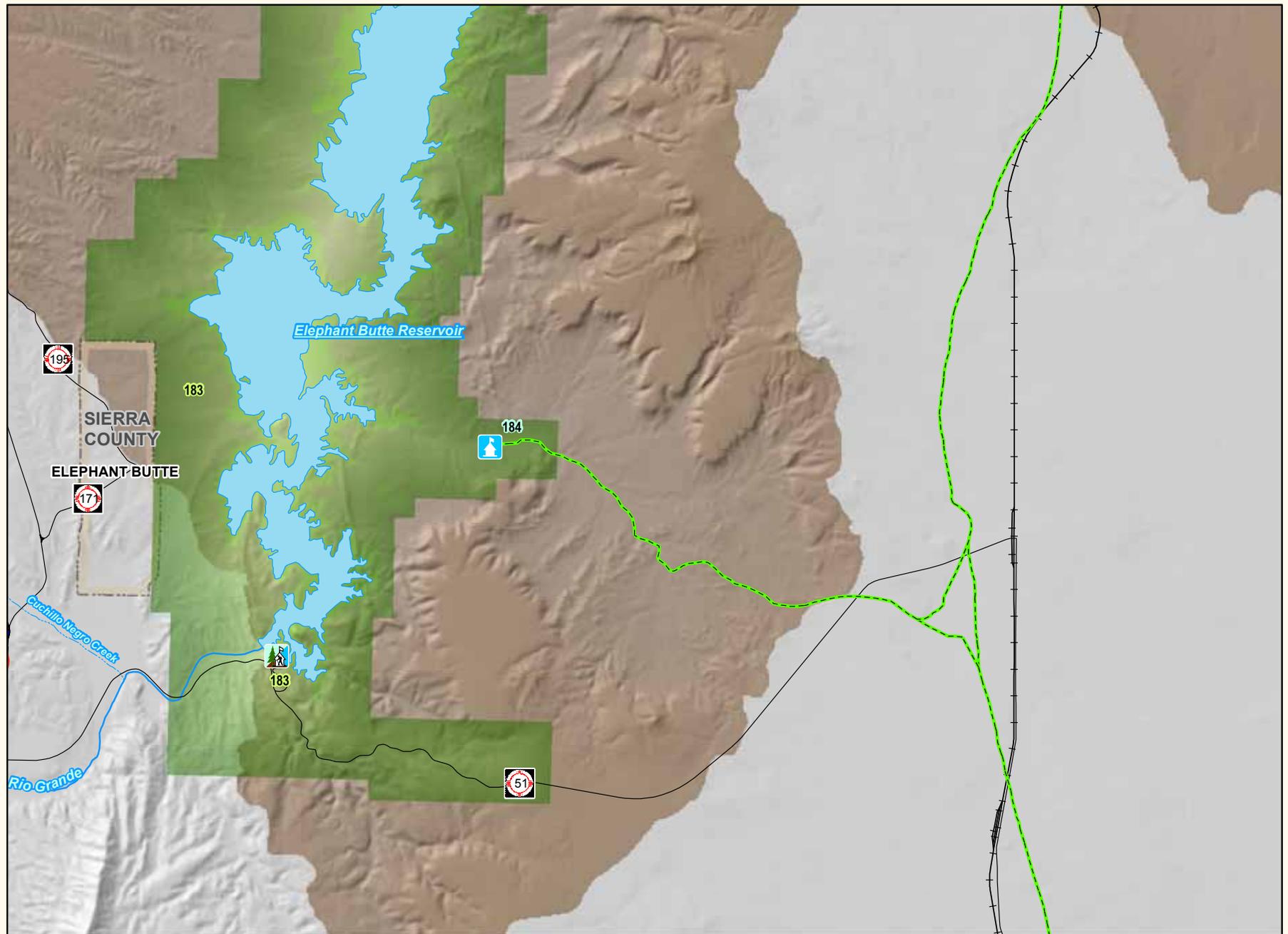
▲ Elephant Butte Headwaters ▲



Scale 1:100,000

▼ Elephant Butte South ▼





Index Guide to Numbered Features

Page Number	Site of Interest #	Name (with hyperlink to internet)	Alternate Hyperlink	Recreation	Education	Conservation	Owner	Administrative Organization	Type	Existence	Picnic	Biking	Trails	Attraction - or - Activity	NAD83 UTM Coordinate (with hyperlink to Google Maps)			
1	Cochiti Reservoir	1	Cochiti Dam and Lake recreation facilities		Yes	No	No	Pueblo de Cochiti / U.S. Army Corps of Engineers	U.S. Army Corps of Engineers, Albuquerque District	Federal Open Space	Completed	Yes	Yes	camping, picnicking, trails, playground, boating	13S 379927 3944927			
		2	Cochiti Deviation		No	No	Yes	Pueblo de Cochiti	U.S. Army Corps of Engineers, Albuquerque District	Restoration Project	Current			restoration	13S 380897 3943436			
		3	Cochiti RM 231.3		No	No	Yes	U.S. Bureau of Reclamation	USBR, Albuquerque Area Office, Technical Services Division	River Maintenance Project	Completed			river maintenance	13S 379109 3941639			
		4	Santa Fe River Confluence		No	No	Yes	U.S. Bureau of Reclamation	USBR, Albuquerque Area Office, Technical Services Division	River Maintenance Project	Completed			river maintenance	13S 378598 3940463			
		5	Cochiti RM 228.9		No	No	Yes	U.S. Bureau of Reclamation	USBR, Albuquerque Area Office, Technical Services Division	River Maintenance Project	Completed			river maintenance	13S 377652 3938935			
		6	Pena Blanca		Yes	No	No	Middle Rio Grande Conservancy District	Middle Rio Grande Conservancy District	Sites of interest	Open To Public			Site along El Camino Real de Tierra Adentro National Historic Trail	13S 378717 3937054			
		8	Galisteo Dam and Reservoir Salt Cedar Eradication Project		No	No	Yes	U.S. Army Corps of Engineers	U.S. Army Corps of Engineers, Albuquerque District	Restoration Project	Completed			restoration	13S 391113 3926101			
		9	Galisteo Dam day use picnic area		Yes	No	No	U.S. Army Corps of Engineers	U.S. Army Corps of Engineers, Albuquerque District	Federal Open Space	Completed	Yes		picnicking	13S 390351 3924522			
		2	San Felipe Pueblo	7	Santo Domingo BEMP Site		Yes	Yes		Bosque Ecosystem Monitoring Program	Bosque Ecosystem Monitoring Program Site	Existing			Bosque Ecosystem Monitoring Program Site	13S 373983 3930478		
10	San Felipe RM 215.5				No	No	Yes	U.S. Bureau of Reclamation	USBR, Albuquerque Area Office, Technical Services Division	River Maintenance Project	Current			river maintenance	13S 368793 3922031			
12	San Felipe RM 213.7				No	No	Yes	U.S. Bureau of Reclamation	USBR, Albuquerque Area Office, Technical Services Division	River Maintenance Project	Current			river maintenance	13S 367500 3919944			
13	San Felipe RM 213.4				No	No	Yes	U.S. Bureau of Reclamation	USBR, Albuquerque Area Office, Technical Services Division	River Maintenance Project	Current			river maintenance	13S 366983 3919821			
14	San Felipe Phase 1 Mitigation Sites				No	No	Yes	U.S. Bureau of Reclamation	USBR, Albuquerque Area Office, Technical Services Division	River Maintenance Project	Completed			river maintenance	13S 366398 3918792			
15	San Felipe Phase 1 Mitigation Sites				No	No	Yes	U.S. Bureau of Reclamation	USBR, Albuquerque Area Office, Technical Services Division	River Maintenance Project	Completed			river maintenance	13S 366288 3918609			
16	San Felipe RM 212.0				No	No	Yes	U.S. Bureau of Reclamation	USBR, Albuquerque Area Office, Technical Services Division	River Maintenance Project	Current			river maintenance	13S 365956 3918315			
17	San Felipe Phase 1 Mitigation Sites				No	No	Yes	U.S. Bureau of Reclamation	USBR, Albuquerque Area Office, Technical Services Division	River Maintenance Project	Completed			river maintenance	13S 366045 3918225			
19	Las Huertas Creek				No	No	Yes	U.S. Bureau of Reclamation	USBR, Albuquerque Area Office, Technical Services Division	River Maintenance Project	Completed			river maintenance	13S 363095 3916225			
20	Potential Recreation Site				Yes	No	No			Open Space	Proposed			river access	13S 363856 3916198			
21	Santa Ana Restoration				No	No	Yes	U.S. Bureau of Reclamation	USBR, Albuquerque Area Office, Technical Services Division	River Maintenance Project	Completed			river maintenance	13S 362425 3914303			
3	Bernallillo	23	Picitas Open Space		Yes	Yes	Yes	City of Albuquerque	Albuquerque Open Space	City-owned Open Space	Open To Public	No	Yes	Yes	multi-use trails, education programs, land reclamation	13S 366498 3911269		
		18	Jemez Canyon Dam day use picnic area		Yes	No	No	U.S. Army Corps of Engineers	U.S. Army Corps of Engineers, Albuquerque District	Federal Open Space	Completed	Yes		picnicking	13S 359522 3917614			
		19	Las Huertas Creek		No	No	Yes	U.S. Bureau of Reclamation	USBR, Albuquerque Area Office, Technical Services Division	River Maintenance Project	Completed			river maintenance	13S 363095 3916225			
		20	Potential Recreation Site		Yes	No	No			Open Space	Proposed			river access	13S 363856 3916198			
		21	Santa Ana Restoration		No	No	Yes	U.S. Bureau of Reclamation	USBR, Albuquerque Area Office, Technical Services Division	River Maintenance Project	Completed			river maintenance	13S 362425 3914303			
		22	Santa Ana BEMP Site		No	Yes	Yes		Bosque Ecosystem Monitoring Program	Bosque Ecosystem Monitoring Program Site	Existing			Bosque Ecosystem Monitoring Program Site	13S 359524 3912159			
		23	Picitas Open Space		Yes	Yes	Yes	City of Albuquerque	Albuquerque Open Space	City-owned Open Space	Open To Public	No	Yes	Yes	multi-use trails, education programs, land reclamation	13S 366498 3911269		
		24	Coronado State Monument / Kuaua Pueblo	1 2	No	Yes	No	State of New Mexico	New Mexico State Monuments	Sites of interest	Open To Public	Yes		excavated 1300 earthen pueblo	13S 358451 3910683			
		25	Coronado Campground		Yes	No	No	Town of Bernallillo		Campground	Open To Public	Yes	Yes	Yes	camping, picnicking, trails, volleyball, river access	13S 358266 3910213		
		26	City of Bernallillo Rio Grande Access (Proposed)		Proposed	No	No	Town of Bernallillo	Town of Bernallillo	River Access	Proposed			river access	13S 358515 3909756			
		27	Bernallillo		No	No	Yes	U.S. Bureau of Reclamation	USBR, Albuquerque Area Office, Technical Services Division	River Maintenance Project	Completed			river maintenance	13S 358337 3908818			
		28	Sandia		No	No	Yes	U.S. Bureau of Reclamation	USBR, Albuquerque Area Office, Technical Services Division	River Maintenance Project	Completed			river maintenance	13S 357323 3907842			
		29	River's Edge Bosque Area		Yes	No	N			Open Space	Open To Public			river access	13S 355652 3906500			
		30	Corrales North Bench (Proposed)		Proposed	No	N			River Access	Proposed			river access	13S 354545 3905476			
		32	Casa San Ysidro / Gutiérrez-Minge House	1 2	No	Yes	No	City of Albuquerque	Albuquerque Museum of Art and History	Sites of interest	Open To Public			historic homestead / museum	13S 352969 3900181			
		33	Corrales Bosque Preserve		Yes	No	Yes	Village of Corrales	Corrales Bosque Advisory Commission	Village-owned Preserve	Open To Public	No	No	Yes	Bosque Access, Trail	13S 353361 3899446		
		4	Albuquerque	33	Corrales Bosque Preserve		Yes	No	Yes	Village of Corrales	Corrales Bosque Advisory Commission	Village-owned Preserve	Open To Public	No	No	Yes	Bosque Access, Trail	13S 353361 3899446
				35	Calabacillas Arroyo		Yes	No	No	City of Albuquerque	Albuquerque Open Space	City-owned Open Space	Open To Public				13S 346828 3896798	
36	Alameda			1 2	No	Yes	No		Parajes, Presidios and Historic Communities	Open To Public				Parajes, Presidios and Historic Communities along El Camino Real de Tierra Adentro National Historic Trail	13S 350553 3896179			
37	Bobcat BEMP Site				No	Yes	Yes		Bosque Ecosystem Monitoring Program	Bosque Ecosystem Monitoring Program Site	Existing			Bosque Ecosystem Monitoring Program Site	13S 350340 3896133			
38	Badger BEMP Site				No	Yes	Yes		Bosque Ecosystem Monitoring Program	Bosque Ecosystem Monitoring Program Site	Existing			Bosque Ecosystem Monitoring Program Site	13S 350549 3895965			
39	Corrales South River Access (Proposed)				Proposed	No	N			River Access	Proposed			river access	13S 350111 3895790			
40	Minnow BEMP Site				No	Yes	Yes		Bosque Ecosystem Monitoring Program	Bosque Ecosystem Monitoring Program Site	Existing			Bosque Ecosystem Monitoring Program Site	13S 350063 3895705			
41	Bachachi				Yes	Yes	Yes	Bernallillo County	Parks & Recreation Department	County-owned Open Space	Open To Public	Yes	Yes	Yes	Arboretum, Bosque Access, Education Building, Trails, Wetland	13S 350685 3895700		
42	Diversion BEMP Site				No	Yes	Yes		Bosque Ecosystem Monitoring Program	Bosque Ecosystem Monitoring Program Site	Existing			Bosque Ecosystem Monitoring Program Site	13S 350309 3895568			
43	Recreation opportunity with parking				Yes	No	No	Middle Rio Grande Conservancy District	Middle Rio Grande Conservancy District	Recreation opportunity with parking	Existing			river access	13S 349280 3895567			
44	Recreation opportunity with parking		Yes	No	No	Middle Rio Grande Conservancy District	Middle Rio Grande Conservancy District	Recreation opportunity with parking	Existing			river access	13S 349110 3895424					

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				Recreation	Education	Conservation										
4	Albuquerque	45	Calabacillas BEMP Site		No	Yes	Yes		Bosque Ecosystem Monitoring Program	Bosque Ecosystem Monitoring Program Site	Existing				Bosque Ecosystem Monitoring Program Site	13S 349853 3895422
		46	Alameda BEMP Site		No	Yes	Yes		Bosque Ecosystem Monitoring Program	Bosque Ecosystem Monitoring Program Site	Existing				Bosque Ecosystem Monitoring Program Site	13S 350053 3895139
		47	Piedras Marcadas Canyon		Yes	Yes	No	City of Albuquerque	Albuquerque Open Space	City-owned Open Space	Open To Public	No	No	Yes	hiking, trails, interpretive signage - petroglyphs	13S 344841 3893950
		48	Las Marcadas		Yes	Yes	Yes	City of Albuquerque	Albuquerque Open Space	City-owned Open Space	Open To Public					13S 346505 3893589
		49	Open Space Visitor Center		Yes	Yes	Yes	City of Albuquerque	Albuquerque Open Space	City-owned Open Space	Open To Public	No	No	No	art gallery, farming, birding, nature viewing, exhibits interpreting natural and cultural resources of Open Space projects	13S 347647 3892629
		53	Petroglyph National Monument		Yes	Yes	No	City of Albuquerque	National Parks Service	City-owned Open Space	Open To Public	Yes	No	Yes	Petroglyphs, hiking, picnicking	13S 339835 3891062
		55	Los Poblanos Fields		Yes	Yes	No	City of Albuquerque	Albuquerque Open Space	City-owned Open Space	Open To Public	Yes	Yes	Yes	community gardening, wildlife viewing, picnicking, walking, jogging, bicycling and horseback riding	13S 349116 3890481
		56	Montano BEMP Site		No	Yes	Yes		Bosque Ecosystem Monitoring Program	Bosque Ecosystem Monitoring Program Site	Existing				Bosque Ecosystem Monitoring Program Site	13S 346927 3890447
		57	Savannah BEMP Site		No	Yes	Yes		Bosque Ecosystem Monitoring Program	Bosque Ecosystem Monitoring Program Site	Existing				Bosque Ecosystem Monitoring Program Site	13S 346776 3890179
		60	Rio Grande Nature Center Habitat Restoration Project		Yes	Yes	Yes	City of Albuquerque	U.S. Army Corps of Engineers, Albuquerque District	Restoration Project	Completed				restoration	13S 346447 3889005
61	Candelaria Farm (Wildlife Preserve)		No	Yes	Yes	City of Albuquerque	Albuquerque Open Space	City-owned Open Space	Guided Programs Only	No	No	No	Limited to guided programs only	13S 347113 3888885		
62	Rio Grande Nature Center State Park (Wildlife Preserve)		No	No	Yes	City of Albuquerque	New Mexico State Parks Division	City-owned Open Space	Closed To Public	No	No	No		13S 346686 3888846		
63	Rio Grande Nature Center State Park		Yes	Yes	Yes	City of Albuquerque	New Mexico State Parks Division	New Mexico State Park	Open To Public					13S 346596 3888809		
64	Rio Grande Valley State Park		Yes	Yes	Yes	Middle Rio Grande Conservancy District City of Albuquerque	MRGCD / Albuquerque Open Space Division	Open Space	Open To Public	Yes	Yes	Yes	hiking, biking, interpretive trails, trails, fishing, picnicking	13S 346596 3888809		
65	Recreation opportunity with parking		Yes	No	No	Middle Rio Grande Conservancy District	Middle Rio Grande Conservancy District	Recreation opportunity with parking	Existing				river access	13S 346714 3888696		
66	Rio Grande Nature Center BEMP Site		No	Yes	Yes		Bosque Ecosystem Monitoring Program	Bosque Ecosystem Monitoring Program Site	Existing				Bosque Ecosystem Monitoring Program Site	13S 346158 3888404		
68	Indian Pueblo Culture Center		No	Yes	No	Indian Pueblo Culture Center	Indian Pueblo Culture Center	Museum	Open To Public				Indian Pueblo Culture Center	13S 348808 3886652		
69	Rte 66 BEMP Site		No	Yes	Yes		Bosque Ecosystem Monitoring Program	Bosque Ecosystem Monitoring Program Site	Existing				Bosque Ecosystem Monitoring Program Site	13S 345751 3885516		
72	Albuquerque Museum of Art & History		1	2	No	City of Albuquerque	Albuquerque Museum of Art and History	Sites of Interest	Open To Public				Albuquerque Museum of Art & History	13S 347936 3885146		
73	La Villa de Albuquerque		1	2	No	Yes	No		Parajes, Presidios and Historic Communities	Open To Public			Parajes, Presidios and Historic Communities along El Camino Real de Tierra Adentro National Historic Trail	13S 347832 3884976		
74	Recreation opportunity with parking		Yes	No	No	Middle Rio Grande Conservancy District	Middle Rio Grande Conservancy District	Recreation opportunity with parking	Existing				river access	13S 346967 3884762		
75	Albuquerque Aquarium & Botanical Park		Yes	Yes	Yes	City of Albuquerque	Albuquerque BioPark	BioPark	Open To Public	Yes	No	Yes	Albuquerque Aquarium & Botanical Park	13S 346823 3884651		
76	Recreation opportunity with parking		Yes	No	No	Middle Rio Grande Conservancy District	Middle Rio Grande Conservancy District	Recreation opportunity with parking	Existing				river access	13S 346862 3884559		
77	Atrisco Terrace		Yes	Yes	Yes	City of Albuquerque	Albuquerque Open Space	City-owned Open Space	Open To Public					13S 338240 3884467		
78	Recreation opportunity with parking		Yes	No	No	Middle Rio Grande Conservancy District	Middle Rio Grande Conservancy District	Recreation opportunity with parking	Existing				river access	13S 347348 3883869		
80	Tingley Pond trails		Yes	No	No	City of Albuquerque	U.S. Army Corps of Engineers, Albuquerque District	City-owned Open Space	Completed			Yes	trails	13S 347431 3883794		
81	Albuquerque Biological Park Wetland Restoration Project		No	No	Yes	City of Albuquerque	U.S. Army Corps of Engineers, Albuquerque District	Restoration Project	Completed				restoration	13S 347515 3883745		
83	Atrisco		1	2	No	Yes	No		Parajes, Presidios and Historic Communities	Open To Public			Parajes, Presidios and Historic Communities along El Camino Real de Tierra Adentro National Historic Trail	13S 346202 3883337		
84	BioPark BEMP Site		No	Yes	Yes		Bosque Ecosystem Monitoring Program	Bosque Ecosystem Monitoring Program Site	Existing				Bosque Ecosystem Monitoring Program Site	13S 347935 3883045		
85	Ecosystem Restoration @ RT66		Yes	Yes	Yes	U.S. Army Corps of Engineers	U.S. Army Corps of Engineers, Albuquerque District	Restoration Project	Completed				restoration	13S 347534 3882893		
86	Rio Grande Zoo		Yes	Yes	Yes	City of Albuquerque	Albuquerque BioPark	BioPark	Open To Public	Yes	No	Yes	Rio Grande Zoo	13S 348514 3882839		
87	Valle del Bosque		Yes	No	Yes	Bernalillo County	Parks & Recreation Department	County-owned Open Space	Open To Public	Yes	No	Yes	Bosque Access, Trails	13S 347515 3882713		
88	Recreation opportunity with parking		Yes	No	No	Middle Rio Grande Conservancy District	Middle Rio Grande Conservancy District	Recreation opportunity with parking	Existing				river access	13S 348745 3882328		
90	Recreation opportunity with parking		Yes	No	No	Middle Rio Grande Conservancy District	Middle Rio Grande Conservancy District	Recreation opportunity with parking	Existing				river access	13S 348398 3881989		
91	Hispanic Cultural Center BEMP Site		No	Yes	Yes		Bosque Ecosystem Monitoring Program	Bosque Ecosystem Monitoring Program Site	Existing				Bosque Ecosystem Monitoring Program Site	13S 348819 3881931		
92	Rio Grande Silvery Minnow Sanctuary		Yes	Yes	Yes	U.S. Bureau of Reclamation	Middle Rio Grande Endangered Species Collaborative Program	Collaborative Wildlife Refuge	Current				river maintenance	13S 348793 3880076		
93	Sanchez Farm		Yes	Yes	Yes	Bernalillo County	Parks & Recreation Department	County-owned Open Space	Open To Public	No	No	Yes	Farming, Gardens, Trails	13S 347596 3879886		
97	Bosque Wildfire Project		Yes	Yes	Yes		U.S. Army Corps of Engineers, Albuquerque District	Wildfire Prevention Mitigation Project	Completed				restoration	13S 348269 3879256		
99	Middle Rio Grande Ecosystem Restoration Project		Yes	Yes	Yes	U.S. Army Corps of Engineers	U.S. Army Corps of Engineers, Albuquerque District	Restoration Project	Current				restoration	13S 347307 3877366		
100	Recreation opportunity with parking		Yes	No	No	Middle Rio Grande Conservancy District	Middle Rio Grande Conservancy District	Recreation opportunity with parking	Existing				river access	13S 347689 3877364		
101	Recreation opportunity with parking		Yes	No	No	Middle Rio Grande Conservancy District	Middle Rio Grande Conservancy District	Recreation opportunity with parking	Existing				river access	13S 347267 3877275		
102	Hubbell Oxbow		No	No	No	City of Albuquerque	Albuquerque Open Space	City-owned Open Space	Open To Public	No	No	No	farming	13S 343252 3876745		
103	Montessa Park		Yes	No	No	City of Albuquerque	Albuquerque Open Space	City-owned Open Space	Open To Public	No	No	No	disc golf course, off-leash dog park, off-road vehicle area	13S 333748 3876130		
104	Harrison BEMP Site		No	Yes	Yes		Bosque Ecosystem Monitoring Program	Bosque Ecosystem Monitoring Program Site	Existing				Bosque Ecosystem Monitoring Program Site	13S 347293 3875992		

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				Recreation	Education	Conservation									
5	64	Rio Grande Valley State Park		Yes	Yes	Yes	Middle Rio Grande Conservancy District City of Albuquerque	MRGCD / Albuquerque Open Space Division	Open Space	Open To Public	Yes	Yes	Yes	hiking, biking, interpretive trails, trails, fishing, picnicking	13S 346596 388809
	105	Durand		Yes	No	No	Bernalillo County	Parks & Recreation Department	County-owned Open Space	Open To Public	Yes	No	Yes	Boque Access, Farming, Trails	13S 345807 3874566
	107	Pajarito		Yes	Yes	No	Bernalillo County	Parks & Recreation Department	County-owned Open Space	Open To Public	Yes	No	Yes	Farmina, Trails	13S 344310 3873432
	108	Hubbell North		Yes	Yes	No	Bernalillo County	Parks & Recreation Department	County-owned Open Space	In Development	No	No	No	planned Farming, Gardens, Trails	13S 345231 3873405
	109	The Guñerrez-Hubbell House	1 2	No	Yes	No	Bernalillo County	Parks & Recreation Department	Museum	Open To Public				Site along El Camino Real de Tierra Adentro National Historic Trail	13S 345186 3873137
	110	The Guñerrez-Hubbell House	1 2	No	Yes	No	Bernalillo County	Parks & Recreation Department	Museum	Open To Public				Site along El Camino Real de Tierra Adentro National Historic Trail	13S 345186 3873137
	111	Pajarito	1 2	No	Yes	No			Parajes, Presidios and Historic Communities	Open To Public				Parajes, Presidios and Historic Communities along El Camino Real de Tierra Adentro National Historic Trail	13S 345195 3872852
	113	Price's Dainy / Middle Rio Grande National Wildlife Refuge		No	No	No	U.S. Fish and Wildlife Service	U.S. Fish and Wildlife Service	National Wildlife Refuge	Proposed	No	No	No	In Development	13S 346995 3871974
	114	Los Padillas	1 2	No	Yes	No			Parajes, Presidios and Historic Communities	Open To Public				Parajes, Presidios and Historic Communities along El Camino Real de Tierra Adentro National Historic Trail	13S 345229 3870939
	115	Bosque de Pinos	1 2	No	Yes	No			Parajes, Presidios and Historic Communities	Open To Public				Parajes, Presidios and Historic Communities along El Camino Real de Tierra Adentro National Historic Trail	13S 345546 3857725
	116	Bosque Farms BEMP Site		No	Yes	Yes			Bosque Ecosystem Monitoring Program	Existing				Bosque Ecosystem Monitoring Program Site	13S 343233 3857621
	117	Los Lunas Habitat Restoration Project		No	No	Yes	Los Lunas	U.S. Army Corps of Engineers, Albuquerque District	Restoration Project	Completed				restoration	13S 343272 3853930
	118	Los Lunas BEMP Site		No	Yes	Yes			Bosque Ecosystem Monitoring Program	Existing				Bosque Ecosystem Monitoring Program Site	13S 343188 3853575
	119	Valencia	1 2	No	Yes	No			Parajes, Presidios and Historic Communities	Open To Public				Parajes, Presidios and Historic Communities along El Camino Real de Tierra Adentro National Historic Trail	13S 344558 3853268
	120	Los Lunas River Park		Yes	Yes	Yes	Village of Los Lunas	Parks Division	City-owned Open Space	Open To Public	Yes	Yes	Yes	picnicking, trails	13S 343052 3852577
120A	Los Lunas River Access		Yes	No	No			River Access	Existing	No	No	No	river access	13S 342674 3852762	
6	121	Tomé Hill	1 2	Yes	Yes	No			Listed Historical Site	Open To Public				Tomé Hill Park, petroglyphs; natural landmark along El Camino Real de Tierra Adentro National Historic Trail	13S 344004 3847287
	122	Tomé Plaza	1 2	Yes	No	No			Parajes, Presidios and Historic Communities	Open To Public				Parajes, Presidios and Historic Communities along El Camino Real de Tierra Adentro National Historic Trail	13S 341547 3845702
	123	Whitfield Wildlife Conservation Area		Yes	Yes	Yes	Valencia Soil and Water Conservation District	Valencia Soil and Water Conservation District	USDA National Resource Conservation Services Wetlands Reserve Program	Open To Public	No	No	No	nature viewing, education center	13S 340930 3837537
	124	Reynolds Forest BEMP Site		No	Yes	Yes			Bosque Ecosystem Monitoring Program	Existing				Bosque Ecosystem Monitoring Program Site	13S 340289 3836781
	125	Reynolds Clear BEMP Site		No	Yes	Yes			Bosque Ecosystem Monitoring Program	Existing				Bosque Ecosystem Monitoring Program Site	13S 340363 3836682
	126	Senator Willie M. Chavez State Park		Yes	No	No	Middle Rio Grande Conservancy District	Middle Rio Grande Conservancy District	Open Space	Open To Public	Yes			picnicking, river access	13S 340618 3835789
	127	Valencia Clear BEMP Site		No	Yes	Yes			Bosque Ecosystem Monitoring Program	Existing				Bosque Ecosystem Monitoring Program Site	13S 340613 3835454
	128	Belen BEMP Site		No	Yes	Yes			Bosque Ecosystem Monitoring Program	Existing				Bosque Ecosystem Monitoring Program Site	13S 340747 3835429
	129	Valencia Forest BEMP Site		No	Yes	Yes			Bosque Ecosystem Monitoring Program	Existing				Bosque Ecosystem Monitoring Program Site	13S 340673 3835290
	130	Crawford BEMP Site		No	Yes	Yes			Bosque Ecosystem Monitoring Program	Existing				Bosque Ecosystem Monitoring Program Site	13S 340334 3834556
7	131	Las Barrancas	1 2	No	Yes	No			Parajes, Presidios and Historic Communities	Open To Public				Parajes, Presidios and Historic Communities along El Camino Real de Tierra Adentro National Historic Trail	13S 339512 3829151
	132	Sabinal	1 2	No	Yes	No			Parajes, Presidios and Historic Communities	Open To Public				Parajes, Presidios and Historic Communities along El Camino Real de Tierra Adentro National Historic Trail	13S 334103 3818370
	133	Las Nutrias	1 2	No	Yes	No			Parajes, Presidios and Historic Communities	Open To Public				Parajes, Presidios and Historic Communities along El Camino Real de Tierra Adentro National Historic Trail	13S 337451 3816436
	134	Bernardo Wildlife Management Area		Yes	No	Yes	New Mexico Game and Fish	New Mexico Game and Fish	State Wildlife Refuge	Open To Public				auto tour	13S 332673 3811557
	134A	Bernardo River Access		Yes	No	No			River Access	Existing	No	No	No	river access	13S 334589 3809909
8	135	Sevilleta National Wildlife Refuge		Limited	Yes	Yes	U.S. Fish and Wildlife Service	U.S. Fish and Wildlife Service	National Wildlife Refuge	Limited Opportunities	No	No	No	Units A and B only - Birding, environmental education, research, nature viewing; limited hunting	13S 326646 3802945
	136	Sevilleta	1 2	Yes	Yes	Yes			Parajes, Presidios and Historic Communities	Open To Public				Parajes, Presidios and Historic Communities along El Camino Real de Tierra Adentro National Historic Trail	13S 330306 3802081
	137	La Jova Refuge		Yes	Yes	Yes	New Mexico Game and Fish	New Mexico Game and Fish	State Wildlife Refuge	Open To Public				wildlife viewing, wetlands	13S 327807 3801988
	138	Sevilleta BEMP Site		No	Yes	Yes			Bosque Ecosystem Monitoring Program	Existing				Bosque Ecosystem Monitoring Program Site	13S 326608 3792405
	139	Drain Unit 7		No	No	Yes	U.S. Bureau of Reclamation	USBR, Albuquerque Area Office, Technical Services Division	River Maintenance Project	Completed				river maintenance	13S 328359 3792263
	140	San Acacia RM 114		No	No	Yes	U.S. Bureau of Reclamation	USBR, Albuquerque Area Office, Technical Services Division	River Maintenance Project	Completed				river maintenance	13S 325019 3789825
	141	San Acacia RM 113		No	No	Yes	U.S. Bureau of Reclamation	USBR, Albuquerque Area Office, Technical Services Division	River Maintenance Project	Completed				river maintenance	13S 325419 3788339
	142	San Acacia Riverine Park		Yes	No	Yes	Middle Rio Grande Conservancy District	Save Our Bosque Task Force	Open Space	Open To Public	Yes	Yes	Yes	4X4's, ATV, equestrian riders, hiking, river access	13S 325666 3787934
	143	Polvadera Plus Riverine Park		Yes	No	Yes	Middle Rio Grande Conservancy District	Save Our Bosque Task Force	Open Space	Open To Public				river access	13S 325955 3787658
	144	San Acacia RM 111		No	No	Yes	U.S. Bureau of Reclamation	USBR, Albuquerque Area Office, Technical Services Division	River Maintenance Project	Completed				river maintenance	13S 325819 3786149
145	Polvadera Riverine Park		Yes	No	Yes	Middle Rio Grande Conservancy District	Save Our Bosque Task Force	Open Space	Open To Public				river access	13S 325925 3785614	

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				Recreation	Education	Conservation										
9	Socorro	146	Lemitar BEMP Site		No	Yes	Yes	Bosque Ecosystem Monitoring Program Site	Bosque Ecosystem Monitoring Program Site	Existing				Bosque Ecosystem Monitoring Program Site	13S 325797 3782290	
		147	Socorro Nature Area	1	Yes	Yes	Yes	U.S. Bureau of Land Management	U.S. Bureau of Land Management	Federal Nature Area	Open To Public	Yes	No	Yes	Hiking, camping, picnicking, nature viewing, interpretive trail	13S 325884 3781806
		148	Lemitar	1 2	No	Yes	No			Parajes, Presidios and Historic Communities	Open To Public				Parajes, Presidios and Historic Communities along El Camino Real de Tierra Adentro National Historic Trail	13S 323980 3781491
		149	Sabino	1 2	No	Yes	No			Parajes, Presidios and Historic Communities	Open To Public				Parajes, Presidios and Historic Communities along El Camino Real de Tierra Adentro National Historic Trail	13S 327386 3780855
		150	The Tubes Riverine Park		Yes	No	Yes	Middle Rio Grande Conservancy District	Save Our Bosque Task Force	Open Space	Open To Public	Yes		Yes	picnicking, trails, river access	13S 326002 3777677
		151	Arroyo de la Parida		No	No	Yes	U.S. Bureau of Reclamation	USBR, Albuquerque Area Office, Technical Services Division	River Maintenance Project	Completed				river maintenance	13S 326002 3777677
		153	Escondida Lake	1	Yes	Yes	Yes	City of Socorro	City of Socorro Parks and Recreation	City-owned Open Space	Open To Public	Yes	Yes		fishing and camping, RV hookups, tent sites	13S 325625 3777267
		152	Johnson (Gordy's) Hill - North		Yes	No	No	U.S. Bureau of Land Management	U.S. Bureau of Land Management	Federal Open Space	Open To Public	No	Yes	No	Motorcycle riding, ATV, scenic drives, mountain biking	13S 331569 3777670
		154	Escondida Bridge Riverine Park		Yes	No	Yes	Middle Rio Grande Conservancy District	Save Our Bosque Task Force	Open Space	Open To Public	Yes	Yes		picnicking, trails, river access	13S 325715 3777083
		155	Johnson (Gordy's) Hill - South		Yes	No	No	U.S. Bureau of Land Management	U.S. Bureau of Land Management	Federal Open Space	Open To Public	No	Yes	No	Motorcycle riding, ATV, scenic drives, mountain biking	13S 331778 3774839
		156	Confluence Riverine Park		Yes	No	Yes	Middle Rio Grande Conservancy District	Socorro Amateur Radio Association	Open Space	Open To Public	Yes	Yes	Yes	picnicking, biking, trails, river access	13S 326465 3774692
		157	Bosque Riverine Park		Yes	No	Yes	Middle Rio Grande Conservancy District	Save Our Bosque Task Force	Open Space	Open To Public	Yes	Yes	Yes	picnicking, trails, river access	13S 327221 3773294
		158	Sandbar Riverine Park		Yes	No	Yes	Middle Rio Grande Conservancy District	Save Our Bosque Task Force	Open Space	Open To Public	Yes	Yes	Yes	picnicking, trails, river access	13S 327417 3772659
		159	Island Riverine Park		Yes	No	Yes	Middle Rio Grande Conservancy District	Save Our Bosque Task Force	Open Space	Open To Public	Yes	Yes	Yes	picnicking, trails, river access	13S 327078 3771378
		160	Otero Plus Riverine Park		Yes	No	Yes	Middle Rio Grande Conservancy District	Save Our Bosque Task Force	Open Space	Open To Public	Yes	Yes	Yes	picnicking, trails, river access	13S 326877 3770750
		161	Otero Riverine Park		Yes	No	Yes	Middle Rio Grande Conservancy District	Save Our Bosque Task Force	Open Space	Open To Public	Yes	Yes	Yes	picnicking, trails, river access	13S 326863 3770564
162	Bosqueillo Crossing Riverine Park		Yes	No	Yes	Middle Rio Grande Conservancy District	Save Our Bosque Task Force	Open Space	Open To Public	Yes	Yes	Yes	picnicking, trails, river access	13S 327858 3765583		
163	Brown Arroyo Riverine Park		Yes	No	Yes	Middle Rio Grande Conservancy District	Save Our Bosque Task Force	Open Space	Open To Public	Yes	Yes	Yes	picnicking, trails, river access	13S 327807 3763498		
164	Luis Lopez	1 2	No	Yes	No			Parajes, Presidios and Historic Communities	Open To Public				Parajes, Presidios and Historic Communities along El Camino Real de Tierra Adentro National Historic Trail	13S 325917 3762521		
10	Bosque del Apache NWR North	165	Beaver Riverine Park		Yes	No	Yes	Middle Rio Grande Conservancy District	Save Our Bosque Task Force	Open Space	Open To Public	Yes	Yes	picnicking, trails, river access	13S 329027 3758679	
		166	Old Corral Riverine Park		Yes	No	Yes	Middle Rio Grande Conservancy District	Save Our Bosque Task Force	Open Space	Open To Public	Yes	Yes	Yes	picnicking, trails, river access	13S 329127 3758483
		167	Cottonwood Grove Riverine Park		Yes	No	Yes	Middle Rio Grande Conservancy District	Save Our Bosque Task Force	Open Space	Open To Public	Yes	Yes	Yes	picnicking, trails, river access	13S 329066 3758113
		168	San Antonio Riverine Park		Yes	No	Yes	Middle Rio Grande Conservancy District	Save Our Bosque Task Force	Open Space	Open To Public	Yes	Yes	Yes	picnicking, trails, river access	13S 328719 3754957
		169	BDA Levee		No	No	Yes	U.S. Bureau of Reclamation	USBR, Albuquerque Area Office, Technical Services Division	River Maintenance Project	Periodic Maintenance Needed				river maintenance	13S 328836 3749291
		170	BDA Sediment Plug		No	No	Yes	U.S. Bureau of Reclamation	USBR, Albuquerque Area Office, Technical Services Division	River Maintenance Project	Periodic Maintenance Needed				river maintenance	13S 328847 3743800
		171	Bosque Del Apache National Wildlife Refuge		Yes	Yes	Yes	U.S. Fish and Wildlife Service	U.S. Fish and Wildlife Service	National Wildlife Refuge	Open To Public	No	No	Yes	Birding, environmental education, hunting/fishing, interpretation, trails, nature viewing	13S 326521 3741615
		172	BDA Channel Widening		No	No	Yes	U.S. Bureau of Reclamation	USBR, Albuquerque Area Office, Technical Services Division	River Maintenance Project	Completed				river maintenance	13S 326370 3738295
11	Bosque del Apache NWR South	171	Bosque Del Apache National Wildlife Refuge		Yes	Yes	Yes	U.S. Fish and Wildlife Service	U.S. Fish and Wildlife Service	National Wildlife Refuge	Open To Public	No	No	Yes	Birding, environmental education, hunting/fishing, interpretation, trails, nature viewing	13S 326521 3741615
		172	BDA Channel Widening		No	No	Yes	U.S. Bureau of Reclamation	USBR, Albuquerque Area Office, Technical Services Division	River Maintenance Project	Completed				river maintenance	13S 326370 3738295
		173	Tiffany Levee*		No	No	Yes	U.S. Bureau of Reclamation	USBR, Albuquerque Area Office, Technical Services Division	River Maintenance Project	Periodic Maintenance Needed				river maintenance	13S 322659 3733213
		174	Valverde	1 2	No	Yes	No			Parajes, Presidios and Historic Communities	Open To Public				Parajes, Presidios and Historic Communities along El Camino Real de Tierra Adentro National Historic Trail	13S 321109 3730917
		175	San Marcial Levee*		No	No	Yes	U.S. Bureau of Reclamation	USBR, Albuquerque Area Office, Technical Services Division	River Maintenance Project	Periodic Maintenance Needed				river maintenance	13S 315870 3729249
		176	Tiffany Sediment Plug		No	No	Yes	U.S. Bureau of Reclamation	USBR, Albuquerque Area Office, Technical Services Division	River Maintenance Project	Periodic Maintenance Needed				river maintenance	13S 318587 3728726
		177	San Marcial Railroad Bridge		Yes	No	No	Middle Rio Grande Conservancy District	Middle Rio Grande Conservancy District	Recreation opportunity	Existing				river access	13S 315084 3728496
		178	El Contadero	1 2	No	Yes	No			Parajes, Presidios and Historic Communities	Open To Public				Parajes, Presidios and Historic Communities along El Camino Real de Tierra Adentro National Historic Trail	13S 317856 3726932
		179	Fort Craig	1 2	Yes	Yes	No	Bureau of Land Management	Bureau of Land Management	Listed Historical Site	Open To Public	Yes			National Historic Site along El Camino Real de Tierra Adentro National Historic Trail	13S 313302 3724034
		180	Fort Craig Bend		No	No	Yes	U.S. Bureau of Reclamation	USBR, Albuquerque Area Office, Technical Services Division	River Maintenance Project	Completed				river maintenance	13S 313942 3722286
12	Elephant Butte Headwaters	183	Elephant Butte Lake State Park		Yes	Yes	Yes	U.S. Bureau of Reclamation	New Mexico State Parks Division	New Mexico State Park	Open To Public	Yes	Yes	Yes	Hiking, camping, picnicking, nature viewing, trail, mountain biking, boating, fishing, outdoor classroom program, cultural history	13S 295889 3670357
		181	El Camino Real International Heritage Center	1 2	No	Yes	No	State of New Mexico	New Mexico State Monuments	Sites of interest	Open To Public				El Camino Real de Tierra Adentro National Historic Trail	13S 305554 3719321
		182	Fray Cristobal	1 2	No	Yes	No			Parajes, Presidios and Historic Communities	Open To Public				Parajes, Presidios and Historic Communities along El Camino Real de Tierra Adentro National Historic Trail	13S 307153 3711524
13	E. Butte North	183	Elephant Butte Lake State Park		Yes	Yes	Yes	U.S. Bureau of Reclamation	New Mexico State Parks Division	New Mexico State Park	Open To Public	Yes	Yes	Yes	Hiking, camping, picnicking, nature viewing, trail, mountain biking, boating, fishing, outdoor classroom program, cultural history	13S 295889 3670357
		183	Elephant Butte Lake State Park		Yes	Yes	Yes	U.S. Bureau of Reclamation	New Mexico State Parks Division	New Mexico State Park	Open To Public	Yes	Yes	Yes	Hiking, camping, picnicking, nature viewing, trail, mountain biking, boating, fishing, outdoor classroom program, cultural history	13S 295889 3670357
14	E. Butte South	183	Elephant Butte Lake State Park		Yes	Yes	Yes	U.S. Bureau of Reclamation	New Mexico State Parks Division	New Mexico State Park	Open To Public	Yes	Yes	Yes	Hiking, camping, picnicking, nature viewing, trail, mountain biking, boating, fishing, outdoor classroom program, cultural history	13S 295889 3670357
		184	Ojo del Muerto	1 2	No	Yes	No			Parajes, Presidios and Historic Communities	Open To Public				Parajes, Presidios and Historic Communities along El Camino Real de Tierra Adentro National Historic Trail	13S 300140 3674520

Middle Rio Grande Conservation Initiative

Appendix B: Bosque Biological Plan Recommendations

Middle Rio Grande Ecosystem: Bosque Biological Management Plan and Update¹

Summary List of Recommendations

Recommendation 1: Coordinate Rio Grande water management activities to support and improve the bosque's riverine and terrestrial habitats, with special emphasis on mimicking typical natural hydrographs.

Recommendation 2: Implement measures to allow fluvial processes to occur within the river channel and the adjacent bosque to the extent possible.

Recommendation 3: Reintroduce the dynamics of surface water/ground water exchange, manage ground-water withdrawal, and restrict contamination.

Recommendation 4: Protect, extend, and enhance the structure of aquatic habitat to the benefit of native communities.

Recommendation 5: Protect and enhance surface water quality.

Recommendation 6: Integrate management of nonnative and native fish species in all aquatic environments in the Middle Rio Grande riparian ecosystem including wetlands, canals, and drains.

Recommendation 7: Protect the geographic extent of the Rio Grande bosque and avoid further fragmentation of the riparian ecosystem and component habitats.

Recommendation 8: Protect, extend, and enhance riparian vegetation in noncontiguous areas in the floodplain.

Recommendation 9: Manage the buffer zone of the contiguous bosque to protect ecosystem processes, enhance wildlife habitat values, and maintain rural and semirural conditions.

Recommendation 10: Manage livestock grazing in a manner compatible with biological quality and ecosystem integrity.

Recommendation 11: Manage activities that remove dead wood in a manner compatible with biological quality and ecosystem integrity.

Recommendation 12: Manage recreational activities in the bosque in a manner compatible with biological quality and ecosystem integrity.

Recommendation 13: Prevent unmanaged fires in all reaches of the bosque.

Recommendation 14: Use native plant species and local genetic stock in vegetation establishment and management efforts throughout the bosque.

Recommendation 15: Protect, enhance, and extend (create) wetlands throughout the Middle Rio Grande riparian zone.

Recommendation 16: Sustain and enhance existing cottonwood communities, and create new native cottonwood communities wherever possible throughout the Middle Rio Grande riparian zone.

Recommendation 17: Contain the expansion of existing large stands of nonnative vegetation in the Middle Rio Grande riparian zone. At the same time, study the ecology of these stands and develop creative ways of maximizing their biological values.

Appendix B: Bosque Biological Plan Recommendations

Recommendation 18: Develop a coordinated program to monitor biological quality (with emphasis on the diversity and abundance of native species) and ecosystem integrity (with emphasis on restoring the functional connection between the river and riparian zone) of the Middle Rio Grande ecosystem.

Recommendation 19: Develop a coordinated research program to study the ecological processes and biotic communities that characterize the Middle Rio Grande riparian ecosystem.

Recommendation 20: Regularly review and update the Middle Rio Grande Ecosystem: Bosque Biological Management Plan.

Recommendation 21: Integrate resources management activities along the Rio Grande and within the contributing watersheds to protect and enhance biological quality and ecosystem integrity.

Recommendation 22: Develop outreach initiatives through public education programs and events, and community participation activities and projects, to broaden public understanding of and generate more active interest in bosque restoration and river ecosystem management in the Middle Rio Grande.



Snow goose. © Marvin DeJong

Middle Rio Grande Conservation Initiative

Appendix C: Major Restoration and Habitat Efforts

Rio Grande Revival. Major River Restoration and Habitat Stewardship Efforts in the MRG

Middle Rio Grande Bosque Initiative. The MRGBI was a principal outgrowth from the work of the Rio Grande Bosque Conservation Committee (appointed by Sen. Pete Domenici in 1991) and the completion of the Middle Rio Grande Ecosystem: Bosque Biological Management Plan (BBMP. (Crawford et. al. 1993). The BBMP contains 22 main recommendations to guide management of the river and its riparian corridor (see Appendix B). The MRGBI's objective is to protect, enhance, and restore biological values by addressing ecological functions. From FY1994—FY2009, the U.S. Fish and Wildlife Service received a total of \$9.3 million for MRGBI and administered a coordinating structure for the program that was inclusive of many governmental and non-governmental stakeholders. These funds accomplished a total of 317 projects within four funding areas: research, monitoring, habitat enhancement, and education/outreach efforts. Funding for MRGBI, however, was always treated as a

Congressional “earmark” and FWS never incorporated the program into its base budget. From a peak of \$1.048 million in FY2002, federal funding gradually declined, ending in FY2009. More information can be found online at www.mrgbi.com.

Middle Rio Grande Endangered Species Collaborative Program. MRGESCP is a partnership involving 16 signatories organized to protect and improve the status of endangered species (Rio Grande silvery minnow and the Southwestern willow flycatcher) along the MRG while simultaneously protecting existing and future regional water uses. The BOR provides overall leadership for the program. Activities include water acquisition and management, habitat restoration, endangered species monitoring, and silvery minnow propagation. Congress provided approximately \$115.8 million to BOR from FY2001 to 2009 to support MEGESCP activities. These funds have been supplemented by approximately \$12.7 million in non-federal match. Accomplishments have been significant, including numerous habitat restoration projects and acquisition of nearly 160,000 acre-feet of supplemental water from willing lessors to maintain flows. For annual reports, accomplishments and ongoing work, see www.middleriogrande.com.

Army Corps of Engineers Programs. In addition to responsibilities for flood control projects, ecosystem restoration is an important focus of the Albuquerque District. USACE is working with numerous partners, including MRGESCP, Pueblo of Isleta, Pueblo of Sandia,



Great blue heron. © Marvin DeJong

Appendix C: Major Restoration and Habitat Efforts

Pueblo of Santa Ana, Village of Corrales, the City of Albuquerque, BOR/MRGESCP, and ISC. The Route 66 and the MRG Restoration/Revitalization projects will restore 121 and 916 acres, respectively, of riparian habitat through the construction of high flow channels, back-water wetlands, and willow swales. The Bosque Wildfire Project has removed non-native vegetation, reduced fuel loads, restored burned areas, and improved emergency access to the bosque by removing 8,000 jetty jacks and installing six emergency access bridges. Other projects such as the Albuquerque Biological Park Wetland Restoration, Rio Grande Nature Center State Park side channel, Los Lunas Habitat Restoration, and Pueblo of Santa Ana Restoration have restored wetland, salt-grass meadow, woodland, and aquatic habitat. USACE is working with MRGESCP on the Cochiti Deviation, a 5-year study to evaluate reshaping spring runoff flows. The evaluation phase of Adaptive Management for the study is in progress. Finally, the Rio Grande Environmental Management Program (Water Resource Act, P.L. 110-114, Sec. 5056) authorized USACE up to \$15 million annually for enhancement of fish/wildlife habitat and long-term data collection throughout the Rio Grande Basin in Colorado, New Mexico and Texas. The program authority expired in Fiscal Year 2011 before federal funding could be appropriated, www.spa.usace.army.mil.

Middle Rio Grande Conservancy District. MRGCD plays a varying role in numerous bosque restoration projects that occur within the District, ranging from project sponsor to project coordination. Partners are diverse, including the City of Albuquerque Open Space Division, USACE, BOR, Bosque Del Apache National Wildlife Refuge, the Natural Resource

Conservation Service. Funds for projects have come from diverse sources, including the District, the U.S. Forest Service Collaborative Forest Restoration Program, New Mexico Forestry Division Wildland Urban Interface Program, the Joint Fire Science Program, and the MRGBI. A ten-year restoration treatment and research/monitoring project at 10 sites in MRGCD involved some 350 acres and was recognized with a “Wings Across the Americas” award for support of bird and habitat conservation. www.mrgcd.com.

Save Our Bosque Task Force. SOBTF is a non-profit organization of landowners, citizens, and agency representatives focusing on restoration, education, and recreation in the San Acacia reach of the MRG. For 19 years, this organization has built river parks, protected the bosque from wildfire, provided recreational opportunities (4 mile trail established in bosque), led the community to pick up trash in the bosque, and accomplished habitat restoration on over 600 acres of privately owned lands within the active floodplain. They created a conceptual restoration plan for the 45 mile reach in 2004, and have led forums on river ecosystem adaptive management, monitoring the bosque, and held public outreach programs to inform on their and other special interest efforts in the reach. The Task Force built strong partnerships with private landowners in the Socorro area for conservation and restoration of their lands (6 landowners, 200 acres) with the Rio Grande Agricultural Land Trust, Socorro Soil and Water Conservation District, NM State Forestry, and Bosque del Apache NWR. www.sobtf.org.

Other Local and State Bosque Restoration Efforts. Local land management agencies invest funds and work in partnerships for bosque

Appendix C: Major Restoration and Habitat Efforts

restoration. The City of Albuquerque Open Space Division (OSD) has restored several hundred acres of bosque, planting nearly 30,000 cottonwood trees and thousands of native shrubs. Following the major bosque fires of 2003-2004, the City's role in fuels reduction has also been significant. OSD, with the assistance of EMNRD/State Forestry Division, oversaw fuels reduction on over 2,000 acres. OSD has implemented several restoration projects with MRGESCP, Ciudad Soil and Water, and other partners, and has taken on maintenance responsibility for all of the acreage within MRGCD restored by the USACE in their recent projects. The City of Rio Rancho is completing a bosque restoration project in partnership with the Interstate Streams Commission. The Office of the State Natural Resource Trustee has invested various environmental settlement funds in restoration projects.

Pueblo Programs. The Six MRG Pueblos have invested considerable effort and funds in restoration projects and programs, and are partners with the agencies listed above. See "Pueblo Issues and Perspectives" chapter for a more detailed discussion of Pueblo effort and tribal partnership programs.

Natural Resources Conservation Service Programs. NRCS delivers voluntary programs, products and services that help local people protect and improve natural resources on non-federal lands. NRCS provides technical information and guidance, plans conservation systems and practices, and offers financial assistance for conservation activities through the programs of the 2008 Farm Bill. These programs help landowners improve land stewardship on working cropland and rangeland, conserve water supplies, enhance wildlife habitat, preserve high-quality

farmland, protect native plants and animals, and improve stream conditions. Programs such as Cooperative Conservation Partnership Initiative, Agriculture Water Enhancement Program, Conservation Stewardship Program, Farm and Ranchland Protection Program, Wetland Reserve Program, Grassland Reserve Program, and Wildlife Habitat Incentives Program deployed over \$31 million across New Mexico in FY2010.

Greater Rio Grande Watershed Alliance. State funding in the early 2000s to remove salt cedar and other non-native phreatophytes spurred efforts by five Soil and Water Conservation Districts (SWCDs) and the Natural Resources Conservation Service (NRCS). Initial one-dimensional projects that simply removed non-natives evolved into a more integrated bosque restoration program and GRGWA itself has broadened (it now includes ten SWCDs, several Pueblos, State Forestry Division, New Mexico Environment Department, and New Mexico Department of Agriculture, and other partners). Comprehensive plans have been prepared for many projects, which are integrated with community fire plans and watershed plans. www.allaboutwatersheds.org/groups/GRGWA.

Middle Rio Grande Conservation Initiative

Appendix D: Key Education Facilities and Programs

Program Descriptions of Some Key Education Facilities and Programs in the Middle Rio Grande

Albuquerque-Bernalillo County Water Utility Authority.

ABCWUA provides hands-on science presentations in 600 classes each year, teaching approximately 16,000 students how they can conserve and protect the region's water resources. The Water Authority also provides a full-day field trip for 45 fourth-grade classes (1100 students) who spend the day learning about water. In addition, about 45 classes, grades 4 to post-graduate university level, take free tours at the Wastewater Treatment Plant. <http://www.abcwua.org/education/>.

Albuquerque Open Space Division. The City OSD does educational programs for hundreds of school children and adults at its diverse properties in the foothills, on the mesas, and in the bosque. The Open Space Visitor Center on the City's west side has developed into a prime attraction and program location.

Audubon New Mexico. Audubon's statewide outdoor science program, Birds of a Feather Explore Together, teaches children about the myriad habitats and wildlife found throughout our state and reaches upwards of 1,200 fourth and fifth grade students annually. Students learn about bird adaptations and habitats, with an emphasis on riparian bird species, in addition to other animals and plants that are located in New Mexico and in the Middle Rio Grande Valley. Birds of a Feather Explore Together is designed specifically for New Mexico students and meets New Mexico public school standards.

Bernalillo County Open Space. Bernalillo County manages several open space areas, and offers a wide range of programs for families and adults, including festivals, backyard gardening seminars, and natural history talks and workshops. The Bachechi Open Space at the intersection of Alameda and Rio Grande has a new classroom for environmental education programming, and is partnering with RiverXchange, the Water Authority and others in making full use of this new area. The County also offers extensive programming at Open Space properties such as the Gutierrez-Hubbell House, Sanchez Farms, and other properties. Bernalillo County also administers the Master Naturalist Program, which began in 2010. The Master Naturalist Program provides adult education (55 hours of classes) in a broad range of natural history subjects, requiring service projects in return. Master Naturalist Interns work on projects in resource management or education, primarily at a county Open Space area, but also at other partner locations.



White-tailed deer. © Marvin DeJong

Appendix D: Key Education Facilities and Programs

Approximately 25 volunteers are trained each year. There is interest in several other communities in New Mexico, along the Rio Grande, to start their own programs with the support of this Master Naturalist program.

Bosque del Apache NWR/ Friends of Bosque del Apache Environmental Education

Program. The Refuge supports school and adult tours to the refuge year-round, but primarily during the fall and winter months (November to February). The Refuge supplies trained volunteers and utilizes staff to serve as tour guides and field naturalists to numerous groups each year. The non-profit Friends of Bosque del Apache NWR has a bus scholarship program that brings New Mexico school children to the Refuge. The Friends also direct ECOLAB (Every Child Outside Learning About Bosque), a 12-week environmental education program for approximately twenty 2nd and 3rd graders from the San Antonio School (located 8 miles to the north of the Refuge). These students learn about the diverse river ecosystem through hands on field studies, demonstrations, and monitoring. Working intensively with teachers from the school, the Friends have developed curriculum

and activities centered around Bosque del Apache NWR to help the classes meet many of their state standards for science, as well as reading, math, and social studies.

Bosque Education Guide (BEG). The Bosque Education Guide is a resource book of background information, activities, curriculum suggestions, and references to help teach about the bosque—our local ecosystem. The Guide's 45 activities engage students in topics such as the history of the river, restoration and service learning projects, ecosystems, geology, and fire, with activities that are appropriate for the classroom, outside on the playground, and in the bosque. Some activities are translated into Spanish. The Guide fits perfectly in the new emphasis of project-based studies in classrooms giving teachers the resources for an important local focus in their teaching. Over 1500 educators up and down the Rio Grande in New Mexico have been trained to use these materials since the first edition in 1995; interest is still high with good attendance at full-day workshops where teachers receive the Guide and a teaching kit. Major sponsors have been the US Fish & Wildlife Service's Middle Rio Grande Bosque Initiative,



View into the Chupadera Mountains. © Marvin DeJong

Appendix D: Key Education Facilities and Programs

NM Museum of Natural History & Science and the Rio Grande Nature Center, NM State Parks. This has been a grass-roots effort since its start, involving over 300 individuals in creating the Guide as experts, educators, artists and reviewers. Every agency up and down the valley and educators of all ages and disciplines contributed and has helped make this a great educational resource. It continues through strong collaborations between agencies, especially the Rio Grande Nature Center and the NM Museum of Natural History & Science. The USFWS Middle Rio Grande Bosque Initiative has been a main source of funding since the origination of the Guide. The Bosque Education Guide has been a main educational outreach effort of the Bosque Initiative Group. Since that funding has all but disappeared, we have scrambled to find funding. The Friends of the Rio Grande Nature Center, as well as NM State Parks have recently funded workshops and materials. Consistent funding would be appropriate.

Bosque Ecosystem Monitoring Program (BEMP). The Bosque Ecosystem Monitoring Program is joint effort coordinated by the University of New Mexico's (UNM) Long Term Ecological Research (LTER) network and Bosque School. BEMP research is conducted by student and citizen volunteers along the Middle Rio Grande and its associated riparian forest. Through this project, citizen and student groups accept responsibility for gathering long-term data related to the overall condition of the forest ecosystem located along New Mexico's most prominent river. The program consists of a series of 27 research sites along 560 km (350 miles) of the Rio Grande. Sites are presently located between Ohkay Owingeh pueblo and Mesilla Valley Bosque State Park, twenty-five of these sites are within the MRG. Monitoring activities

are synchronized between sites with volunteers (primarily grade K-12 students and their teachers) collecting long-term data on: core weather data, shallow groundwater table depth, monthly precipitation, surface active arthropod activity, add measurements of forest production such as: leaf litter biomass/plant productivity, tree diameter and growth rates, woody and herbaceous plant distribution. Data gathered by volunteers is incorporated into larger UNM sponsored bosque research efforts and is shared with other researchers, as well as land and other natural resource managers. Over 5,000 students have participated in the program. BEMP is all grant funded and educator limited (i.e., the present # of educators is a limiting factor on the # of schools/students served); BEMP tries to keep groups to 34 students with 2 teachers. The more staff the agencies and NGOs can put in the classroom the better. BEMP also helps to teach a 400 level biology class at UNM, which puts college students working with younger kids. That way, teachers get some more help and the college students get some professional experience. BEMP also runs a summer Bosque Science Camp.

New Mexico Department of Game and Fish. NMDGF delivers numerous programs, including Project WET, Project Learning Tree, Watershed Watch, wildlife trunks for classroom use, and archery and youth hunting education. A new Project Wild Guide will soon be introduced. State Wildlife Management Areas, such as the Bernardo/La Joya waterfowl areas, offer interpretive opportunities. DGF employs full-time environmental educators and requires all DGF employees to give four classroom presentations per year on wildlife/habitat. An new program will soon bring youth from Kewa Pueblo to the DGF headquarters in Santa Fe to monitor birds and water.

Appendix D: Key Education Facilities and Programs

New Mexico State Monuments. Coronado State Monument in Bernalillo and the International Camino Real Heritage Center (south of Socorro) are two of the most important education facilities in the MRG. Coronado State Monument is located adjacent to the river and is a popular destination for local residents and tourists. The Monument focuses mainly on historical/cultural themes, but the use of more docents has expanded river-based education programs. The monument faces staff and budget shortages right now, and there is a lot of potential to do expand river-related educational programming.

New Mexico Museum of Natural History and Science/Sandia Mountain Natural History Center. SMNHC, a program of the Museum, hosts APS students for a 4.5-hour environmental education program at its East Mountain location in Cedar Crest. SMNHC also does a substantial amount of external programming around the

state and in the Rio Grande corridor, and has formed partnerships to other outdoor education locations in the MRG such as Whitfield, Elephant Butte, Cochiti, and Bosque del Apache. The Center's programs serve about 12,000 students annually. All programming is aimed primarily at 5th grade students and teaches them about ecology through a variety of hands on, interactive lessons taught in their local ecosystems. In recent years, the Center has been serving fewer students and has had fewer staff due to State and APS budget constraints. SMNHC has implemented a creative partnership with the UNM School of Education to utilize pre-service teaching students; this model could be replicated at other outdoor education locations.

New Mexico State Parks. The State Parks "Outdoor Classroom Program" and the "Kids in Parks" transportation grant program have brought over 100,000 New Mexico students to state parks around New Mexico for outdoor



Candelaria Wetlands. © Marvin DeJong

Appendix D: Key Education Facilities and Programs

learning. The Outdoor Classroom Program is funded by a state appropriation (which reached \$250,000 several years ago, but was eliminated during state budget cutbacks) and the Kids in Parks transportation program is funded by a check-off option on the state income tax return plus some operating budget funds. Last year, the Kids in Parks program received application requests from schools totaling \$50,000, but could fund only \$20,000 in transportation grants.

Project WET. Project WET is an international organization that provides hands-on curriculum and training for teachers who learn how to incorporate water education into their classroom. In NM, free Project WET workshops are offered by ABCWUA/BEMP, DGF, and Environmental Education Association of NM (EEANM). Curriculum guides are purchased for teachers by Lockheed Martin Sandia National Laboratories. <http://www.projectwet.org/>.

Querencia Institute. This is a multi-agency collaboration (federal, state, schools, community-based groups) focused on delivering creative, hands-on work projects for youth in the outdoors. The hands-on projects (e.g. rainwater harvesting for wildlife and organic garden, energy audit, river rafting, riparian plant restoration) are designed to explore 3 topics: ecology, sustainable living, and cultural anthropology. The work of the Institute addresses all 3 categories: conservation, education, and recreation. The Institute is tentatively housed at the National Hispanic Cultural Center. The Institute serves approximately 30 youth during the summer, with additional projects during the school year. The educational collaboration consists of 3 high schools, 2 federal agencies, 3 city/county natural resources management agencies, 1 university, 10 non-profit environmental groups, and 5 local businesses.

Rio Grande Nature Center State Park/Friends of Rio Grande Nature Center. The park is one of the most popular natural attractions in Albuquerque and the Middle Rio Grande, and is one of the most important environmental education facilities in the State. Accomplished staff and volunteers at the park provide diverse, high quality programming for over 197,000 visitors annually. Environmental education programming reaches over 15,500 students annually. Through partnerships with other entities, State Parks has also successfully trained hundreds of teachers to utilize the Bosque Education Guide. Numerous special programs, including festivals, lectures, and other presentations are offered at the park each year.

Rio Rancho Public Schools and Rio Rancho Water Utility. Rio Rancho Public Schools does a “River Exchange Program” with Southern Sandoval County Arroyo Flood Control Authority (SCAFCA) to bring Rio Rancho 5th graders to the river to learn about conservation. RRPS also bought 100 copies of *Last Child in the Woods*; every principal and 38 district resource specialists, school board members, and other decision makers got a copy to stimulate a “community read” about outdoor/environmental education. The City’s Water Conservation Office provides a half-day field trip to their Children’s Water Festival for all fourth-grade students. The Water Conservation Office also provides in-class presentations about water conservation, water quality, and watersheds, as well as offering tours of both their largest facility that removes naturally-occurring arsenic from drinking water and the wastewater treatment facility. <http://www.ci.rio-rancho.nm.us>.

Appendix D: Key Education Facilities and Programs

River Source. River Source provides watershed science and policy education, planning, monitoring, ecological restoration (and promoting collaboration). On the education front, River Source currently works with 20 schools and 1,000 students each year to engage youth in hands-on watershed science with a service learning approach to inform communities about the health of rivers.

RiverXchange. This water education organization combines a year-long water resources curriculum with class partnerships through social networking technology. Approximately 45 New Mexico fifth grade classes are partnered with “high tech pen pals” in another part of the U.S. or world to share what they are learning about critical water resources issues relating to their local river.

Save Our Bosque Task Force/Socorro Soil & Water Conservation District. SOBTF partners with SSWCD to offer an educational program at Otero Park in Socorro County. The program takes 4th and 5th graders from a charter school to the river on a monthly basis to integrate

language arts, art, bird watching, water chemistry, and soil science into outdoor learning.

Whitfield Wildlife Conservation Area.

WWCA is a project of the Valencia Soil and Water Conservation District (VSWCD) to develop and manage this 97-acre area just north of Belen. The primary focus is directed towards field and wetland restoration, wildlife conservation, and environmental education. Whitfield has a small visitor/education center and retired teachers serving as volunteers provide high quality environmental education programs that serve all grades, but primarily 4th and 5th graders. Whitfield also partners with Audubon New Mexico and the Sandia Mountain Natural History Center for programming. These programs are serving about 3,600 students per year, a majority of whom are from minority populations. The Friends of Whitfield raises funds to pay for bus transportation (currently about \$2,000/year). Whitfield is growing in popularity and has substantial potential to larger numbers of MRG residents and visitors provided sufficient funding is available.



Gathering monsoon clouds over Bosque del Apache National Wildlife Refuge. © Marvin DeJong

Middle Rio Grande Conservation Initiative

Appendix E: Process and Public Involvement

Secretary of the Interior Ken Salazar appointed the Secretary's Committee for the Rio Grande Conservation Initiative on January 5, 2012 during a public meeting at the Rio Grande Nature Center State Park in Albuquerque that brought together over 100 Middle Rio Grande stakeholders. Secretary Salazar directed that the process of developing a report be stakeholder and citizen-driven to the extent possible. Following its establishment, the Secretary's Committee utilized several mechanisms to engage the public and encourage oral and written input from the public.

From January through June 2012, the Secretary's Committee held nine meetings of the full Committee. The Secretary's Committee also established three subcommittees (Conservation, Recreation, and Education). These subcommittees held a total of ten working meetings. The Secretary's Committee also held special public meetings in Valencia County and Socorro County, and held several other special meetings to collect information and input on key subjects. Total attendance at the public meetings was 214.

The Committee also did targeted outreach to the four county governments and six Pueblos in the MRG. Committee representatives attended three meetings of the Coalition of Six Middle Rio Grande Pueblos, and reached out directly to Pueblo governors and staff on three other occasions to share information of particular concern to the Pueblos and to invite input.

The Committee built on the attendance at the January 5 meeting to develop a list of stakeholders for the Middle Rio Grande and used this list to disseminate information about the process. A

press release went out that explained the project. The Committee established a project web page at the MRGESCP web site (www.middle-riogrande.com) and a project email account (middleriograndeplan@gmail.com). Over several months, the MRG project web page had just under 800 visitors and 7,559 page views.

A public meeting calendar, meeting notes, key background documents related to the Committee's work, a Public Comment Form, and drafts of the Recommendations and full Report were posted on the website and announced to the stakeholder list. The Public Comment Forms provided "scoping-type" input could be submitted via email or in person. These comments were used to surface key issues, identify ongoing successful work in the MRG, and propose actions and recommendations. In addition to extensive discussions at its full meetings and subcommittee meetings, which provided significant public input, the Committee received twenty individualized emailed and written public comment forms and letters as well as another 1,562 email comments (all of these contained identical content). The identical emails came from individuals in forty-five states as well as foreign countries.

The Committee also invited public comment on the draft recommendations and the entire draft report. The Committee received an additional twenty-one written comment letters through these processes.

Middle Rio Grande Conservation Initiative

Endnotes and References

Introduction

1. Title to some of the lands and facilities within MRGCD is in dispute between the District and the U.S. Bureau of Reclamation.

Pueblo Perspectives and Issues

1. This total does not include other lands claimed by pueblos and is only a fraction of the lands to which the pueblos are culturally connected and that they used prior to European arrival in New Mexico.

2. Key federal and state statutes and Executive Orders include: American Indian Religious Freedom Act, Native American Graves Protection and Repatriation Act, Section 106 of the National Historic Preservation Act, National Environmental Policy Act, Archaeological Resources Protection Act, Presidential Executive Order 13007 (Sacred Sites); Presidential Executive Order 13175 (Consultation and Coordination with Indian Tribal Governments), Governor of the State of New Mexico Executive Order 2005-004 (Tribal Consultation). New Mexico Tribal Consultation Act.

Conservation

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Burlington Northern Santa Fe railroad passes over wetlands at Bosque del Apache NWR. © Marvin DeJong

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White-tailed deer along floodplain of the Middle Rio Grande. © Marvin DeJong

